

Supplementary Table 1. Main characteristics of controls from MCC-Spain Study eligible for the analysis of toenail Zn determinants (Total sample, n=3,448) and those with available genetic information (Genetic sample, n=2,351)

Variable	Total sample	Genetic sample	p-value
Participants	3448 (100 %)	2351 (100 %)	
<i>Sociodemographic characteristics</i>			
Sex			<0.01
Male	1707 (49.5 %)	1267 (53.9 %)	
Female	1741 (50.5 %)	1084 (46.1 %)	
Age (mean $\pm$ SD)	62.5 $\pm$ 12.1	62.8 $\pm$ 11.9	0.05
Age (categorized)			0.01
<56 years	954 (27.7 %)	611 (26.0 %)	
56-69 years	1387 (40.2 %)	987 (42.0 %)	
>69 years	1107 (32.1 %)	753 (32.0 %)	
Education			0.10
Primary	1668 (48.4 %)	1158 (49.3 %)	
Secondary	1037 (30.1 %)	710 (30.2 %)	
University	743 (21.5 %)	483 (20.5 %)	
Ethnicity			<0.01
Non-European	51 (1.5 %)	0 (0.0 %)	
European	3394 (98.4 %)	2351 (100 %)	
Unknown	3 (0.1 %)	0 (0.0 %)	
<i>Anthropometry and habits</i>			
BMI (kg/m <sup>2</sup> , mean $\pm$ SD)	26.6 $\pm$ 4.3	26.6 $\pm$ 4.2	0.55
BMI (kg/m <sup>2</sup> , categorized)			<0.01
<25	1259 (36.5 %)	850 (36.2 %)	
25-30	1308 (37.9 %)	940 (40.0 %)	
>30	636 (18.5 %)	418 (17.8 %)	
Unknown	245 (7.1 %)	143 (6.0 %)	
Smoking status			0.03
Never	1534 (44.5 %)	1011 (43.0 %)	
Former smoker	1170 (33.9 %)	821 (34.9 %)	
Current smoker	732 (21.3 %)	513 (21.8 %)	
Unknown	12 (0.4 %)	6 (0.2 %)	
N. of cigarettes/day current smokers	18.1 (11.9)	19.0 (12.0)	0.85
Physical activity (METS/week)			<0.01
0 METs /week	1374 (39.9 %)	947 (40.3 %)	
<8 METs /week	282 (8.2 %)	187 (8.0 %)	
8-15.9 METs /week	366 (10.6 %)	241 (10.3 %)	
>=16 METs /week	1390 (40.3 %)	976 (41.4 %)	
Unknown	36 (1.0 %)	0 (0.0 %)	
<i>Diet</i>			
Adherence to Mediterranean diet			0.02
Low	2461 (71.4 %)	1713 (72.9 %)	
High	708 (20.5 %)	454 (19.3 %)	
Unknown	279 (8.1 %)	184 (7.8 %)	
Total energy intake (kcal/d, mean $\pm$ SD)	1897 (629)	1894 (614)	0.67
Ethanol intake (g/d, mean $\pm$ SD)	10.8 (15.3)	11.2 (15.8)	0.01
Fibre intake (g/d, mean $\pm$ SD)	22.5 (9.7)	22.2 (9.1)	0.13
Zinc intake (g/d, mean $\pm$ SD)	9.3 (2.9)	9.3 (2.9)	0.83
Supplement intake			0.03
No	2806 (81.4 %)	1978 (84.1 %)	
Yes, not specified	137 (4.0 %)	82 (3.5 %)	
Yes, containing zinc	135 (3.9 %)	94 (4.0 %)	
Unknown	370 (10.7 %)	197 (8.4 %)	
<i>Other environmental sources</i>			
Zn in soil (mg/kg, mean $\pm$ SD)	4.36 $\pm$ 0.4	4.37 $\pm$ 0.4	0.03
Any Zn-emitting industry within 3km			
No	2312 (67.1 %)	1446 (61.5 %)	
Yes	1128 (32.7 %)	900 (38.3 %)	
Unknown	8 (0.2 %)	5 (0.2 %)	
<i>Other characteristics</i>			
Season of toenail collection			<0.01
Winter	997 (28.9 %)	752 (32.0 %)	
Spring	1033 (29.9 %)	654 (27.8 %)	
Summer	420 (12.2 %)	304 (12.8 %)	
Autumn	607 (17.6 %)	406 (17.3 %)	
Unknown	391 (11.4 %)	235 (10.1 %)	
Toenail samples' weight (g, mean $\pm$ SD)	0.026 $\pm$ 0.023	0.026 $\pm$ 0.021	0.91
Province			<0.01
Madrid	655 (19.0 %)	569 (24.2 %)	
Barcelona	729 (21.2 %)	407 (17.3 %)	

Variable	Total sample	Genetic sample	p-value
Navarra	243 (7.0 %)	113 (4.8 %)	
Gipuzkoa	347 (10.1 %)	299 (12.7 %)	
Leon	420 (12.2 %)	260 (11.1 %)	
Asturias	227 (6.6 %)	149 (6.3 %)	
Murcia	36 (1.0 %)	0 (0%)	
Huelva	101 (2.9 %)	21 (0.9 %)	
Cantabria	329 (9.5 %)	290 (12.3 %)	
Valencia	124 (3.6 %)	85 (3.6 %)	
Granada	160 (4.6 %)	131 (5.6 %)	
Girona	77 (2.2 %)	27 (1.1 %)	

Note: MCC-Spain is a population-based multicase-control study (2008-2013) designed to explore environmental factors associated with five types of cancer. n=3,448 is the group of controls included in this work with available toenail Zn data. n=2,351 is the group of controls included in this work with available toenail Zn and genetic data. Data are n (%) or mean  $\pm$  SD. p-value obtained using one-way ANOVA or Kruskal-Wallis for continuous variables or Pearson chi-square test for categorical variables. BMI: Body mass index; N.: number of participants; METs: metabolic equivalents of task; g/d: grams per day; mg/d: milligrams per day; SD: standard deviation.

Supplementary Table 2. Main characteristics of the genes related to Zinc metabolism and transportation

Gene name (HGNC)	Ensemble gene ID	Position	Included in this work	Pubmed.ID
<i>MMP1</i>	ENSG00000196611	11: 102789401-102798160	Yes	24978435
<i>MMP10</i>	ENSG00000166670	11: 102770502-102780628	Yes	24978435
<i>MMP11</i>	ENSG00000099953	22: 23768226-23784316	Yes	24978435
<i>MMP14</i>	ENSG00000157227	14: 22836560-22849041	Yes	24978435;24978435
<i>MMP15</i>	ENSG00000102996	16: 58025754-58046901	Yes	24978435
<i>MMP2</i>	ENSG00000087245	16: 55389700-55506691	Yes	24978435
<i>MMP3</i>	ENSG00000149968	11: 102835801-102843609	Yes	24978435
<i>MMP7</i>	ENSG00000137673	11: 102520508-102530750	Yes	24978435
<i>MMP9</i>	ENSG00000100985	20: 46008908-46016561	Yes	24978435
<i>MT1A</i>	ENSG00000205362	16: 56638666-56640087	Yes	14568174
<i>MT1E</i>	ENSG00000169715	16: 56625475-56627112	Yes	14568174
<i>MT1X</i>	ENSG00000187193	16: 56682470-56684196	Yes	14568174
<i>MTF1</i>	ENSG00000188786	1: 37809574-37859592	Yes	14568174
<i>SLC30A1</i>	ENSG00000170385	1: 211571568-211579161	Yes	14568174
<i>SLC30A10</i>	ENSG00000196660	1: 219685427-219959018	Yes	27833104
<i>SLC30A2</i>	ENSG00000158014	1: 26037252-26046118	Yes	26084690
<i>SLC30A4</i>	ENSG00000104154	15: 45479606-45522755	Yes	26084690
<i>SLC30A5</i>	ENSG00000145740	5: 69093991-69131069	Yes	24745988
<i>SLC30A7</i>	ENSG00000162695	1: 100896076-100981757	Yes	26084690
<i>SLC30A8</i>	ENSG00000164756	8: 116950273-117176714	Yes	23506888
<i>SLC30A9</i>	ENSG00000014824	4: 41990502-42090461	Yes	27833104
<i>SLC39A1</i>	ENSG00000143570	1: 153959099-153968184	Yes	26084690
<i>SLC39A10</i>	ENSG00000196950	2: 195575977-195737702	Yes	22050752
<i>SLC39A14</i>	ENSG00000104635	8: 22367278-22434129	Yes	23506906
<i>SLC39A2</i>	ENSG00000165794	14: 20999255-21001871	Yes	26084690
<i>SLC39A3</i>	ENSG00000141873	19: 2732204-2740028	Yes	26084690
<i>SLC39A6</i>	ENSG00000141424	18: 36108531-36129385	Yes	26084690
<i>SLC39A7</i>	ENSG00000112473	6: 33200445-33204439	Yes	23478540
<i>SLC39A8</i>	ENSG00000138821	4: 102251080-102431258	Yes	23506906
<i>SLC39A9</i>	ENSG00000029364	14: 69398015-69462390	Yes	28479083
<i>ZEB1</i>	ENSG00000148516	10: 31318495-31529814	Yes	29028100
<i>MMP13</i>	ENSG00000137745	11: 102942995-102955732	No	24978435
<i>MMP26</i>	ENSG00000167346	11: 4704784-4992431	No	24978435
<i>MT1G</i>	ENSG00000125144	16: 56666730-56668065	No	26959009
<i>MT2A</i>	ENSG00000125148	16: 56608584-56609497	No	26959009
<i>MT3</i>	ENSG00000087250	16: 56589074-56591088	No	24648996
<i>MT4</i>	ENSG00000102891	16: 56565073-56568957	No	26959009
<i>SLC30A3</i>	ENSG00000115194	2: 27253684-27275817	No	23506888
<i>SLC39A4</i>	ENSG00000147804	8: 144409742-144416844	No	26084690
<i>TIMP1</i>	ENSG00000102265	X: 47582408-47586789	No	24978435

Note: HGNC: HUGO Gene Name Committee gene name and symbol; Ensemble gene ID: Ensemble gene identifier; Position: position in Genome Reference Consortium Human Build 38; PubMed ID: PubMed identification number.

Supplementary Table 3. Main characteristics of the single nucleotide polymorphisms (SNPs) included in the study and their association with toenail Zn.

SNP	Chrom	Position	Gene name (HGNC)	MAF	HWE	Reference allele	Effect allele	N	Wild	Heter	Homo	βZn
rs10493941	1	100980265	SLC30A7	0.147	0.034	G	A	2351	1722	565	64	0.125
rs1547387	6	33202118	SLC39A7	0.107	0.489	C	G	2351	1879	442	30	0.004
rs17577	20	46014472	MMP9	0.141	0.927	G	A	2351	1737	567	47	-0.077
rs11989843	8	117138754	SLC30A8	0.196	0.002	A	G	2351	1543	694	114	0.129
rs12447804	16	58041378	MMP15	0.150	0.486	G	A	2351	1704	590	57	0.198
rs17180544	2	195686010	SLC39A10	0.166	0.236	A	G	2351	1642	636	73	0.047
rs4908107	1	100913091	SLC30A7	0.133	0.410	G	A	2351	1773	532	46	0.252
rs3087816	1	100976219	SLC30A7	0.185	0.598	A	G	2351	1556	718	77	-0.064
rs1051647	8	22421885	SLC39A14	0.061	0.223	A	G	2351	2078	261	12	0.040
rs17732614	1	37844125	MTF1	0.173	0.844	A	G	2351	1608	671	72	0.216
rs1785919	18	36112001	SLC39A6	0.375	0.546	G	A	2351	926	1088	337	0.091
rs11541998	16	55502851	MMP2	0.133	0.801	G	C	2351	1767	544	40	0.081
rs2239008	11	102790349	MMP1	0.175	0.232	G	A	2351	1590	697	64	-0.050
rs2433600	15	45484226	SLC30A4	0.123	0.806	G	A	2351	1809	508	34	-0.178
rs28411034	1	37811325	MTF1	0.262	0.370	G	A	2351	1272	926	153	0.012
rs3748682	1	37814315	MTF1	0.236	0.001	A	G	2351	1408	774	169	0.116
rs2466294	8	117172824	SLC30A8	0.444	0.134	C	G	2351	744	1125	482	-0.180
rs337257	5	69095723	SLC30A5	0.244	0.062	C	A	2351	1328	900	123	0.194
rs4976217	5	69106114	SLC30A5	0.213	0.095	G	A	2351	1443	815	93	0.472
rs2071230	11	102790228	MMP1	0.105	0.401	A	G	2351	1885	436	30	0.233
rs4846607	1	219919846	SLC30A10	0.390	0.087	G	A	2351	895	1079	377	-0.098
rs10955804	8	117168851	SLC30A8	0.256	0.149	G	A	2351	1313	870	168	-0.027
rs2234636	14	21000992	SLC39A2	0.379	0.231	A	G	2351	893	1134	324	-0.020
rs11889699	2	195663377	SLC39A10	0.450	0.136	G	A	2351	729	1128	494	-0.055
rs1053605	16	55485695	MMP2	0.075	0.151	G	A	2351	2017	316	18	-0.078
rs679620	11	102842889	MMP3	0.490	0.681	G	A	2351	606	1185	560	-0.065
rs2280521	8	22414482	SLC39A14	0.320	0.600	A	C	2351	1082	1034	235	0.160
rs3759770	14	69400363	SLC39A9	0.480	0.142	G	A	2351	654	1138	559	-0.053
rs738792	22	23779191	MMP11	0.116	0.492	A	G	2351	1841	475	35	-0.108
rs1153829	15	45485146	SLC30A4	0.223	0.852	A	G	2351	1419	817	115	-0.025
rs6700061	1	219924987	SLC30A10	0.080	0.029	G	A	2351	1996	332	23	-0.017
rs10502001	11	102527862	MMP7	0.236	0.315	G	A	2351	1364	865	122	-0.089
rs7833302	8	22398797	SLC39A14	0.151	0.304	G	A	2351	1701	590	60	-0.053
rs2276108	11	102776805	MMP10	0.167	0.028	A	G	2351	1615	685	51	0.079
rs2997452	1	26039058	SLC30A2	0.321	0.624	A	G	2351	1090	1014	247	-0.128
rs12522805	5	69100753	SLC30A5	0.265	0.029	G	A	2351	1248	958	145	0.046
rs1599933	16	56681950	MT1X	0.483	0.965	A	C	2351	630	1173	548	0.028
rs7242481	18	36129254	SLC39A6	0.366	0.701	G	A	2351	940	1100	311	0.026
rs13266634	8	117172544	SLC30A8	0.274	0.929	G	A	2351	1240	936	175	-0.077
rs6998654	8	22370009	SLC39A14	0.096	0.573	G	A	2351	1924	403	24	-0.125
rs1540043	18	36111350	SLC39A6	0.463	0.300	A	C	2351	691	1144	516	-0.065
rs12385913	14	69400121	SLC39A9	0.153	0.772	G	A	2351	1686	612	53	-0.060
rs4619931	4	42072616	SLC30A9	0.268	0.087	A	G	2351	1245	954	152	-0.055
rs4876370	8	117162702	SLC30A8	0.202	0.440	A	G	2351	1503	746	102	0.039
rs7201	16	55505702	MMP2	0.430	0.654	A	C	2351	759	1163	429	0.070
rs183112	16	55493770	MMP2	0.177	0.307	G	A	2351	1599	671	81	0.062
rs2275707	1	219914705	SLC30A10	0.213	0.935	A	C	2351	1458	786	107	-0.158
rs243842	16	55493510	MMP2	0.386	0.030	A	G	2351	910	1065	376	-0.081
rs10282940	8	117175587	SLC30A8	0.103	0.348	G	A	2351	1897	425	29	0.053
rs473279	1	37810130	MTF1	0.328	0.605	A	G	2351	1057	1047	247	-0.084
rs12290253	11	102771530	MMP10	0.199	0.893	A	G	2351	1510	747	94	0.157
rs7349	10	31528977	ZEB1	0.064	0.365	G	A	2351	2057	287	7	0.019
rs1045301	14	69461590	SLC39A9	0.061	0.769	C	A	2351	2071	272	8	-0.109
rs17530357	4	42064294	SLC30A9	0.072	0.551	G	A	2351	2028	309	14	-0.016
rs7945189	11	102789833	MMP1	0.087	0.920	G	A	2351	1962	371	18	-0.016
rs708274	16	56626994	MT1E	0.113	0.797	C	A	2351	1853	467	31	0.013
rs470168	11	102770651	MMP10	0.305	0.604	G	A	2351	1141	986	224	-0.038
rs7519865	1	211574776	SLC30A1	0.153	0.085	G	A	2351	1677	630	44	-0.060
rs11783730	8	22387384	SLC39A14	0.260	0.319	G	A	2351	1277	924	150	0.064
rs6558052	8	22416174	SLC39A14	0.069	0.208	A	G	2351	2043	293	15	-0.088
rs865094	16	55483320	MMP2	0.207	0.933	A	G	2351	1478	773	100	-0.051
rs10113026	8	22405117	SLC39A14	0.204	0.919	G	A	2351	1489	765	97	-0.135

SNP	Chrom	Position	Gene name (HGNC)	MAF	HWE	Reference allele	Effect allele	N	Wild	Heter	Homo	βZn
rs13107325	4	102267552	<i>SLC39A8</i>	0.068	0.102	G	A	2351	2046	289	16	-0.089
rs486055	11	102779693	<i>MMP10</i>	0.117	0.973	G	A	2351	1833	486	32	0.040
rs1042704	14	22843385	<i>MMP14</i>	0.174	0.364	G	A	2351	1597	689	65	0.068
rs11076160	16	56639231	<i>MT1A</i>	0.242	0.195	G	A	2351	1363	839	149	0.024
rs12545568	8	22382355	<i>SLC39A14</i>	0.205	0.450	A	G	2351	1491	755	105	0.193
rs470215	11	102790368	<i>MMP1</i>	0.353	0.855	A	G	2351	982	1078	291	-0.337
rs2072704	1	153963067	<i>SLC39A1</i>	0.162	0.891	G	A	2351	1649	641	61	0.207
rs352636	5	69110126	<i>SLC30A5</i>	0.382	0.295	A	G	2351	910	1086	355	0.024
rs12272341	11	102773870	<i>MMP10</i>	0.114	0.651	G	A	2351	1846	472	33	-0.081
rs4431992	11	102774668	<i>MMP10</i>	0.235	0.183	A	G	2351	1365	868	118	0.156
rs2301234	16	56683070	<i>MT1X</i>	0.412	0.442	C	A	2351	822	1121	408	-0.063
rs6447123	4	42076224	<i>SLC30A9</i>	0.167	0.033	A	G	2351	1618	682	51	0.106
rs7276	14	69462226	<i>SLC39A9</i>	0.195	0.093	A	G	2351	1537	712	102	0.085
rs17576	20	46011586	<i>MMP9</i>	0.389	0.736	A	G	2351	881	1110	360	-0.009
rs4806874	19	2738354	<i>SLC39A3</i>	0.309	0.530	A	G	2351	1129	991	231	-0.052
rs11264743	1	153969038	<i>SLC39A1</i>	0.282	0.921	G	A	2351	1211	954	186	-0.113
rs2464592	8	117171312	<i>SLC30A8</i>	0.362	0.518	A	G	2351	963	1072	316	-0.327
rs10194124	2	195696408	<i>SLC39A10</i>	0.287	0.552	A	G	2351	1200	951	200	-0.153
rs1477017	16	55483250	<i>MMP2</i>	0.332	0.869	A	G	2351	1046	1047	258	-0.077

Note: SNP: dbSNP Reference (rs) number; Chrom: chromosome; Position: position in in Genome Reference Consortium Human Build 38; HGNC: HUGO Gene Name Committee gene name and symbol; MAF: Minor allele frequency (%); HWE: p value of Hardy-Weinberg equilibrium test; N: number of participants genotyped; Wild: number of participants with homozygous wild type; Heter: number of participants with heterozygous variant; Homo: number of participants with homozygous variant; βZn: estimated coefficient for the genetic variant in logistic regression. Logistic regression models were fitted separately for each SNP relating the number of minor alleles (continuously coded as 0 for major-allele homozygous, 1 for heterozygous, and 2 for minor-allele homozygous genotypes) with the log-transformed toenail Zn concentration, adjusting for other SNPs at the same gene, sex, age groups, and province indicators.

Supplementary Table 4. Distribution of total dietary Zn (mg g<sup>-1</sup>) by age, sex, level of education and province.

Total dietary Zn	N	Mean ± SD	Min	p10	Median	p90	Max	p-value
Total	3218	9.268 ± 2.915	0.345	5.995	9.013	12.775	41.041	
Sex								<0.01
Men	1596	9.751 ± 3.014	0.345	6.190	9.521	13.413	32.317	
Women	1622	8.792 ± 2.734	0.843	5.806	8.551	12.017	41.041	
Age								0.01
<56 years	893	9.497 ± 3.104	0.843	6.235	9.158	13.208	41.041	
56-69 years	1299	9.283 ± 2.924	0.345	5.995	8.975	12.794	32.317	
>69 years	1026	9.049 ± 2.716	0.515	5.811	8.870	12.479	21.411	
Education								0.02
Primary	1550	9.149 ± 2.890	0.515	5.863	8.894	12.469	32.317	
Secondary	972	9.327 ± 2.999	0.345	6.057	9.069	12.931	41.041	
University	696	9.451 ± 2.846	1.257	6.292	9.177	13.216	28.140	
Region								0.58
Madrid	596	9.436 ± 2.910	2.316	6.177	9.224	12.773	32.317	
Barcelona	696	9.449 ± 3.240	0.345	6.019	9.056	13.532	41.041	
Navarra	217	8.993 ± 2.766	2.724	5.759	8.875	12.472	22.415	
Gipuzkoa	339	8.377 ± 2.614	1.580	5.428	7.919	11.763	24.496	
Leon	419	9.315 ± 2.208	2.627	6.707	9.217	12.129	18.758	
Asturias	213	9.836 ± 3.021	0.515	6.522	9.583	13.470	22.531	
Murcia	35	10.271 ± 3.068	4.853	6.163	10.436	14.517	17.663	
Huelva	86	8.929 ± 3.419	0.843	5.193	8.428	12.594	29.045	
Cantabria	307	9.193 ± 2.831	0.834	5.869	9.061	13.159	20.203	
Valencia	86	9.355 ± 3.178	1.391	5.975	9.042	13.992	19.137	
Granada	149	9.410 ± 3.363	3.087	5.776	9.160	13.742	23.071	
Girona	75	9.047 ± 2.105	2.811	6.663	8.734	11.718	14.619	

Note: N: number of participants; SD: standard deviation; Min: minimum; p10: 10<sup>th</sup> percentile; p90: 90<sup>th</sup> percentile; Max: maximum. p-value obtained with Pearson chi-square test.

Supplementary Table 5. Distribution of  $PS_{Zn\ 1-out}$  by age, sex, level of education and province.

$PS_{Zn}$	N	Mean $\pm$ SD	Min	p10	Median	p90	Max	p-value
Total	2351	0.286 $\pm$ 0.406	-1.217	-0.235	0.302	0.806	1.845	
Sex								0.26
Men	1.267	0.278 $\pm$ 0.418	-1.094	-0.271	0.309	0.806	1.845	
Women	1084	0.294 $\pm$ 0.390	-1.217	-0.204	0.300	0.807	1.793	
Age								0.59
<56 years	611	0.294 $\pm$ 0.390	-0.866	-0.204	0.325	0.793	1.655	
56-69 years	987	0.296 $\pm$ 0.414	-1.217	-0.245	0.308	0.838	1.845	
>69 years	753	0.265 $\pm$ 0.406	-0.958	-0.251	0.268	0.772	1.698	
Education								0.25
Primary	1.158	0.284 $\pm$ 0.400	-1.217	-0.229	0.300	0.807	1.698	
Secondary	710	0.287 $\pm$ 0.414	-0.866	-0.244	0.323	0.793	1.845	
University	483	0.287 $\pm$ 0.408	-0.853	-0.260	0.285	0.832	1.389	
Province								<0.01
Madrid	569	0.271 $\pm$ 0.409	-0.853	-0.262	0.280	0.790	1.793	
Barcelona	407	0.249 $\pm$ 0.429	-1.217	-0.326	0.248	0.806	1.405	
Navarra	113	0.318 $\pm$ 0.369	-0.621	-0.138	0.343	0.826	1.301	
Gipuzkoa	299	0.313 $\pm$ 0.382	-0.958	-0.183	0.326	0.832	1.362	
Leon	260	0.297 $\pm$ 0.422	-0.866	-0.234	0.294	0.833	1.389	
Asturias	149	0.344 $\pm$ 0.346	-0.655	-0.063	0.364	0.768	1.698	
Murcia	-	-	-	-	-	-	-	
Huelva	21	0.360 $\pm$ 0.450	-0.586	-0.293	0.382	0.844	1.111	
Cantabria	290	0.277 $\pm$ 0.390	-1.094	-0.224	0.278	0.832	1.257	
Valencia	85	0.278 $\pm$ 0.458	-0.780	-0.401	0.294	0.761	1.845	
Granada	131	0.275 $\pm$ 0.424	-0.902	-0.272	0.272	0.870	1.300	
Girona	27	0.380 $\pm$ 0.351	-0.319	-0.053	0.363	0.775	1.251	

Note: N: number of participants; SD: standard deviation; Min: minimum; p10: 10<sup>th</sup> percentile; p90: 90<sup>th</sup> percentile; Max: maximum. p-value obtained with Pearson chi-square test. -: No genetic data.

Supplementary Table 6. Distribution of toenail zinc levels ( $\mu\text{g g}^{-1}$ ) by sex and sociodemographic variables

	Men							Women						
	N	A Mean $\pm$ SD	Min	p10	Median	p90	Max	N	A Mean $\pm$ SD	Min	p10	Median	p90	Max
Total	1707	120.5 $\pm$ 237.8	3.5	70.5	102.6	157.0	9278.1	1741	106.8 $\pm$ 58.1	21.8	72.7	98.2	138.0	1074.7
Age														
<56 years	217	137.0 $\pm$ 181.4	12.3	71.6	102.3	165.6	1727.8	737	105.3 $\pm$ 63.0	25.3	72.5	96.7	134.7	1074.7
56-69 years	826	125.2 $\pm$ 325.4	7.3	71.6	104.1	157.7	9278.1	561	106.8 $\pm$ 46.4	30.5	73.7	100.2	141.7	788.5
>69 years	664	109.3 $\pm$ 52.5	3.5	67.6	100.5	155.2	663.4	443	109.2 $\pm$ 62.7	21.8	70.9	99.8	143.8	964.3
Education														
Primary	848	116.6 $\pm$ 100.8	3.5	69.1	101.0	155.6	1727.8	820	107.9 $\pm$ 66.8	24.0	71.7	98.9	138.8	1074.7
Secondary	488	131.7 $\pm$ 418.2	9.0	71.6	103.4	158.1	9278.1	549	105.2 $\pm$ 45.5	21.8	72.0	97.7	136.8	663.5
University	371	114.9 $\pm$ 83.8	7.3	73.7	104.9	157.0	1539.6	372	106.7 $\pm$ 53.7	41.2	73.5	97.9	136.9	788.5
Ethnicity														
European	1693	120.5 $\pm$ 238.7	3.5	70.5	102.6	156.7	9278.1	1701	106.7 $\pm$ 58.0	21.8	72.8	98.2	137.8	1074.7
Non-European	12	132.7 $\pm$ 79.6	78.4	83.0	103.6	231.6	350.7	39	109.8 $\pm$ 60.5	46.6	60.8	98.3	161.8	409.3
BMI (kg/m <sup>2</sup> )														
<25	456	133.0 $\pm$ 437.9	7.3	70.3	101.1	153.8	9278.1	803	105.5 $\pm$ 56.1	24.0	71.2	97.3	134.7	1005.1
25-30	816	115.8 $\pm$ 88.2	3.5	70.5	102.9	157.0	1727.8	492	106.9 $\pm$ 58.5	30.4	72.7	98.6	137.2	964.3
>30	364	114.5 $\pm$ 64.9	12.1	69.3	102.4	158.1	676.8	272	111.7 $\pm$ 73.4	25.3	75.6	101.1	146.0	1074.7
Physical activity (METs/week)														
T1:0.00	650	130.3 $\pm$ 367.1	7.3	71.5	103.5	157.2	9278.1	724	106.3 $\pm$ 52.9	28.8	72.8	98.4	139.5	964.3
T2: Men 0.01-24.00; Women 0.01-17.09	485	116.8 $\pm$ 102.8	9.0	72.1	104.6	158.0	1727.8	427	106.9 $\pm$ 61.2	21.8	74.0	98.3	136.9	1074.7
T3: Men>24.00; Women >17.09	550	112.7 $\pm$ 82.7	3.5	67.5	99.9	154.2	1539.6	576	107.4 $\pm$ 62.5	30.5	71.5	98.2	136.1	1005.1
Smoking status														
Never	499	106.0 $\pm$ 49.0	3.5	70.1	99.6	145.8	663.4	1035	106.4 $\pm$ 52.6	21.8	70.4	98.3	139.0	964.3
Former smoker	825	117.4 $\pm$ 88.7	19.1	71.5	103.7	161.6	1727.8	345	106.2 $\pm$ 68.3	30.4	73.4	96.3	136.6	1074.7
Current smoker	373	147.2 $\pm$ 487.5	7.3	69.1	104.0	165.9	9278.1	359	108.5 $\pm$ 62.5	25.3	75.6	99.7	136.9	1005.1
Total Zn intake (g/day)														
T1: Men <8.44; Women <7.52	532	118.2 $\pm$ 86.1	3.5	68.9	103.3	162.5	1344.1	539	106.8 $\pm$ 56.4	21.8	70.7	97.8	139.2	788.5
T2: Men 8.44-10.62; Women 7.52-9.57	533	128.1 $\pm$ 404.9	7.3	71.3	100.2	143.5	9278.1	542	106.6 $\pm$ 56.4	46.6	72.0	98.5	137.2	1005.1
T3: Men >10.62; Women >9.57	531	116.6 $\pm$ 95.5	9.0	71.5	104.1	158.9	1727.8	541	106.4 $\pm$ 64.4	25.3	73.6	97.0	135.3	1074.7
Supplement intake														
No	1443	121.8 $\pm$ 257.5	3.5	70.5	102.2	157.2	9278.1	1363	105.8 $\pm$ 52.5	21.8	72.0	97.7	137.5	1005.1
Yes, not specified	45	106.7 $\pm$ 32.2	49.8	73.9	106.6	145.7	227.6	92	123.4 $\pm$ 137.7	57.5	72.7	99.9	145.3	1074.7
Yes, containing zinc	39	107.2 $\pm$ 30.1	30.9	72.9	103.1	146.8	173.7	96	103.8 $\pm$ 25.8	62.6	73.7	101.2	136.5	185.7
Zn soil (mg/kg)														
T1: Men <4.21; Women <4.14	575	117.7 $\pm$ 105.0	12.2	72.6	101.3	158.1	1727.8	596	109.4 $\pm$ 71.4	28.8	76.4	99.2	136.9	1074.7
T2: Men 4.21-4.63; Women 4.14-4.58	521	111.1 $\pm$ 87.7	3.5	67.5	100.8	144.4	1344.1	599	105.5 $\pm$ 48.7	24.0	74.0	98.6	139.0	964.3
T3: Men>4.63; Women >4.58	600	131.8 $\pm$ 378.9	19.1	70.7	105.5	164.9	9278.1	542	105.3 $\pm$ 51.0	21.8	68.0	96.9	139.4	695.7
Any Zn-emitting industry within 3km														
No	1079	117.8 $\pm$ 92.9	3.5	71.6	103.1	161.6	1727.8	1233	107.0 $\pm$ 57.3	21.8	72.8	98.8	137.2	1074.7



	Men							Women						
	N	AMean ± SD	Min	p10	Median	p90	Max	N	AMean ± SD	Min	p10	Median	p90	Max
Yes	622	125.2 ± 374.6	9.0	68.3	101.1	150.9	9278.1	506	106.3 ± 59.9	24.0	72.3	96.3	139.3	964.3
Season of collection														
Winter	475	133.7 ± 424.2	3.5	70.1	103.7	164.3	9278.1	522	106.8 ± 54.5	25.3	72.0	100.1	138.1	964.3
Spring	499	115.5 ± 94.7	7.3	72.7	102.1	151.0	1727.8	534	105.9 ± 37.5	21.8	74.5	98.4	142.0	409.3
Summer	230	116.2 ± 106.1	40.8	69.7	100.3	159.8	1539.6	190	112.8 ± 108.5	30.4	69.3	96.9	130.7	1074.7
Autumn	291	111.1 ± 83.0	9.0	69.4	100.0	148.5	1194.9	316	105.3 ± 60.6	28.8	72.7	96.4	136.1	788.5
Polygenic risk score (PS <sub>Zn</sub> )														
<0.11	430	104.4 ± 48.5	7.3	68.6	96.7	145.0	676.8	359	107.0 ± 80.9	28.8	69.7	94.0	134.3	1005.1
0.11-0.47	417	141.1 ± 460.5	15.0	64.8	101.9	168.9	9278.1	363	103.6 ± 59.8	24.0	70.7	95.7	137.2	1074.7
>0.47	420	118.8 ± 99.9	3.5	75.4	106.7	152.7	1539.6	362	110.7 ± 53.3	45.4	73.7	105.4	141.7	788.5
Polygenic risk score (PS <sub>Zn 1-out</sub> )														
<0.10	418	109.2 ± 49.6	7.3	69.3	101.1	154.1	676.8	355	111.2 ± 81.1	28.8	72.7	99.0	144.7	1005.1
0.10-0.47	434	144.1 ± 456.6	9.0	68.2	102.5	167.5	9278.1	364	105.7 ± 62.6	25.3	69.5	96.4	139.4	1074.7
>0.47	415	109.4 ± 70.5	3.5	71.8	101.8	144.6	1344.1	365	104.5 ± 49.9	24.0	72.0	97.0	131.4	788.5
Province														
Madrid	313	117.4 ± 59.0	7.3	78.7	105.6	164.4	676.8	342	114.7 ± 66.8	25.3	78.2	102.9	152.7	964.3
Barcelona	454	119.5 ± 63.1	21.1	77.3	108.1	162.5	746.0	275	109.8 ± 53.2	48.5	68.2	100.5	148.7	695.7
Navarra	74	128.7 ± 170.0	37.4	77.3	103.0	157.7	1539.6	169	107.1 ± 63.1	30.4	80.7	99.0	127.9	788.5
Gipuzkoa	89	207.1 ± 973.5	40.8	62.9	92.1	163.5	9278.1	258	101.6 ± 50.4	21.8	67.6	93.1	138.2	663.5
Leon	223	112.8 ± 118.9	30.9	70.7	96.8	142.6	1727.8	197	110.4 ± 98.1	46.3	76.4	96.7	131.3	1074.7
Asturias	104	119.5 ± 70.0	9.0	77.5	106.3	158.9	575.3	123	108.1 ± 27.0	41.2	77.6	107.6	140.4	208.1
Murcia	25	131.2 ± 59.0	63.7	85.4	115.6	199.9	350.7	11	112.7 ± 27.1	60.0	88.8	110.7	149.9	151.2
Huelva	58	132.2 ± 150.0	62.7	78.4	102.4	153.9	1194.9	43	105.4 ± 25.0	60.2	75.0	105.4	137.8	178.0
Cantabria	166	91.9 ± 39.7	12.1	54.0	86.5	134.1	340.6	163	93.2 ± 21.6	43.7	69.3	89.8	120.6	166.2
Valencia	68	108.0 ± 56.6	19.1	49.4	101.3	168.9	417.7	56	99.0 ± 23.3	64.0	69.0	92.3	132.3	149.7
Granada	109	120.1 ± 125.9	40.0	65.4	102.4	151.5	1344.1	51	103.2 ± 28.5	24.0	70.9	103.8	132.6	180.0
Girona	24	106.8 ± 35.1	3.5	83.5	98.7	153.0	168.5	53	100.8 ± 22.3	61.8	80.1	98.1	128.4	154.4

Note: N: number of participants; Amean: Arithmetic mean; CI: confidence interval; SD: standard deviation; Min: minimum; p10: 10thpercentile; p90: 90thpercentile; Max: maximum; BMI: Body mass index; T: tertile; METs: metabolic equivalents of task; mg/d: milligrams per day.

Supplementary Table 7. Distribution of toenail Zn levels ( $\mu\text{g g}^{-1}$ ) by sex and diet-related variables

	Men							Women						
	N	A Mean	Min	p10	Median	p90	Max	N	Mean	Min	p10	Median	p90	Max
Total	1707	120.5 ± 237.8	3.5	70.5	102.6	157.0	9278.1	1741	106.8 ± 58.1	21.8	72.7	98.2	138.0	1074.7
Total energy intake (Kcal/day)														
T1: Men <1736; Women <1500	532	115.7 ± 83.0	3.5	68.9	102.1	156.1	1344.1	540	107.9 ± 61.1	21.8	70.8	98.4	140.4	788.5
T2: Men 1736-2222; Women 1500-1913	532	132.8 ± 406.0	7.3	71.1	102.4	165.6	9278.1	541	102.9 ± 32.8	31.9	72.6	96.7	136.1	432.2
T3: Men >2222; Women >1913	532	114.5 ± 94.4	9.0	71.3	102.8	154.1	1727.8	541	109.0 ± 75.3	25.3	73.5	98.2	136.0	1074.7
Ethanol intake (g/day)														
T1: Men <4.60; Women 0.00	529	114.8 ± 69.2	7.3	70.1	102.0	160.2	746.0	594	106.0 ± 61.6	30.4	73.4	96.4	135.1	1005.1
T2: Men 4.60-20.13; Women 0.01-4.40	535	132.9 ± 404.4	3.5	71.3	104.6	156.5	9278.1	482	110.4 ± 75.7	24.0	73.5	98.4	144.1	1074.7
T3: Men >20.13; Women >4.40	532	115.2 ± 106.8	12.3	70.0	101.6	153.8	1727.8	546	103.9 ± 34.7	21.8	69.7	98.7	139.2	432.2
Coffee intake (g/day)														
<50.00	355	113.0 ± 79.1	3.5	67.6	101.1	155.4	1194.9	360	105.1 ± 40.8	34.6	73.9	97.7	139.3	663.5
50.00-100.00	759	114.4 ± 91.5	7.3	70.7	101.5	153.5	1727.8	762	105.7 ± 61.4	21.8	70.7	97.5	135.7	1074.7
>100.00	482	137.2 ± 426.0	12.2	71.3	105.3	165.9	9278.1	500	109.1 ± 66.4	30.4	73.6	98.4	141.7	1005.1
Fibre intake (g/day)														
T1: Men <18.20; Women <17.87	532	141.3 ± 411.5	12.1	70.5	104.3	169.1	9278.1	541	105.6 ± 46.6	21.8	71.7	97.4	135.7	663.5
T2: Men 18.20-25.09; Women 17.87-24.15	532	108.2 ± 43.7	3.5	70.3	101.8	150.9	543.9	540	106.4 ± 52.0	24.0	74.5	98.4	141.8	1005.1
T3: Men >25.09; Women >24.15	532	113.4 ± 94.5	9.0	70.9	102.0	148.9	1727.8	541	107.8 ± 75.0	30.4	71.2	97.5	136.0	1074.7
Meat intake (g/day)														
T1: Men <72.72; Women <54.36	532	112.0 ± 60.4	16.6	70.0	101.2	156.1	746.0	540	105.7 ± 57.2	21.8	71.6	97.5	136.5	788.5
T2: Men 72.72-109.81; Women 54.36-82.47	532	115.5 ± 79.3	7.3	69.3	102.8	155.4	1344.1	541	105.9 ± 54.3	30.5	72.7	97.1	139.2	1005.1
T3: Men >109.81; Women >82.47	532	135.5 ± 413.0	3.5	72.9	102.9	160.8	9278.1	541	108.1 ± 65.4	25.3	73.8	98.4	136.4	1074.7
Fish intake (g/day)														
T1: Men <49.73; Women <43.03	531	138.5 ± 413.2	12.1	69.7	102.4	158.9	9278.1	540	109.1 ± 66.6	21.8	73.8	98.3	139.3	964.3
T2: Men 49.73-76.50; Women 43.03-66.96	534	111.1 ± 52.8	7.3	70.9	102.2	155.1	746.0	541	104.9 ± 43.6	30.5	73.4	98.9	135.7	695.7
T3: Men >76.50; Women >66.96	531	113.4 ± 84.7	3.5	70.5	102.6	156.0	1727.8	541	105.8 ± 64.5	31.9	71.6	96.1	137.8	1074.7
Vegetables and legumes (g/day)														
T1: Men <230.12; Women <243.65	532	135.7 ± 406.2	12.1	70.3	103.4	158.9	9278.1	540	103.7 ± 41.4	21.8	70.2	96.9	134.6	663.5
T2: Men 230.12-340.56; Women 243.65-344.87	533	112.8 ± 80.2	3.5	70.0	102.0	155.2	1539.6	541	103.8 ± 37.5	24.0	71.6	96.6	140.4	536.4
T3: Men >340.56; Women >344.87	531	114.4 ± 95.2	12.3	71.3	102.0	155.1	1727.8	541	112.3 ± 85.7	46.3	74.0	100.2	136.6	1074.7
Fruits intake (g/day)														
T1: Men <221.20; Women <249.59	532	131.6 ± 403.6	12.1	72.9	103.5	158.0	9278.1	540	103.0 ± 32.2	21.8	71.0	97.4	136.6	383.1
T2: Men 221.20-390.74; Women 249.59-420.68	532	115.8 ± 109.0	3.5	68.3	101.2	153.9	1727.8	541	107.3 ± 57.8	24.0	74.4	97.5	137.8	964.3
T3: Men >390.74; Women >420.68	532	115.5 ± 76.6	7.3	70.7	102.8	156.1	1194.9	541	109.5 ± 78.1	30.4	72.7	98.2	138.0	1074.7
Edible fats intake (g/day)														
<15.00	504	119.7 ± 121.5	3.5	69.9	104.3	156.5	1727.8	369	102.8 ± 39.8	21.8	73.2	97.1	134.9	663.5
15.00-37.50	848	113.4 ± 60.7	7.3	71.5	102.3	156.1	746.0	864	108.4 ± 59.1	24.0	73.1	99.2	140.5	1005.1
>37.50	244	149.8 ± 592.2	31.2	70.5	100.5	161.6	9278.1	389	106.1 ± 73.0	25.3	70.4	95.6	136.1	1074.7

	Men							Women						
	N	AMean	Min	p10	Median	p90	Max	N	Mean	Min	p10	Median	p90	Max
Nuts intake (g/day)														
<=1-3 month	888	127.2 ± 319.9	9.0	69.7	102.1	161.6	9278.1	943	106.0 ± 54.9	21.8	72.0	97.1	136.4	1074.7
1-4 week	475	107.2 ± 46.2	3.5	67.5	101.0	142.4	663.4	450	106.0 ± 60.3	31.9	71.0	99.7	137.9	1005.1
>=5-6 week	233	125.5 ± 133.1	23.9	78.7	106.4	156.1	1727.8	229	110.3 ± 72.2	46.6	76.6	97.3	146.0	964.3
Dairy products (g/day)														
T1: Men <250.37; Women <290.02	532	135.6 ± 410.4	3.5	73.0	103.6	158.0	9278.1	542	107.0 ± 51.7	21.8	72.0	98.6	137.8	788.5
T2: Men 250.37-415.23; Women 290.02-472.27	533	113.5 ± 78.5	7.3	70.5	102.4	155.2	1539.6	539	103.1 ± 39.3	40.3	71.7	96.2	135.7	663.5
T3: Men >415.23; Women >472.27	531	113.9 ± 76.8	9.0	68.9	101.9	157.2	1194.9	541	109.6 ± 79.2	25.3	73.4	98.2	141.7	1074.7
Cereals intake (g/day)														
T1: Men <179.42; Women <133.17	532	121.0 ± 98.6	12.2	69.1	103.5	160.8	1344.1	540	108.8 ± 62.0	21.8	73.8	98.1	140.4	788.5
T2: Men 179.42-248.02; Women 133.17-186.45	532	112.5 ± 76.8	3.5	72.1	101.0	161.7	1539.6	541	104.7 ± 48.7	24.0	71.5	98.2	136.1	1005.1
T3: Men >248.02; Women >186.45	532	129.4 ± 406.3	9.0	70.5	102.9	148.9	9278.1	541	106.3 ± 65.4	31.9	72.8	97.0	136.6	1074.7
Eggs intake (frequency)														
<=2-3 month	317	129.2 ± 107.0	16.6	70.5	106.8	178.8	1344.1	281	108.6 ± 62.5	21.8	71.6	97.6	139.0	788.5
1-2 week	872	109.2 ± 70.0	3.5	69.6	100.6	149.9	1727.8	880	103.8 ± 45.5	24.0	70.5	97.9	136.2	964.3
>=3-4 week	407	139.8 ± 465.2	7.3	71.6	102.8	158.9	9278.1	461	110.7 ± 77.2	31.9	75.6	97.7	138.1	1074.7
Adherence to Mediterranean diet														
Low	1263	123.4 ± 274.3	3.5	70.7	102.7	158.0	9278.1	1198	106.2 ± 55.4	24.0	72.8	97.7	136.9	1074.7
High	314	112.3 ± 56.4	7.3	69.4	102.1	155.1	543.9	394	108.1 ± 70.8	46.6	71.6	98.1	139.3	1005.1

Note: N: number of participants; Amean: Arithmetic mean; CI: confidence interval; SD: standard deviation; Min: minimum; p10: 10thpercentile; p90: 90thpercentile; Max: maximum; T: tertile; g/d: grams per day.

Supplementary Table 8. Geometric mean (GM) toenail zinc levels ( $\mu\text{g g}^{-1}$ ) by sex and diet-related variables and association with diet-related variables (adjusted for total energy intake)

	Men				Women				p-int sex Model 2
	N	Gmean (CI 95%)	Gmean ratio Model 1 (CI 95%)	Gmean ratio Model 2 (CI 95%)	N	Gmean (CI 95%)	Gmean ratio Model 1 (CI 95%)	Gmean ratio Model 2 (CI 95%)	
Total	1707	104.1 (102.0,106.3)			1741	100.3 (98.9,101.8)			
Total energy intake (Kcal/day)									
T1: Men <1736; Women <1500	532	103.4 (99.5,107.4)	Ref		540	100.3 (97.4,103.2)	Ref		
T2: Men 1736-2222; Women 1500-1913	532	105.3 (101.2,109.5)	1.02 (0.97,1.08)		541	98.9 (96.7,101.2)	0.98 (0.95,1.02)		
T3: Men >2222; Women >1913	532	103.5 (100.0,107.2)	0.99 (0.94,1.04)		541	101.2 (98.4,104.0)	1.01 (0.97,1.05)		
<i>p-trend</i>			0.62				0.65		
Ethanol intake (g/day)									
T1: Men <4.60; Women 0.00	529	103.6 (99.8,107.5)	Ref		594	99.4 (97.0,101.9)	Ref		
T2: Men 4.60-20.13; Women 0.01-4.40	535	105.4 (101.3,109.8)	1.01 (0.96,1.06)		482	101.9 (98.8,105.1)	1.03 (0.99,1.07)		
T3: Men >20.13; Women >4.40	532	103.2 (99.7,106.7)	0.98 (0.93,1.04)		546	99.3 (96.9,101.8)	1.00 (0.97,1.04)		
<i>p-trend</i>			0.57				0.82		
Coffee intake (g/day)									
<50.00	355	101.9 (97.3,106.7)	Ref		360	100.5 (97.7,103.5)	Ref		
50.00-100.00	759	102.8 (99.8,105.9)	0.99 (0.93,1.04)		762	99.0 (96.8,101.3)	0.97 (0.94,1.01)		
>100.00	482	107.8 (103.4,112.3)	1.02 (0.96,1.09)		500	101.5 (98.6,104.4)	1.00 (0.96,1.05)		
<i>p-trend</i>			0.41				0.69		
Fibre intake (g/day)									
T1: Men <18.20; Women <17.87	532	109.1 (104.5,113.8)	Ref		541	99.7 (97.1,102.4)	Ref		
T2: Men 18.20-25.09; Women 17.87-24.15	532	100.4 (96.9,104.1)	0.91 (0.87,0.97)		540	100.9 (98.3,103.4)	1.00 (0.96,1.04)		
T3: Men >25.09; Women >24.15	532	102.9 (99.6,106.3)	0.93 (0.87,0.99)		541	99.8 (97.1,102.6)	0.99 (0.94,1.03)		
<i>p-trend</i>			0.02				0.53		
Meat intake (g/day)									
T1: Men <72.72; Women <54.36	532	102.8 (99.5,106.3)	Ref		540	99.2 (96.5,101.9)	Ref		
T2: Men 72.72-109.81; Women 54.36-82.47	532	104.0 (100.2,107.9)	1.01 (0.95,1.06)		541	99.9 (97.4,102.6)	1.00 (0.96,1.04)		

	Men				Women				p-int sex Model 2
	N	Gmean (CI 95%)	Gmean ratio Model 1 (CI 95%)	Gmean ratio Model 2 (CI 95%)	N	Gmean (CI 95%)	Gmean ratio Model 1 (CI 95%)	Gmean ratio Model 2 (CI 95%)	
T3: Men >109.81; Women >82.47	532	105.4 (101.2,109.9)	1.01 (0.96,1.07)		541	101.3 (98.6,104.0)	1.02 (0.98,1.06)		
<i>p-trend</i>			0.69				0.36		
Fish intake (g/day)									
T1: Men <49.73; Women <43.03	531	106.0 (101.5,110.7)	Ref		540	101.0 (98.1,104.0)	Ref		
T2: Men 49.73-76.50; Women 43.03-66.96	534	103.3 (100.1,106.6)	0.97 (0.92,1.02)		541	100.0 (97.6,102.4)	0.98 (0.94,1.02)		
T3: Men >76.50; Women >66.96	531	102.9 (99.2,106.7)	0.96 (0.91,1.01)		541	99.4 (96.8,102.0)	0.97 (0.93,1.01)		
<i>p-trend</i>			0.11				0.10		
Vegetables and legumes (g/day)									
T1: Men <230.12; Women <243.65	532	106.7 (102.4,111.1)	Ref	Ref	540	98.6 (96.1,101.2)	Ref	Ref	0.26
T2: Men 230.12-340.56; Women 243.65-344.87	533	102.1 (98.3,105.9)	0.94 (0.89,1.00)	0.93 (0.86,1.00)	541	99.0 (96.6,101.5)	0.99 (0.95,1.03)	1.00 (0.94,1.06)	
T3: Men >340.56; Women >344.87	531	103.5 (100.1,107.1)	0.95 (0.90,1.01)	0.93 (0.85,1.01)	541	102.7 (99.8,105.7)	1.03 (0.99,1.07)	1.05 (0.99,1.11)	
<i>p-trend</i>			0.12	0.07			0.16	0.14	
Fruits intake (g/day)									
T1: Men <221.20; Women <249.59	532	105.4 (101.5,109.6)	Ref		540	98.7 (96.3,101.2)	Ref		
T2: Men 221.20-390.74; Women 249.59-420.68	532	102.4 (98.6,106.2)	0.96 (0.91,1.02)		541	100.9 (98.3,103.6)	1.02 (0.98,1.06)		
T3: Men >390.74; Women >420.68	532	104.4 (100.7,108.3)	0.99 (0.94,1.05)		541	100.8 (97.9,103.7)	1.01 (0.97,1.05)		
<i>p-trend</i>			0.77				0.68		
Edible fats intake (g/day)									
<15.00	504	104.3 (100.1,108.7)	Ref		369	98.1 (95.2,101.2)	Ref		
15.00,37.50	848	103.8 (101.0,106.7)	0.99 (0.95,1.04)		864	101.7 (99.5,103.8)	1.03 (0.99,1.07)		
>37.50	244	104.6 (98.5,111.0)	0.99 (0.92,1.06)		389	98.6 (95.5,101.9)	1.00 (0.95,1.05)		
<i>p-trend</i>			0.73				0.97		
Nuts intake (frequency)									
<=1-3 month	888	104.8 (101.6,108.1)	Ref	Ref	943	99.7 (97.7,101.7)	Ref	Ref	0.56

	Men				Women				p-int sex Model 2
	N	Gmean (CI 95%)	Gmean ratio Model 1 (CI 95%)	Gmean ratio Model 2 (CI 95%)	N	Gmean (CI 95%)	Gmean ratio Model 1 (CI 95%)	Gmean ratio Model 2 (CI 95%)	
1-4 week	475	99.6 (96.0,103.3)	0.95 (0.90,0.99)	0.93 (0.87,0.99)	450	99.9 (97.1,102.8)	1.00 (0.96,1.03)	0.99 (0.94,1.04)	
>=5-6 week	233	110.8 (105.3,116.6)	1.05 (0.98,1.12)	1.01 (0.93,1.11)	229	102.3 (98.0,106.7)	1.02 (0.97,1.07)	1.04 (0.96,1.12)	
<i>p-trend</i>			0.76	0.52			0.62	0.56	
Dairy products (g/day)									
T1: Men <250.37; Women <290.02	532	106.6 (102.5,110.9)	Ref		542	100.7 (98.0,103.5)	Ref		
T2: Men 250.37-415.23; Women 290.02-472.27	533	103.1 (99.4,106.8)	0.98 (0.93,1.04)		539	98.6 (96.3,101.0)	0.98 (0.95,1.02)		
T3: Men >415.23; Women >472.27	531	102.6 (98.9,106.4)	0.98 (0.92,1.03)		541	101.0 (98.2,103.9)	1.01 (0.97,1.05)		
<i>p-trend</i>			0.39				0.75		
Cereals intake (g/day)									
T1: Men <179.42; Women <133.17	532	107.1 (103.3,111.1)	Ref	Ref	540	101.3 (98.5,104.2)	Ref	Ref	0.28
T2: Men 179.42-248.02; Women 133.17-186.45	532	102.3 (98.6,106.1)	0.95 (0.90,1.01)	0.98 (0.91,1.05)	541	99.6 (97.2,102.1)	0.98 (0.94,1.02)	0.98 (0.92,1.03)	
T3: Men >248.02; Women >186.45	532	102.8 (98.9,106.9)	0.95 (0.89,1.01)	0.99 (0.91,1.08)	541	99.5 (96.9,102.1)	0.98 (0.94,1.02)	0.99 (0.93,1.06)	
<i>p-trend</i>			0.07	0.75			0.33	0.78	
Eggs intake (frequency)									
<=2-3 month	317	112.4 (106.8,118.3)	Ref		281	100.5 (96.4,104.8)	Ref		
1-2 week	872	100.5 (97.9,103.2)	0.90 (0.85,0.95)		880	98.9 (97.0,100.8)	0.98 (0.94,1.03)		
>=3-4 week	407	105.5 (100.6,110.7)	0.95 (0.89,1.02)		461	102.3 (99.3,105.5)	1.033 (0.99,1.08)		
<i>p-trend</i>			0.24				0.09		
Adherence Mediterranean diet									
Low	1263	104.5 (102.0,107.1)	1.00		1198	100.1 (98.3,101.9)	Ref		
High	314	102.9 (98.2,107.8)	0.98 (0.93,1.04)		394	100.5 (97.3,103.7)	0.99 (0.96,1.03)		

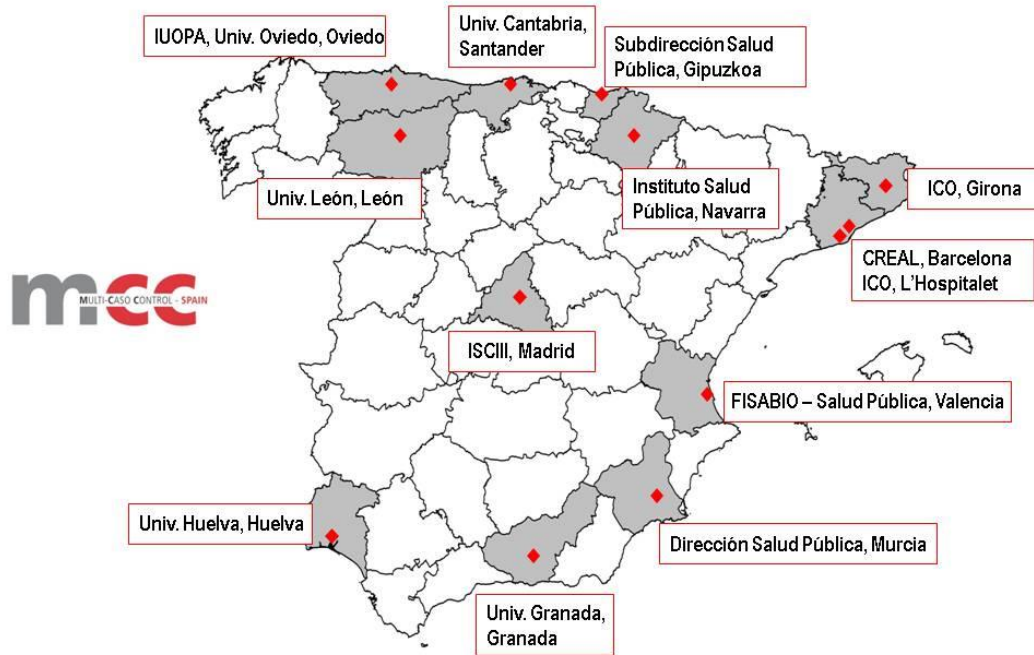
Note: Ref: reference category; T: tertile; g/d: grams per day; Gmean: Geometric mean; CI: confidence interval; Model 1 adjusted for age groups, educational level, total energy intake and province of residence. Model 2: adjusted by age groups, educational level, province of residence, total energy intake, smoking status, tertiles of dietary Zn, supplements intake, tertiles of topsoil Zn, industrial Zn exposure, season of toenail collection, genetic variability (tertiles of PSzn 1-out), and tertiles of food groups that are known sources of dietary phytate (tertiles of cereals, vegetables and legumes, and nuts intake). p-trend: tests for log-linear trend in adjusted geometric mean toenail Zn concentrations across categories of ordinal factors; p-int sex: Effect heterogeneity comparing the results of model 2 between men and women was assessed by Wald tests.

Supplementary Table 9. Geometric mean (GM) toenail zinc levels ( $\mu\text{g g}^{-1}$ ) by sex and tobacco-related variables and association with tobacco-related variables

	Men			Women			p-int sex
	N	GMean (CI 95%)	GMean ratio (CI 95%)	N	GMean (CI 95%)	GMean ratio (CI 95%)	
N. cigarettes/day							0.01
0	499	97.9 (94.3-101.6)	Ref	1035	100.3 (98.4-102.4)	Ref	
1-10	282	106.8 (101.7-112.2)	1.09 (1.02-1.16)	303	99.7 (95.8-103.9)	1.00 (0.96-1.04)	
>10	805	106.9 (103.6-110.3)	1.08 (1.03-1.13)	374	100.9 (97.9-103.9)	1.02 (0.98-1.06)	
Pack-years							0.01
0	499	97.9 (94.3-101.6)	Ref	1035	100.3 (98.4-102.4)	Ref	
1-10	486	109.2 (105.1-113.5)	1.10 (1.05-1.17)	517	99.4 (96.6-102.3)	1.00 (0.96-1.04)	
>10	593	104.9 (101.1-108.8)	1.06 (1.01-1.12)	158	103.3 (98.9-108.0)	1.04 (0.98-1.09)	

Note: GMean: Geometric mean; CI: confidence interval; p-int: p value interaction by sex.

Supplementary Figure 1. Map of research nodes participating in the MCC-Spain study.





Supplementary Figure 2. Diagram illustrating the study participants from the MCC-Spain study eligible for this work. MCC-Spain is a population-based multicase-control study (2008-2013) designed to explore environmental factors associated with five types of cancer.

