

# Prevalence and determinants of sunbed use in thirty European countries: data from the Euromelanoma skin cancer prevention campaign

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**Introduction.** Although considered as a first-group carcinogen, indoor tanning is a common practice in Europe. Euromelanoma is a pan-European skin cancer prevention campaign.

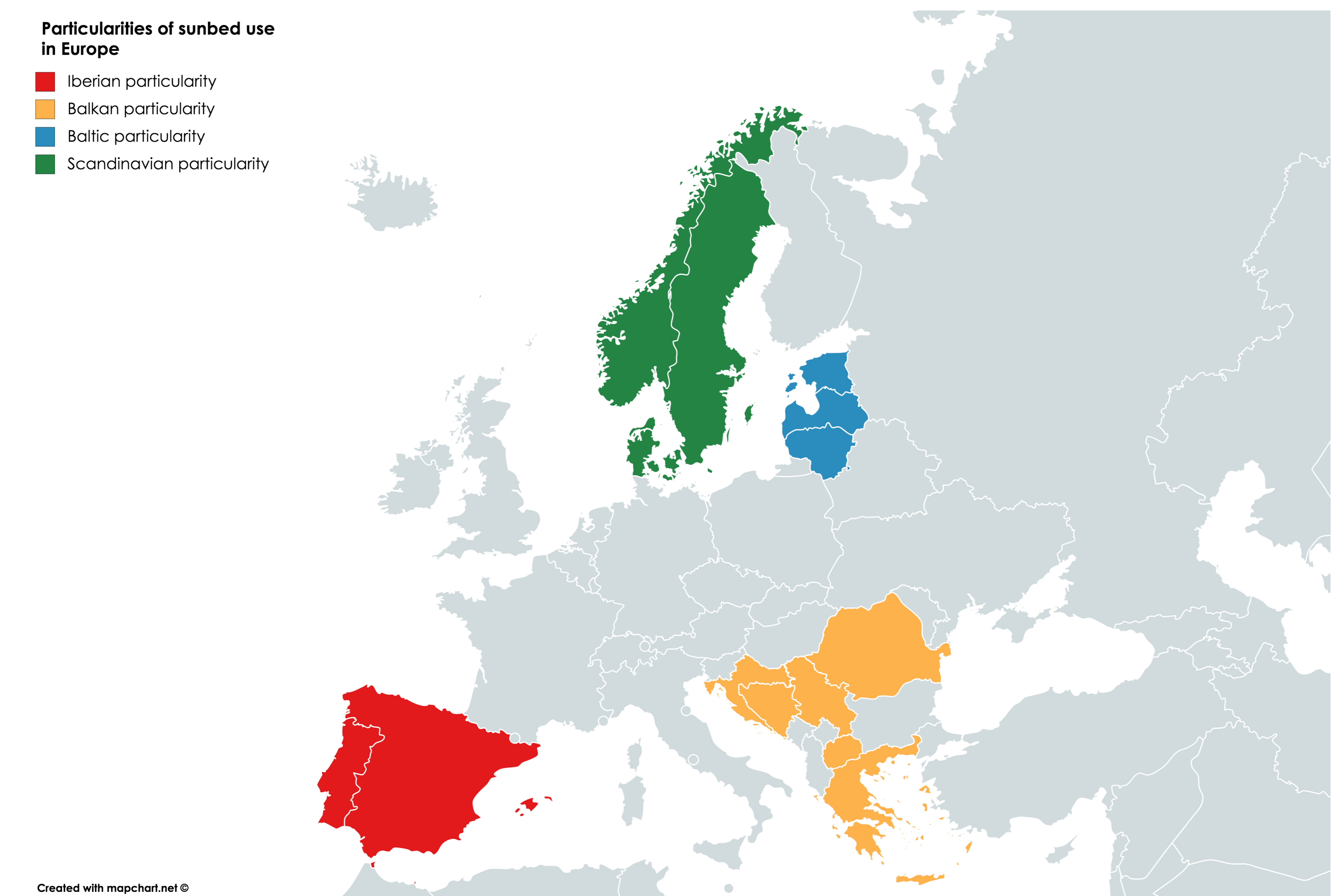
**Objective.** To compare several European countries in terms of prevalence and determinants of sunbed use.

**Materials and Methods.** Participants in the Euromelanoma campaigns filled in questionnaires containing demographics and risk factors, including type/duration of sunbed use. Multivariate analyses adjusted for age, gender, education, skin type, and year of survey were employed to assess factors independently associated with sunbed use in each country.

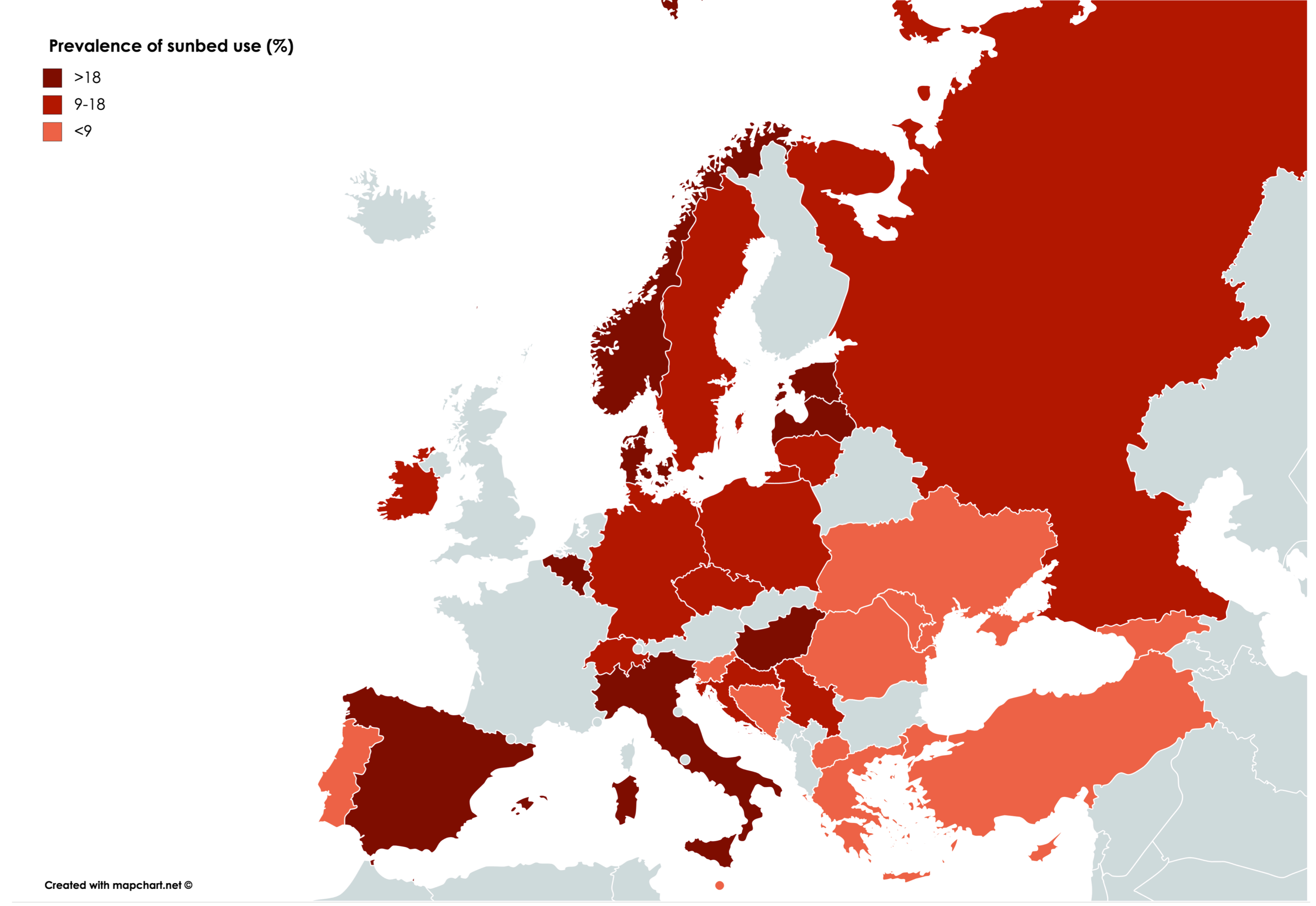
	A. Gender				P	Ratio F/M	B. Education				P	C. Skin type				P
	Females		Males				High education	Low education		Skin type III-VI		Skin type I-II				
	%	95% CI	%	95% CI			%	95% CI	%	95% CI		%	95% CI	%	95% CI	
Belgium	34.6	33.4-35.8	13.1	12.0-14.3	<0.001	2.6	25.5	24.4-26.6	28.1	26.5-29.6	<0.001	28.6	27.5-29.8	23.1	21.8-24.5	<0.001
Bosnia-Herzegovina	7.3	6.5-8.1	1.1	0.7-1.6	<0.001	6.6	6.5	5.8-7.4	3.5	2.8-4.2	0.002	5.4	4.8-6.0	4.3	3.4-5.4	0.10
Croatia	17.6	16.2-19.0	2.8	2.0-3.8	<0.001	6.3	15.2	13.6-16.9	10.4	9.2-11.7	0.21	12.7	11.6-13.9	11.8	9.9-14.0	0.01
Cyprus	7.7	0.2-36.0	-	-	-	-	-	-	-	-	-	-	-	8.0	1.0-26.0	-
Czech Rep.	13.7	13.1-14.4	3.9	3.4-4.5	<0.001	3.5	12.0	10.7-13.3	10.6	9.9-11.4	0.62	11.4	10.9-12.0	7.4	6.6-8.2	<0.001
Denmark	28.3	26.0-30.7	15.4	12.7-18.4	<0.001	1.8	26.3	23.9-28.7	19.5	16.7-22.6	<0.001	23.8	21.8-25.9	24.0	20.3-28.1	0.20
Estonia	21.7	19.2-24.4	7.3	4.7-10.7	<0.001	3	19.6	17.0-22.5	17.8	14.1-22.0	0.48	18.3	15.3-21.6	17.5	14.8-20.5	0.53
Georgia	1.7	1.2-2.4	0.5	0.1-1.3	0.08	3.4	1.6	1.1-2.2	0.7	0.2-1.8	0.78	1.6	1.1-2.3	0.5	0.1-1.4	0.06
Germany	13.0	12.0-14.0	6.4	5.5-7.4	<0.001	2	9.8	8.9-10.9	11.2	10.1-12.4	0.01	11.6	10.8-12.5	6.6	5.5-7.9	<0.001
Greece	4.3	4.0-4.6	0.9	0.7-1.1	<0.001	4.8	3.6	3.3-3.8	1.6	1.3-1.9	<0.001	3.0	2.8-3.3	3.1	2.7-3.4	0.25
Hungary	25.0	24.1-25.9	7.6	6.7-8.6	<0.001	3.3	22.7	21.7-23.8	18.9	17.9-20.0	0.02	21.6	20.7-22.5	17.0	15.8-18.3	<0.001
Ireland	16.3	11.1-22.7	7.7	3.2-15.2	0.02	2.1	11.1	6.6-17.2	16.2	9.7-24.7	0.39	13.6	9.0-19.4	12.6	6.7-21.0	0.31
Italy	25.8	23.9-27.8	12.3	10.6-14.3	<0.001	2.1	24.3	21.7-27.1	19.2	17.6-21.0	0.69	19.8	18.2-21.4	21.3	18.6-24.1	0.94
Latvia	29.1	26.8-31.5	10.4	7.6-13.8	<0.001	2.8	26.5	24.3-28.9	22.0	18.0-26.4	0.65	28.7	25.6-32.0	22.2	19.8-24.7	<0.001
Lithuania	18.5	17.3-19.8	5.2	4.2-6.5	<0.001	3.6	15.2	14.1-16.3	13.9	11.9-16.2	0.81	16.0	14.9-17.2	10.9	9.4-12.6	<0.001
Macedonia (FYROM)	6.4	4.8-8.2	1.3	0.5-2.9	0.01	4.9	6.9	5.1-9.0	1.8	0.9-3.3	0.01	5.7	4.2-7.5	2.8	1.5-4.7	0.10
Malta	0.8	0.1-3.0	-	-	-	-	0.6	0.0-3.4	0.4	0.0-2.3	0.35	0.4	0.0-2.2	0.6	0.0-3.1	0.99
Moldova	5.1	0.6-17.3	-	-	-	-	4.8	0.6-16.2	-	-	-	4.7	0.6-15.8	-	-	-
Norway	27.4	24.2-30.8	14.1	11.2-17.6	<0.001	1.9	22.6	20.0-25.3	20.1	15.1-25.9	0.91	22.7	20.1-25.4	19.5	14.4-25.5	0.02
Poland	19.6	18.4-20.8	6.3	5.3-7.4	<0.001	3.1	16.5	15.4-17.6	13.4	12.0-14.9	0.50	16.3	15.3-17.3	11.8	10.2-13.5	<0.001
Portugal	2.5	2.1-3.0	1.1	0.7-1.5	<0.001	2.3	1.9	1.3-2.3	1.8	1.4-2.4	0.03	1.9	1.5-2.4	2.0	1.6-2.6	0.62
Romania	8.3	7.0-9.7	1.8	1.1-3.0	<0.001	4.6	6.3	5.0-7.9	5.8	4.5-7.2	0.94	6.3	5.2-7.5	5.4	4.0-7.1	0.29
Russia	11.1	10.5-11.8	4.1	3.2-5.1	<0.001	2.7	11.7	11.0-12.4	6.1	5.2-7.1	<0.001	11.2	10.6-11.9	7.0	6.2-7.9	<0.001
Serbia	13.3	12.4-14.2	3.0	2.3-3.7	<0.001	4.4	11.6	10.7-12.7	8.6	7.8-9.5	0.003	10.4	9.7-11.2	9.3	8.1-10.6	0.003
Slovenia	8.6	6.3-11.5	2.2	0.9-4.4	<0.001	3.9	7.1	4.9-9.9	4.3	2.5-7.1	0.51	6.5	4.7-8.7	4.1	1.7-8.2	0.12
Spain	25.1	23.4-26.8	8.8	7.4-10.4	<0.001	2.9	23.1	21.5-24.8	12.4	10.7-14.3	<0.001	20.1	18.4-21.9	18.6	16.9-20.4	0.02
Sweden	21.5	20.7-22.3	8.1	7.4-8.8	<0.001	2.7	17.1	16.4-17.9	16.5	15.5-17.5	0.95	17.4	16.7-18.0	14.4	13.2-15.6	<0.001
Switzerland	11.5	10.9-12.1	6.0	5.5-6.6	<0.001	1.9	10.0	9.5-10.6	7.1	6.4-7.9	0.005	8.9	8.4-9.4	9.2	8.5-10.0	0.03
Turkey	1.4	0.7-2.4	0.4	0.1-1.5	0.08	3.5	1.4	0.7-2.5	0.5	0.1-1.6	0.28	1.0	0.5-2.0	0.9	0.3-2.1	0.70
Ukraine	3.2	2.8-3.6	0.7	0.5-1.1	<0.001	4.6	2.7	2.4-3.1	1.5	1.1-2.0	0.002	2.6	2.3-2.9	1.8	1.4-2.4	0.01

**Table 1.** Prevalence of sunbed use for the 30 participating countries according to gender, education, and skin type. Groups were compared by means of multivariate models including age, gender, education, skin type, and year of survey. Significant findings are highlighted in bold. Differences could not be ascertained for Cyprus (all users females, with low education and skin type I-II), Malta (all users females) and Moldova (all users females, with high education and skin type III-VI). FYROM, Former Yugoslav Republic of Macedonia

**Conclusions.** The main determinants of sunbed use were age (young adults) and gender (females), whereas education and skin type had a less relevant effect. Geographic particularities were found in four regions: Iberian (prevalence ten times higher in Spain than Portugal), Balkan (prevalence disproportionately higher among women), Baltic (highest prevalence among young adults), and Scandinavian (highest prevalence among adolescents) (Figure 2). These data have public health relevance for future interventions aimed at reducing sunbed use in Europe.



**Figure 4.** Geographic particularities of sunbed use in Europe: *Iberian particularity*, prevalence of ever use was 10 times higher in Spain than in Portugal; *Balkan particularity*, prevalence of ever use was disproportionately in favour of women; *Baltic particularity*, the highest prevalence of ever use among young adults; *Scandinavian particularity*, the highest prevalence of ever use among adolescents.



**Figure 1.** Prevalence of ever use of sunbed in the 30 participating countries. Countries were grouped in tertiles based on the distribution of their prevalence of sunbed use.

**Results.** In total, 227,888 individuals (67.4% females, median age 44, 63.4% highly educated, 71.9% skin types III-VI) from 30 countries participated. Overall prevalence of sunbed ever-use was 10.6% ( $\leq 19$ -year-olds: 5.9%; 20 to 35-year-olds: 17.0%;  $>35$ -year-olds: 8.3%). Sunbed use prevalence was higher in northern, sun-deprived countries: significant correlations were found between sunbed use prevalence and countries' latitude ( $p < 0.001$ ) and sunshine ( $p = 0.002$ ); Italy and Spain represented exceptions towards excessive exposure (Figure 1). Females displayed higher prevalence than males in all countries. Balkan countries displayed the highest female/male ratios ( $\geq 4$ ) (Table 1A). Sunbed use was significantly more prevalent among highly educated participants (11/30 countries) (Table 1B) and skin type III-VI (14/30 countries) (Table 1C). Very different prevalence rates were found for Spain (19.3%) and Portugal (2.0%). Scandinavian countries ranked highest in sunbed use among  $\leq 19$ -year-olds, Baltic countries among 20 to 35-year-olds (Table 2).

	Age <20 years		Age 20-35 years		Age >35 years		P-value*	P-value†
	%	95% CI	%	95% CI	%	95% CI		
Belgium	26.5	24.1-28.9	30.0	28.1-31.9	25.2	24.1-26.3	<0.001	<0.001
Bosnia-Herzegovina	4.0	2.6-6.0	11.2	9.9-12.6	2.2	1.8-2.7	<0.001	<0.001
Croatia	3.9	2.2-6.5	23.2	20.8-25.7	9.2	8.2-10.3	0.01	<0.001
Cyprus	-	-	15.4	1.9-45.5	-	-	-	-
Czech Republic	7.2	6.0-8.6	21.9	20.8-23.1	5.7	5.3-6.2	0.001	<0.001
Denmark	23.9	15.6-33.9	36.0	31.6-40.7	20.9	19.0-23.0	0.30	<0.001
Estonia	11.4	6.5-18.1	33.4	28.4-38.8	13.3	11.1-15.7	0.06	<0.001
Georgia	0.4	0.0-2.2	4.8	3.1-6.9	0.6	0.3-1.0	0.99	<0.001
Germany	11.9	9.4-14.8	18.9	16.6-21.4	8.8	8.0-9.5	0.02	<0.001
Greece	1.5	1.1-2.0	4.5	4.1-4.9	2.3	2.1-2.6	<0.001	<0.001
Hungary	10.6	8.9-12.6	33.4	31.9-35.0	15.0	14.2-15.9	0.08	<0.001
Ireland	15.0	3.2-37.9	10.0	3.3-21.8	13.6	9.2-19.2	0.28	0.76
Italy	5.9	3.7-9.0	32.4	28.9-35.9	18.9	17.3-20.6	<0.001	<0.001
Latvia	16.9	11.8-23.2	46.8	42.7-51.0	15.7	13.7-18.0	0.03	<0.001
Lithuania	11.3	9.0-14.0	34.2	31.8-36.8	6.9	6.0-7.8	<0.001	<0.001
Macedonia (FYROM)	4.1	1.7-8.2	12.2	9.0-16.1	1.2	0.5-2.2	<0.001	<0.001
Malta	-	-	-	-	0.6	0.1-2.2	-	-
Moldova	-	-	-	-	5.3	0.6-17.8	-	-
Norway	33.3	13.3-59.0	32.3	26.8-38.3	19.1	16.6-21.8	0.08	<0.001
Poland	7.0	5.4-9.0	23.1	21.4-24.8	12.0	10.9-13.1	<0.001	<0.001
Portugal	1.6	1.0-2.5	4.5	3.5-5.6	1.2	0.9-1.5	0.88	<0.001
Romania	6.5	4.9-8.5	10.3	8.0-13.1	3.5	2.5-4.7	0.02	<0.001
Russia	7.1	5.7-8.7	20.9	19.5-22.3	5.3	4.8-5.9	<0.001	<0.001
Serbia	9.5	7.8-11.3	19.1	17.4-20.8	6.4	5.8-7.2	0.002	<0.001
Slovenia	-	-	10.8	7.0-15.8	4.6	3.0-6.7	-	0.003
Spain	16.6	14.5-18.9	29.5	26.4-32.6	16.5	14.8-18.2	<0.001	<0.001
Sweden	23.5	19.6-27.7	23.1	21.4-24.8	15.5	14.9-16.1	<0.001	<0.001
Switzerland	5.5	4.2-7.1	12.9	11.9-14.0	8.3	7.8-8.8	0.01	<0.001
Turkey	1.8	0.4-5.1	1.3	0.5-2.7	0.6	0.2-1.5	0.09	0.14
Ukraine	2.6	1.9-3.5	7.0	6.1-8.0	0.9	0.7-1.2	<0.001	<0.001

**Table 2.** Prevalence of sunbed use for the 30 participating countries, according to age group (adolescents, young adults, adult/elderly).

Age groups were compared by means of multivariate models also including gender, education, skin type and year of survey. \*p value refers to the comparison between the  $<20$  years and the  $>35$  years groups. †p value refers to the comparison between the 20-35 years and the  $>35$  years groups. Differences could not be assessed for Cyprus (all users young adult), Malta (all users adults/elderly), Moldova (all users adults/elderly) and Slovenia (no adolescent users). Significant findings are highlighted in bold. FYROM, Former Yugoslav Republic of Macedonia

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