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ORIGINAL ARTICLE

The Euromelanoma skin cancer prevention campaign in Europe: characteristics and results of 2009 and 2010

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Abstract

Background Euromelanoma is a skin cancer education and prevention campaign that started in 1999 in Belgium as 'Melanoma day'. Since 2000, it is active in a large and growing number of European countries under the name Euromelanoma.

Objective To evaluate results of Euromelanoma in 2009 and 2010 in 20 countries, describing characteristics of screenees, rates of clinically suspicious lesions for skin cancer and detection rates of melanomas.

Methods Euromelanoma questionnaires were used by 20 countries providing their data in a standardized database (Belgium, Croatia, Cyprus, Czech Republic, FYRO Macedonia, Germany, Greece, Hungary, Italy, Lithuania, Luxembourg, Malta, Moldavia, Portugal, Serbia, Slovenia, Spain, Sweden, Switzerland and Ukraine).

Results In total, 59 858 subjects were screened in 20 countries. Most screenees were female (64%), median ages were 43 (female) and 46 (male) and 33% had phototype I or II. The suspicion rates ranged from 1.1% to 19.4% for melanoma (average 2.8%), from 0.0% to 10.7% for basal cell carcinoma (average 3.1%) and from 0.0% to 1.8% for squamous cell carcinoma (average 0.4%). The overall positive predictive value of countries where (estimation of) positive predictive value could be determined was 13.0%, melanoma detection rates varied from 0.1% to 1.9%. Dermoscopy was used in 78% of examinations with clinically suspected melanoma; full body skin examination was performed in 72% of the screenees.

Conclusion Although the population screened during Euromelanoma was relatively young, high rates of clinically suspected melanoma were found. The efficacy of Euromelanoma could be improved by targeting high-risk populations and by better use of dermoscopy and full body skin examination.

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Conflicts of interest

All authors declared no conflicts of interest.

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[1]Euromelanoma group (institutions are listed in the appendix).

Introduction

In Europe, the incidence of cutaneous melanoma is rising and varies largely across countries with the highest rates in Scandinavia and Switzerland.[1–3] Mortality from melanoma has decreased in Australia, Ireland and the United States,[4–6] but has been reported to increase in England, France, Italy, the Netherlands, Poland and Sweden.[4,7,8] In Eastern Europe, the mortality rates are higher and melanomas are thicker at diagnosis compared with those in Western Europe.[9] A combination of education, public awareness and improved early detection of melanoma is needed to reduce the mortality in these countries.

To combat the rising incidence of melanoma a 'Melanoma day' was initiated in Belgium in 1999 as a skin cancer prevention campaign, which later expanded into 'Euromelanoma'.[10] Euromelanoma is the name of a task force connected to the European Academy of Dermatology and Venereology which has been organizing 'Euromelanoma days' since 2000 in a growing number of European countries.[11–16]

The main objective of Euromelanoma is to improve primary and secondary prevention of melanoma in Europe. The campaign consists of two main initiatives: spreading information about skin cancer to the general public and offering skin examinations to a large audience to enhance early detection of skin cancer. A broad network of European dermatologists offers their time and skills to provide public information about skin cancer, and they perform skin cancer screening on a pre-scheduled day in May. Every year, a theme is chosen to target different high-risk populations. Although the precise organization of Euromelanoma differs between countries because of local circumstances, a central coordination was established in 2009 to standardize and facilitate the organization and evaluation of results. A common questionnaire was then developed to be filled out by people attending the Euromelanoma screenings (screenees). In 2009 and 2010, Euromelanoma was organized in 27 countries, 20 of which used (parts of) this questionnaire. In this report, results of the Euromelanoma days across European countries are compared for the first time, investigating the characteristics of the populations visiting Euromelanoma days and attempting to evaluate the efficacy of the Euromelanoma days in detecting clinically suspicious lesions.

Materials and methods

Euromelanoma questionnaires

A common Euromelanoma questionnaire was developed for use in 2009 based on existing materials from Belgium and Switzerland and agreed upon by all Euromelanoma countries. In 2010, some improvements were made; therefore, the 2009 and 2010 questionnaires differed slightly.

During their visit, the screenees were asked to fill out this one-page anonymous questionnaire with questions on their date of birth, gender, degree of education, reason for their visit, risk factors for skin cancer, their sun habits, skin characteristics and relevant medical history. The phototype questions differed in 2009 and 2010. Question in 2009: 'Skin colour and phototype (describe the colour of your skin and how it reacts during sun exposure in the summer)'; in 2010 the question and possible answers only concerned skin reaction to the summer sun.

Subsequently, after the patient completed the questionnaire, the dermatologists performed a skin examination and filled out their findings on a different section of the same questionnaire. If a suspicious lesion was found, the screenees received advice for further diagnosis (biopsy or excision) or treatment. Data on the number of histopathologically confirmed melanomas among patients with a clinically suspicious lesion were provided by 11 countries. Legal and financial constraints are the cause of the absence of information on histopathological confirmation in most other countries.

Participating countries

Only results for countries that used (parts of) the common questionnaire and provided data to the centralized database or data in the same format as the centralized database are included. In Table 1, the 20 participating countries of 2009 and 2010 that provided data are listed. Bulgaria, Ireland, Latvia, Poland, Romania, Russia and Slovakia organized a Euromelanoma day, but their data were not included in our analysis due to lack of time to enter the data (Russia and Ireland), the use of another questionnaire (Poland), providing data after deadline (Slovakia), not using a questionnaire (Bulgaria) or reason not provided (Latvia and Romania). Belgium organized a melanoma day in 2010, but without free examinations. All countries organized Euromelanoma days in accordance with the ethical standards of the responsible institutional or regional committee on human experimentation and with the Helsinki Declaration of 1975, as revised in 1983.

Central database or separate files

In 2009, Euromelanoma started with a central database developed with Limesurvey version 1.82 +. All countries received a link to enter their data, ensuring data storage in a common format. Countries that used an independent database but could extract and provide their data in English in a comparable format to the central database before December 1st, 2010 were also included in the analysis. Duplicate data, test screenee data and data provided after December 1st 2010 were eliminated.

Some countries had specific eligibility criteria for the Euromelanoma day. Sweden admitted only adult individuals (> 18 years). Spain used an online survey to invite screenees 'at risk'. Due to legal restriction, screenees had to pay for their visit in Germany and Sweden.

Statistical analysis

All statistical analyses were performed with PASW Statistics 17. Proportions of the different characteristics of the screenees (participants) were calculated. To calculate the rate of clinically suspicious lesions, the total number of screenees with a suspicious skin

Table 1 Characteristics of participating Euromelanoma screenees in 2009 and 2010

Country*	Participating screenees (*N*)			Gender screenees (%)		Age screenees (median)		Level of education screenees (%)†					Phototype screenees (%)				
	2009	2010	Total	Female	Unknown	Female	Male	Primary school	High school	Vocational education	University degree	Unknown	I	II	III	IV–VI	Unknown
Belgium, Luxembourg	2652	NA	2652	59	2	48	51	7	35	34	16	8	7	36	43	13	1
Croatia	ND	1404	1404	69	1	43	45	8	45	9	37	1	4	17	35	42	2
Cyprus	ND	35	35	37	23	33	56	14	37	6	43	0	17	54	20	9	0
Czech Republic	6149	7691	13840	67	0	42	43	23	52	6	19	0	5	21	40	33	1
FYRO Macedonia	ND	330	330	70	0	38	43	4	35	9	51	0	20	20	27	32	0
Germany	612	1887	2499	60	3	48	52	15	26	28	23	7	5	30	43	16	6
Greece	4005	3695	7700	61	4	36	38	8	20	23	47	2	5	41	33	18	2
Hungary	2113	2643	4756	73	1	37	34	9	38	8	41	4	7	26	35	29	3
Italy	ND	1085	1085	64	0	43	48	22	45	1	30	2	6	18	44	30	2
Lithuania	1085	1073	2158	72	2	45	37	6	16	23	53	2	8	25	46	20	2
Malta	63	77	140	57	0	56	58	19	49	9	21	4	9	34	40	17	0
Moldavia	ND	56	56	70	0	51	34	9	14	41	34	2	0	23	43	34	0
Portugal	1246	1262	2508	61	1	40	44	14	40	7	34	4	6	33	50	12	1
Serbia	1548	1524	3072	67	2	40	44	7	45	15	31	3	5	25	48	21	1
Slovenia	ND	359	359	60	1	46	47	7	40	5	47	1	4	14	33	48	1
Spain	1047	999	2046	65	0	38	39	19	22	59	0	0	12	33	45	9	0
Sweden	2953	2565	5518	64	2	54	60	12	25	21	41	1	3	23	54	18	1
Switzerland	4672	4553	9225	57	1	50	53	6	16	45	26	7	6	25	44	21	4
Ukraine	ND	475	475	79	0	48	46	19	1	0	0	80	0	4	12	80	3
Total	28145	31713	59858	64	1	43	46	11	30	23	32	4	6	27	42	24	2

*The seven countries that did not provide questionnaire-based data were Bulgaria (*N* = missing), Ireland (*N* 2010 = unsure), Latvia (*N* = missing), Poland (*N* 2009 = 2000; *N* 2010 = 2887), Romania (*N* 2009 = 3124; *N* 2010 = 3276), Russia (*N* 2009 = 4358; *N* 2010 = 8163) and Slovakia (*N* 2010 = 1716).

†Level of education: Portugal 2009, Germany 2010 and Czech Republic 2010 excluded (missing data).

NA, not applicable; ND, no data.

cancer in a country was divided by the total number of screenees of that country. For the 11 countries with information on the number of histopathologically confirmed lesions among Euromelanoma screenees, we calculated the positive predictive values (PPV) and detection rates. Estimations of PPV and detection rates were calculated for countries that did not link suspicious lesions to histopathologically confirmed lesions on an individual patient basis. To analyse risk factors for a suspected skin cancer, some characteristics were compared between screenees with and without suspected lesions. For categorical variables, the chi-squared test was used with a Bonferroni correction for multiple testing. A level of significance of 0.05 was chosen for all statistical tests.

Results

Characteristics of screenees

All included European countries (13 in 2009 and 18 in 2010) provided data from 28 145 screenees in 2009 and 31 713 screenees in 2010 (Table 1). In 2009, Belgian data included screenees from Luxembourg, as these countries shared the organization. Around two-thirds of the screenees were females in almost all countries (Table 1); the proportion of females was the highest in Eastern Europe. The median age of screenees varied between 33 years and 60 years of age. Belgium, Germany, Malta, Sweden and Switzerland managed to attract an older population in comparison with the other countries. A substantial proportion of screenees was relatively young; the largest proportion of screenees had an age of 20–34 years and was female (17%). In total, 7% of the screenees consisted of children and teenagers. Few screenees were of phototype I (6%). In 2010, 71% of the screenees had phototype III or higher, compared with 59% in 2009. Participants were generally highly educated and 32% had a university degree (Table 1). The main reasons for a visit to the Euromelanoma days were the presence of many moles (40%) or a recently changed or suspicious lesion (27%).

Suspicious lesions

In 2009 and 2010, 3618 lesions suspected of being a melanoma were observed among the screenees (Table 2). The average suspicion rate of melanoma was 2.8%, whereas 8% of the screenees had a lesion suspected of being skin cancer of any type. The median ages of screenees with a lesion suspected of being melanoma, basal cell carcinoma (BCC) and squamous cell carcinoma (SCC) were 44, 65 and 67 years of age respectively. Suspicion rates differed greatly between countries (suspicion rate for melanoma: 1–19%; for BCC: 0–11%; for SCC: 0–2%). The majority of suspicious lesions were first detected by the patient or the dermatologist (Table 3).

In 2009 and 2010, 11 of 20 participating countries provided the total number of histopathologically confirmed melanomas out of their screened population. Large differences in detection rates and PPV were found (Table 2). The (estimated) *PPV* of melanoma (% of histopathologically confirmed melanomas among all patients suspected of having a melanoma) in these countries was between 3% and 100% (average PPV 13.0%). The *detection* rates (% of histopathologically confirmed melanomas diagnosed among all screenees) varied from 0.1% in Greece and Czech Republic to 1.1% in Sweden and 1.9% in Ukraine.

Patterns of clinical examination

One out of five lesions suspected of being melanoma was not examined with dermoscopy (22%). The dermatologists performed a full body skin examination in 72% of the screenees (Table 2) and a partial skin examination in 21% (data missing in 7%) with large differences across countries.

Risk factors

The screenees having a suspected melanoma did not differ with respect to phototype and number of severe sunburns during childhood compared with screenees without a suspected melanoma (Table 4). More lesions suspected of melanoma were detected among screenees who had over 50 moles (20% vs. 8%, $P < 0.001$) and/or atypical moles (72% vs. 17%, $P < 0.001$). A personal history of non-melanoma skin cancer was self-reported in 18% of screenees with a suspicion of BCC, compared with 2% in screenees without lesions suspected to be BCC ($P < 0.001$). Actinic keratoses, indicators of chronic sun damage, were seen three times more often among screenees with lesions suspected of BCC than in the group without suspected lesions for BCC (29% vs. 9%, $P < 0.001$). Screenees with lesions suspected of SCC were highly associated with the presence of actinic keratoses (56% vs. 9%, $P < 0.001$) and outdoor occupation (33% vs. 21%, $P < 0.001$).

Sun exposure patterns of the screenees

Solarium use was most common among female screenees younger than 35 years (Fig. 1). In some countries, almost 40% of this group of screenees used solariums, in Spain even 51%. Half of the screenees with a suspected melanoma reported to always use sunscreens when they sunbathed (52%). In contrast, screenees with suspected BCC and SCC did not use sunscreen very often (30% and 27%, respectively). Solarium use was more common in patients with suspected melanoma (11%), compared with the group suspected of having a BCC (5%) or SCC (5%) (Table 5). Holidays to sunny destinations were not strongly associated with the presence of lesions suspected to be skin cancer in our populations (results not shown, 79% of screenees with suspicion of skin cancer and 82% of screenees without a suspicion of skin cancer). The proportion of screenees with phototype I or II who had experienced sunburn before the age of 18 years varied between 42% (Serbia) and 100% (Ukraine). Among subjects with darker phototypes, these proportions ranged from 24% in Serbia and Italy to 71% in Spain (Fig. 2).

Discussion

The Euromelanoma screening day is mainly organized to draw attention to primary prevention and to send out early detection

Table 2 Number of suspicious lesions, number of screenees with a suspicious lesion, number of histopathologically confirmed melanomas, suspicion rate, detection rate and PPV of melanoma in 2009 and 2010

Country	*N*	Susp. mel¶	Scr. with susp. mel¶	Hist. conf. mel	Susp. rate mel (%)¶	Det. rate mel (%)	PPV mel (%)	Dermoscopy in susp. mel (%)**	Susp. BCC	Scr. with susp. BCC	Susp. rate BCC (%)	Susp. SCC	Scr. with susp. SCC	Susp. rate SCC (%)	Full body skin exam. (%)††
Belgium, Luxembourg*	2652	51	54	12	2.0	0.45	22.2	94.4	96	84	3.2	13	7	0.3	88.8
Croatia	1404	624	273	ND	19.4	NA	NA	76.6	57	42	3.0	18	8	0.6	92.9
Cyprus	35	3	4	ND	11.4	NA	NA	50.0	0	0	0.0	0	0	0.0	82.9
Czech Republic*§	13840	146	146	20	1.1	0.14	13.7	74.9	323	264	1.9	30	30	0.2	74.8
FYRO Macedonia*	330	13	13	3	3.9	0.91	23.1	61.5	23	16	4.8	2	2	0.6	91.8
Germany	2499	500	336	ND	13.4	NA	NA	90.2	92	103	4.1	41	30	1.2	80.1
Greece*‡	7700	156	148	7	1.9	0.09	4.7	67.6	119	106	1.4	19	32	0.4	80.3
Hungary*	4756	289	182	12	3.8	0.25	6.6	95.1	149	107	2.2	2	7	0.1	91.0
Italy*	1085	15	14	3	1.3	0.28	21.4	64.3	50	34	3.1	4	4	0.4	82.4
Lithuania*	2158	162	125	4	5.8	0.19	3.2	83.2	52	58	2.7	3	5	0.2	65.7
Malta*	140	2	2	1	1.4	0.71	50.0	100.0	3	3	2.1	0	0	0.0	97.1
Moldavia	56	11	8	ND	14.3	NA	NA	62.5	5	6	10.7	0	1	1.8	0.0
Portugal	2508	18	34	ND	1.4	NA	NA	88.2	35	65	2.6	4	5	0.2	85.7
Serbia	3072	404	235	ND	7.6	NA	NA	48.9	112	103	3.4	19	20	0.7	89.0
Slovenia*	359	73	44	2	12.3	0.56	4.5	84.1	13	13	3.6	0	1	0.3	86.6
Spain	2046	0	29	ND	1.4	NA	NA	ND	0	47	2.3	0	6	0.3	100.0
Sweden†	5518	489	329	63	6.0	1.14	19.1	84.5	453	355	6.4	32	29	0.5	68.3
Switzerland	9225	653	474	ND	5.1	NA	NA	74.5	445	414	4.5	73	75	0.8	32.3
Ukraine*	475	9	9	9	1.9	1.89	100.0	100.0	23	23	4.8	0	0	0.0	0.0
Total‡‡	59858	3618	2459	136	2.8	0.35	13.0	77.6	2050	1843	3.1	260	262	0.4	72.0

*Estimation of PPV and detection rate (atypical moles are included in suspicious melanoma count and/or histopathologically confirmed melanomas are estimations and/or confirmed melanomas were not linked to central database).

†Accurate value of PPV and detection rate (histological confirmation was confirmed and linked to central database).

‡Only histopathologically confirmed melanoma number of 2009 in Greece, true PPV and detection rate will be higher.

§Czech Republic: Atypical moles were included in the suspicious melanoma count (n = 1099) and screenees with a suspicious melanoma count (n = 462), true number of suspicious melanoma and histologically confirmed melanomas were provided separately.

¶Some countries (including Croatia, Cyprus, FYRO Macedonia, Germany, Lithuania, Malta, Switzerland and Ukraine) included atypical moles in the suspicious melanoma count. Suspicious melanoma count was missing in some screenees with a suspicious melanoma from Belgium and Luxembourg, Cyprus, Spain and Portugal.

**Portugal 2009, Spain 2009 and Spain 2010 excluded (missing data).

††Portugal 2009 excluded (missing data).

‡‡Overall suspicion rate melanoma and total PPV melanoma based on countries that only included suspicious melanoma in suspicious melanoma count.

BCC, basal cell carcinoma; Det. Rate, Detection rate; Hist. conf., Histopathologically confirmed; mel, melanoma; NA, not applicable; ND, no data; PPV, positive predictive value; SCC, squamous cell carcinoma; Scr., screenees; skin exam., skin examination; Susp., suspicious.

Table 3 Suspicious lesion detection in 2009 and 2010

Suspicious lesion detected by*	Suspicious melanoma							Suspicious basal cell carcinoma							Suspicious squamous cell carcinoma						
	N	Pat. (%)	Derm. (%)	An. health prof. (%)	Part. (%)	Other pers. (%)	Unkn. (%)	*N*	Pat. (%)	Derm. (%)	An. health prof. (%)	Part. (%)	Other pers. (%)	Unkn. (%)	*N*	Pat. (%)	Derm. (%)	An. health prof. (%)	Part. (%)	Other pers. (%)	Unkn. (%)
Belgium, Luxembourg	54	24	56	4	0	4	13	84	32	45	1	4	0	18	7	29	29	0	0	0	43
Croatia	273	35	56	1	1	1	5	42	45	45	5	0	0	5	8	75	13	0	0	0	13
Cyprus	4	25	50	25	0	0	0	0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	NA	NA
Czech Republic†	462	35	38	1	2	2	23	264	28	55	2	1	4	10	30	27	67	3	0	0	3
FYRO Macedonia	13	8	85	8	0	0	0	16	6	94	0	0	0	0	2	50	50	0	0	0	0
Germany	336	7	86	2	0	0	5	103	12	80	4	1	0	4	30	0	90	10	0	0	0
Greece	148	54	37	1	1	2	4	106	44	42	0	8	0	6	32	56	31	3	0	0	9
Hungary	182	14	72	3	1	1	9	107	25	59	2	4	1	9	7	29	57	0	0	0	14
Italy	14	14	71	0	0	0	14	34	24	56	0	0	0	21	4	25	25	0	0	25	25
Lithuania	125	54	33	0	0	4	9	58	55	36	2	0	3	3	5	0	60	0	0	20	20
Malta	2	100	0	0	0	0	0	3	67	0	0	0	0	33	0	NA	NA	NA	NA	NA	NA
Moldavia	8	75	25	0	0	0	0	6	33	67	0	0	0	0	1	0	100	0	0	0	0
Portugal	17	24	47	0	6	0	24	33	70	18	0	0	0	12	4	50	25	0	0	0	25
Serbia	235	38	37	1	0	1	23	103	50	27	1	0	2	19	20	45	20	0	5	0	30
Slovenia	44	27	57	2	2	0	11	13	54	38	0	0	0	8	1	0	100	0	0	0	0
Sweden	329	53	29	1	5	2	9	355	62	26	1	1	0	10	29	72	21	0	3	0	3
Switzerland	363	49	38	1	3	1	9	201	59	25	1	3	0	11	40	70	13	3	0	0	15
Ukraine	9	0	100	0	0	0	0	23	0	100	0	0	0	0	0	NA	NA	NA	NA	NA	NA

*Switzerland 2009, Portugal 2009, Spain 2009 and Spain 2010 excluded (missing data).

†Czech Republic: Atypical moles were included in the screenees with a suspicious melanoma count (n = 462), true number of suspicious melanoma and histologically confirmed melanomas were provided separately.

Pat., Patient; Derm., Dermatologist; An. health prof., Another health professional; Part., Spouse/partner; Other pers., Other person; Unkn., Unknown; NA, not applicable.

Table 4 Risk factors in suspicious lesion group compared with no suspicious lesion group

Risk factor	Total number of screenees (missing data excluded)	Total number of screenees with risk factor	Screenees with susp. mel (%)†	Screenees with no susp. mel (%)	Screenees with susp. BCC (%)	Screenees with no susp. BCC (%)	Screenees with susp. SCC (%)	Screenees with no susp. SCC (%)
I have many moles‡	54 679	22 050	1132 (47)*	20 918 (40)	514 (30)*	21 536 (41)	79 (34)	21 971 (40)
Recently changed or suspicious lesion§	58 612	15 982	847 (31)*	15 135 (27)	789 (44)*	15 193 (27)	117 (45)*	15 865 (27)
Previously diagnosed with skin cancer¶	55 925	1710	89 (4)	1621 (3)	280 (16)*	1430 (3)	30 (13)*	1680 (3)
Severe sunburn before the age of 18	59 858	25 568	1132 (41)	24 436 (43)	772 (42)	24 796 (43)	113 (43)	25 455 (43)
> 1 year in country with high sun exposure before the age of 18 years‡	54 679	1487	72 (3)	1415 (3)	42 (2)	1445 (3)	4 (2)	1483 (3)
> 1 year in country with high sun exposure after the age of 18 years‡	54 679	2836	124 (5)	2712 (5)	128 (8)*	2708 (5)	23 (10)*	2813 (5)
Solarium use	59 858	6209	293 (11)	5916 (10)	89 (5)*	6120 (11)	13 (5)	6196 (10)
Outdoor occupation	59 858	12 707	624 (22)	12 083 (21)	525 (28)*	12 182 (21)	87 (33)*	12 620 (21)
Positive family history melanoma	59 858	8673	311 (11)*	8362 (15)	248 (13)	8425 (15)	34 (13)	8639 (14)
Personal history of melanoma	59 858	731	93 (3)*	638 (1)	54 (3)*	677 (1)	13 (5)*	718 (1)
Personal history of non-melanoma skin cancer	59 858	1608	89 (3)	1519 (3)	327 (18)*	1281 (2)	40 (15)*	1568 (3)
Phototype I or II	59 858	19 500	762 (27)*	18 738 (33)	656 (36)	18 844 (32)	91 (35)	19 409 (33)
Presence of > 50 moles	59 858	5040	557 (20)*	4483 (8)	100 (5)*	4940 (9)	21 (8)	5019 (8)
Presence of >100 moles	59 858	1475	175 (6)*	1300 (2)	31 (2)	1444 (2)	6 (2)	1469 (2)
Presence of atypical moles according to definition	59 858	11 518	2007 (72)*	9511 (17)	262 (14)*	11 256 (19)	35 (13)	11 483 (19)
Presence of lentigines on the back or chest**	56 566	17 182	1035 (38)*	16 147 (30)	744 (42)*	16 438 (30)	129 (51)*	17 053 (30)
Presence of actinic keratoses§	58 612	5660	274 (10)	5386 (10)	519 (29)*	5141 (9)	145 (56)*	5515 (9)

*Chi-squared test was significant (2 sided, $P < 0.0029411$) with Bonferroni correction [0.05/17(number of variables)].

†Czech Republic: Atypical moles were included in the suspicious melanoma count ($n = 1099$) and screenees with a suspicious melanoma count ($n = 462$), true number of suspicious melanoma and histologically confirmed melanomas were provided separately.

‡Portugal 2009, Spain 2009, Spain 2010 and Germany 2010 excluded (missing data).

§Portugal 2009 excluded (missing data).

¶Spain 2009, Spain 2010 and Germany 2010 excluded (missing data).

**Portugal 2009, Spain 2009 and Spain 2010 excluded (missing data).

BCC, basal cell carcinoma; mel, melanoma; SCC, squamous cell carcinoma; Susp., suspicious.

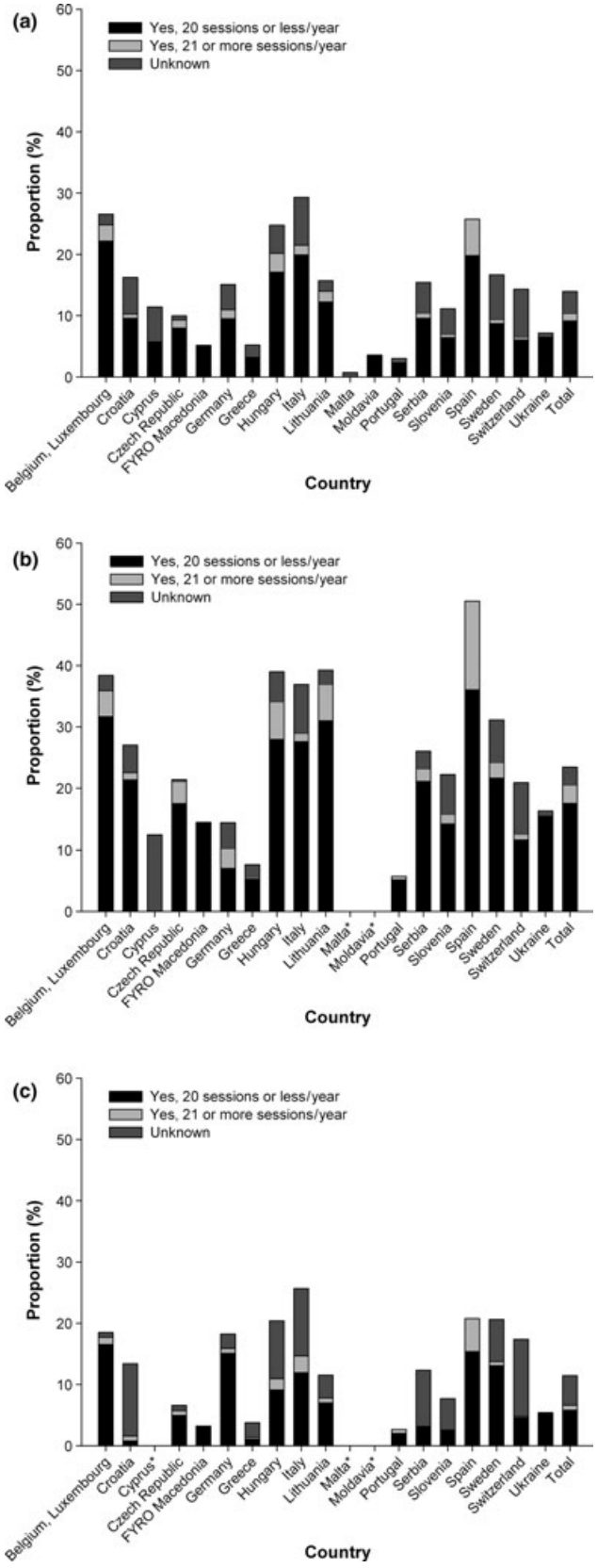

Figure 1 (a) Solarium use of Euromelanoma screenees in 2009 and 2010 (total). (b) Solarium use of Euromelanoma screenees in 2009 and 2010 [Female < 35 years, (*)No female screenees < 35 years using solarium]. (c) Solarium use of Euromelanoma screenees in 2009 and 2010 [Male <35 years, (*) No male screenees < 35 years using solarium].

messages to the general population. This evaluation of 2 years of the Euromelanoma campaign showed that a large proportion of screenees were relatively young, highly educated and female. Despite the relatively young population, the suspicion rate of skin cancer and, more specifically, melanoma was reasonable: 8% and 3% respectively. The fact that fewer lesions suspected to be non-melanoma skin cancers were detected than expected compared with the melanoma-suspected lesions might be due to the focus on pigmented lesions in the information campaign and the relatively young age of the majority of screenees. In general, incidence and therefore the likelihood of detecting melanomas in young populations are low. The efficacy would be higher if only middle-aged or older adults were included.[17] If the ultimate aim is a decrease in mortality and morbidity, screening of more male individuals and less educated populations might be more effective. Melanomas are more common among highly educated people and those with high socioeconomic status,[18–20] but the risk of dying from melanoma is higher in elderly men and in people with a lower socioeconomic level, potentially due to a lower skin cancer awareness.[21,22] However, one should keep in mind that skin cancer screening has never been proven to be very effective in directly influencing mortality and morbidity.[23]

Suspicion rates varied greatly between countries (from 1% to 19%) and were sometimes influenced by individuals in whom many lesions suspected of being a melanoma were reported (Table 2). To avoid bias due to individual patients with extremely high numbers of suspected lesions, we calculated the proportion of the screenees with a suspicious lesion by dividing the number of screenees with at least one suspicious lesion (rather than the total number of suspected lesions) by the total number of screenees. Countries that included atypical moles as 'suspicious melanomas' (melanoma suspicion rate in these countries together was 7.6%) were excluded from the total suspicion rate of melanoma (2.8%). The (estimated) detection rates of melanoma, defined as the number of screenees with histopathologically confirmed melanoma divided by the total number of screenees, varied substantially across participating countries (from 0.1% to 1.9%). Sweden was the only country with a melanoma detection rate higher than 1% (1.1%). This high detection rate is probably due to the combination of a high incidence of melanoma in Sweden[1] and the selection criteria that were applied for the Euromelanoma day (age > 18 years and payment for the visit), which resulted in a higher risk population. Ukraine had a PPV of 100% and a detection rate of 1.9%, but the confirmed melanomas were few, not linked to the central database, and these numbers should therefore be interpreted with caution.

Table 5 Sunbathing habits of Euromelanoma screenees in 2009 and 2010

Susp. lesion or no susp. lesion group	Use of sunscreens when your are sunbathing*					Use of solarium				
	N	Never (%)	Sometimes (%)	Always (%)	Unknown (%)	*N*	No (%)	Yes < 20 sess./year (%)	Yes > 21 sess./year (%)	Unknown (%)
Susp. mel	2306	9.1	29.1	51.7	10.1	2775	85.6	9.4	1.1	3.8
No susp. mel	47701	11.8	30.2	47.8	10.2	57083	86.1	9.1	1.3	3.6
Susp BCC	1477	22.0	30.8	29.8	17.4	1843	90.3	4.3	0.5	4.8
No susp. BCC	48530	11.3	30.1	48.6	10.0	58015	85.9	9.3	1.3	3.5
Susp. SCC	197	28.9	26.9	26.4	17.8	262	90.8	4.2	0.8	4.2
No susp. SCC	49810	11.6	30.2	48.1	10.2	59596	86.0	9.1	1.3	3.6
Susp. skin cancer	3833	14.7	29.4	42.7	13.2	4703	87.6	7.3	0.9	4.2
No susp. skin cancer	46174	11.4	30.2	48.4	10.0	55155	85.9	9.3	1.3	3.5

*Portugal 2009, Switzerland 2009, Spain 2009, Spain 2010 and Germany 2010 excluded (missing data).
BCC, basal cell carcinoma; mel, melanoma; SCC, squamous cell carcinoma; sess., sessions; Susp., suspicious.

In the skin cancer education and free skin cancer screening programs of the American Academy of Dermatology (AAD), a total of 363 histopathologically confirmed melanomas were observed amongst 242 374 screenees, resulting in a detection rate of 0.15%.[24] While this appears to be on the lower side of the range observed in the Euromelanoma participants, a final diagnosis was obtained in 72% of the AAD screenees,[25] causing an underestimation of their detection rate. The median age of the screenees in the AAD national screening programme was 52, which was higher than that of the Euromelanoma screenees (Male: 46, Female 43) and therefore cannot be considered as an explanation for the lower detection rate in the United States. The PPV in the Euromelanoma campaign (13%) was comparable to the 17% observed in the AAD programme.[25]

In some countries, dermatologists considered all lesions with some clinically and/or dermoscopic atypical aspects, including atypical naevi, as a suspicious lesion, while other dermatologists used this definition only for lesions highly suspicious of melanoma. As a consequence, the suspicion rate of melanoma was extremely high in certain countries where the former interpretation was used (up to 19%); it is highly unlikely that so many melanomas were truly suspected. The detection rate might become more reliable with a more precise and widely accepted definition of a 'suspicious lesion'. Also, the reimbursement schedule and referral for biopsies differed and could influence these results (in 13 countries, screenees were referred to outpatient clinics; in four countries, suspicious lesions were immediately biopsied). Suspicion rates of BCC and SCC were more consistent across countries (on average 3.1% and 0.4% respectively). It would be of interest to know the true PPV of a clinically suspicious lesion, to examine whether country-specific detection rates correlate with their PPV. This is only possible when the linkage procedures with histopathological confirmation are guaranteed and are possible on an individual basis for each country.

The distribution of skin types differed between 2009 and 2010, but the 2009 data were similar to data reported by individual Euromelanoma countries in previous years.[14,15] These differences are likely due to the change in phrasing of the phototype question in 2010. Interestingly, there was no association between phototype and sunburns during childhood in screenees with clinical suspicion of melanoma. This lack of association might be due to the fact that phototype measurements are self-reported and therefore depend on an individual's interpretation of statements like 'tans with difficulty' (the proportion of phototype IV–VI range from 9% in Spain and Cyprus to 48% in Slovenia). The phototype question does seem to have measured the susceptibility of sunburn, as screenees with phototype I/II did report more sunburns before the age of 18 years (Fig. 2). Most likely, the lack of association of phototype with skin cancer suspicion is because a skin cancer suspicion often does not translate into a histopathologically confirmed skin cancer (average PPV was 13%). Alternative explanations include recall bias for sunburns during childhood and the fact that phototype is not a very strong risk factor for melanoma (relative risks in the range from 2.1 for phototype I vs. IV[26] to 2.0 for sunburn history[27] to 6.9 for a number of 101–120 naevi (compared with less than 15 naevi) to 10.1 for the presence of atypical naevi[28]).

The success of the Euromelanoma days depends on several important factors including the number of dermatologists and countries that participate, as well as the costs of the screening and information campaign. Also, the characteristics of the population screened during Euromelanoma were influenced by the message broadcasted and local rules of participation. Adapting the message to target a high-risk population combined with more restrictive admission has been shown successful in Belgium and Sweden.[13,14] For example, one could consider excluding children and teenagers from the screening activities, unless they have specific lesions that they are worried about. Education about tanning or solarium use is more important in this young population. To improve the diagnostic accuracy of the clinical findings during screening, the use of

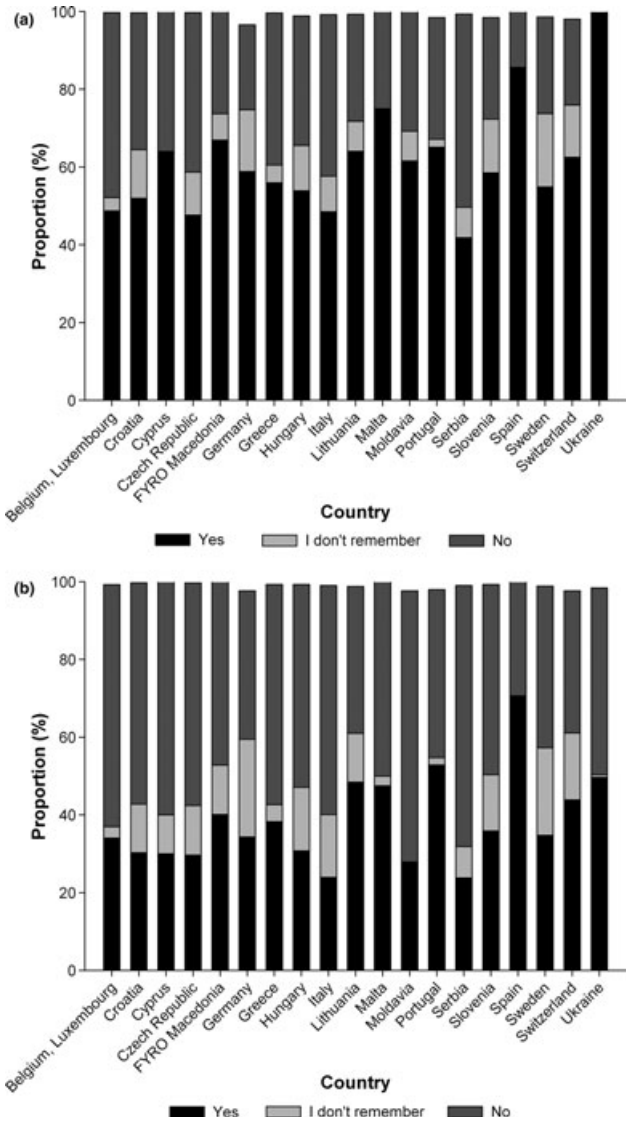

Figure 2 (a) Sunburns in Euromelanoma screenees with phototype I or II. (b) Sunburns in Euromelanoma screenees with phototype III–VI.

dermoscopy and full body skin examinations should increase. Lastly, obtaining reports from the histopathological confirmation of excised or biopsied suspected lesions in more countries will generate more interesting results in the future.

Conclusion

Although many screenees attending the Euromelanoma days are not at high risk, high rates of clinically suspected melanoma were found. To improve the quality of this large Pan-European skin cancer prevention campaign, stricter rules on screening eligibility and performance of full body skin examinations in all the included participants will result in higher detection rates. Increased use of dermoscopy for suspected lesions will raise the diagnostic accuracy of skin examinations. Moreover, a better definition of suspicious lesions is necessary and histopathological confirmation of suspected lesions should be provided in more countries.

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Appendix

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