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Survival for skin melanoma in Europe: results of the EUROCARE-5 study.

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Abstract

Background

In Europe skin melanoma (SM) survival has increased over time but differences between countries and areas of Europe remain.

Methods

We calculated European relative survival estimates and geographical comparisons for 241,485 cases of invasive SM, in ages 15 years and over, diagnosed in Europe (2000-2007), with survival time trends estimated using the period approach during 1999-2007, for 213,101 cases.

Results

In Europe, estimated 5-year relative survival was 83.2% (95% confidence interval, CI 82.9%-83.6%). The highest values were in Northern (87.7%; 87.2%-88.2%) and Central (87.6%; 87.2%-88.0%) Europe, followed by Ireland and UK (85.6%; 85.2%-86.0%) and Southern Europe (82.6%; 82.1%-83.2%). The lowest survival estimate was in Eastern Europe (74.3%; 73.6%-75.1%). Within regions the inter-country absolute difference in percentage points of survival varied from 3.9% in Northern to 33.8% in Eastern Europe. Relative survival decreased markedly with age and was higher in women than men. Differences according to SM morphology and skin sub-sites also emerged. Survival has slightly increased from 1999 to 2007, with a small improvement in Northern and the most pronounced improvement in Eastern Europe.

Discussion

SM survival is high and still increasing in Europe. The gap between Northern and Southern and especially Eastern European countries, although still present, diminished over time. Differences in early detection practices may presumably explain most of the geographical differences, better survival in women and in younger ages. However, part of the improvement in survival may be attributed to overdiagnosis.

Key-words: EUROCARE, skin melanoma, cancer survival, registries, European populations

Introduction

Skin melanoma (SM) incidence has increased sharply in most Western-type countries over the last decades; a trend that continues [1]. In 2012, SM ranked seventh among the most frequently diagnosed cancers in the European Union, 3.2% of all new cancers (all ages, both sexes). [2]

The main known modifiable risk factor for SM is intermittent ultraviolet radiation exposure (UV). Therefore, the rise in incidence has been presumably driven by increased leisure exposure to UV radiation from sun and indoor tanning [3].

Mortality rates are still increasing in many European countries (e.g. Ireland, Sweden, Netherlands, etc.) [2,4] and they are nearly stable in others (e.g. Austria, Denmark, Croatia, Czech Republic, etc.) [2].

According to previous EUROCARE studies, SM relative survival (RS) has increased over time [5]; SM ranks fourth among cancers with the best survival in Europe [6].

However, survival varies markedly between and within European regions with only a slight decrease in geographical differences seen over time [5]. Survival also varies across age groups and between sexes.

The main prognostic factor for SM is stage at diagnosis (Breslow thickness) [7] and prompt and appropriate treatment. Therefore, in many countries a lot of effort is put in early diagnosis. However, improvements in survival do not necessarily reduce mortality [8]. In fact, overdiagnosis and lead time bias affect survival without preventing deaths. Therefore, differences and changes in survival must be interpreted with caution.

The aim of the present EUROCARE-5 study is to provide updated data on SM RS, focusing on differences still present across European countries.

Materials and methods

We considered all adult patients (15 years and over) diagnosed in 2000-2007, with one or multiple invasive SM, which was defined by topography (C44.0-C44.9) and morphology (8720-8790) codes, according to the International Classification of Diseases for Oncology, (ICDO-3) [9].

Overall, 241,485 cases from 29 countries (86 cancer registries [CRs]), divided into five European regions (Ireland and UK [Ireland/UK], Northern, Central, Southern and Eastern Europe), and followed up to the end of 2008 were included in the analyses.

We estimated the age-specific (15-44, 45-54, 55-64, 65-74, and 75+ years) and age-standardised 1-year, 5-year and 5-year relative survival conditional to surviving 1 year after diagnosis.

We also presented the 5-year RS for different morphology and topography subgroups. In particular, we considered 5 morphology subgroups: superficial spreading (SSM, ICDO-3 code 8743), lentigo malignant (8742), nodular melanoma (8721), other specified types (8722-3, 8730, 8740-1, 8744-6, 8761, 8770-4, 8780) and not otherwise specified (NOS, 8720) SM; and 4 topography groups: head and neck (C44.0-C44.4), trunk (C44.5), limbs (C44.6-C44.7), overlapping and not specified sites (C44.8, C44.9).

Age-standardised incidence rates were also computed.

We also analysed trends in 5-year RS over 1999-2001, 2002-2004, and 2005-2007, involving 213,101 cases from the 65 CRs with complete incidence data from at least 1996 to 2006, with the exception of 16 CRs from France and Spain with data from 1995 to 2004.

Statistical methods

Data collection, quality checks process and statistical methods of the EURO CARE project were described elsewhere in this monograph [10]. In brief, RS for cases diagnosed in 2000-2007 was estimated by the complete cohort approach [11] and for time trends analyses the period approach [10,12] was applied. The Z-test [10] was used to compare survival estimates over the study period.

European survival estimates derived from the cohort analyses were country-weighted; whereas estimates in the trend analysis were area-weighted [10].

Both age-specific and age-standardised [13] RS were obtained by using the Ederer II method for expected survival [14], whereas incidence rates were age-standardised on the European standard population.

The Pearson's correlation coefficient [15] was computed between age-standardised incidence rates and age-standardised five-year RS for the period 2000-2007, by European region.

Finally, only the 51 out of 86 CRs with adequate morphology completeness (i.e. proportion of NOS SM < 30%) were included in the survival analyses for cases diagnosed in 2000-2007.

Results

The EUROCARE-5 database collected 243,417 SM diagnosed in 2000-2007 (Table 1). Cases with major errors, known only from death certificate (DCO), or known from autopsy alone were excluded from the survival analyses. The proportion of major errors was 0% or negligible for the majority of the registries but 5% in Cracow (Poland). Moreover, the proportions of DCO and autopsy cases were, respectively, low (0.4%; range 0.0%-2.7%) or negligible (0.04%; range 0.0%-0.5%). After exclusions, 241,485 cases were included in the analyses. The proportion of microscopically verified cases was 98.5% (range 87.5%-100%).

Overall Europe, 15.4% of analysed SM were located on the head and neck (range 12.9%, Southern Europe - 18.5%, Ireland/UK), 32.6% on the trunk (27.2%, Ireland/UK - 40.6%, Eastern Europe), 44.3% on the limbs (36.6%, Southern Europe - 49.3%, Ireland/UK) and 7.7% on not specified (or overlapping) sites (4.9%, Ireland/UK - 19.1%, Southern Europe) (Table 2).

Considering all the 86 analysed CRs, the proportion of cases with morphology NOS was 38.6% (Table 1), ranging from 5.7% (Biella, Italy), 6% (Doubs, France) to 93.7% (Poland, Cracow), 96.8% (Croatia), 99.0% (Poland, Silesia) and 99.6% (Finland). Thus, not all the CRs made available detailed information for the requested variable. Among the 51 CRs with complete information on morphology (99068 cases), more than half of cases presented a SSM, whereas only 6% of cases the lentigo maligna. Morphology distribution was quite homogeneous among European regions, except

for Eastern Europe showing the lowest proportion of SSM (34.7%) and the highest proportion of cases with morphology NOS (23.7%) (Table 2).

The 5-year age-standardised RS for Europe was 83.2% (95% confidence interval, CI 82.9%-83.6%) ranging from 87.7% (95%CI 87.2%-88.2%) in Northern to 74.3% in Eastern (95% CI 73.6%-75.1%) Europe (Figure 1). Survival estimates varied markedly among Eastern European countries but were relatively high and homogeneous in the other regions. The absolute difference between the highest and lowest survival value was 4.2 percentage points (4.2%) in Northern Europe, 7.3% in Central Europe, 10.7% in Ireland and UK, 17.2% in Southern Europe and 33.8% in Eastern Europe where almost all countries had low survival with the exception of Czech Republic (83.4%).

One-year RS was 95.1%, with the same - but less evident - ranking across countries than 5-year RS, 97.4% in Northern and 91.5% in Eastern Europe.

Patients who survived one year since diagnosis had a slightly better 5-year RS than those at the time of diagnosis (87.5% vs. 83.2%, European average). This improvement was quite small and homogeneous in Northern, Central Europe and Ireland and UK (around +3 percentage points) while it was higher in Southern (+4.8%) and Eastern (+6.9%) Europe.

The correlation coefficient between age-standardised survival and incidence rate was high (0.7), i.e. high incidence often coincided with high survival.

Overall Europe, RS was significantly higher in women than in men: the absolute difference in RS between women and men was +2.2% at 1 year after diagnosis, +5.9% at 3 years and +7.4% at five years (Figure 1). Same results were evident for all age groups (Figure 1) and each European region. Differences in 5-year RS between sexes were quite stable across Europe, ranging from 5.5% in Central Europe to 8.6% in Ireland and UK (data not shown).

Moreover, five-year RS decreased with advancing age, from 89.5% for patients aged 15-44 years, to 85.4% in the age group 45-54 years, 83.6% for 55-64 years, 80.0% for 65-74 years and 72% for 75+ years old.

As regards morphology, the highest survival was observed in Europe for lentigo malignant (98.4%, range 97.2%-99.7%), followed by SSM (94.7%; 92.8%-95.0%), SM NOS (78.2%; 60.8%-82.7%), other SM (76.5%; 70.5%-80.4%) and then nodular (70.0%; 63.8%-70.1%) (Figure 2a).

Among specified morphologies, the 5-year RS for nodular and other SM in Eastern Europe was worse than the European average. Women had better survival for all morphologies (Figures 2b-c).

Five-year RS estimates for skin sub-sites in Europe were: 84.9% for limbs (95% CI 73.8%-85.4%), 80.6% for trunk (95% CI 73.8%-81.2%), 80.3% for head and neck (95% CI 73.8%-81.4%), and 64.9% for overlapping and unspecified sites (95% CI 63.9%-66.0%). Eastern Europe showed worse survival for all sub-sites (Figure 3a). However, we found that survival was generally better for women than for men for all sub-sites (Figures 3b-c).

Figure 4 shows trends in 5-year age-adjusted RS. In Europe, there was a slight improvement from 82.4% in 1999-2001 to 85.2% in the most recent period ($p<0.001$). The absolute difference in survival estimates between 2005-2007 and 1999-2001 was 0.8% ($p=0.08$) for Northern Europe, 2.3% for Central ($p<0.001$) and Southern Europe ($p=0.01$), 3.1% for Ireland and UK ($p<0.001$) and 5% for Eastern Europe ($p<0.001$).

Discussion

The present study provided survival estimates based on the widest SM dataset ever published in the EURO CARE project.

Five-year RS for SM in Europe was high, 83.2%. Among the analyzed European regions, the best survival was found in Northern and Central Europe, then in Ireland and UK and in Southern Europe; Eastern Europe had the lowest survival. Areas with the best survival had the lowest inter-country variability while Eastern Europe presented the highest variability.

These findings confirmed previously documented geographical differences [16].

SM survival is strongly related to the stage (Breslow thickness) at diagnosis [7]. Thinner SM have a better prognosis than thicker ones. Therefore, part of the geographical differences may be caused by

different stage distribution at diagnosis. Early detection and population awareness on skin self-examination promote the detection of thinner SM.

Unfortunately, information of stage is not available in the present study. However, a poorer distribution for Breslow's thickness has been already document in Eastern countries in comparison with Northern and Western countries [17]. Moreover, the 1-year RS was lower in Eastern Europe than in other regions, which indicated a larger proportion of SM with late stage at diagnosis [18].

The close relationship between Breslow's thickness and prognosis legitimized those who support early diagnosis [19-20]. However, a favourable survival does not necessarily indicate low mortality. There is little evidence about the effectiveness of SM screening on mortality [21-24] and no results from randomized trials evaluating mortality reduction are to be expected [22,25].

Despite the few indications for positive screening effectiveness from observational studies, an improvement in survival may be at least partially apparent due to a side effect of early diagnosis named overdiagnosis [8,26]. This means the detection of tumours that for their nature (indolent, regression, etc.) or for the combination of their nature and the age of the patient would have not become clinically evident during the life of the patient [27]. The strong relationship between the increase in biopsy rate and the incidence of SM has been proposed as a clue for overdiagnosis [28] and, although at least part of the growth in incidence is true [29] - considering also the increase in mortality [2,4] - overdiagnosis is contemplated as the main explanation for the rise in trends [30].

Therefore, differences in early diagnosis patterns could explain some of the variability in SM survival in Europe. The strong correlation evidenced between SM incidence and survival supports this hypothesis.

Other explanations could contribute to the differences in survival, such as different socioeconomic status, which has been shown to be an independent prognostic factor [31]. In addition, also treatment differences could be involved. For example, differential use of new expensive drugs could become more important for SM diagnosed in more recent years, due to the availability of BRAF or MEK inhibitors and anti-CTLA4 monoclonal antibodies [32].

We also found a relationship between survival and SM morphology (worse survival for nodular SM and for NOS SM in Eastern Europe) and topography (worse survival for NOS and overlapping sites). Interpretation of SM with NOS morphology or site is difficult. As regards morphology, our data showed, in all the countries out of Eastern Europe, intermediate survival for NOS SM. Therefore, in these regions NOS seemed to represent a ‘sample’ of all the morphology types. On the contrary, in Eastern Europe, morphology NOS had the worst prognosis. In this case NOS seemed to be a proof for cases selection, e.g. patients with advanced stage at diagnosis or older ones, etc.

In all the analysed regions survival for SM with NOS site was worse than for specified sites.

Moreover, a geographical variation in the case-mix by morphology sub-groups could contribute to explain at least some of the geographical differences observed in survival. However, survival in Eastern Europe for nodular, other types and NOS SM, was lower than the European average suggesting again the role of stage at diagnosis (possibly mediated by socioeconomic status, or treatment differences).

Sex has been confirmed [33] to be a strong survival predictor with better prognosis for women. The difference in relative survival between women and men was already present within the 1-year after diagnosis and increased over time. Women had better survival across all ages, skin sub-sites and morphologies. A better stage distribution at diagnosis has been suggested as a possible explanation [31] due to the supposed greater attention of women than men to their body and health. Moreover, an independent effect of female sex, supporting yet unknown biological factors, has also been suggested [34].

The present study confirmed that SM RS decreased with increasing age of the patients. Also the effect of age was presumably mediated by thickness at diagnosis [35] as a different amount of early diagnosis across generations.

Five-year RS has improved over time, in all the areas and especially in Eastern countries. The survival levels in Northern and Central Europe were probably approaching a plateau considering the slowing down of the improvement during the last period of time.

The EUROCARE standardized protocol reassured about the quality and comparability of analyzed data [36]. The quality of the database has been addressed in another chapter of this monograph [10]. However, although it is straightforward to interpret clearly an indicator of low quality, e.g. high proportion of patients lost to follow-up, it is more difficult to understand very high values of a quality index, e.g. 0% DCO or 100% microscopy verification. Also to infer the quality of histology reporting on the basis of the details in morphological entities definition may be fallacious; this could be the case of Denmark for which no detailed morphology codes have been made available for this study [35].

Due to increased incidence and higher survival, the number of people with a history of SM has risen in the European populations. In 2010, more than 1,000,000 European citizens were estimated to have had a previous SM diagnosis [37]. The increase in incidence and the improvement in survival will boost the number of prevalent SM patients in all the European countries.

In conclusion, the heterogeneity in SM survival in Europe shows the need for the improvement in diagnostic activity in the Eastern countries, which all (except for Bulgaria) also have SM mortality rates higher than the European average [2]. The range of theoretical improvement is wide, in fact, there are more than 13 percentage points of differences in 5-year RS from Eastern to Northern or Central European Countries. Skin melanoma control and prevention should consider the possible overdiagnosis evaluating the improvement in survival together with those in mortality and incidence [38]. Moreover, primary prevention should match secondary prevention programs.

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Figure 1. Age-specific and age-standardised relative survival for skin melanomas diagnosed in 2000-2007, by European region, country, gender and overall.

EUROPE, adults diagnosed 2000-2007

Age-standardized 1-yr, 5-yr relative survival (95% confidence interval) and at 5-yr conditional on surviving 1 year

	Number of cases	One year	Five years	Conditional
Northern Europe	40,597	97.4 (97.2- 97.5)	87.7 (87.2- 88.2)	90.1 (89.6- 90.6)
Denmark	9,654	97.0 (96.5- 97.4)	87.8 (86.7- 88.9)	90.5 (89.5- 91.6)
Finland	6,209	95.9 (95.3- 96.5)	85.3 (84.1- 86.6)	89.0 (87.8- 90.2)
Iceland	404	96.6 (94.2- 99.0)	85.0 (79.2- 91.2)	88.0 (82.4- 93.9)
Norway	8,575	97.1 (96.7- 97.6)	86.4 (85.4- 87.5)	89.0 (87.9- 90.0)
Sweden	15,755	98.3 (98.0- 98.6)	89.2 (88.5- 90.0)	90.8 (90.1- 91.5)
Ireland and UK	75,761	96.2 (96.0- 96.3)	85.6 (85.2- 86.0)	89.0 (88.6- 89.4)
Ireland	4,451	96.9 (96.3- 97.6)	86.4 (84.9- 88.0)	89.2 (87.7- 90.7)
UK, England	59,155	96.1 (96.0- 96.3)	85.3 (84.9- 85.8)	88.8 (88.4- 89.2)
UK, Northern Ireland	1,822	97.5 (96.6- 98.5)	90.7 (88.5- 93.1)	93.0 (90.9- 95.3)
UK, Scotland	6,774	97.0 (96.5- 97.5)	88.8 (87.6- 90.1)	91.5 (90.4- 92.7)
UK, Wales	3,559	93.8 (92.9- 94.7)	80.0 (78.2- 81.9)	85.4 (83.6- 87.1)
Central Europe	68,765	96.8 (96.6- 96.9)	87.6 (87.2- 88.0)	90.5 (90.2- 90.9)
Austria	8,543	91.7 (91.1- 92.3)	83.1 (82.0- 84.2)	90.6 (89.6- 91.6)
Belgium	6,202	96.2 (95.7- 96.8)	83.4 (82.1- 84.8)	86.7 (85.4- 88.0)
France	4,292	97.8 (97.3- 98.4)	87.2 (85.9- 88.5)	89.1 (87.9- 90.4)
Germany	21,043	97.1 (96.8- 97.4)	89.4 (88.7- 90.1)	92.1 (91.4- 92.7)
Switzerland	4,131	98.3 (97.8- 98.8)	90.4 (89.0- 91.8)	92.0 (90.6- 93.3)
The Netherlands	24,554	98.0 (97.8- 98.3)	88.4 (87.7- 89.1)	90.2 (89.5- 90.8)
Southern Europe	30,806	94.6 (94.3- 94.9)	82.6 (82.1- 83.2)	87.4 (86.8- 87.9)
Croatia	3,812	84.9 (83.7- 86.1)	70.6 (68.6- 72.7)	83.2 (81.1- 85.3)
Italy	17,813	96.4 (96.1- 96.7)	85.4 (84.7- 86.1)	88.6 (88.0- 89.3)
Malta	275	98.6 (96.5- 100.8)	87.8 (81.1- 95.0)	89.0 (82.5- 96.0)
Portugal	3,168	93.6 (92.7- 94.6)	80.3 (78.5- 82.2)	85.8 (84.1- 87.5)
Slovenia	2,628	95.7 (94.8- 96.6)	80.4 (78.2- 82.6)	84.0 (81.9- 86.2)
Spain	3,110	96.1 (95.3- 96.8)	84.6 (83.0- 86.2)	88.1 (86.6- 89.6)
Eastern Europe	25,556	91.5 (91.1- 91.9)	74.3 (73.6- 75.1)	81.2 (80.5- 82.0)
Bulgaria	2,720	78.9 (77.3- 80.6)	49.6 (47.1- 52.2)	62.9 (60.0- 65.9)
Czech Republic	13,003	95.7 (95.3- 96.1)	83.4 (82.4- 84.3)	87.1 (86.2- 88.1)
Estonia	1,023	93.8 (92.1- 95.4)	71.7 (68.0- 75.5)	76.5 (72.8- 80.3)
Latvia	1,235	86.7 (84.7- 88.8)	65.1 (61.5- 68.8)	75.0 (71.3- 78.9)
Lithuania	1,551	88.7 (86.9- 90.4)	69.2 (66.2- 72.3)	78.0 (75.1- 81.1)
Poland	2,371	84.8 (83.3- 86.3)	61.5 (59.0- 64.1)	72.6 (69.9- 75.3)
Slovakia	3,653	92.2 (91.2- 93.2)	74.7 (72.8- 76.7)	81.1 (79.2- 83.0)
Europe	241,485	95.1 (94.9- 95.3)	83.2 (82.9- 83.6)	87.5 (87.2- 87.9)

Age-standardized 5-yr relative survival (%)

Skin Melanoma

Europe, country-weighted age-specific and age-standardized observed(obs) and relative(rel) survival(%)

	All cases	Numbers of cases	One year	Three years	Five years
15-44	55,401	obs 97.1 92.2 89.0			
		rel 97.2 92.5 89.5			
45-54	40,144	obs 95.3 88.3 83.6			
		rel 95.7 89.3 85.4			
55-64	49,904	obs 94.5 85.5 79.7			
		rel 95.3 87.9 83.6			
65-74	47,849	obs 92.5 79.4 70.8			
		rel 94.4 85.0 80.0			
75+	48,187	obs 83.8 60.6 46.6			
		rel 90.8 77.6 72.0			
All adults	241,485	obs 93.5 83.2 76.6			
		rel 95.1 87.4 83.2			
Male (46%)					
15-44	20,786	obs 95.5 88.0 83.9			
		rel 95.7 88.4 84.7			
45-54	17,822	obs 93.6 84.1 77.7			
		rel 94.0 85.4 80.0			
55-64	25,533	obs 92.8 81.2 74.3			
		rel 93.8 84.3 79.4			
65-74	25,534	obs 90.8 75.4 65.5			
		rel 93.3 82.3 76.8			
75+	21,832	obs 83.1 57.8 42.9			
		rel 90.9 76.6 70.2			
All adults	111,507	obs 91.9 79.2 71.4			
		rel 93.9 84.2 79.2			
Female (54%)					
15-44	34,615	obs 98.1 94.9 92.2			
		rel 98.1 95.1 92.6			
45-54	22,322	obs 96.9 91.8 88.5			
		rel 97.1 92.6 89.8			
55-64	24,371	obs 96.3 89.9 85.3			
		rel 96.8 91.5 88.0			
65-74	22,315	obs 94.3 83.9 78.5			
		rel 95.6 87.8 83.2			
75+	28,355	obs 84.5 62.9 49.5			
		rel 90.7 78.6 73.4			
All adults	129,978	obs 94.8 86.6 81.0			
		rel 96.1 90.1 86.6			

Figure 2. Age-standardised 5-year relative survival (RS) for cases of both sexes (a.), and men (b.) and women (c.), separately, diagnosed with skin melanoma in 2000-2007, by morphological subgroups and European regions.

^aEstimates are the country-weighted European average (based on countries' average population in 2000-2007).

Figure 3. Age-standardised 5-year relative survival (RS) for cases of both sexes (a.), and men (b.) and women (c.), separately, diagnosed with skin melanoma in 2000-2007, by subsite and European regions.

^aEstimates are the country-weighted European average (based on countries' average population in 2000-2007).

Table 1. Quality indicators for skin melanoma cases (2000-2007) and number of cases included in the survival analyses, by registry^a, European country and region.

Country and region	Cases excluded from survival analyses								Quality indicators						
	Number of cases		Major errors		DCO ^a		Autopsy ^b		Alive with zero survival time		Cases eligible for survival analyses	Microscopically verified		Unspecified morphology ^c	
Cancer registry	N	N	%	N	%			N	%	N	N	%	N	%	
Northern Europe	40,642	24	0.1	2	0.0	15.0	0.0	4	0.0	40597	40,435	99.6	21680	53.4	
Denmark	9,657	0	0.0	0	0.0	3.0	0.0	0	0.0	9654	9,548	98.9	9654	100.0	
Finland	6,217	1	0.0	1	0.0	6.0	0.1	0	0.0	6209	6,197	99.8	6183	99.6	
Iceland	404	0	0.0	0	0.0	0.0	0.0	0	0.0	404	403	99.8	153	37.8	
Norway	8,600	23	0.3	1	0.0	1.0	0.0	0	0.0	8575	8,532	99.5	1786	20.8	
Sweden	15,764	0	0.0	0	0.0	5.0	0.0	4	0.0	15755	15,755	100.0	3904	24.8	
Ireland and UK	76,163	12	0.0	388	0.5	1.0	0.0	1	0.0	75761	73,841	97.5	27859	36.8	
Ireland	4,459	1	0.0	6	0.1	1.0	0.0	0	0.0	4451	4,429	99.5	1807	40.6	
UK, England	59,510	9	0.0	346	0.6	0.0	0.0	0	0.0	59155	57,735	97.6	22718	38.4	
UK, Northern Ireland	1,824	1	0.1	1	0.1	0.0	0.0	0	0.0	1822	1,809	99.3	287	15.7	
UK, Scotland	6,778	0	0.0	3	0.0	0.0	0.0	1	0.0	6774	6,754	99.7	1433	21.2	
UK, Wales	3,592	1	0.0	32	0.9	0.0	0.0	0	0.0	3559	3,114	87.5	1614	45.4	
Central Europe	69,812	2	0.0	374	0.5	4.0	0.0	667	1.0	68765	68,085	99.0	19261	28.0	
Austria	8,545	2	0.0	0	0.0	0.0	0.0	0	0.0	8543	8,423	98.6	5269	61.7	
Belgium	6,387	0	0.0	0	0.0	0.0	0.0	185	2.9	6202	6,159	99.3	2559	41.3	
France	4,648	0	0.0	0	0.0	0.0	0.0	356	7.7	4292	4,284	99.8	615	14.3	
Bas Rhin	754	0	0.0	0	0.0	0.0	0.0	9	1.2	745	743	99.7	169	22.7	
Calvados	321	0	0.0	0	0.0	0.0	0.0	11	3.4	310	309	99.7	50	16.2	
Doubs	282	0	0.0	0	0.0	0.0	0.0	5	1.8	277	277	100.0	17	6.0	
Herault	513	0	0.0	0	0.0	0.0	0.0	23	4.5	490	490	100.0	66	13.5	
Isere	667	0	0.0	0	0.0	0.0	0.0	78	11.7	589	589	100.0	42	7.0	
Loire Atlantique ^c	1,352	0	0.0	0	0.0	0.0	0.0	190	14.1	1162	1,160	99.8	187	16.1	

Manche	283	0	0.0	0	0.0	0.0	0.0	29	10.2	254	254	100.0	33	13.1
Somme	262	0	0.0	0	0.0	0.0	0.0	10	3.8	252	249	98.9	33	13.0
Tarn	214	0	0.0	0	0.0	0.0	0.0	1	0.5	213	213	100.0	18	8.4
Germany	21,491	0	0.0	370	1.7	1.0	0.0	77	0.4	21043	20543	97.6	5859	27.8
Brandenburg	2,574	0	0.0	56	2.2	0.0	0.0	0	0.0	2518	2,445	97.1	839	33.3
Bremen	820	0	0.0	20	2.4	0.0	0.0	1	0.1	799	777	97.2	244	30.5
Hamburg	2,509	0	0.0	34	1.4	0.0	0.0	1	0.0	2474	2,410	97.4	1602	64.8
Mecklenburg- Vorpommern	1,704	0	0.0	46	2.7	0.0	0.0	0	0.0	1658	1,610	97.1	406	24.5
Munich	4,532	0	0.0	12	0.3	0.0	0.0	75	1.7	4445	4,445	100.0	607	13.7
Northrhine Westfalia	2,973	0	0.0	58	2.0	1.0	0.0	0	0.0	2914	2,771	95.1	816	28.0
Saarland	1,264	0	0.0	16	1.3	0.0	0.0	0	0.0	1248	1,228	98.4	364	29.2
Saxony	5,115	0	0.0	128	2.5	0.0	0.0	0	0.0	4987	4,857	97.4	981	19.7
Switzerland	4,185	0	0.0	4	0.1	3.0	0.1	47	1.1	4131	4,122	99.8	779	18.9
Basel	812	0	0.0	3	0.4	1.0	0.1	47	5.8	761	756	99.3	73	9.6
Geneva	995	0	0.0	1	0.1	2.0	0.2	0	0.0	992	989	99.7	215	21.7
Grisons	374	0	0.0	0	0.0	0.0	0.0	0	0.0	374	374	100.0	65	17.4
St. Gallen	820	0	0.0	0	0.0	0.0	0.0	0	0.0	820	820	100.0	180	22.0
Ticino	667	0	0.0	0	0.0	0.0	0.0	0	0.0	667	666	99.9	179	26.8
Valais	517	0	0.0	0	0.0	0.0	0.0	0	0.0	517	517	100.0	67	12.9
The Netherlands	24,556	0	0.0	0	0.0	0.0	0.0	2	0.0	24554	24,554	100.0	4180	17.0
Southern Europe	31,008	58	0.2	45	0.1	1.0	0.0	98	0.3	30806	30,440	98.8	13337	43.3
Croatia	3,812	0	0.0	0	0.0	0.0	0.0	0	0.0	3812	3,808	99.9	3689	96.8
Italy	17,849	1	0.0	27	0.2	0.0	0.0	8	0.0	17813	17,521	98.4	5415	30.4
Alto Adige	578	0	0.0	0	0.0	0.0	0.0	0	0.0	578	576	99.7	38	6.6
Biella	212	0	0.0	1	0.5	0.0	0.0	0	0.0	211	210	99.5	12	5.7
Catanzaro	49	0	0.0	0	0.0	0.0	0.0	0	0.0	49	49	100.0	6	12.2
Ferrara	384	0	0.0	0	0.0	0.0	0.0	0	0.0	384	383	99.7	80	20.8
Firenze-Prato	1,240	0	0.0	1	0.1	0.0	0.0	1	0.1	1238	1,181	95.4	198	16.0
Friuli Venezia Giulia	1,882	0	0.0	0	0.0	0.0	0.0	0	0.0	1882	1,882	100.0	770	40.9

Genova	788	0	0.0	5	0.6	0.0	0.0	0	0.0	783	762	97.3	126	16.1
Latina	510	0	0.0	6	1.2	0.0	0.0	1	0.2	503	443	88.0	158	31.4
Mantova	223	0	0.0	0	0.0	0.0	0.0	0	0.0	223	222	99.6	136	61.0
Milano	1,694	0	0.0	0	0.0	0.0	0.0	3	0.2	1691	1,689	99.9	358	21.2
Modena	697	0	0.0	0	0.0	0.0	0.0	0	0.0	697	697	100.0	130	18.7
Napoli	233	0	0.0	0	0.0	0.0	0.0	1	0.4	232	231	99.6	65	27.9
Nuoro	25	0	0.0	0	0.0	0.0	0.0	0	0.0	25	25	100.0	10	40.0
Palermo	350	0	0.0	3	0.9	0.0	0.0	0	0.0	347	308	88.9	95	27.4
Parma	542	0	0.0	0	0.0	0.0	0.0	0	0.0	542	542	100.0	53	9.8
Ragusa	173	0	0.0	1	0.6	0.0	0.0	0	0.0	172	167	97.1	34	19.7
Reggio Emilia	478	0	0.0	0	0.0	0.0	0.0	0	0.0	478	473	99.0	290	60.7
Romagna	1,556	0	0.0	2	0.1	0.0	0.0	0	0.0	1554	1,535	98.8	233	15.0
Salerno	497	0	0.0	3	0.6	0.0	0.0	2	0.4	492	474	96.4	186	37.8
Sassari	180	0	0.0	1	0.6	0.0	0.0	0	0.0	179	175	97.8	54	30.0
Siracusa	206	0	0.0	1	0.5	0.0	0.0	0	0.0	205	200	97.6	29	14.1
Sondrio	179	0	0.0	0	0.0	0.0	0.0	0	0.0	179	178	99.4	28	15.6
Torino	1,179	1	0.1	0	0.0	0.0	0.0	0	0.0	1178	1,174	99.7	305	25.9
Trapani	124	0	0.0	0	0.0	0.0	0.0	0	0.0	124	123	99.2	11	8.9
Trentino	402	0	0.0	0	0.0	0.0	0.0	0	0.0	402	402	100.0	103	25.6
Umbria	815	0	0.0	0	0.0	0.0	0.0	0	0.0	815	811	99.5	234	28.7
Varese	577	0	0.0	0	0.0	0.0	0.0	0	0.0	577	571	99.0	123	21.3
Veneto	2,076	0	0.0	3	0.1	0.0	0.0	0	0.0	2073	2,038	98.3	1550	74.8
Malta	280	1	0.4	3	1.1	0.0	0.0	1	0.4	275	266	96.8	108	39.3
Portugal	3257	55	1.7	1	0.0	0.0	0.0	33	1.0	3168	3134	98.9	2305	72.8
Açores	84	0	0.0	1	1.2	0.0	0.0	2	2.4	81	80	98.8	60	73.8
Northern Portugal	1,065	0	0.0	0	0.0	0.0	0.0	18	1.7	1047	1,047	100.0	733	70.0
Southern Portugal	2,108	55	2.6	0	0.0	0.0	0.0	13	0.6	2040	2,007	98.4	1512	74.1
Slovenia National	2,629	0	0.0	0	0.0	1.0	0.0	0	0.0	2628	2,628	100.0	890	33.9
Spain	3,181	1	0.0	14	0.4	0.0	0.0	56	1.8	3110	3083	99.1	930	29.9
Basque Country	1,067	0	0.0	6	0.6	0.0	0.0	11	1.0	1050	1,044	99.4	378	36.0

Cuenca	62	0	0.0	0	0.0	0.0	0.0	0	0.0	62	62	100.0	15	24.2
Girona	409	1	0.2	2	0.5	0.0	0.0	8	2.0	398	393	98.8	60	15.0
Granada	408	0	0.0	0	0.0	0.0	0.0	0	0.0	408	404	99.0	71	17.4
Murcia	450	0	0.0	2	0.4	0.0	0.0	37	8.2	411	406	98.7	81	19.8
Navarra	397	0	0.0	1	0.3	0.0	0.0	0	0.0	396	394	99.5	132	33.2
Tarragona	388	0	0.0	3	0.8	0.0	0.0	0	0.0	385	380	98.7	193	50.0
Eastern Europe	25,792	31	0.1	97	0.4	80.0	0.3	28	0.1	25556	25,174	98.5	11540	45.2
Bulgaria	2,722	0	0.0	2	0.1	0.0	0.0	0	0.0	2720	2,717	99.9	2106	77.4
Czech Republic	13,087	0	0.0	0	0.0	70.0	0.5	14	0.1	13003	13,003	100.0	4238	32.6
Estonia	1,027	0	0.0	2	0.2	2.0	0.2	0	0.0	1023	1,014	99.1	214	21.0
Latvia	1,265	4	0.3	21	1.7	5.0	0.4	0	0.0	1235	1,182	95.7	671	54.3
Lithuania	1,554	0	0.0	1	0.1	0.0	0.0	2	0.1	1551	1,549	99.9	1208	77.9
Poland	2,496	27	1.1	2	0.1	1.0	0.0	14	0.6	2452	2,282	93.1	2145	87.5
Cracow	522	27	5.2	0	0.0	1.0	0.2	5	1.0	489	489	100.0	458	93.7
Kielce	623	0	0.0	1	0.2	0.0	0.0	0	0.0	622	622	100.0	440	70.8
Silesia	1,267	0	0.0	0	0.0	0.0	0.0	7	0.6	1260	1,171	92.9	1247	99.0
Slovakia	3,725	0	0.0	70	1.9	2.0	0.1	0	0.0	3653	3,427	93.8	958	26.2
Europe	243,417	127	0.1	906	0.4	101.0	0.0	798	0.3	241485	237,975	98.5	93213	38.6

^a Data from European 86 cancer registries

^b Cases known by death certificate

^c Diagnosed incidentally at autopsy

^d Proportion of patients diagnosed while alive in 2000–03, censored with less than 5 years of follow-up. For the French registries this quality indicator was calculated for cases diagnosed in 2000–02

^e Morphology not otherwise specified

^f Specialised cancer registry till 1997

Table 2. Distribution of topography^a and morphology^b subgroups for skin melanoma cases diagnosed in 2000-2007, overall and by European region.

				European regions						
Codes				Northern Europe	Ireland and UK	Central Europe	Southern Europe	Eastern Europe	Europe	
Morphology	Nodular melanoma	8721	N	4,546	1,043	6,924	1,431	818	14,762	
			%	18.70	12.10	14.40	10.80	17.50	14.90	
	Lentigo maligna	8742	N	1,217	968	2,995	520	235	5,935	
			%	5.00	11.30	6.20	3.90	5.00	6.00	
	Superficial spreading	8743	N	12,610	4,341	27,324	5,953	1,623	51,851	
			%	51.80	50.50	56.70	45.00	34.70	52.30	
	Other specified types	c	N	498	556	2,656	2,981	894	7,585	
			%	2.00	6.50	5.50	22.50	19.10	7.70	
	NOS	8720	N	5,459	1,688	8,330	2,352	1,106	18,935	
			%	22.40	19.60	17.30	17.80	23.70	19.10	
All cases			N	24,330	8,596	48,229	13,237	4,676	99,068	
Topography	Head and neck	C44.0-C44.4	N	5,543	13,983	10,106	3,971	3,642	37,245	
			%	13.7	18.5	14.7	12.9	14.3	15.4	
	Trunk	C44.5	N	15,888	20,753	21,969	9,682	10,383	78,675	
			%	39.1	27.4	31.9	31.4	40.6	32.6	
	Limbs	C44.6-C44.7	N	16,733	37,332	31,632	11,269	9,973	106,939	
			%	41.2	49.3	46	36.6	39	44.3	
	Not specified sites	C44.8-C44.9	N	2,433	3,693	5,058	5,884	1,558	18,626	
			%	6	4.9	7.4	19.1	6.1	7.7	
	All cases			N	40597	75,761	68,765	30,806	25,556	241,485

^a Data from 86 European cancer registries (CRs); ^b Data from 51/86 CRs with adequate information on morphology (arbitrarily defined as <30% not otherwise specified [NOS] morphology codes 8720); ^c Comprising the following morphology codes: 8722-3, 8730, 8740-1, 8744-6, 8761, 8770-4, 8780