

Economic burden of skin cancers in Europe

Introduction

As observed by Dr Eline Noels of the Erasmus University of Rotterdam, the knowledge of the economic burden of skin cancers is “essential to enable health policy decision-makers to make well-informed decisions on potential interventions and to be able to evaluate the future effect of these decisions”.

Currently there is a lack of comprehensive and updated studies providing a quantitative and updated assessment of the economic burden of skin cancers; it is true particularly for non-melanoma skin cancers due to poor collection of registered data.

Skin cancers (MM and NMSC) all together represent the 6th most costly type of cancer (after breast, colon-rectum, prostate, lymphoma, and lung cancer) and medical costs for skin cancers are expected to grow in the coming years due to a rising incidence and to the introduction of new and expensive treatments / drugs.

Two methodologies for the assessment of the medical costs

Two models are used to assess the cost-of-illness at a country or region level:

- **A top-down model** where large administrative datasets (National Health Services, health insurers, regional databases, etc.) are analysed and actual costs related to skin cancers are extracted and aggregated.
- **A bottom-up model** where patterns of care are defined and average yearly cost per patient is determined; to get the total national economic burden the cost-per-patient is multiplied by the prevalence of the considered disease.

In some cases, a mixed approach is used: a specific territory is deeply analysed with a top-down approach and then the outcomes are extended to the entire country on the basis of the skin cancer prevalence rates valid for the various regions.

The economic burden of skin cancers in Europe

The only study covering all the European countries was coordinated by the Hamburg University¹; it uses a bottom-up costing model but unfortunately it is based on 2012 data and addresses melanoma only. For each country it assesses:

- Cost per patient (direct medical cost i.e., cost for medical services and drugs).
- National costs for 1st year management of the disease (total direct medical costs, morbidity costs, premature mortality costs); total direct medical costs are calculated by multiplying the

¹ M. Krensel, I. Schafer, M. Augustin – “Cost-of-illness of melanoma in Europe – a modelling approach”; JEADV, Journal of European Academy of Dermatology and Venereology” 2019, 33 (Suppl. 2), 34-45.

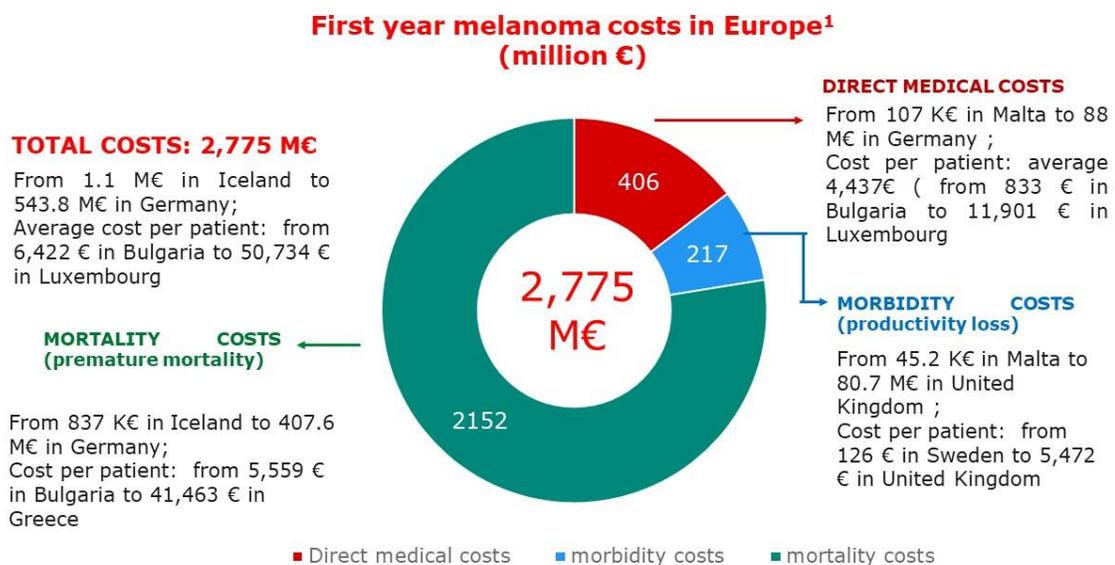
cost per patient by the 1-year prevalence i.e., the number of patients diagnosed with melanoma in 2012 and still alive at the end of the year.

To allow a comparison across countries, the costs per patient were adjusted for purchasing power parity by considering the gross domestic product pro-capita and the health expenditure pro capita for each considered country.

The report includes the EU27 Member States plus Iceland, Norway, Switzerland, and United Kingdom.

The large part of indirect costs is related to mortality costs i.e., years of life lost for a premature death due to melanoma (before 65 years old). Morbidity costs due to productivity loss represent a small percentage of the indirect costs; they vary from 126 € per patient in Sweden to 5,472 € p.p. in United Kingdom.

The main outcomes of the analysis done by the University of Hamburg are summarized in the diagram of fig. 1:



1 –EU27 + United Kingdom, Iceland, Norway and Switzerland

Source: M. Krensel, I. Schafer, M. Augustin – “Cost-of-illness of melanoma in Europe – a modelling approach”; JEADV, Journal of European Academy of Dermatology and Venereology” 2019, 33 (Suppl. 2), 34-45

Fig. 1: – Total costs in Europe for melanoma (2012) as calculated by a study coordinated by the University of Hamburg.

Weak points of the approach used by the Hamburg University are:

- It is limited to melanoma.
- It is based on old data (2012).
- It considers only the “first year patients” and neglects the patients in the follow up phase (continuing care).

As a result the total European medical direct costs of melanoma (in the range of 400 million Euro) represent an amount much smaller than the 1.95 B US\$ reported in U.S.A. for 2013 (medical services and prescription drugs) for melanoma and calculated with a top-down approach².

An updated model for the direct medical costs (2018)

We report here below an updated costing model for the skin cancers direct medical costs that adjusts the Hamburg University model as follows:

- The costs per patient were increased by 5% to consider the appreciation of the Euro (2018 vs. 2012). It is limited to melanoma.
- Data related to 1-year prevalence were updated to 2018 (source: Globocan 2018).
- A multiplier equal to 5.4 was applied to the 1st year total direct costs; it is the same multiplier used in research done in USA³ where the total direct costs were obtained as the sum of:
 - Initial care costs (18.5%) i.e., related to the patients diagnosed during the year under consideration.
 - Continuing care costs (68.3%) related to follow-up patients i.e., the patients diagnosed in previous years and in “continuing care”.
 - Last year of life costs (13.1%) related to the higher costs spent for patients in their last year of life.

In addition, we extended the analysis to non-melanoma skin cancers. Since there is no availability of data related to the direct medical costs of NMSC in Europe, we applied the same ratio between NMSC and MM direct costs per patient estimated in U.S.A.⁴ i.e., cost per patient for NMSC = 0.33 * cost per patient for MM.

The outcomes of the analysis are reported in the following table:

² Henry W. Lim et al. – The burden of skin disease in the United States - American Academy of Dermatology, March 1, 2017.

³ Centres for Disease Control and Prevention – Am. J. Prev. Med. 2014 Nov. 9; Doi: 10.1016/j.amepre.2014.08.036 <http://dx.doi.org/doi:10.1016/j.amepre.2014.08.036>

⁴ H.W. Lim et al. – The burden of skin disease in the United States – American Academy of Dermatology, 2017.

Type of skin cancers	2018 estimation of direct medical costs			For reference: Hamburg University study	
	1 year prevalence (2018) ⁵	1 st year direct costs (initial care)	Total direct costs by adding continuing care and last year of life costs	1 year prevalence (2012)	1 st year direct costs (initial care)
Melanoma	118,000	574 million Euro	3.1 billion Euro	91,500	406 million Euro
Non-melanoma skin cancers	278,000	443 million Euro	2.4 billion Euro	DATA NOT AVAILABLE	

Table 2: – Estimation of direct medical costs in Europe for melanoma and non-melanoma screen cancers (2018).

The following table provides a comparison of the direct medical costs of skin cancers in in Europe, U.S.A., and Australia.

Region	TOTAL DIRECT MEDICAL COSTS FOR SKIN CANCERS			NOTES
	Melanoma	Non-melanoma skin cancers	TOTAL COSTS	
EUROPE	3.1 Billion Euro	2.4 Billion Euro	5.5 Billion Euro	2018 (see above)
U.S.A.	3.3 Billion US\$ (2.9 B€)	4.8 Billion US\$ (4.2 B€)	8.1 Billion US\$ (7.1 B€)	2020 ⁶
AUSTRALIA	272 million AU\$ (177 M€)	703 million AU\$ (457 M€)	975 million AU\$ (634 M€)	2017 ⁷
	400 million AU\$ (250 M€)	1.3 Billion AU\$ (814 M€)	1.7 Billion AU\$ (1.06 B M€)	2019 ⁸

Table 2: – Total direct medical costs for melanoma and non-melanoma screen cancers in various regions.

MM and NMSC- Direct medical costs per country in Europe

The following tables report the direct medical costs in Europe per country for melanoma (Table 3a) and for non-melanoma screen cancers (Table 3b):

⁵ Source: Globocan 2018.

⁶ NIH – National Cancer Institute – National costs for cancer care – 2020 projection.

⁷ Gordon L. – Sunscreen Summit QIMRB 19/3/2018; Elliott TM, Whiteman DC et al. “Estimated Healthcare costs of melanoma in Australia over 3 years post-diagnosis” – Appl Health Econ Health Policy 2017 Dec; 15(6):805-16; <https://wiki.cancer.org.au/skincancerstats>

⁸ Gordon L. et al - The economics of skin cancer prevention with implications for Australia and New Zealand: where are we now? – Public Health, research and practice - March 2022, Volume 32, Issue 1.

Country	MELANOMA (2018 data)			
	1 year prevalence 2018	direct medical costs per patient (€)	First year total direct medical costs	first year plus continuing care and last year of life care
Austria	1935	5728	11083196	59849260
Belgium	3265	5303	17312663	93488378
Bulgaria	436	875	381347	2059276
Croatia	511	1569	801606	4328671
Cyprus	75	2625	196875	1063125
Czech Rep.	2217	2338	5184122	27994259
Denmark	2445	11333	27708329	149624978
Estonia	210	2064	433503	2340916
Finland	1540	5619	8652567	46723862
France	13515	4839	65405167	353187900
Germany	30006	5222	156680830	846076481
Greece	1486	2636	3916353	21148306
Hungary	1486	1521	2260875	12208723
Iceland	46	5245	241259	1302796
Ireland	1149	5834	6703036	36196395
Italy	11243	4125	46382434	250465145
Latvia	182	1635	297543	1606731
Lithuania	401	1700	681680	3681072
Luxembourg	137	12496	1711959	9244578
Malta	57	2617	149146	805389
Norway	2632	12036	31679147	171067393
Poland	3283	1558	5115571	27624081
Portugal	1145	2438	2791625	15074772
Romania	917	1014	930113	5022611
Slovakia	692	2048	1416870	7651098
Slovenia	629	2665	1676222	9051599
Spain	4852	3395	16470842	88942546
Sweden	4054	3439	13940693	75279740
Switzerland	3046	9855	30019244	162103917
The Netherlands	7450	5863	43680840	235876536
United Kingdom	16785	4169	69968273	377828672
TOTAL	117,827	4,870	573,873,927	3,098,919,205

Table 3a: – Direct medical costs in Europe per country for melanoma.

Country	NON MELNOMA SKIN CANCERS (2018 data)			
	1 year prevalence 2018	direct medical costs per patient (€)	First year total direct medical costs	first year plus continuing care
Austria	3256	1890	6154353	33233505
Belgium	7340	1750	12843716	69356064
Bulgaria	1329	289	383595	2071414
Croatia	927	518	479881	2591357
Cyprus	214	866	185378	1001039
Czech Rep.	3465	772	2673786	14438446
Denmark	2703	3740	10108610	54586497
Estonia	131	681	89240	481894
Finland	1810	1854	3355960	18122184
France	39911	1597	63738605	344188469
Germany	74681	1723	128686154	694905234
Greece	2290	870	1991647	10754896
Hungary	3373	502	1693511	9144958
Iceland	94	1731	162692	878538
Ireland	4147	1925	7983614	43111514
Italy	27956	1361	38059256	205519985
Latvia	248	540	133796	722499
Lithuania	438	561	245711	1326838
Luxembourg	306	4124	1261851	6813996
Malta	84	863	72532	391674
Norway	2134	3972	8476098	45770927
Poland	3670	514	1887136	10190535
Portugal	2195	805	1766038	9536604
Romania	1180	335	394968	2132829
Slovakia	704	676	475675	2568646
Slovenia	497	879	437070	2360179
Spain	19635	1120	21995804	118777344
Sweden	4648	1135	5274492	28482258
Switzerland	10773	3252	35036478	189196984
The Netherlands	14462	1935	27981887	151102192
United Kingdom	43005	1376	59157893	319452622
TOTAL	277,606	1,596	443,187,430	2,393,212,120

Table 3b: – Direct medical costs in Europe per country for non- melanoma screen cancers.

The results are summarized in the diagrams of fig. 2 (direct medical costs per patient) and of fig. 3 (total direct medical costs for the main European countries):

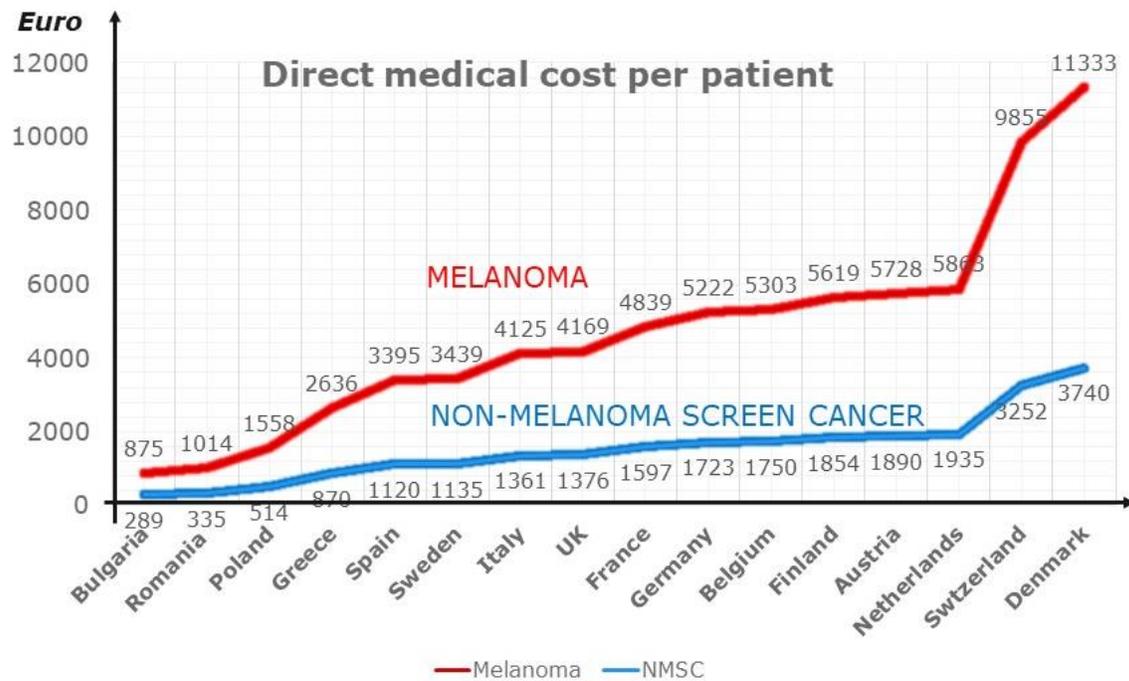


Fig. 2: – Direct medical costs per patient (2018 estimates)

The average yearly direct medical cost per patient in Europe is equivalent to 4,870 Euro for melanoma and 1,596 Euro for non-melanoma screen cancers.

There are significant differentiations across Europe: the direct medical cost per patient for melanoma varies from 875 € in Bulgaria to 12,500 € in Luxembourg and for non-melanoma screen cancers the direct medical cost per patient varies from 289 Euro in Bulgaria up to 4,124 Euro in Luxembourg.

There is an exponential growth of the treatment costs of melanoma linked to the progression of the lesion from in situ and thin towards thicker configurations. In Europe 90% of the melanoma total direct medical costs are related to stage III and IV melanomas. In this context early detection of melanoma represents the most effective tool not only to save lives but also to reduce costs. Fortunately, the researchers notice a promising trend and expect a reduction over time of the average thickness of melanoma lesions.

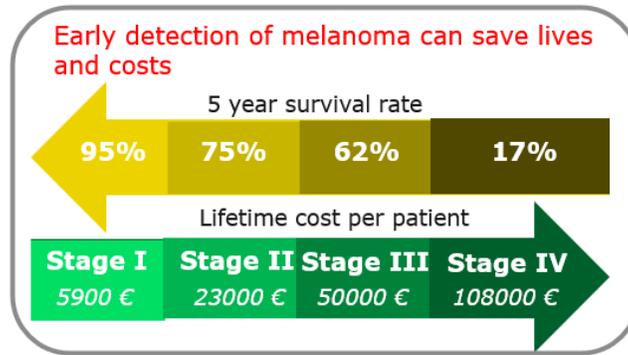


Fig. 3: – How 5-year survival rate and lifetime cost per patient change depending on the staging of melanoma lesion.⁹

The following fig. 4 shows the estimated total direct medical costs for the main European countries:

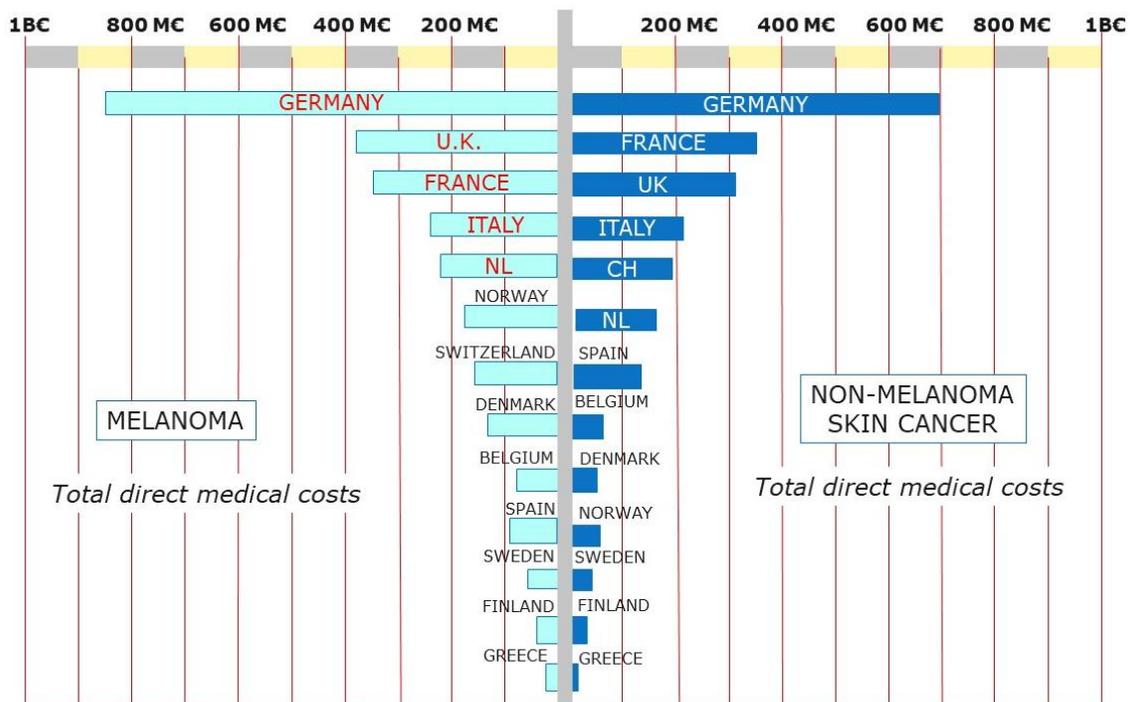


Fig. 4: – Direct medical costs per country (2018 estimates).

For both MM and NMSC Germany is the country with the highest total medical costs followed by France, United Kingdom, and Italy.

Medical costs for skin cancers are expected to increase in the coming years; this is due to a rising incidence for both MM and NMSC and to the introduction of new and expensive treatments /drugs.

⁹ Serra-Arbeloa, Á.O. Rabines-Juárez, M.S. Álvarez-Ruiz, F. Guillén-Grima - Cost of Cutaneous Melanoma by Tumor Stage: A descriptive analysis- Actas Dermo-Sifiliográficas (English Edition)- Volume 108, Issue 3, April 2017, Pages 229-236.