

How Costly is Skin Cancer for Society?

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In this paper the authors are asking for better assessment of the cost-effectiveness of preventative programs such as “the Melanoma Monday project” in future research. From a societal perspective, a comprehensive health promotion campaign aimed at skin cancer could potentially constitute excellent value for money.

The annual cost of skin cancer in Sweden in 2005 was estimated to be €142.4 million (€15/inhabitant). When comparing direct costs, i.e. only those costs associated with medical consumption, skin cancer is more costly than the equivalent costs of both multiple sclerosis and brain tumours, and is close to the cost of breast cancer.

Background

Each year approximately 400–500 patients die as a result of skin cancer in Sweden. To put the magnitude of this figure into perspective one may compare it with road traffic accidents in Sweden, which were the main cause of death in 440 cases in 2005 (1). Moreover, skin cancer is one of the most rapidly increasing cancers among the Swedish population, which makes it a serious burden on society, not only due to human suffering, but also due to the societal costs that it invokes. Consequently, effective preventative measures could potentially both save societal resources and avoid significant human suffering, yet the economic impact has not been fully assessed.

This article is a synopsis of a more extensive article published in *Acta Dermato-Venereologica* (2) and presents the costs re-

lated to skin cancer from a societal perspective. A full analysis in Swedish (3) is also available to download at: <http://www.ep.liu.se/ea/cmt/2007/005/cmt07005.pdf>. This study is a prevalence-based cost of illness study, a methodology commonly used to study the economic burden of diseases (4). It is based on the Swedish national epidemiological data on the incidence of cutaneous malignant melanoma (CMM) (5) and non-melanoma skin cancers (NMSC) (5), i.e. both basal cell carcinoma (BCC) (6) and squamous cell carcinoma (SCC). To identify the study population for the estimate of costs we used ICD-10 codes for the main skin cancer diagnoses; C43–44 and D03–04 for in situ tumours (7). In order to capture essential costs associated with secondary prevention we also included follow-up visits and diagnoses such as actinic keratosis (AK) and melanocytic naevi (MN) constituting potential preliminary stages and potential precursor lesions of skin cancer. Unfortunately, there is no national register covering episodes in outpatient care. Instead we used a defined population-based data-set on episodes and cost per patient from Östergötland county council and extrapolated this result as an estimate of the total cost of outpatient care in Sweden. The diagnoses included in our cost estimate are shown in Table I.

Table I. Cost of skin cancer in Sweden in 2005, presented in €1000 (figures in parentheses represent percentage of total cost)

Type of cost	CMM	NMSC	MIS/CIS	MN	AK	Total
Direct costs	22,082 (15.5)	30,988 (21.8)	1,042 (0.7)	10,456 (7.3)	15,077 (10.6)	79,643 (55.9)
Inpatient care	7,296 (5.1)	5,244 (3.7)	177 (0.1)	330 (0.2)	39 (0.1)	13,087 (9.2)
Outpatient care	14,638 (10.3)	24,933 (17.5)	865 (0.6)	5,200 (3.7)	14,428 (10.1)	60,064 (42.2)
Primary care	147 (0.1)	810 (0.6)		4,925 (3.5)	609 (0.4)	6,492 (4.6)
Indirect costs*	57,589 (40.4)	5,214 (3.7)				62,803 (44.1)
Mortality	50,588 (35.5)	2,687 (1.9)				53,275 (37.4)
Morbidity	7,002 (4.9)	2,527 (1.8)				9,528 (6.7)
Total costs	79,671 (55.9)	36,202 (25.4)	1,042 (0.7)	10,456 (7.3)	15,077 (10.6)	142,446 (100.0)

*3% discount rate.

CMM: cutaneous malignant melanoma; NMSC: non-melanoma skin cancer; MIS: melanoma in situ; CIS: cancer in situ in the skin; MN: melanocytic naevi; AK: actinic keratosis.

What constitutes a societal cost?

It is not always self-evident what constitutes a societal cost. Consequently, this can sometimes blur the understanding and potential use of such cost estimates among decision-makers. Usually, however, societal costs are divided into two categories: direct and indirect costs. Direct costs are the value of those resources directly involved in providing healthcare, such as the time of healthcare professionals, medicines, equipment, etc. Indirect costs, on the other hand, refer to those costs that correspond to the loss of productivity occurring as a result of an individual's inability to work on account of the disease. Such inability to work can be due to sick leave, early retirement or premature death. Transfers within society, such as social security benefits, do not, however, constitute societal costs.

In the presented study direct costs are represented by those identifiable healthcare resources consumed due to detection, treatment and follow-up of skin cancer. Divided into three subcategories depending on the type of setting that facilitated care; inpatient care, outpatient care (i.e. specialist care whether hospital-based or in private practice) and primary care. Indirect costs are estimated by the length of absence from work multiplied by the relevant cost of labour.

Societal costs associated with skin cancer

The annual cost of skin cancer in Sweden during 2005 was estimated to be €142.4 million (€15/inhabitant), as shown in Table I. Healthcare costs and lost productivity accounted for 55.9% and 44.1% of the total burden, respectively. The two main cost drivers were outpatient resource utilization and loss-of-production due to premature death, amounting to 42.2% and 37.4% of the total costs, respectively. Melanoma was found to be the diagnosis contributing the largest economic burden; with an estimated cost of €79.7 million. Other skin cancers were, however, the main cost driver for health services associated with a total cost of €36.2 million.

Although the estimated cost presented in this article is substantial, it is important to note that it is still likely to be an underestimate for a number of reasons. First, we relied on administrative systems that did not include costs related to visits where individuals seek medical consultations for other main diagnoses but have suspicious skin lesions examined at the same time.

Secondly, we found the number of skin cancer episodes reported in the primary care setting to be unreasonably low in relation to the number of referrals to the dermatology clinic, which makes us believe that our estimates of incidence in primary care are a clear underestimation. However, it is unlikely that this under-reporting will have any significant impact on the total economic burden. Finally, it is important to note that there is a considerable number of episodes being diagnosed as benign skin tumours when malignant skin tumours are suspected by the patient, for instance seborrhoeic keratoses, histiocytoma and benign actinic lentigo. We have, however, chosen not to include costs associated with these benign diagnoses, since we have not been able to present any valid figures for these diagnoses in primary care and outpatient screening clinics. An approximation, however, indicates that the cost might well be in the same order of magnitude as for MN.

How costly is skin cancer compared with other illnesses?

In Table II the cost of skin cancer is compared with the result of other fairly recent cost-of-illness studies performed in Sweden. When comparing only cost associated with medical consumption, skin cancer is more costly than equivalent costs for both multiple sclerosis and brain tumours, and is close to the cost of breast cancer. However, of these diagnoses, skin cancer is the least costly illness from a societal perspective. This is mainly due to the relatively low share of cost associated with productivity loss for skin cancer. A common criticism

Table II. Cost of illness in Sweden presented in million € in 2005 prices (figures in parentheses represent percentage of total cost for each illness)

Illness	Year	Indirect costs	Direct costs	Total costs	Reference
Depression	2004	1,727 (65%)	946 (35%)	2,673	10
Stroke	1991	323 (24%)	1,042 (76%)	1,365	11
Diabetes mellitus	1994	399 (57%)	298 (42%)	697	12
Breast cancer	2002	233 (70%)	99 (30%)	332	13
Multiple sclerosis	1994	166 (79%)	45 (21%)	211	14
Brain tumours	1996	118 (74%)	41 (26%)	159	15
Skin cancer	2005	63 (44%)	80 (56%)	142	2

of the human capital approach used in this study to estimate the value of the productivity loss due to absenteeism from work and premature mortality is, that it discriminates against those elderly people who are not in employment. This criticism is especially relevant for this study, since the majority of individuals diagnosed with skin cancer are of retirement age or older. Most of the other illnesses in Table II affect individuals who are of working age, making the indirect cost considerably higher.

It is also worth pointing out that while cost-of-illness studies of the kind presented here are useful for providing summary figures for the magnitude of the impact of particular diseases, they are unlikely to be useful for setting priorities in terms of funding for prevention and treatment. For this purpose cost-effectiveness analyses taking into account outcomes in terms of changes in survival and quality of life associated with specific interventions aimed at treating and preventing a particular health condition are needed.

Few studies have assessed the cost-effectiveness of preventive programmes for skin cancer. Two examples in the case of skin cancer are, however, the evaluation of a primary prevention campaign in Australia (8) and the simulation model focusing on melanoma screening in high-risk individuals in the USA (9). Although not applicable to a Swedish setting, these studies demonstrate that a comprehensive health promotion campaign aimed at skin cancer might constitute excellent value for money from a societal perspective. It would therefore be of great interest to assess the cost-effectiveness of preventative programs such as “the Melanoma Monday project” in future research.

References

1. Statistics Sweden, Vägtrafikskador. SIKA statistik 2006; 3: 2006.
2. Tinghög G, Carlsson P, Synnerstad I, Rosdahl I. Societal cost of skin cancer in Sweden in 2005. *Acta Derm Venereol* 2008; 88: 467–473.
3. Tinghög G, Carlsson P, Synnerstad I, Rosdahl I. Samhällskostnader för hudcancer – samt en jämförelse med kostnaderna för vägtrafikolyckor. [Societal costs for skin cancer and roadtraffic accidents in Sweden – a methodological comparison]. *CMT Rapport* 2007; 5: 2007 (in Swedish).
4. Rice DP. Estimating the cost of illness. *Health Economics Series* no. 6. Washington: Public Health Service, Division of Medical Care Administration; 1966, xi, p.131.
5. Centre for Epidemiology. Cancer incidence in Sweden 2005. *Health and Diseases* 2007; 3: 2007.
6. The National Board of Health and Welfare. Basalcellscancer – Statistik för 2004–2005. [Basal cell cancer. Statistics for 2004–2005] Stockholm: The National Board of Health and Welfare, 2006.
7. World Health Organization. International statistical classification of diseases and related health problems: ICD-10. 2nd edn. Geneva: World Health Organization; 2004, p. 808.
8. Carter R, Marks R, Hill D. Could a national skin cancer primary prevention campaign in Australia be worthwhile? An economic perspective. *Health Promotion International* 1999; 14: 73–82.
9. Losina E, Walensky RP, Geller A, Beddingfield FC 3rd, Wolf LL, Gilchrist BA, Freedberg KA. Visual screening for malignant melanoma: a cost-effectiveness analysis. *Arch Dermatol* 2007; 143: 21–28.
10. Sobocki P, Jönsson B, Angst J, Rehnberg C. Cost of depression in Europe. *J Ment Health Policy Econ* 2006; 9: 87–98.
11. Terént A, Marké LA, Asplund K, Norrving B, Jonsson E, Wester PO. Costs of stroke in Sweden. A national perspective. *Stroke* 1994; 25: 2363–2369.
12. Henriksson F, Jonsson B. Diabetes: the cost of illness in Sweden. *J Intern Med* 1998; 244: 461–468.
13. Lidgren M, Wilking N, Jonsson B. Cost of breast cancer in Sweden in 2002. *Eur J Health Econ* 2007; 8: 5–15.
14. Henriksson F, Jonsson B. The economic cost of multiple sclerosis in Sweden in 1994. *Pharmacoeconomics* 1998; 13: 597–606.
15. Blomqvist P, Lycke J, Strang P, Törnqvist H, Ekblom A. Brain tumours in Sweden 1996: care and costs. *J Neurol Neurosurg Psychiatry* 2000; 69: 792–798.

REFERENCES:

1. Reitamo S., et al. *J Allergy Clin Immunol* 2002;109: 539-546.
2. European Tacrolimus study group: *Br. J. Dermatol* 2005;152:1282-89.
3. Summary of Product Characteristics May 2007.
4. Wollenberg, A. et al.: *Allergy* 2008;63: 742-750

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