COST OF SKIN CANCER IN ENGLAND

MORRIS, S., COX, B., AND BOSANQUET, N.

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Cost of skin cancer in England

S. Morris, B. Cox and N. Bosanquet*

Tanaka Business School, Imperial College London, South Kensington Campus, London SW7 2AZ, UK

* Faculty of Medicine, Imperial College London

Correspondence: Dr. Stephen Morris
Tel: +44 (0)20 759 49118
Fax: +44 (0)20 7823 7685
Email: s.morris@imperial.ac.uk
Summary

Background
Skin cancer is one of the most common forms of cancer in the UK, yet its economic impact has not been assessed.

Objective
To estimate the financial cost of skin cancer in England in 2002.

Methods
NHS costs were calculated by combining published data on health service use by patients with skin cancer with published data on the unit cost of services. Indirect costs arising from individuals’ inability to function in their usual role as a result of skin cancer were estimated from incapacity benefit claims and numbers of registered deaths due to skin cancer.

Results
The total costs of skin cancer were in excess of £190 million. Costs to the NHS represented 37% of the total (£71 million). 63% of the total cost of skin cancer was due to malignant melanoma.

Conclusions
The cost of skin cancer to the NHS in England is considerable, though it represents a relatively small proportion of total NHS expenditure on all cancers. This might be due to the fact that skin cancer is managed efficiently and effectively, and that many skin cancers can be treated on an
outpatient basis, not requiring the need for expensive inpatient care. Further economic studies are required to assess the cost-effectiveness of treatment and prevention of skin cancer.

*Key words:* skin cancer; melanoma; cost
Introduction

Skin cancer is one of the most common forms of cancer in the UK, with recent figures suggesting an annual incidence of around 70,000 cases.\textsuperscript{1-4} There are in excess of 2,000 deaths from skin cancer each year in the UK, of which around three quarters are due to malignant melanoma.\textsuperscript{2,4,5} Evidence shows that cases of malignant melanoma have increased by a larger amount than many other major cancers in recent years, and that the incidence has more than doubled since the early 1970s.\textsuperscript{6} The aim of this study is to estimate the financial cost of skin cancer in England. A search of the NHS Economic Evaluations Database\textsuperscript{7} reveals this to be the first study to estimate this figure.

Methods

The cost of skin cancer comprises costs to the NHS, costs incurred by patients in the receipt of care, and indirect costs arising from people’s inability to work due to their illness. The latter are based on lost working days due to skin cancer morbidity (called here indirect morbidity costs) and lost working life years due to deaths from skin cancer (indirect mortality costs).

NHS costs are calculated using the latest available data on the number of general practitioner (GP) consultations, inpatient stays, day cases, and outpatient visits due to skin cancer. Unit costs are taken from published national sources and applied to each category to give an overall estimate of the cost to the NHS of skin cancer.
The perspective for the analysis is societal, in that both NHS and wider costs are included. All costs are reported in 2002 UK pounds. Where appropriate, future values are discounted into present value terms at a rate of 3.5%, as recommended by the National Institute for Clinical Excellence.  

Costs are estimated separately for two classifications of skin cancer: malignant melanoma (ICD-9 code 172, ICD-10 code C43); and, other malignant neoplasms of the skin (173 and C44, respectively). Note that the latter includes non-melanoma skin cancer, cases of which are known to be underestimated in the UK. 

GP consultations

Rates of total GP consultations for skin cancer per new case were obtained from *Morbidity Statistics from General Practice* by ICD-9 code. These rates were then applied to 2001 data on the incidence of skin cancer based on comparable ICD-10 codes from *Cancer Statistics: Registrations*. This gives the number of GP consultations associated with skin cancer. The cost of GP consultations was obtained by multiplying the number of consultations by the unit cost per consultation, taken from the *Unit Costs of Health and Social Care*.  

Inpatient stays and day cases

The number of hospitalisations for skin cancer by ICD-10 code were taken from *Hospital Episodes Statistics* in three categories: inpatient emergency admissions; inpatient elective
admissions; and day cases. The total cost of each type of hospitalisation was then calculated by multiplying the number of admissions of each type by the mean cost per admission of each type for Health Resource Group code J43 (Major Skin Tumours) in the *NHS Reference Costs 2002*.  

**Outpatient attendances**

Outpatient attendance data are available by specialty from *Hospital Activity Statistics*, but no specific figures are available for skin cancer diagnoses. To calculate the number of outpatient attendances due to skin cancer, the total number of hospital admissions for both skin cancer classifications as a proportion of all hospitalisations in the specialties of dermatology (specialty code 330), plastic surgery (160) and radiotherapy (800) was calculated, and these proportions were then applied to the total number of outpatient attendances across the three specialties. The cost of skin cancer specific outpatient attendances was then calculated by multiplying the predicted number of outpatient attendances due to skin cancer by the unit cost calculated from *NHS Reference Costs 2002* on the basis of the mean cost per outpatient attendance in the Dermatology Health Resource Group label (codes J01op to J10op).

**Costs incurred by patients receiving treatment**

Costs incurred by patients in the receipt of treatment for skin cancer include travel costs and costs associated with lost earnings from time off work. These items were computed for each component of NHS costs. Lost earnings from time off work in the receipt of treatment are included in the indirect morbidity costs if the treatment requires absence from work for more
than three days and a claim for incapacity benefit is made. Hence, to avoid double counting, lost earnings arising from the receipt of inpatient care are not included here.

Unit costs incurred by patients when attending a GP consultation were taken from the *Unit Costs of Health and Social Care* ¹¹ and include the weighted average loss of waged and non-waged time plus on costs plus travel costs. This cost was multiplied by the number of GP consultations for skin cancer to give the total costs incurred by patients for GP skin cancer consultations.

Unit costs incurred by patients for hospitalisations were based on Kernick et al. ¹⁵ who report average transport costs and economic inactivity costs incurred by patients from GP consultations and outpatient attendances. Travel costs for inpatient admissions were calculated by multiplying the unit travel costs given in Kernick et al. ¹⁵ by the number of hospital inpatient emergency and elective admissions. Patient costs incurred for day case treatment were based on average patient transport costs and economic inactivity costs for outpatient attendances reported in Kernick et al. ¹⁵ The unit patient costs were multiplied by the relevant number of each type of hospital attendance to estimate the total patient costs associated with hospitalisations.

Patient costs for outpatient attendances were calculated by multiplying the unit costs reported in Kernick et al. ¹⁵ by the number of skin cancer outpatient attendances.

*Indirect costs*
Indirect costs of skin cancer arise when individuals with skin cancer are unable to function in their usual role as a result of their illness. This is manifested by their inability to work, arising from skin cancer morbidity and mortality.

**Morbidity costs**

Morbidity costs were based on the total number of days of incapacity benefit for the period April 1st 2001 to March 31st 2002 for the diagnosis of skin cancer, based on ICD-10 codes. The data were obtained on application from the Department of Work and Pensions by age and sex groups. The figures in each group were multiplied by age and sex specific mean daily wages from the *New Earnings Survey* reported in the *Annual Abstract of Statistics*.

**Mortality costs**

The number of deaths in England and Wales due to skin cancer were obtained by age and sex groups from *Mortality Statistics: Cause*. The figures were adjusted to values for England by multiplying the number of deaths in each age and sex category by the proportion of the population of England and Wales living in England, reported in the *Annual Abstract of Statistics*. Assuming a mean retirement age of 65 years for males and 60 years for females, residual years of working life assuming full employment were computed by subtracting age at death from the sex specific retirement age. The data were then adjusted for the proportion of males and females in employment taken from the *Labour Force Survey* reported in the *Annual Abstract of Statistics* and discounted into present value terms. Employment adjusted years of residual working life
lost due to skin cancer mortality were then multiplied by annual earnings data from the New Earnings Survey reported in the Annual Abstract of Statistics 16 to give the indirect mortality costs associated with skin cancer.

**Results**

*New registrations*

There were 56,456 new registrations of skin cancer, of which 11% were for malignant melanoma (Table 1). 52% of all cases occurred in males, and 71% of cases were in individuals who were older than the normal retirement age (65 years for males, 60 years for females). There were 275,044 new registrations of all cancers combined across all ages and both sexes, with skin cancer accounting for 20% of the total.

*NHS costs*

There were an estimated 106,000 GP consultations due to skin cancer. The number of inpatient admissions, day cases and outpatient attendances was 14,000, 49,000, and 458,000, respectively. The resulting costs of skin cancer borne by the NHS are estimated to be £71 million (Table 2). The cost of each component and the proportion of total NHS costs attributable to each component are also shown. 19% of the total cost to the NHS is due to malignant melanoma, which is greater than the percentage of new cases (11%) suggesting that malignant melanoma is relatively more costly to the NHS than other skin cancers.
Costs incurred by patients receiving treatment

Patient costs associated with travel and lost earnings from time off work are estimated to be £10 million. This equivalent to 15% of total NHS costs.

Indirect morbidity costs

Claims for incapacity benefit by people in England with a diagnosis of skin cancer indicate that 218,000 working days were lost as a result of skin cancer. This results in total lost earnings of nearly £21 million.

Deaths from skin cancer indirect mortality costs

The estimated number of deaths from skin cancer is 1,819 (Table 1). This represents just over 1% of all 132,378 cancer deaths. 77% of skin cancer deaths were due to malignant melanoma. 54% of all deaths from skin cancer occurred in males, and 67% of deaths occurred in individuals past the normal retirement age. Deaths from skin cancer were estimated to result in the loss of an estimated £90 million (Table 2).

Total cost
The total cost of skin cancer in England in 2002 is estimated to be in excess of £190 million. NHS costs account for 37% of the total, with the remainder being attributable to patient costs (5%), indirect morbidity costs (11%) and indirect mortality costs (47%). 63% of the total cost of skin cancer is due to malignant melanoma.

By dividing the total cost by the number of registrations it is possible to estimate the mean cost per registration. The mean cost to the NHS per registration of malignant melanoma is £2,179, and the mean total cost is £20,020. Mean costs for other malignant skin neoplasms are £1,149 and £1,413, respectively.

**Conclusions**

In this study data from published sources have been used to calculate the cost of skin cancer in England in 2002. NHS costs, including costs incurred for GP consultations, inpatient stays, day cases and outpatient attendances, are estimated to be £71 million per annum. To put this into perspective, with this amount of money it would be possible to employ around an additional 650 Consultants for one year, employ an additional 2,900 E-grade nurses for one year, or to purchase 14,600,000 50mg doses of sildenafil. To further highlight the relative cost of skin cancer, Liu al. compare the NHS cost of selected diseases in the UK. Converting their results to 2002 prices using the NHS Pay and Prices Index, and to figures for England on the basis of the resident population, we find that the annual NHS costs associated with skin cancer are of a similar order of magnitude to those for multiple sclerosis (£75 million), and are considerably greater than the NHS costs associated with migraine (£40 million).
The cost of skin cancer to the NHS in England is considerable, though it represents a relatively small proportion of total NHS expenditure on all cancers. Bosanquet and Sikora report that total annual expenditure on all cancers in the UK NHS is £2,105 million. Converting this estimate to figures for England on the basis of the resident population means that around £1,800 million is spent annually on cancer in the English NHS. Skin cancer accounts for around 4% of this total, yet it accounts for at least 20% of all cases of cancer. A similar finding has been reported in the United States for non-melanoma skin cancer. This might be explained by the fact that skin cancer is managed efficiently and effectively, and that many skin cancers can be treated on an outpatient basis, not requiring the need for expensive inpatient care. This view is supported by the observations from Table 1 that while skin cancer accounts for at least 20% of all cases of cancer it accounts for only around 1% of all cancer deaths.

While the cost estimates presented in this paper are substantial, it is likely that they have been underestimated for a number of reasons. First, GP consultations for skin cancer were costed using the rate of consultations per case taken from general morbidity statistics from 1991-1992. Given the general trend for the increased use of health services over time, this number is likely to be an underestimate. Second, the estimated costs of skin cancer exclude certain aspects of patient management. This is due to the lack of availability of reliable estimates of the health resource use for certain cost components, such as home visits by GPs and the cost of contacts with other members of the primary care team. Third, it is recognised that the incidence of non-melanoma skin cancers in England is known to be underestimated. However, it should be borne in mind that the NHS costs are based on health service contacts by disease code, and so it is unlikely that the underreporting of new cases will have an impact on these figures.
The analysis also considers patient costs associated with the receipt of care for skin cancer, and the indirect costs. Indirect costs represent the value of lost production to society, and the human capital approach is used. This approach computes the lost income from the time that patients are absent from work because of sickness, and the lost future income due to premature mortality. A criticism of the human capital approach is that it discriminates against those who are not in employment. This is especially relevant in the case of skin cancer, since the majority of cases occur in individuals of retirement age or older – in this analysis no indirect cost is calculated for such individuals. Furthermore, the indirect morbidity estimates were derived from the number of lost days using incapacity benefit claims data made by employers classified by diagnostic codes for skin cancer. Claims for incapacity benefit underestimate the actual number of working days lost, since they do not include short periods of sickness of three days or less of Statutory Sick Pay, which are payable by employers. Note also that the number of days off work from skin cancer due to diagnoses other than malignant melanoma were reported by the Department of Work and Pensions as being nil or negligible (numbers are reported to the nearest thousand days). The upshot is that taken in combination it is likely that the NHS and total cost estimates presented in this study will probably underestimate the true cost of skin cancer in England.

Caveats notwithstanding, there is little doubt that skin cancer is a major public health issue, and it is hoped that the figures presented in this paper motivate research interest and resources to address the problem of skin cancer, in particular from an economics perspective. It is also worth pointing out that while burden of illness studies of the kind presented here are useful as a means of providing summary figures for the magnitude of the impact of a particular disease, they are unlikely to be useful for setting priorities in terms of funding for treatment and prevention. Of more use for this purpose are cost-effectiveness analyses, which take into account the costs and
benefits associated with specific interventions aimed at treating and preventing a particular problem. A good example in the case of skin cancer is the evaluation of a national skin cancer primary prevention campaign by Carter et al.,\textsuperscript{21} which demonstrates that a comprehensive, well-funded national skin cancer health promotion campaign would prove excellent value for money from the perspective of the Federal government in Australia. Unfortunately, cost-effectiveness analyses in the treatment and prevention of skin cancer are few and far between, with none focusing on the UK.\textsuperscript{7}
References

7 http://www.york.ac.uk/inst/crd/crddatabases.htm


Table 1. Registrations and deaths from skin cancer

<table>
<thead>
<tr>
<th>Age</th>
<th>Registrations</th>
<th>Deaths</th>
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<tbody>
<tr>
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<td>Malignant melanoma</td>
<td>Other malignant neoplasms of the skin</td>
</tr>
<tr>
<td></td>
<td>Males</td>
<td>Females</td>
</tr>
<tr>
<td>&lt;1</td>
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<td>1</td>
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<td>192</td>
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<td>1</td>
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<td>10-14</td>
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<td>85+</td>
<td>4,187</td>
<td>3,949</td>
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<tr>
<td>Total</td>
<td>2,638</td>
<td>3,424</td>
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Table 2. Cost of skin cancer in England in 2002

<table>
<thead>
<tr>
<th></th>
<th>Malignant melanoma</th>
<th>Other malignant neoplasms of the skin</th>
<th>All skin cancers</th>
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<tr>
<td></td>
<td>£000s  % NHS % Total</td>
<td>£000s  % NHS % Total</td>
<td>£000s  % NHS % Total</td>
</tr>
<tr>
<td>GP consultations</td>
<td>416 3.1 0.3</td>
<td>1,698 2.9 2.4</td>
<td>2,114 3.0 1.1</td>
</tr>
<tr>
<td>Inpatient care</td>
<td>6,806 51.5 5.6</td>
<td>18,071 31.2 25.4</td>
<td>24,877 35.0 12.9</td>
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<tr>
<td>Day cases</td>
<td>1,509 11.4 1.2</td>
<td>12,036 20.8 16.9</td>
<td>13,545 19.1 7.0</td>
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<tr>
<td>Outpatient attendances</td>
<td>4,477 33.9 3.7</td>
<td>26,073 45.0 36.6</td>
<td>30,550 43.0 15.9</td>
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<tr>
<td>NHS cost</td>
<td>13,208 100.0 10.9</td>
<td>57,878 100.0 81.3</td>
<td>71,086 100.0 36.9</td>
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<tr>
<td>Patient costs</td>
<td>1,548 1.3</td>
<td>8,941 12.6</td>
<td>10,489 5.4</td>
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<tr>
<td>Indirect morbidity costs</td>
<td>20,855 17.2</td>
<td>0.0</td>
<td>20,855 10.8</td>
</tr>
<tr>
<td>Indirect mortality costs</td>
<td>85,749 70.7</td>
<td>4,406 6.2</td>
<td>90,155 46.8</td>
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<td>Total cost</td>
<td>121,360 100.0</td>
<td>71,225 100.0</td>
<td>192,585 100.0</td>
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Numbers may not sum due to rounding.