



## Original Research

## Skin cancer in the youth population of the United Kingdom

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## ABSTRACT

Skin cancer is disproportionately high in the youth population of the United Kingdom, as compared with other cancers, yet it is a topic which so far has received little recognition, subsequently relevant literature is relatively scarce. In the United Kingdom, malignant melanoma is now one of the commonest cancers in those aged 15–34 years. Furthermore, malignant melanoma the 7th most common cancer in men, and 5th most common cancer in women in the United Kingdom in 2013 accounting for 4% of all cancer cases in the United Kingdom. Moreover, skin cancer is currently the fastest growing cancer in the world with a five-fold increase in frequency since the 1970's resulting in disfigurement and death.

This essay explores this skin cancer age-related anomaly through the lens of public health. A scoping review combined with a thematic analysis of literature, identified risk factors including demographic and environmental risk factors within the youth population. Research suggests that 86% of cases could be prevented alleviating the current financial burden of over £100 million spent on managing skin cancer. I therefore suggest a multi primary and secondary prevention approach through education programs, whilst promoting awareness and tanning alternatives targeting both youth and parental populations. A final recommendation involves government incentives to increase sun protective factor (SPF) in creams, and imposing a complete national ban on tanning beds. All these preventions would contribute to lowering skin cancer prevalence in the youth population whilst also alleviating the financial burden of the disease.

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## 1. Introduction

The National Institute of Clinical Excellence (NICE) recommends that extra care be taken by children and the youth to avoid skin damage as they are deemed to be an at-risk and vulnerable group with regards to both melanoma and non-melanoma skin cancer later in life [1,2]. Skin cancer is a major global issue, which is increasing in incidence in the United Kingdom faster than any other cancer [3], and is disproportionately affecting British youths [3,4].

Skin cancer is divided into two groups, melanoma and non-melanoma skin cancer; the latter is then further subdivided into basal cell carcinoma (BCC) and squamous cell carcinoma (SCC). Melanomas account for the vast majority of skin cancer deaths, whereas non-melanomas, especially BCCs, are most commonly associated with gross disfigurement by invading adjacent structures [3].

This study initially identifies social determinants of skin cancer in the United Kingdom's youth population to elucidate driving forces behind the prevalence and increasing incidence within this cohort, including demographic, environmental, solar and machine UV radiation. Subsequently, a discussion will highlight medical and financial justifications to promote primary and secondary prevention strategies. A review of youth attitudes and behaviours towards skin cancer will guide how to implement primary prevention interventions. Finally, recommendations covering screening, education programs, propaganda, and legal actions will be covered.

## 2. Epidemiology

The United Kingdom ranks 32nd out of 172 in the world for deaths secondary to skin cancer, 2.7 deaths per 100,000, and is considered to be within the group of countries with the highest skin cancer related death rates [5]. There are over 14,500 confirmed cases in 2013 [3], accounting for 4% of all cancer cases in the UK, and making malignant melanoma the 7th most common cancer in men, and 5th most common cancer in women in the United Kingdom in 2013 [6]. There are also, over 102,000 non-melanoma cases were registered in 2011, with 75% being BCCs (76,500) and 25% being

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SCCs (25,500) [3]. Moreover, it has been estimated that 30–50% BCC and 30% SCC remained unrecorded [7].

Over the last 30 years the rate of confirmed skin cancer cases has increased faster than any of the other 10 most common cancers in the United Kingdom [3]. Indeed they have increased over five fold since 1970s [3]. Since the late 1970s the incidence of malignant melanoma has increased by 360%, with a six-fold increase in males (544%) and a three-fold increase in females (263%). More recently, in just these past 10 years malignant melanoma incidence rates have increased by almost 50% [7].

Although the incidence of skin cancer increases with increasing age, unlike many diseases it is disproportionately high in the youth population [3,4]. For the purposes of this dissertation the youth population will be defined as youths aged 0–34 years of age, which reflects the years during which youths are affected by skin cancer compared to the four most common United Kingdom cancers, as revealed by the literature.

In the United Kingdom, malignant melanoma is now one of the commonest cancers in those aged 15–34 years [8]. More than two people aged 15–34 are diagnosed with malignant melanoma daily; it is the second most common cancer in this age group [3]. More specifically, melanoma is the most common form of cancer for young adults 25–29 years old and the second most common form of cancer for young people 15–29 years old [9,10]. In the United Kingdom, skin cancer incidence steeply increases from 20 years onwards [4]. Over a third of cases are found in people aged less than 55 years with 4% in those under 30 years of age, and 7.2% under 34 years [11].

In comparison, the four most common cancers in decreasing order, namely breast, prostate, lung, and bowel, relatively spare the youth population [12]. Cases start accumulate over the age of 34 for breast cancer, 45 for lung, and over the age of 50 for prostate and bowel cancers [13–16]. In contrast, skin cancer begins to affect the population noticeably from age 15 onwards, and there are a few cases reported for even younger children [11].

### 3. Methodology

This study uses Levac et al.'s six stage modified methodology framework of Arksey and O'Malley's [17] scoping review to find research from the electronic database and grey literature relevant to the topic. This is used in conjunction with a thematic analysis to chart the data into themes and help sort through the information and shape the dissertation.

#### 1 Formulate a research question

The first stage entails formulating a research question which will facilitate the process of reviewing literature on the chosen dissertation topic and guide subsequent stages within the scoping review methodological framework.

Research question: Which interventions would most effectively reduce the incidence of skin cancer in the youth population of the United Kingdom?

#### 2 Identify relevant studies

PubMed and Medline database searches were conducted online continuously throughout February – June 2016, in order to identify articles relevant to the dissertation topic. This study researched articles from 2010 onwards, but also included other key articles relevant to the topic preceding that date. This initial search identified 52 relevant research articles, and over 100 grey literature pieces. The systematic literature research involved combinations of the following keywords: “Skin cancer”; “Incidence”; “Prevalence”;

“Weather”; “UV radiation”; “Solar radiation”; “Tanning beds”; “Sun tan beds”; “Intervention”; “Prevention”; “Attitude”; “Behaviour”; “Youths”; and “United Kingdom”. Further information was retrieved through a grey literature review of various legitimate national and international organisation websites such as: Cancer Research UK; World Health Organisation (WHO); British Association of Dermatologists; National Institute for Health and Care Excellence (NICE); and the British Skin Foundation.

#### 3 Study selection

Inclusion criteria identified prior to the search included: geographic region (the United Kingdom), and population (the youth population). Other inclusion criteria identified post search included: credibility of source recognized on national or international level, publication of articles in established peer reviewed journals, and relevance of information to the study. After the selection process, 50 articles were identified with 18 research articles, and 32 grey literature articles.

#### 4 Charting the data

The database and grey literature were then charted through a thematic analysis. By using a categorizing structure, to search for relevant qualitative data, the thematic charting of evidence revealed significant data trends thereby highlighting pertinent areas of study to pursue. Major themes included: The relationships between skin cancer and demographic information, geographic location, and UV radiation. Additional themes included attitudes and behavior of the youth population in the United Kingdom with regards to skin cancer, and prevention interventions. These pertinent themes, identified through literature data abstraction, are reflected in the various sections and subsections of this study.

#### 5 Collating, summarising, and reporting the articles

The literature was initially divided into three overarching themes: Epidemiology of skin cancer, Social determinants of health, and Interventions. The reporting was carried out by summarizing the information within subsections. Conclusions were subsequently drawn whilst taking into consideration the end goal of providing intervention recommendations to address the issue of skin cancer.

#### 6 Consultation (knowledge-translation)

It is important to ensure that the study's recommendations are both relevant to decision-makers as well as practical. Relevant decision makers in this study are: medical practitioners, parents, schools, the government, companies, and the youths themselves. The knowledge-translation strategy for this project was guided by three questions:

- I How disproportionate is the prevalence of skin cancer within the youth population of the United Kingdom?
- II What are the social determinants of health which could explain such a phenomenon?
- III Which interventions would best address the situation and why?

Insight and feedback was provided by Dr. Lisa Fitzgerald, a public health sociologist specialising in the health of vulnerable populations, in this case skin cancer within the youth population of the United Kingdom.

## 4. Social determinants

### 4.1. Demographic risk factors

There are well documented physiological risk factors which inherently make certain types of skin more prone to skin cancer. A combined effort by the National Cancer Intelligence Network and Cancer Research UK, found that both Caucasian females and males have a significantly greater incidence of melanoma in the United Kingdom, as compared with Asian and Black ethnicities [18]. Caucasian populations have a lack of melanin, responsible for skin pigmentation, which acts as a sun protectant by dissipating 99.9% of absorbed UVB radiation [19]. In 2011, 86% of the United Kingdom population was Caucasian which means that the majority of the population have the type of skin which is most vulnerable to skin cancer [20].

Furthermore, almost half (45%) the United Kingdom population has light eyes (including mixed and green) with blue 20%, medium eyes (hazel) 20%, and dark eyes including brown 15% [21]. Furthermore, 25% of the British population has blond hair and 3% have red hair, which means that over a quarter of the population have even more non-modifiable risk factors for skin cancer [22]. Therefore, the majority of the United Kingdom's population are genetically predisposed to acquiring skin cancer.

### 4.2. Environmental risk factors

The ozone layer acts as a sunscreen for earth, and therefore plays a vital part in protecting humans from the majority of the sun's radiation [23]. However, the ozone has progressively depleted [24], which means the atmosphere is losing its ability to filter harmful UV radiation. The WHO estimates that a 10% decrease in ozone layer could cause an additional 300,000 non-melanoma and 4500 melanoma skin cancers [23].

The United Kingdom's overcast weather exposure can vary from low to high UV index ratings. UV indexes take into account latitude, longitude, amount of ozone in the atmosphere, sensitivity of human skin to UV radiation, as well as cloud formation; the latter absorbs UV radiation. Interestingly, clear skies allow virtually 100% of UV to pass through, scattered clouds transmit 89%, broken clouds transmit 73%, and overcast skies transmit 31% [25]. This means that United Kingdom inhabitants are constantly exposed to solar radiation, even though one does not experience it. Indeed, a pool taken by the Institute of Cancer Research found that two thirds of the British population do not wear sunscreen when in the United Kingdom [26].

### 4.3. Exposure to solar UV radiation

The number of United Kingdom residents which holiday abroad, to countries with sunny weather, rose by 4% in the year 2013 and continues to rise; especially in young adults [27]. Concurrently, the Institute of Cancer Research found that up to a third of United Kingdom residents did not wear sunscreen when on holiday [26]. It has been reported that over half of young adults aged between 18 and 29 years have had at least one sunburn, and that five or more sunburns puts a youth at double the risk of getting melanoma skin cancer, and increases their lifetime melanoma risk by 80% [28–30]. Furthermore, even if an individual tans, rather than burns, 6 times a year in high school or college there is still a 73% increase in BCC skin cancer risk [31]. The combination of living in an overcast country which does not emphasize solar protection and traveling to countries with higher sun exposure, increases the young nation's risk of acquiring skin cancer significantly.

### 4.4. Tanning device UV radiation

Unfortunately, the sun is not the only source of UV radiation. The International Agency of Research on Cancer (IARC) have classed UV tanning devices as a Group 1 risk category, which includes all cancer-causing substances such as: solar UV radiation, plutonium, and cigarettes [32]. The 2010 National Health Interview Survey noted that indoor tanners tended to be young women [33]. The IARC also determined that those who started using sunbeds before the age of 35 increased their risk of melanoma by 75% [34]. Tanning booths typically have 95% UVA, 5% UVB± 3%, where UVA is most linked with cancer, and sunlamps can give up to 12 times more annual UVA than sunlight [35]. One sunbed tanning session increases an individual's risk of SCC by 67%, BCC by 29%, and melanoma by 20%, and each extra session can increase the risk of skin cancer by up to 2% [36,37]. Furthermore, up to 25% of BCC presentations could be avoided if people did not tan indoors [38].

## 5. Interventions

### 5.1. Primary and secondary prevention

Whilst there is a high survival rate of 90% for 10 or more years, in 2012 2148 patients died from malignant melanoma, yet it is estimated that 86% of these cases were preventable, hence the need for primary interventions [7]. The vast majority of patients diagnosed with malignant melanoma are in early stages compatible with high survival rates post treatment [39]. Therefore a secondary prevention which focusses on the signs early skin cancer stages would also be effective. In addition, interventions should be tailored around psychological factors most relevant to the youth population, in order to address their lack of awareness, misinformation, concerns with beauty, and the significant role of parental influence [40,41].

### 5.2. Primary prevention benefits – cost-effective

In 2008 the United Kingdom Health department determined that £105.2 million was spent on skin cancer management [42]. An independent company confirmed this amount with an estimation of £106–112 million [42]. In 2013 there were 40 cases of malignant melanoma diagnosed on a daily basis [3], each costing between £2507–2560. Similarly, an underestimated 102,000 non-melanoma cases were registered in 2011 each costing between £889–1126 [7].

Skin cancer has increased faster than any of the other 10 most common cancers in the United Kingdom [3]. and it estimated that the cost to the NHS in 2020 will amount to over £180 million [42]. However, since 86% of cases are estimated to be preventable [7], the United Kingdom stands to potentially save over 80 million pounds by preventing the occurrence of skin cancer [7,42]. In view of this, preventative strategies should be given a high public health national priority in the interest of patient care and economic relief.

### 5.3. Education

Cancer Research United Kingdom organisation suggests that the most cost effective method of screening for skin cancer is awareness of what changes to look for [43]. Therefore a priority should be to educate youths, their parents, and medical practitioners regarding skin cancer appearance.

Education establishments are the perfect grounds to increase awareness targeting both kids and their parents [41]. The youth population respond best to experience [40], therefore visual aids such as skin scanners should be incorporated to demonstrate the hidden effects of UV radiation despite overcast weather [44]. Also,

beauty being an important reason why youths expose themselves to UV radiation [40,41], means that education should also focus on the undesirable cosmetic effects of the sun: wrinkles, loss of elasticity, increased signs of aging, and post-surgical scars [3,45].

#### 5.4. Public health social marketing

Advertising, media, and public service announcements, currently focus on awareness of the deleterious effects of the sun and promote alternative tanning methods [46]. However, I believe a stronger, healthier and more effective campaign would be to celebrate the beauty of all skin colours. Effectively such a campaign would curtail UV radiation, associated risky behaviour carried out by youths, by challenging the currently perceived beauty ideal of tanned skin.

#### 5.5. Legal and government action

There are two main areas in which I believe the government could make a significant and constructive difference.

Companies could be given incentives, such as tax deductions and/or promotional advantages, to include sun protective factor (SPF) in their products [47]. This would create a mutually beneficial relationship between these companies and the government to address an important and increasingly prevalent medical issue.

The IARC, states that any sunbed exposure before the age of 35 increases your risk of acquiring melanoma by 75%. Although the Sunbeds Regulation Act 2010 [48] has made sunbeds illegal for those under 18, coin machines are still available and readily accessible without regulation. Since these coin machines cannot verify a person's age, I would posit that such machines are therefore illegally operating in the United Kingdom. As for individuals over 18, although it is legal to use sunbeds, these machines remain categorised as a Group 1 carcinogen risk for skin cancer [32]. I therefore recommend that decisive action be taken on behalf of the government, encouraging the United Kingdom to adopt the same policy as Brazil, and NSW Australia, by passing a complete ban on tanning devices [49].

## 6. Conclusion

Skin cancer is steadily increasing in prevalence, faster than any other cancer, disproportionately affecting a growing youth population. Therefore it is essential to address the modifiable risk factors through primary and secondary prevention, whilst take into account the psychology of the youth population.

Summary of recommendations:

1. The British government should recognised the significant influence of parents over their child's behaviour and focus efforts to address both the youths and their parents.
2. The British government should increase education in schools for both children and parents regarding skin cancer.
3. Educational facilities should acquire skin scanners in order to support educating parents and children regarding skin cancer.
4. The British government and beauty affiliated establishments should increase public health social marketing for both kids and parents.
5. The British government should promote a new equal image of beauty for all skin colours alike.
6. The British government should incentivise SPF placement in beauty products.
7. The British government should implement a complete bad on all sunbeds throughout the nation.

Skin cancer in the British youth is unquestionably a serious public health issue, for which I would encourage a multi-action approach to achieve effective and lasting results, both addressing the medical affliction on the youth population and associated economic strain on the United Kingdom.

## Conflict of interest

The authors declare that there are no conflict of interest.

## Funding

None.

## Ethical approval

Not required (This study entailed a literature review and subsequent personal suggestions to tackle the issue at hand. There is no breach of confidence, or encroachment of human or animal rights).

## Authorship

Dr. Robertson (FR) conceived the topic, researched and wrote the article under the guidance of Dr. Fitzgerald (LF), a public health sociologist specialising in the health of vulnerable populations, in this case skin cancer within the youth population of the United Kingdom, who edited the article and provided insight and feedback.

## Human and animal rights

There was no infringement of human or animal rights.

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