ScotPHN report

Scottish Public Health Network (ScotPHN)

Skin Cancer in Scotland: What scope is there for further public health action?

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Foreword

Across Scotland, the incidence of all types of skin cancer continues to increase and create greater demand in our cancer services. It is therefore timely for the Scottish Public Health Network to be producing this short, scoping report exploring what additional, public health actions could be taken to help prevent this increasing burden of disease.

Of course, interventions aimed at preventing skin cancer have been part of the public health "offer" for some time now, so in undertaking this work the chief concern has been to understand what the increase in incidence really means in practice, what more we could be – or should have been – doing right now in prevention, and what – if any – are the future challenges that we may need to face in the future.

I am grateful to Rebecca Walton, Julie Arnot and Phil Mackie at ScotPHN who have been lead authors on this report. They have provided us all with a useful tool to help take a critical look at our approach to skin cancer prevention and, where needed, make the case for change.

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1. Executive Summary

1.1 The purpose of this scoping exercise

This scoping exercise was undertaken to help local Directors of Public Health and their teams consider what opportunity there may be – if any – to strengthen preventative intervention to reduce the growing burden of skin cancer in Scotland.

This report presents work on three specific areas which will help inform the consideration. These are:

- describing the epidemiology of skin cancer in Scotland;
- outlining changes to UV exposure and the impact on health, with particular reference to skin cancer; and
- reviewing the evidence of effectiveness for both primary prevention (avoidance of solar and artificial ultraviolet radiation) and secondary prevention (early detection) of skin cancer.

1.2 The epidemiology of skin cancer

Malignant melanoma and non-melanoma skin cancers are common in the Scottish population compared to other types of cancer. The incidence of both these groups of skin cancer has been rising over the past decades. Currently, malignant melanoma is the 6th most common cancer with the incidence increasing 38% for males and 22% for females over the past decade.

Like most cancers, the incidence of malignant melanoma increases with age, but melanoma has a disproportionate effect on younger people, with over a third of cases occurring in people under 55yrs. Younger females have a higher incidence than younger males, but this is reversed in the older age groups.

The mortality associated with malignant melanoma is lower than for many other cancers, ranked 17th most common cause of death from cancer in Scotland. There is no significant difference in mortality in Scotland compared to the UK. Mortality rates have increased over the past decade but less than incidence. All person mortality increased by 10% and incidence increased by 30% between 2003-2013. Epidemiology suggests that the rate of increase in incidence may be beginning to slow.

1-year and 5-year survival is highest among younger people and for melanoma diagnosed at an early stage. Survival statistics are better for females than for males, although the greatest improvement in 5-year survival over the past two decades has been for males. Evidence suggests that the difference in survival between males and females may be associated with later presentation and thicker tumours at diagnosis for males. The projected increase in incidence, particularly amongst older males, (see below) is likely to result in increased mortality rates because both age and male sex are poor prognostic indicators.

The incidence and mortality associated with malignant melanoma is lowest amongst people from the most deprived communities across Scotland. It is also low for Asian and Black minority ethnic groups compared to Caucasian populations, although evidence suggests that a subgroup of melanoma (Hand and Foot Melanoma) may have a similar incidence across these populations. There is insufficient data to comment on other minority ethnic groups.

Non-melanoma skin cancer is the most common group of cancers, accounting for approximately 20% of all new malignancies in the UK, and 90% of all skin cancers, with over 11,000 cases registered in Scotland (2012). The figures are likely to be an underestimate because registration is incomplete. However, the mortality associated with non-melanoma skin cancer is low, numbering fewer than 100 cases annually for both males and females.

Projections for the incidence of malignant melanoma and non-melanoma skin cancer have been estimated for the short and longer term. The incidence has increased over recent decades and these trends have been used to indicate future figures. The impact of an aging population accounts for much of the predicted increase in incidence of all cancers. Estimates from ISD Scotland suggest an 8% increase in all cancers over the 5-year period to 2020. The incidence of malignant melanoma in Scotland is predicted to change by 64% between 2003-2007 to 2018-2022, an increase in cases from 4,634 (for 2003-2007) to 7,617 (for 2018-2022). Similar work undertaken for the UK population suggests that the age-standardised rate of malignant melanoma will increase by 50% between 2007-2030. The total number of cases is predicted to increase annually by 2.8% for females and 3.5% for males until 2030. Much of the increase in incidence is amongst those aged over 60 years, especially men.

Projections for the incidence of non-melanoma skin cancer suggest that the number of cases will double between 2000 and 2030. This projected increase in cases has implications for services.

1.3 The aetiology of skin cancer

Skin cancer is a multifactorial disorder resulting from the effect of multiple genes in combination with lifestyle and environmental factors. UV radiation exposure is the major modifiable environmental factor associated with the development of skin cancer. UV radiation can be due to natural exposure (solar radiation) or due to artificial UV through the use of indoor tanning facilities such as sunbeds and sunlamps. Despite a consensus of opinion supporting this association, the exact mechanisms are not clear.

1.3.1 Environmental risk factors

A number of factors have an impact on the level of exposure to solar UV radiation. The ozone layer, solar elevation, cloud cover and other atmospheric components such as air pollution, and ground reflection all have an influence. Thinning of the ozone layer exposes people to more solar radiation. Although the Montreal Protocol

of 1987 has phased out the use of ozone-depleting gases, modelling suggests that exposure to UV radiation will peak around 2020, with an estimated 10% increase in UV radiation relative to the 1980s. The WHO Stratospheric Ozone Depletion, Ultraviolet Radiation and Health Report, compiled as part of the WHO Programme on Climate Change and Health, estimates that by 2050 there will be 5% increase in the incidence of skin cancer (assuming no change in population age demographics).

1.3.2 Life-style risk factors

Artificial sources of UV radiation such as indoor tanning facilities are associated with an increase in skin cancer. Studies suggest that using a sun-bed before 35 years of age is associated with an increase in risk of melanoma, and before 25 years associated with increased risk of BCC. “Ever” use of a sun-bed was associated with an increased risk of melanoma, BCC and SCC.

Increase in person exposure to UV radiation is influenced by behaviour. Sun-protection behaviours include:

- avoidance of sunburn and excessive sun exposure;
- spending time in the shade for the four hours around noon (11am-3pm);
- wearing clothing that protects against exposure including a broad brimmed hat and sunglasses; and
- using additional protection with sunscreen.

The proportion of individuals who use sun-protective measures varies across studied populations but factors associated with sun-protective behaviours include female gender, skin-sensitive phenotype, a greater perceived benefit of sun-protection and a greater perceived risk of skin cancer.

However, for Caucasian populations there is a fashion towards having a suntan. Studies have found females are more likely to approve of risky behaviours such as sun bathing. Holidays abroad, often to sunny destinations have become increasingly popular for UK residents. There is an upward trend in the number of visits abroad, with 38 million trips reported in 2013, the most frequent destination being Spain. It has been suggested that skin cancer may be associated with intermittent high intensity UV radiation exposure, such as when on holiday. The use of indoor tanning facilities is also high, especially amongst younger people. One study found that the summary prevalence of ‘ever exposure’ was 35.7% (95% CI 27.5%-44%) for adults.

Small amounts of solar UV radiation are beneficial for health and essential for the production of vitamin D, however, over-exposure may result in acute and chronic effects on the skin, eye and immune system. Physical activity is an important component of a healthy lifestyle and is often undertaken outdoors, exposed to UV radiation. A balance needs to be found between beneficial levels of UV radiation exposure and reducing the risk of harm.

Exposure to UVB radiation in sunlight boosts vitamin D supply but it is still unclear how much sunlight is required to maintain adequate levels. The guidance on maintaining adequate vitamin D levels is under review. Current UK government

advice is that no dietary intake of vitamin D is necessary for individuals living a 'normal lifestyle'. Only certain groups of the population, who are at risk of vitamin D deficiency, are currently advised to take a daily supplement.

NICE published guidance (2014) to increase supplement use amongst at-risk groups[i]. This will include the development of activities to increase awareness about vitamin D for the population of England. This work is awaiting the completion of guidance from Scientific Advisory Committee on Nutrition (SACN) which is currently undergoing a period of consultation. The draft SACN guidance recommends that consideration should be given to strategies for the UK population to achieve the Reference Nutrient Intake (RNI) of 10µg/d vitamin D for those aged 4 years and older. For younger children the aim is to achieve a Safe Intake in the range 8.5-10 µg/d at ages 0 to < 1 year and 10 µg/d at ages 1 to < 4 years[ii]. This is the amount needed for 97.5% of the population to maintain a serum 25(OH)D concentration of 25 nmol/L when UVB sunshine exposure is minimal.

If these draft recommendations are adopted it would change the balance of risk and benefit associated with exposure to solar radiation, given that the whole population would be encouraged to gain sufficient levels of vitamin D from nutritional intake.

1.3.3 Individual risk factors

There are a range of risk factors that increase the risk of developing skin cancer:

- fair skin; people with skin types I and II burn rapidly;
- children and young people; babies are at greatest risk;
- outdoor workers;
- family history of melanoma;
- people with a lot of moles (more than 50);
- people who are at risk of overexposure to UV radiation through their use of indoor tanning facilities or through their sunbathing behaviour; and
- people who are immunosuppressed.

The genetic understanding of cancer has developed rapidly in recent years. Most cancers arise from several genetic mutations that accumulate in the cells over a person's lifetime. These mutations are acquired from exposure to carcinogens and from random unrepaired mutations that occur during cell division. In addition there are some germline mutations which are inherited. There are multiple gene mutations associated with malignant melanoma. CDKN2A is the major high-risk susceptibility gene which has been found to occur in up to 50% of melanomas. Other mutations are found in CDK4, CDK6, TERT, BRAF, MITF and MC1R. There are also gene mutations associated with BCC and SCC.

1.4 Evidence for effective primary prevention of skin cancer

1.4.1 Increasing knowledge, changing attitudes and behaviour

National Institute for Health and Care Excellence

The National Institute for Health and Care Excellence (NICE) issued guidance on skin cancer prevention in January 2011. The recommendations focus on preventing the first occurrence of skin cancer attributable to over exposure to natural and artificial UV radiation. The six recommendations aim to raise and maintain awareness – and increase knowledge – of the risks of exposure to natural and artificial ultraviolet (UV) radiation. They also aim to influence attitudes and prompt people to change their behaviour to protect themselves against skin cancer.

The NICE costing statement (NICE 2015) suggested that implementation of NICE Guidance PH32 should not lead to significant costs. However, costs will vary according to local practice and both NHS organisations and local authorities are advised to assess what additional resources are needed locally.

NICE Recommendation 1. Information provision

Existing national mass-media skin cancer prevention campaigns should continue to be developed, delivered and sustained. Efforts should be made to integrate messages with existing national health promotion programmes. Local practitioners should continue to develop low cost information related activities (1:1, group-based and local media). The need for interventions to be low cost was emphasised.

NICE Recommendation 2. Developing and evaluating information campaigns and interventions

Local assessment should be used to identify target populations and evidence gathered on their needs and barriers to change. Clear measurable objectives need to be identified for prevention activities.

NICE Recommendation 3. The factual content of information

The message content is detailed in Appendix 2. This includes an explanation of UV radiation exposure and how it damages skin, how to assess individual risk and options for protection. There needs to be acknowledgement of the risks and benefits of exposure to solar radiation. It is suggested that when planning the recommended activities consideration should be given to the need for regular physical activity and for sufficient exposure to the sun in order to synthesise vitamin D.

NICE Recommendation 4. Message tone and tailoring for specific audiences

Ensure messages are appropriate for the target group, for example taking account of cognitive ability, particularly children. Ensure messages address the social and practical barriers to protecting against UV radiation exposure. Messages should be phrased to enhance people's belief in their self-efficacy relating to behaviour change.

NICE Recommendation 5. The workplace – to help protect children, young people and outdoor workers

Employers and managers of educational and leisure facilities, and employers of people who work outdoors, should assess if there is a risk of harmful exposure to the sun. If there is, they should develop, implement and monitor tailored policies to ensure people are protected as much as possible. Specific guidance is given in relation to children and young people.

NICE Recommendation 6. The provision of shade

Architects, designers, planners and employers are encouraged to consider providing areas of shade when designing or constructing new buildings, or developing communal outdoor areas.

The following interventions were not found to be cost effective:

- specific multi-component interventions (for example combining information with resources such as sun hats or sun screen); and
- the addition of shade structures to existing buildings.

There is no evidence to support the use of non-information related resources alone: such as provision of sun screen or sunhats (no studies identified).

NICE is currently working on new guidance, *Sunlight exposure: communicating the benefits and risks to the general population*. This is due to be published in February 2016 and will replace recommendations 1–5 in Skin cancer prevention: information, resources and environmental changes NICE guideline PH32 (2011).

The guidance is about communicating the benefits and risks of sunlight exposure to the general public as opposed to the risks and benefits of sunlight per se. Once published, relevant recommendations from SACN and The Advisory Group on Non-ionising Radiation (outlining health effects of UV radiation in relation to vitamin D synthesis) will be referred to in this guideline.

1.4.2 Legislation for indoor tanning

The International Commission on Non-Ionising Radiation Protection has recommended not using artificial UV tanning equipment for non-medical purposes. Similarly the British Association of Dermatologists recommends that sun-bed use should be avoided. Scotland was the first UK country to introduce new legislation on sunbed use, which came into force in December 2009. The regulations make it illegal for sunbed operators to allow under 18s to use sunbeds on their premises, to have unsupervised use of sunbeds, bans the sale or hire of sunbeds to under 18s and requires an operator to display a notice on their premises about the health risks of sunbed use.

However, there is concern that publicity for indoor tanning facilities may be inappropriately promoting health benefits, for example, in relation to vitamin D. While sunbed use may increase the synthesis of vitamin D, where people require more vitamin D than safe exposure to the sun can provide, this should be supplemented through diet rather than sunbed use. This is in line with the proposed Reference

Nutrient Intake (RNI) for vitamin D outlined in The Vitamin D Working Group of the Scientific Advisory Committee on Nutrition (SACN) draft guidance.

1.5 Evidence for effective secondary prevention of skin cancer

1.5.1 General Population: Early Detection of Skin Cancer

Whilst it is recognized that diagnosing melanoma at an early stage improves survival, there is little research evaluating interventions to improve awareness and early presentation of cancer. It has been suggested that public cancer awareness campaigns have been associated with some improvement in the awareness and diagnosis of cancer, but long-term benefits were unclear.

The Scottish Detect Cancer Early Programme is an initiative to improve survival for people with cancer in Scotland by diagnosing and treating the disease at an earlier stage[iii]. Although the programme does not include skin cancer, the first stage of the campaign was developed around the generic 'detecting cancer early benefits'; building belief that you can survive cancer, raising awareness that outcomes significantly improve if cancer is detected early and dispelling any worries about contacting health professionals. Evaluation found that the campaign did reach a large proportion of the population and there was some increase in knowledge, but there was no assessment of changes in behaviour.

1.5.2 "At Risk" Populations: Early Detection of Skin Cancer

There is evidence to suggest that targeted intervention for 'at risk' populations may improve outcomes. The current guidance is outlined below.

Malignant Melanoma

The British Association of Dermatologists guideline for the management of cutaneous melanoma[lxiii] sets out the evidence for secondary prevention for moderate and high-risk groups. They recommend that at risk individuals should be considered for referral to specialist clinics, advised of their increased risk and undertake regular skin self-examination.

The 2003 SIGN Guideline 72 Cutaneous Melanoma commented that the available evidence is insufficient to recommend for or against the routine screening of individuals at higher risk of melanoma. It suggested that interventions to promote the awareness of risk factors and skin self-awareness are probably warranted. Specifically, healthcare professionals and members of the public should be aware of the risk factors for melanoma. Individuals identified as being at higher risk should be:

- advised about appropriate methods of sun protection;
- educated about the diagnostic features of cutaneous melanoma; and
- encouraged to perform self-examination of the skin.

Squamous Cell Carcinoma – patients with organ transplants

The British Association of Dermatologists Guideline of Management of Squamous Cell Carcinoma[iv] recommends that people with organ transplants are at high risk of developing cutaneous SCC. Skin surveillance to allow early detection and treatment,

and measures to prevent SCC should be part of their routine care.

Similarly the Scottish Referral Guidelines for Suspected Skin Cancer[v] state that patients who are therapeutically immuno-suppressed after an organ transplant have a high incidence of skin cancers especially SCC. In transplant patients these tumours can be unusually aggressive and more prone to metastasize. It is strongly recommended that transplant patients are aware of this risk and are urgently referred with any suspicious lesion.

1.6 Opportunities for action

Opportunity 1: Information provision
Evidence suggests that mass media campaigns and local information can improve knowledge and attitudes about sun protective behaviours and the use of indoor tanning facilities. The information offered to the population of Scotland should be reviewed and developed in line with NICE Recommendations 1-4, and relevant findings from the awaited NICE guidance on Sunlight exposure: communicating the benefits and risks to the general population, including changes to guidance on vitamin D.

Use information gained from this needs assessment to inform primary prevention activity. In particular:

- progress needs to be made to reach middle-aged and older men who suffer a disproportionate burden from malignant melanoma; and
- continue to target advice to those travelling abroad for sunny holidays.

Opportunity 2: The workplace
A strategy should be developed to help protect children, young people and those who work outdoors, to ensure sun-safe outdoor activity. Specifically there should be support for employers and managers of educational and leisure facilities and employers of people who work outdoor:

- to assess the risk of harmful UV radiation exposure to children and employees;
- to develop effective policies to reduce the risk such exposure.

Opportunity 3: Provision of shade
Opportunities to influence the design of new buildings should be explored, for example through discussion with Local Authority Planning Departments.

Opportunity 4: Encourage enforcement of sunbed legislation

Within the context of local Community Planning or other partnership arrangements, encourage local authority partners to use their powers to ensure the sunbed legislation is enacted.

Consider if it is appropriate to request the removal of sunbeds from public authority gyms and leisure centres (if they are there?).

Explore local and national avenues regarding advertising controls. BAD advocates that advertising claims of health benefits of sunbeds should be banned given that there are no health benefits that cannot be more safely and effectively achieved through other means[vi].

Opportunity 5: Redesign of existing interventions that are not cost-effective.
Multi-component interventions (incorporating both information and sun-protection resources such as sunscreen or hats) should be redesigned, because they have not been found to be cost effective.

Opportunity 6: Self-examination
The components of skin self-examination should be reviewed and supported by the best available evidence

Opportunity 7: Early detection
Promoting prompt detection of melanoma is associated with early stage disease and therefore improved survival. Measures to promote awareness of malignant melanoma amongst the general population and targeting those at increased risk of developing melanoma should be reviewed / encouraged.

Opportunity 8: Decreasing referral time
Individuals at increased risk of malignant melanoma should be referred to specialist clinics where they can be advised of their increased risk and be taught how to self-examine their skin.

Opportunity 9: Care of transplant patients
Ensure that patients who have received an organ transplant are offered advice on how to prevent SCC, how to undertake SSE, how to recognise SCC and should be offered prompt referral for the management of any suspicious lesions.

As part of their routine care immuno-suppressed organ transplant patients should be aware of the need to take measures to prevent SCC, should have regular skin examination to allow early detection, and should be urgently referred with any suspicious lesion.

Opportunity 10: Cost implications
Undertake a formal health economic modelling exercise to understand the potential, future costs of skin cancer in Scotland associated with the current growth in changes and the potential effects of effective primary and secondary prevention.

2. Introduction

This scoping exercise was undertaken to help local Directors of Public Health and their teams consider what opportunity there may be, if any, to strengthen preventative intervention to reduce the growing burden of skin cancer in Scotland.

This report presents work on three specific areas which will help inform the consideration. These are:

- describing the epidemiology of skin cancer in Scotland;
- outlining changes to UV exposure and the impact on health, with particular reference to skin cancer; and
- reviewing the evidence of effectiveness for both primary prevention (avoidance of solar and artificial ultraviolet radiation) and secondary prevention (early detection) of skin cancer.

2.1 Context

Skin cancer is classified into two main groups, malignant melanoma and non-melanoma skin cancer (NMSC).

Malignant melanoma is the considered to be the more serious type of skin cancer and is responsible for most of the deaths from skin cancer. Malignant melanoma is not one disease; it arises from multiple sites (sun-exposed skin, non-sun-exposed skin, retina, nail plates and mucosa) and has complex genetic differences. For the purposes of this review we refer to malignant cutaneous melanoma only.

Non-melanoma skin cancer is the most common group of cancers registered in the UK and Ireland accounting for 20% of all new malignancies. The incidence and mortality associated with skin cancer are described in section 3.

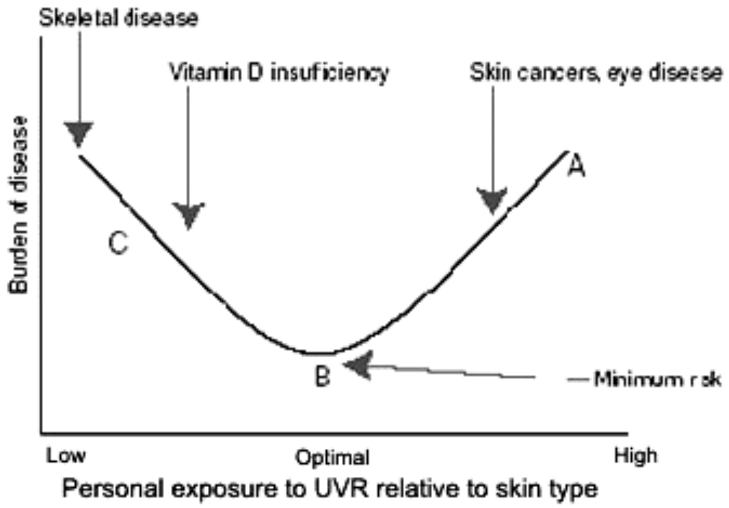
Exposure to ultraviolet (UV) radiation is the leading cause of skin cancer. This can be due to natural exposure (solar UV radiation) or artificial UV radiation. Small amounts of solar UV radiation are beneficial for health and essential for the production of vitamin D, however, over-exposure may result in acute and chronic effects on the skin, eye and immune system[vii]. This relationship is illustrated in figure 1, suggesting that a balance needs to be found between beneficial levels of UV radiation exposure and reducing the risk of harm. In addition, physical activity is an important component of a healthy lifestyle and is often undertaken outdoors, exposed to UV radiation. Again, a balance needs to be found between the benefits of physical activity and reducing the risk of harm from exposure to solar radiation.

The impact of climate change and ozone depletion on human exposure to UV radiation has been considered by INTERSUN[1], the Global UV Project, and by the

[1] INTERSUN, the Global UV Project. At the United Nations Conference on Environment and Development (UNCED) in 1992 it was declared under Agenda 21 that there should be activities on

World Health Organization (WHO) as part of the Climate Change and Human Health Work Programme[2]. Their key findings and recommendations are discussed in section 4.

Figure 1. Illustration of the relationship between exposure to UV radiation and burden of disease[viii]



The risk of developing skin cancer can be reduced by taking 'sun-protective measures' and reducing exposure to artificial UV radiation. Measures are also available to enhance the detection of skin cancer that has not yet become symptomatic (secondary prevention). The evidence base for such measures is outlined in section 5.

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the effects of UV radiation. In response, WHO, the United Nations Environment Programme, the World Meteorological Organization, the International Agency on Cancer Research and the International Commission on Non-Ionizing Radiation Protection set up INTERSUN, The Global UV Project. The mission statement is: to reduce the global burden of disease resulting from exposure to UV radiation.

[2] WHO established a Work Plan on Climate Change and Health following a request from the 61st World Health Assembly in 2008. One element of this is to enhance scientific evidence, working with experts and institutions to improve the understanding and evidence base of the linkages between climate change and health.

3. The epidemiology of skin cancer

3.1 Introduction

Melanoma and NMSC together are the most common type of cancer in Caucasian populations.

Melanoma is currently classified into four main types; superficial spreading, nodular, acral and lentigo maligna melanoma subtypes. Superficial spreading melanomas are found on any body site but most frequently the leg in females and the back in males. Nodular melanomas are the most aggressive and rapidly growing form and may be less pigmented than the other varieties. Acral melanomas are found on the palms and soles and comprise less than 10% of melanomas on Caucasian skin (but comprise a larger proportion of all melanomas on Asian and Black ethnic minority skin). Lentigo maligna melanoma, seen on light-exposed skin such as the face and forearms, is a more slowly growing and affects older individuals.

There are two main types of NMSC, basal cell carcinoma (BCC) and squamous cell carcinoma (SCC). BCC is rarely fatal but if not diagnosed early enough or not properly treated it can destroy local tissue, occasionally becoming inoperable. SCC can also destroy tissue, and can be fatal if metastasis occurs.

Patients who are immunocompromised or who have a genetic predisposition are at increased risk of developing skin cancers. There are also rare types of skin cancer. For the purposes of this scoping exercise only malignant cutaneous melanoma and non-melanoma skin cancer will be considered in detail.

3.2 Malignant Melanoma

3.2.1 International Comparison

International rates of cancer are difficult to compare but table 1 illustrates how melanoma varies by region. Incidence rates are highest in New Zealand and Australia with incidence of melanoma (world age-standardised rate) 35.8 per 100,000 population and 34.9 per 100,000 population respectively. This has been attributed to the migration of Caucasian populations to areas which receive relatively high levels of solar UV radiation. Skin cancer does occur in darker-skinned populations but at significantly lower rates (see section on ethnicity and melanoma).

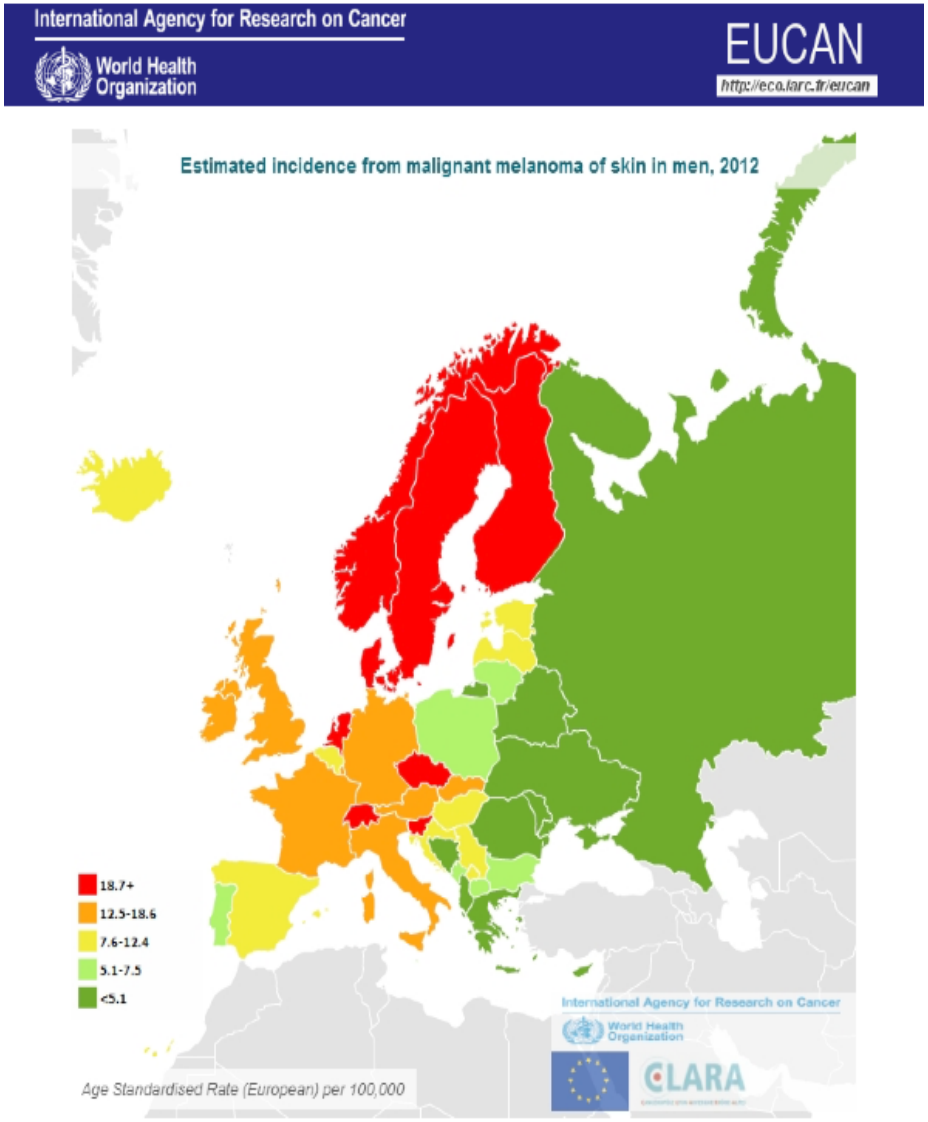
Within Europe, the UK has a relatively high incidence of melanoma. The incidence of melanoma across Europe is illustrated in the maps (see figure 2), provided by Globocan 2012 IARC[ix]. For melanoma there is a European age-standardised incidence rate (ASR) of 18.6 per 100,000 males, and 19.8 per 100,000 females, based on 2012 estimates[x].

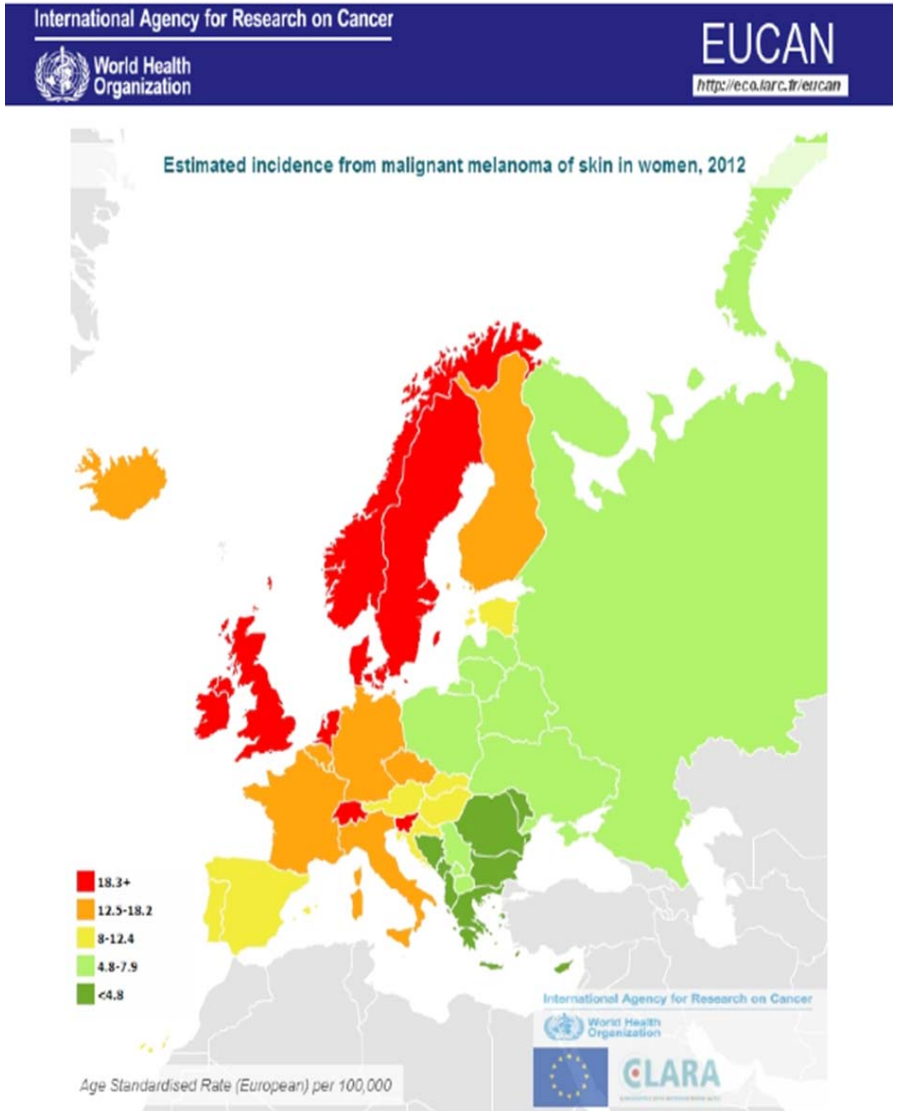
Table 1. Melanoma of skin - Estimated incidence, all ages: both sexes 2012.

Population	Number of cases	Crude Rate	ASR*
New Zealand	2473	55.4	**35.8**
Australia	12265	53.5	**34.9**
Denmark	1596	28.5	**19.2**
Norway	1506	30.4	**18.8**
Sweden	2911	30.7	**18.0**
United Kingdom	**14445**	**23.0**	**14.6**
United States of America	69109	21.9	**14.3**
Ireland	859	18.8	**13.7**
Finland	1208	22.4	**12.6**
Iceland	51	15.5	**12.1**
Canada	5382	15.5	**9.6**
Estonia	166	12.4	**7.4**
Latvia	225	10.1	**5.6**
Lithuania	275	8.4	**5.2**

*Crude and age-standardised rates per 100,000.

Source: GLOBOCAN 2012 v1.0, Cancer Incidence and Mortality Worldwide: IARC [xi]





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3.2.2 Malignant Melanoma in Scotland

Incidence

The Scottish Cancer Registry contains data on all new cases of cancer. The latest publication of Cancer Incidence in Scotland[xii] shows that malignant melanoma was ranked the sixth most common cancer for males and fifth most common for females in 2013 (table 2). There has been a steep rise in incidence of 38% in males and 22% in females over the last decade.

Table 2. Most Common Cancers in Scotland (2013)

Males

Rank	ICD-10 site grouping	Number	Frequency	10 year % change	Significant difference
1	Prostate	3,165	21.1%	-0.8	
2	Trachea, bronchus and lung	2,571	17.1%	-15.0	3
3	Colorectal	2,100	14.0%	-3.1	
4	Head and neck	869	5.8%	+6.8	
5	Kidney	595	4.0%	+25.1	3
6	**Malignant melanoma (skin)**	**585**	**3.9%**	**+38.5**	**3**
7	Oesophagus	566	3.8%	-8.5	
8	Non-hodgkin's lymphoma	561	3.7%	1.8	
9	Bladder	527	3.5%	-13.3	
10	Stomach	430	2.9%	-30.1	3
	Other malignant neoplasms	3,520	22.0%		
	All malignant neoplasms excluding NMSC	15,032	100%	-4.4	

Females

Rank	ICD-10 site grouping	Number	Frequency	10 year % change	Significant difference
1	Breast	4,665	29.2%	+9.1	3
2	Trachea, bronchus and lung	2,553	16%	+13.4	3
3	Colorectal	1,712	10.7%	+3.3	
4	Corpus uteri	729	4.6%	+33.0	3
5	**Malignant melanoma (skin)**	**587**	**3.7%**	**+22.2**	**3**
6	Ovary	565	3.5%	-13.8	3
7	Non-Hodgkin's lymphoma	501	3.1%	+9.0	
8	Head and neck	409	2.6%	+25.4	3
9	Pancreas	386	2.4%	+8.6	
10	Kidney	354	2.2%	+34.9	3
	Other malignant neoplasms	3,520	22.0%		
	All malignant neoplasms excluding NMSC	15,981	100%	+7.0	3

Source: Scottish Cancer Registry, ISD

The incidence of malignant melanoma is slightly higher in Scotland (ASR 18.6 per 100,000 population (95% CI 18-19.3)) compared to the UK (ASR 16.8 per 100,000 population (95% CI 16.6-17). The rate is also higher for Scottish females, ASR 19.6 per 100,000 population (95% CI 18.7-20.6) compared to UK ASR 17 per 100,000 population (95% CI 16.7-17.2) but not significantly different for males (see table 3).

Table 3. Incidence of Malignant Melanoma in UK 2000-2010

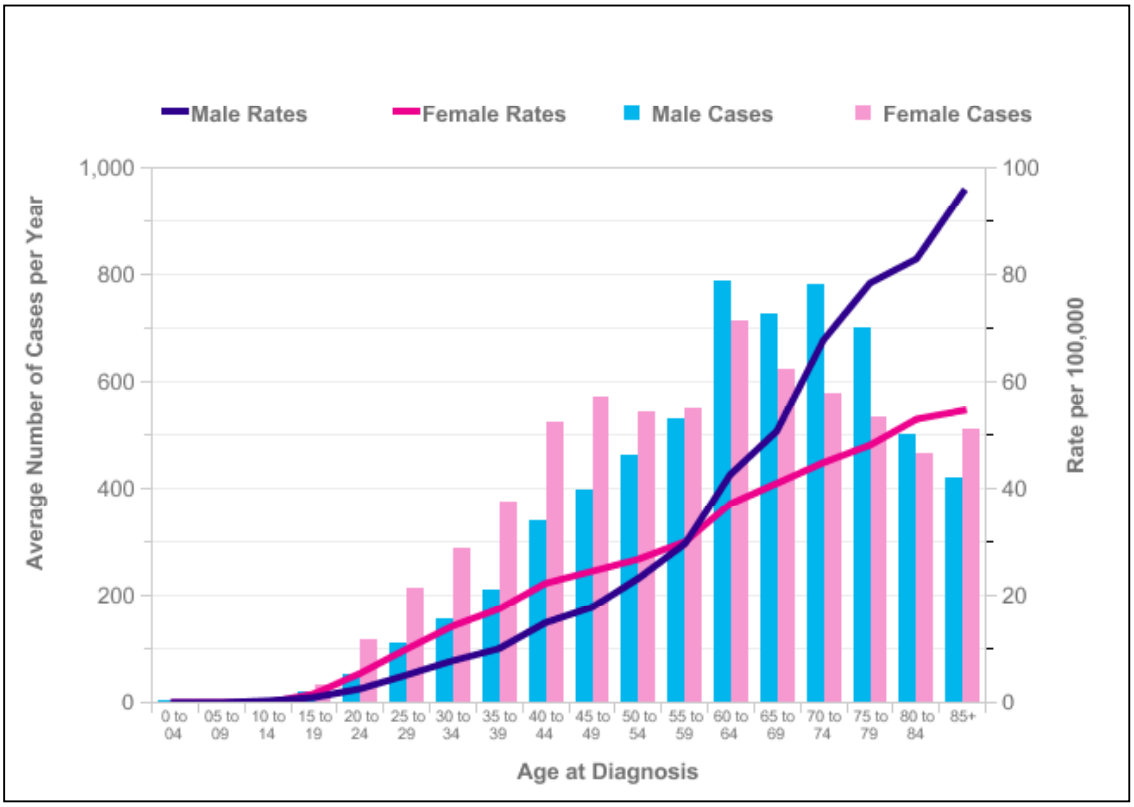
	Av. No. Cases / year	ASR/100,000 population	Lower CI	Upper CI
Persons				
Scotland	1174	18.6	18	19.3
England	10193	16.6	16.4	16.8
UK	12321	16.8	16.6	17
Male				
Scotland	529	17.7	16.8	18.6
England	4909	16.5	16.2	16.8
UK	5904	16.6	16.4	16.9
Female				
Scotland	644	19.6	18.7	20.6
England	5284	16.7	16.5	17
UK	6417	17	16.7	17.2

Source: UK Cancer e-Atlas by NHS Health Boundaries. National Cancer Intelligence Network. http://www.ncin.org.uk/cancer_information_tools/eatlas/pct/atlas.html?select=Eav&indicator=i0

Incidence of Melanoma by Age and Gender

Like most cancers the incidence of skin cancer increases with age but malignant melanoma is disproportionately high in young people. More than a third of all cases of malignant melanoma occur in people under 55 years of age. Age-specific incidence rates in the UK are higher for younger females compared to younger males and lower for older females compared to males (with rates in males overtaking females in the 55-59 year old age range) (figure 3).

Figure 3. Average Number of New Cases of Melanoma per Year and Age-Specific Incidence Rates per 100,000 population in UK (2008-2010)



Prepared by Cancer Research UK[xxvi]

Original data sources:
1. Office for National Statistics. Cancer Statistics: Registrations Series MB1. http://www.ons.gov.uk/ons/search/index.html?newquery=series+mb1
2. Welsh Cancer Intelligence and Surveillance Unit. http://www.wcisu.wales.nhs.uk
3.Information Services Division Scotland. Cancer Information Programme. www.isdscotland.org/cancer
4. N. Ireland Cancer Registry. www.qub.ac.uk/nicr.

Mortality

Mortality rates associated with malignant melanoma are low compared to many other cancers, being ranked 17, with a total of 180 deaths recorded in 2013 (table 4). But as for incidence rates, the mortality rates are increasing, 10.4% increase in all person mortality between 2003 and 2013.

Table 4. Summary Statistics for Malignant Melanoma in Scotland

Scotland

Summary Statistic	Males	Females	Persons
Rank – incidence 2013	6	5	6
Rank – mortality 2013	16	17	17
Number of new cases diagnosed in 2013	585	587	1,172
Number of deaths recorded in 2013	88	92	180
Change in incidence from 2003 to 2013	+38.5%	+22.2%	+30.3%
Change in mortality from 2003 to 2013.	+5.1%	+20.3%	+10.4%
1 year relative survival for patients diagnosed between 2007 and 2011	97.0%	99.1%.	98.5%
5 year relative survival for patients diagnosed between 2007 and 2011	89.8%	96.4%.	94.0%

Notes:
1. Survival figures are not age standardised.
2. Change in incidence and mortality is estimated by Poisson regression.

Source: ISD Scotland, Cancer Statistics, Skin Cancer.
http://www.isdscotland.org/Health-Topics/Cancer/Cancer-Statistics/Skin/#summary

Compared to UK there is no significant difference in mortality rates between England, Scotland and the UK as a whole (see table 5).

Table 5. Mortality from Malignant Melanoma 2009-2011 for Scotland and the UK.

Persons	Av. No. deaths / year	ASR/100,000 population	L CI	UCI
Scotland	185	2.7	2.5	2.9
England	1808	2.6	2.6	2.7
UK	2164	2.7	2.6	2.7
Male				
Scotland	107	3.4	3.0	3.8
England	1035	3.3	3.1	3.4
UK	1240	3.3	3.2	3.4
Female				
Scotland	79	2.0	1.7	2.3
England	772	2.0	1.9	2.1
UK	924	2.0	1.9	2.1

Source: UK Cancer e-Atlas by NHS Health Boundaries. National Cancer Intelligence Network.
http://www.ncin.org.uk/cancer_information_tools/eatlas/pct/atlas.html?select=Eav&indicator=i0

Survival

Survival data are collated by ISD[xiii] and are described by age, sex and stage of melanoma.

- Age

  Survival is better for younger patients compared to older patients even after adjustment for higher general mortality in the older group, as shown in table 6. This could be due to differences in tumour biology, better general health, earlier diagnosis or better suitability for and effectiveness of treatment.

Table 6. To show % relative survival at 5yrs after diagnosis by age (2007-2011)

	15-44yrs	45-54yrs	55-64yrs	65-74yrs	75-84yrs	85-99yrs
Males	91.0	89.7	90.4	90.9	82.1	60.6
Females	97.2	96.1	95.6	95.7	92.5	83.7

- Gender

  The age-standardised relative survival for malignant melanoma between 2007-2011 showed 97.4% men survived 1 year and 87.9% survived 5 years. For women, 98.4% survived 1 year and 95.1% survived 5 years. The percentage change in 5 year survival between 1987-1991 and 2007-2011 was 13.2% (74.7% to 87.9%) for males and 6% (89.1% to 95.1%) for females. This improvement in 5 year survival may be associated with an increase in diagnosis at an earlier stage.

  Differences in survival between men and women can be found in many cancers. For melanoma the absolute difference in survival is over 7% in favour of women, similar to that for thyroid and oral cancer. A study of mortality in England examined whether the difference in survival rates for melanoma between males and females could be related to stage of cancer (tumour thickness) at presentation. Analysis of the data on all cases of malignant melanoma in England between 1985-1975 and 2007-2008 observed that the incidence of melanoma in males is increasing faster than that in females, particularly over the age of 65. Based on the sample population males seem to present with thicker tumours. The authors commented that male sex and increased age are independent risk factors of mortality for malignant melanoma in other large international datasets[xiv].

- Stage

  Survival by stage is not yet routinely available for the UK due to inconsistencies in collecting and recording of staging data in the past[xv]. Data from the Scottish Melanoma Group, reported in a review of the epidemiology of melanoma[xvi], show 5 year survival by thickness of tumour at presentation. Thinner tumours have a higher proportion of individuals who survive 5 years (table 7).

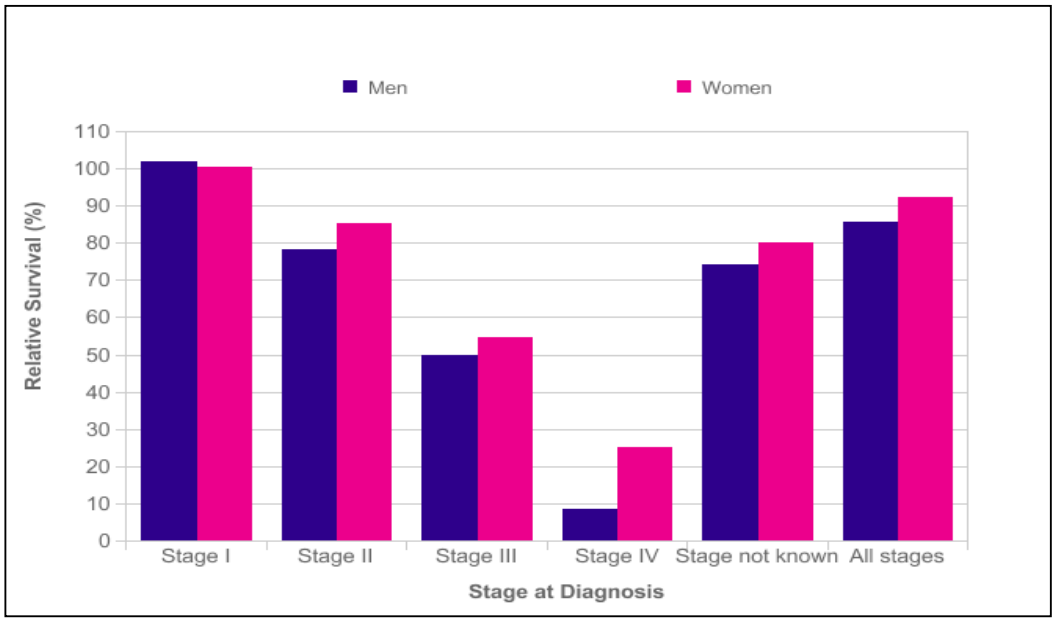
Table 7. Five-year survival (%) of 8897 patients diagnosed in Scotland from 1979 to 1998 based on the time period and thickness category

Males	<1.0 mm	1–1.99 mm	2–2.99 mm	3–3.99 mm	>4.0 mm
1979–83	73.2	68.4	55.0	40.0	33.9
1984–88	82.7	78.3	56.5	45.1	30.8
1989–93	90.2	80.0	61.4	56.1	36.2
1994–98	93.6	87.9	71.3	65.3	52.4
Females					
1979–83	86.0	84.9	62.9	55.7	37.6
1984–88	93.6	87.8	79.4	64.1	43.0
1989–93	93.5	94.9	77.4	66.2	44.8
1994–98	95.8	94.3	86.6	71.4	48.3

Survival by stage has also been analysed for the former Anglia Cancer Network in the east of England for the period 2006-2010 (figure 4). The study used relative survival, a measure of the excess mortality experienced by cancer patients in comparison with a similar group of people in the general population. These data cover only 5% of the population of England. Although the findings are not representative they clearly illustrate how survival falls as the stage at diagnosis increases, and males have a worse survival compared females.

There is much discussion in the literature about how to explain the increasing incidence of melanoma but relatively stable mortality rate. Much of the improved survival is attributed to early detection of thin tumour, however, some suggest that there may be increased detection of biologically insignificant, benign melanoma[xvii]. Length-time bias may result from increased awareness and early diagnosis of indolent melanoma, whilst more aggressive, rapidly progressing thick tumours continue to have a poor prognosis. The challenge remains to identify aggressive tumours as early as possible.

Figure 4. To Show Five-Year Relative Survival (%) by Stage, Adults Aged 15-99, Former Anglia Cancer Network 2002-2006



Prepared by Cancer Research UK

Note: Relative survival can be greater than 100% because it accounts for background mortality. A relative survival figure greater than 100 indicates that people diagnosed have a better chance of surviving one (five) year(s) after diagnosis than the general population

Analysis of relative survival across the UK compared to Europe is reported in EUROCARE (European Cancer Registry-based study on survival and care of cancer patients). This is a series of cancer registry-based comparisons of cancer survival by country in Europe, with EUROCARE-5 reporting on patients diagnosed between 2000-2007[xviii].

As shown in table 8 malignant melanoma is one of the few cancers in which five-year relative survival in Scotland (89%) is significantly higher than the European average (83%). Within the UK there is significantly lower five-year relative survival (cumulative) in Wales (80%) compared with England, Scotland and Northern Ireland (85%, 89%, 91%, respectively).

It is suggested that lower survival in Wales may be explained by differences in stage at diagnosis, particularly among the more deprived men and women who seem to fare worse compared with their UK counterparts. Differences in public awareness and early diagnosis initiatives may also play a role.

Table 8. Malignant melanoma survival across the UK 2000-2007 standardised by age (ICSS*) at 5yrs from diagnosis: (EUROCARE—5)

Country	Interval	Sex	RSC	Lower Confidence Interval	Upper Confidence Interval
UK, ENGLAND	4-<5 yr	Male	80.7	80.02	81.39
UK, NORTHERN IRELAND	4-<5 yr	Male	85.58	81.63	89.72
UK, SCOTLAND	**4-<5 yr**	**Male**	**84.45**	**82.42**	**86.52**
UK, WALES	4-<5 yr	Male	74.14	71.2	77.21
European average	4-<5 yr	Male	79.16	78.58	79.75
UK, ENGLAND	4-<5 yr	Female	89.08	88.57	89.6
UK, NORTHERN IRELAND	4-<5 yr	Female	94.57	91.92	97.29
UK, SCOTLAND	**4-<5 yr**	**Female**	**92.1**	**90.57**	**93.66**
UK, WALES	4-<5 yr	Female	84.58	82.33	86.9
European average	4-<5 yr	Female	86.58	86.13	87.02
UK, ENGLAND	4-<5 yr	Male and female	85.35	84.93	85.77
UK, NORTHERN IRELAND	4-<5 yr	Male and female	90.74	88.46	93.08
UK, SCOTLAND	**4-<5 yr**	**Male and female**	**88.82**	**87.58**	**90.08**
UK, WALES	4-<5 yr	Male and female	80.05	78.24	81.89
European average	4-<5 yr	Male and female	83.22	82.86	83.58

*International Cancer Survival Standards (ICSS) used for standardising survival by age according to cancer site. Age classes and weighting for three types of cancer incidence age patterns[xix].

Deprivation and Melanoma

Malignant melanoma incidence is inversely related to deprivation in the UK. In Scotland the incidence and mortality associated with malignant melanoma is highest in the least deprived populations (table 9).

Table 9. Scotland Age-Standardised Incidence and Mortality (EASRs), by SIMD 2012 Deprivation Quintile. Incidence: combined period 2008-2012; Mortality: 2009-2013

Incidence (persons)				
	Number of registrations	EASR	Lower 95% CI	Upper 95% CI
5 = least deprived	1,560	31.6	30	33.2
4	1,335	25.8	24.4	27.3
3	1,188	23.3	22.0	24.7
2	984	19.8	18.5	21.1
1=most deprived	845	18.1	16.9	19.4
Test for trend (poisson regression)	0.0000			

Mortality (persons)				
	Number of death registrations	EASR	Lower 95% CI	Upper 95% CI
5 = least deprived	204	4.2	3.6	4.8
4	203	4.0	3.4	4.6
3	189	4.0	3.4	4.6
2	176	3.7	3.2	4.3
1=most deprived	151	3.4	2.8	4.0
Test for trend (Poisson regression)	0.0000			

Source; ISD Scotland Skin Cancer Statistics[xx]
EASR: Age standardised incidence / mortality rate
per 100,000 person years at risk (European standard population)

Ethnicity and Melanoma

Cancer Research UK and the National Cancer Intelligence Network undertook the first analysis of cancer incidence and survival by major ethnic group and reviewed all cases of cancer diagnosed in England between 2002 and 2006[xxi].

Asian ethnic groups and Black ethnic groups were at significantly lower risk of malignant melanoma of the skin. There were insufficient data to analyse the incidence of melanoma amongst Chinese and Mixed ethnic groups. The analysis was limited by lack of data on ethnicity (missing data for 35% males and 37%

females) and includes only the population of England. The ranges of age-standardised rates result from different assumptions about the ethnicity of cases with unknown ethnicity and are not confidence intervals. Despite the limitations, these data suggest that the incidence is considerably lower in Asian and Black ethnic population groups (table 10).

Table 10. Age-standardised rates of malignant melanoma of the skin by ethnic group for all ages. England 2002-2006.

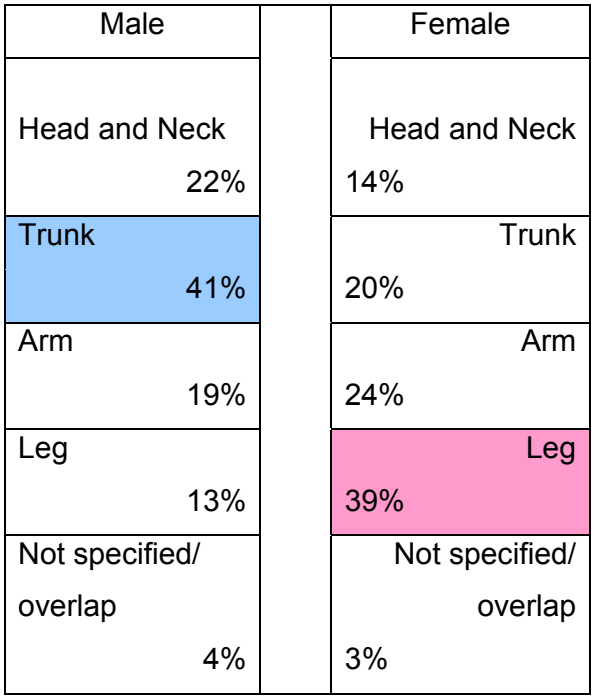
Ethnic Group	Males	Females
Asian Ethnic Group	0.2 to 0.8 per 100,000	0.2 to 1.1 per 100,000
Black Ethnic Group	0.6 to 2.6 per 100,000	1.0 to 3.6 per 100,000
White ethnic Group	13.1 to 13.6 per 100,000	14.7 to 15.2 per 100,000

Although the incidence of melanoma is lower in Asian, Black and other minority ethnic groups the mortality rates in these subgroups are higher when compared with their Caucasian counterparts[xxii]. This discrepancy is thought to be largely as a result of delayed detection/treatment, and a false perception among patient and physician that brown skin confers complete protection against skin cancer[xxiii]. In addition, there are rarer subtypes of melanoma such as Hand and Foot Melanoma (HFM). A recent literature review found that HFM appears to have similar incidence in people with pale skin compared to pigmented skin[xxiv]. Compared to melanoma at other sites it has a poor prognosis which may be due to late diagnosis or because approximately 50% of HFM are acral lentiginous melanoma subtype, which carries a worse prognosis than cutaneous malignant melanoma.

Anatomical Distribution of Melanoma

The distribution of malignant melanoma on the body differs by sex. Over 40% of cases in males arise on the trunk of the body, particularly on the back, while the most common place for females is on the leg (figure 6). Analysis of the distribution of melanoma found an increasing trend of malignant melanoma for both males and females in sun exposed anatomical sites compared to the flat trend of non-sun exposed malignant melanoma. This suggests an association between sun exposure behaviour and the development of malignant melanoma of the skin[xxv]. The authors suggest that gender specific anatomical site of sun exposed malignant melanoma may represent exposure differences and may have important relevance for prevention campaigns.

Figure 6. Percentage Distribution of Cases Diagnosed on Parts of the Body, by Sex, UK, 2008-2010



Cancer Research UK[xxvi]
Original data source: Estimates of worldwide burden of cancer in 2008: GLOBOCAN 2008.

3.3 Non-Melanoma Skin Cancer in Scotland

Non-melanoma skin cancer is the most common group of cancers. However, current data underestimate the true risk of non-melanoma skin cancer due to the incompleteness of registration. Only the first BCC per patient is registered, so by definition they exclude recurrent disease. Most non-melanoma skin cancers are detected early and can be treated on an outpatient basis with the result that some are not registered (the lack of a discharge record for such patients is one of the reasons why registration of new cases is less complete than for other cancers, most of which involve hospitalisation).

In order to standardise comparison of trends between regions the UK Association of Cancer Registries recommend reporting only the first BCC or SCC per person. However, the UK registries do not currently record NMSC in a standardised way, for example, Scotland registers first BCC and all SCCs. Non-melanoma skin cancer is often excluded from comparative analyses of cancer data, both because of concerns about the completeness of registration and a perception that cancers of this kind are rarely life threatening. In summary, the data underestimate the true risk of non-melanoma skin cancer and comparison between regions and countries should be interpreted with caution.

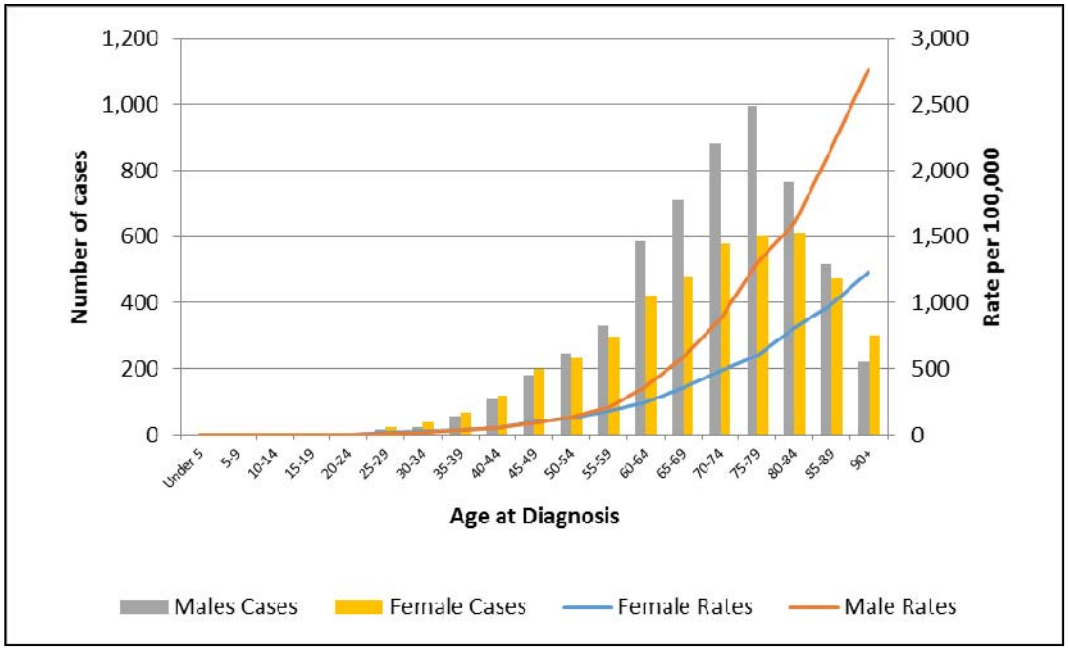
3.3.1 Non-Melanoma Skin Cancer in Scotland

Analysis of NMSC registrations across the UK, by the National Cancer Intelligence Network (NCIN), suggest that they account for roughly 20% of all new malignancies and 90% of all skin cancers registered in the UK and Ireland[xxvii].

The NCIN data briefing shows that BCC represents about 74% of NMSC and SCC represent 23% of NMSC. The incidence of both BCC and SCC is higher in males. There was a large increase in incidence of BCC and SCC registrations across the cancer registries between 2000-2002 and 2008-2010. For BCC the incidence increased on average by 36% for males and 32% for females. For SCC the incidence increased on average by 34% for males and 39% for females. NCIN reports that it is difficult to identify the proportion of increase that can be attributed to improved registration compared to the true incidence of NMSC. However, trends in NMSC incidence in the East of Scotland, verified histologically, also found that age-adjusted rates of SCC and first ever BCC increased significantly for both sexes between 1992 and 2003[xxviii].

There were over 11,000 NMSC registered in Scotland in 2013. The median age at diagnosis is higher for NMSC compared to malignant melanoma. The anatomical distribution of NMSC is most commonly on sun exposed body parts such as the face, neck, ears and forearms.

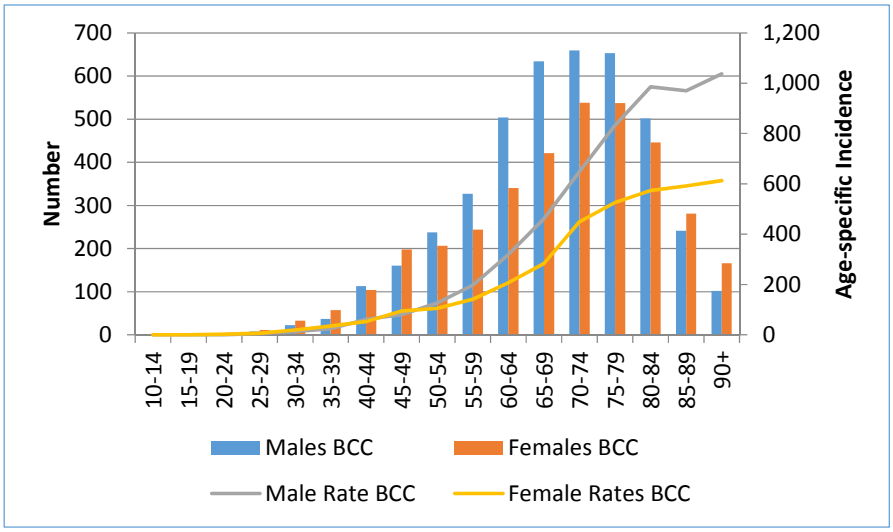
Figure 5. Incidence of NMSC in Scotland by Age (2010)
Number of New Cases and Age-Specific Incidence Rates per 100,000



Source; Scottish Cancer Registry ISD.

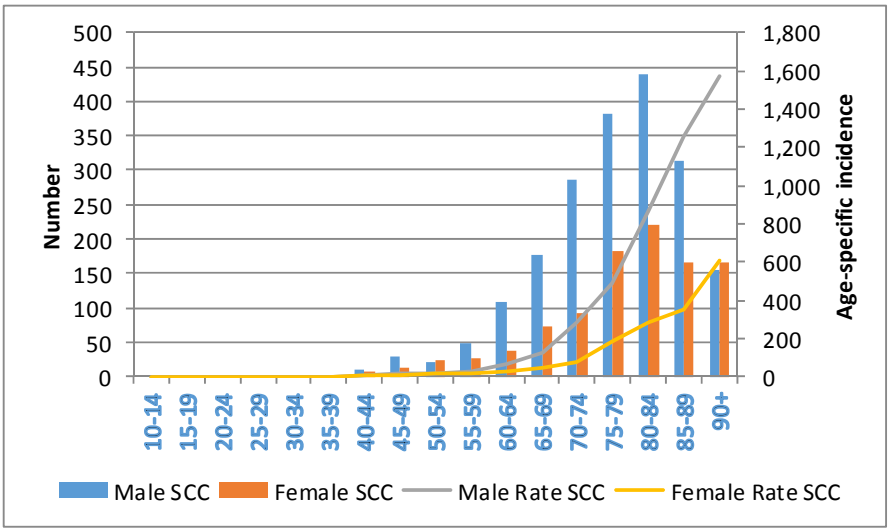
Figure 5 shows that the number of recorded cases and age specific rates of NMSC in Scotland increases with age. Age specific rates are higher for older males compared with females.

Figure 6. Number of cases and incidence of BCC in Scotland by sex (2012)



Source; Scottish Cancer Registry ISD.

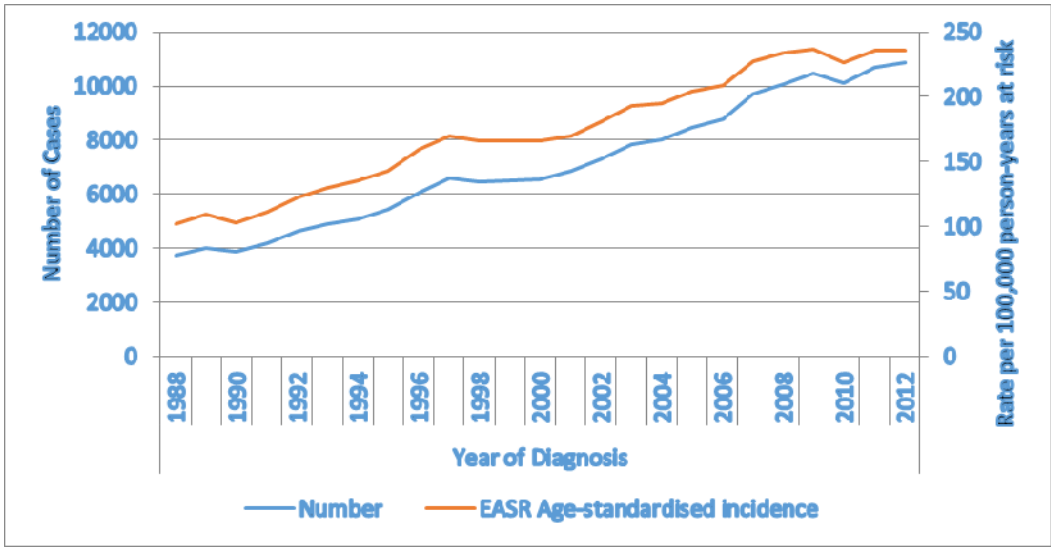
Figure 7. Number of cases and incidence of SCC in Scotland by sex (2012)



Source; Scottish Cancer Registry ISD.

Figures 6 and 7 illustrate how the incidence of BCC and SCC in Scotland vary by age and sex. The incidence of both BCC and SCC is higher in males than females. For males, the number and incidence of BCC is higher than SCC for all age groups until 85-89 years and over. For females in all age groups, the number and incidence of BCC is higher than for SCC.

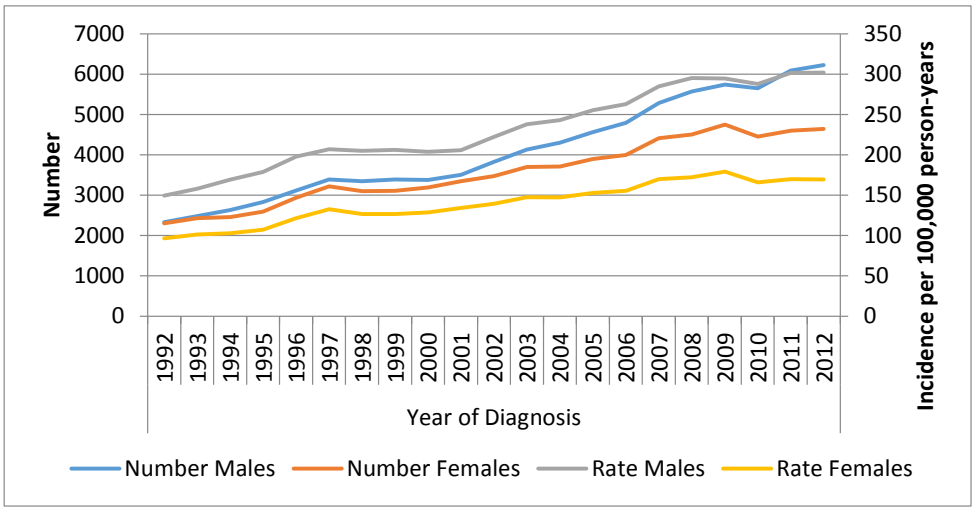
Figure 9. Changes in Incidence of NMSC in Scotland (1988-2012). Number and Age-Standardised Rate of NMSC in Scotland (all persons)



Source; Scottish Cancer Registry ISD.
EASR: age-standardised incidence rate per 100,000 person-years at risk (using the 2013 European Standard Population)

The incidence of NMSC has increased considerably over time, as illustrated in figure 9. The total recorded number of cases of NMSC diagnosed in 1992 was 4635, increasing annually to 10,872 in 2012. The age-standardised rates have also shown a yearly increase. In 1992 the incidence was 123 (95% CI 119-127) per 100,000 person-years at risk, 2002 it was 181 (95% CI 176-185) and by 2012 the incidence was 236 (95% CI 231-240).

Figure 10. Incidence of Non-Melanoma Skin Cancer in Scotland by sex (1992-2012)



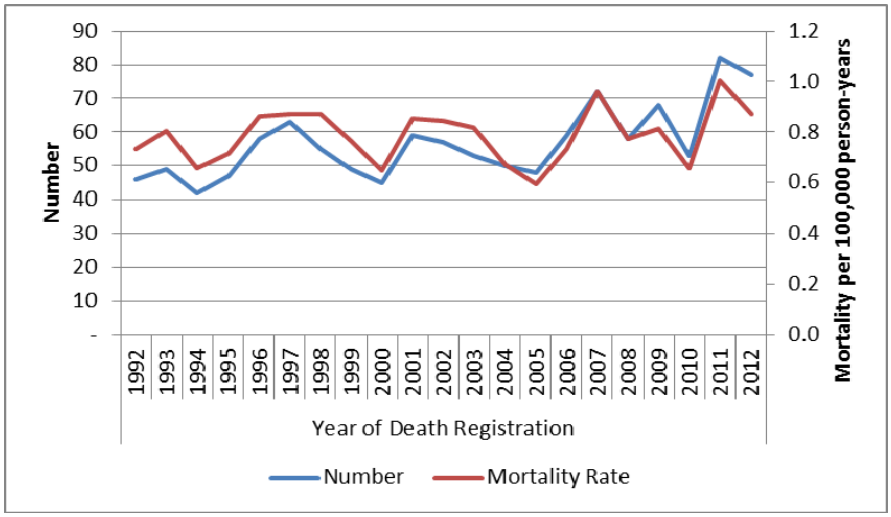
Source; Scottish Cancer Registry ISD.

The incidence of NMSC has increased for both males and females over the past two decades (figure 10). Males have continued to experience a consistently higher incidence compared to females.

3.3.2 Mortality

Mortality from NMSC is low as illustrated in figure 11 with less than 100 deaths per year caused by NMSC.

Figure 11. Mortality from Non-Melanoma Skin Cancer in Scotland (all persons) 1992-2012. Number and EASR (age-standardised mortality rate per 100,000 person-years at risk (European standard population))



Source: National Records of Scotland (NRS), ISD.

3.4 Skin Cancer Incidence - Trends and Projections

3.4.1 Trends

The analyses of trends in cancer help to inform planning of future services. The Scottish Melanoma Group studied 12,450 cases of invasive cutaneous melanoma diagnosed between 1979-2003[xxix]. It reported a trebling of the incidence in males of all ages; the steepest rate of increase was in those age 60 and over. Females had a 2.3-fold increase. Although the rate of increase fell between 1980-1989 and 1990-1999 there was no evidence that the incidence had stabilised.

Analysis of international trends in incidence of melanoma across 39 countries based on high quality cancer registration data suggests a possible levelling-off of the increasing incidence in some countries[xxx]. The rates continue to increase in most European countries, but may be stabilising in Australia, New Zealand, and the United States (among others). The incidence of melanoma in the youngest age-groups for these populations (25-44 years) appear to be stablising or even declining, although these changes are too recent to be conclusive evidence of a significant trend and were only statistically significant for Australian and Icelandic females.

Similar findings have been described over the previous decade for three-year averages of age-specific melanoma incidence trends in Europe per 100,000 person-years. Data suggest that the increase in incidence rates is levelling off, especially in younger age groups, in many northern European countries in both sexes (males in Denmark, Norway, Sweden, Finland, England and Wales; females in Norway, Sweden, Finland, England and Wales), Switzerland, Czech Republic (males) and Slovakia (males)[xxxi].

Trends in mortality rates differ from incidence, with mortality increasing at a slower rate than incidence. In Scotland between 1979-2003 the mortality rate for males doubled (incidence tripled) and was fairly constant for females (incidence doubled)[xxix]. This has been attributed to improved survival, much of it thought to be associated with earlier detection of thinner tumours.

3.4.2 Projections

Projections of cancer incidence in Scotland to 2020 were produced by ISD in 2010[xxxii]. These were based on historical incidence data and General Register Office for Scotland (GRO) population estimates 1978-2007 and GRO population projections for 2008-2022. The population projections predict that the Scottish population will grow, but only in the older age groups. An increase of 40% for 60-74 year olds and an increase of 81% for those 75+ years old. The impact of the aging population accounts for much of the predicted 8% increase in incidence of cancer (all new cancers) for every 5 year period to 2020.

Projections for malignant melanoma suggest that the incidence may increase by 46% in the period 2003-2007 to 2013-2017 and 64% for the period 2003-2007 to 2018-2022 table 10). This equates to a projected 7,617 cases for 2018-22 compared to 4,634 registered in 2003-2007.

Table 10. To show the five cancers with the largest % predicted change in incidence

	Number			Predicted percentage change	
	Actual 2003-2007	Projected 2013-2017	Projected 2018-2022	2003-07 to 2013-17	2003-07 to 2018-22
All cancer	136,758	161,280	174,898	18%	28%
Prostate	12,887	19,023	23,154	48%	80%
Melanoma of skin	4,634	6,748	7,617	46%	64%
Non-Hodgkin's	4,578	6,061	6,700	32%	46%
Kidney	3,584	4,561	4,952	27%	38%
Leukaemia	3,257	4,055	4,455	25%	27%

Source: ISD Scotland[xxxii]

Work undertaken by a team at the Centre for Cancer Prevention, the Wolfsan Institute of Preventative Medicine used smooth function age-period-cohort modelling of cancer incidence data from Great Britain to extrapolate to 2030 and applied to the UK population projections. There is projected to be almost no change in the overall incidence rates of cancer (for all cancers combined) in the 23-year period 2007–2030: the age-standardised incidence is projected to decrease by −1.0% (equivalent to an average annual change of −0.04%) in males and -1.9% (−0.08% per year) females (table 11)[xxxiii]. But taking account of the aging population demographics the numbers of cancers will increase by up to 2% annually.

For malignant melanoma, projections suggest that the age-standardised rates will increase by over 50% for males and females between 2007-2030, an annual change of 1.8%. The total number of cases of malignant melanoma is projected to increase by 2.8% for females and 3.5% for males per year until 2030.

Table 11. Projected change in incidence of Melanoma to 2030

	Age std rates per 100000					Number of cases				
				Change					Change	
	1984	2007	2030	Total	Annual	1984	2007	2030	Total	Annual
Males										
All cancer	379.6	408.5	404.6	-1%	0%	108556	149169	231026	55%	1.9%
Melanoma	3.7	14.6	22.3	52%	1.8%	987	5010	10939	118%	3.5%
Females										
All cancer	293	356.9	350	-1.9%	-0.1%	107658	148716	200929	35%	1.3%
Melanoma	6.2	15.4	23.4	52%	1.8%	1939	5713	10884	91%	2.8%

Source: Cancer incidence in the UK: Projections to the year 2030
Br J Cancer 2011;105:1795–1803

3.4.3 Projections for NMSC incidence

The incidence of NMSC will continue to increase as a result of changing demographics. Analysis undertaken by Diffey *et al* suggests that the relative number of cases of NMSC in the UK will double between 2000-2030, before levelling out around 2040[xxxiv]. This analysis used the number of cases of NMSC in 5-year age bands for all persons (male and female) for Great Britain for the year 2000 combining with the projected population of Great Britain. These figures do not model potential changes in incidence of skin cancer associated with UV radiation exposure behaviour or use of immunosuppressive drugs. On that basis these figures are likely to be an under-estimate.

4. The aetiology of skin cancer

Skin cancer is a multifactorial disorder resulting from the effect of multiple genes in combination with lifestyle and environmental factors. UV radiation exposure is the major modifiable environmental factor associated with the development of skin cancer. Despite a consensus of opinion supporting this association, the exact mechanisms are not clear. It is speculated that UV radiation exerts three main effects; carcinogenic, inflammatory and immunosuppressive.

4.1 UV radiation exposure

The major modifiable risk factor associated with skin cancer is exposure to UV radiation. It has been estimated that 85.9% of melanoma cases in the UK are attributable to solar UV exposure[xxxv]. Specific types of sun exposure appear to lead to different types of cancer in susceptible individuals. The evidence suggests that short exposures to UV radiation and particularly sunburn at an earlier age may be a significant aetiological factor for superficial spreading melanoma. The role of UV radiation exposure is unclear for nodular melanomas. Sacral melanomas do not appear to have a direct relationship to UV radiation exposure. Lentigo malignant melanoma are associated with chronic sun-exposure. Intense intermittent exposure is associated with BCC, whilst chronic exposure has been associated with SCC.

UV radiation can be due to natural exposure (solar radiation) or due to artificial UV through the use of indoor tanning facilities such as sunbeds and sunlamps[xxxvi,xxxvii]. UV radiation is commonly subdivided as UVA, UVB and UVC. For solar radiation, all UVC is absorbed by the atmosphere and does not reach the Earth's surface. Most UVB is absorbed by the atmosphere but it is the most damaging form of UV radiation. UVA accounts for up to 95% of the UV radiation reaching the Earth's surface. UVA penetrates further into the skin than UVB and it is now thought that both UVA and UVB contribute to the development of skin cancer.

Exposure to solar UV radiation

A number of factors have an impact on the level of exposure to solar UV radiation. The ozone layer, solar elevation, cloud cover and other atmospheric components such as air pollution, and ground reflection all have an influence.

Ozone is an effective absorber of UV radiation but depletion of the stratospheric ozone layer exposes people to more UV radiation. Thinning of the ozone layer has occurred since the beginning of the 1980s in all regions except equatorial ones. Stratospheric ozone depletion is caused by man-made emissions (halocarbons). In 1987 the Montreal Protocol was ratified and the phasing out of ozone-destroying gases began. According to global models, the Montreal Protocol will have prevented 2 million cases of skin cancer annually by 2030[xxxviii].

The WHO Programme on Climate Change and Health undertook a review of stratospheric ozone depletion, ultraviolet radiation and health[xxxix]. It reports that during the 1980s and 1990s at northern mid-latitudes such as Europe the average year-round ozone concentration declined by around 4% per decade. Modelling from the late 1980s suggests that exposures to UV radiation in these latitudes are likely to

peak around 2020 with an estimated 10% increase in UV radiation relative to 1980s levels. Data from the Health Protection Agency solar monitoring sites suggest that a small upward trend in total solar UV radiation reaching the Earth in the UK is slowing but the effects of climate change and related cloud cover are complex and are still being investigated[xl].

The potential impact of ozone depletion has been considered the United Nations Environment Program. This predicts increases in skin cancer incidence and sunburn severity due to stratospheric ozone depletion for at least the first half of the twenty-first. The WHO Stratospheric Ozone Depletion, Ultraviolet Radiation and Health Report states that a modelling of future ozone levels and UV radiation exposures study has estimated that a 'European' population living at around 45 degrees north will experience, by 2050, an approximate 5% excess of total skin cancer incidence (assuming, conservatively, no change in age distribution)[xxxix].

The intensity of UV radiation is related to solar elevation and the angle at which the UV rays pass through the atmosphere. This varies with season, time of day and latitude. UV intensities are highest during the summer months in the four-hour period around noon. UV intensities are generally highest under cloudless skies but hazy days have higher levels of water vapour which cause UV scattering and increase UV exposure. The reflective properties of the ground also contribute to UV exposure. Grass, soil and water reflect around 10% of UV radiation but snow strongly reflects (80%) and sand reflects 10-25%.

Personal exposure to natural UV radiation depends on exposure geometry (different parts of the body will receive different amounts of UV depending on their orientation towards the sun and reflection from ground surfaces), exposure duration, personal protection (clothing, hats, sunglasses and the proper use of sunscreen) and behaviour.

In the UK the Meteorological Office produces the UV forecast to inform people of levels of UV radiation[3]. It provides a year round forecast for cities across the world, and a summer forecast for the UK. The forecast is expressed as a 'solar UV index', a system developed by the WHO and includes the effect of the position of the sun in the sky, forecast cloud cover and ozone amounts in the stratosphere.

Exposure to artificial sources of UV radiation

Artificial sources of UV radiation include indoor tanning facilities such as sunbeds/sunlamps/tanning booths, as well as medical and industrial exposure. (Medical and industrial exposure is heavily regulated so will not be considered here). The indoor tanning industry developed in the early 1980s. Indoor tanning facilities emit both UVA and UVB and there appears to be variation in the output of artificial tanning units. A survey of artificial tanning units in England found that the majority exceeded the maximum safety levels set out in current European standards[xli].

[3] The UV Forecast. Available at http://www.metoffice.gov.uk/health/public/uvforecast

As with sun exposure, studies indicate that use of indoor tanning facilities are associated with increased risk of malignant melanoma as well as NMSC. The International Agency for Research on Cancer (IARC) reviewed available evidence on the health effects of exposure to artificial UV radiation[xlii]. The review found a consistent increase in the risk of melanoma in people who first use indoor tanning facilities in their twenties or teenage years. A large systematic review and meta-analysis published in 2012 supports this finding, the summary relative risk for first exposure to sunbed use starting before age 35 years is 1.87 (95% CI 1.41 to 2.48) suggesting childhood and adolescence as the key periods for initiation and development of melanoma in adulthood[xliii]. 'Ever-use' of sunbeds was associated with a summary relative risk of 1.20 (95% CI 1.08 to 1.34). There was a 1.8% (95% CI 0% to 3.8%) increase in relative risk of melanoma for each additional session of sunbed use per year, suggesting a possible dose-response.

A systematic review and meta-analysis of indoor tanning exposure and NMSC resulted in similar findings[xliv]. 'Ever-use' of sunbeds compared to 'never-use' was associated with relative risk of 1.29 (95% CI 1.08 to 1.53) for BCC and 1.67 (95% CI 1.29 to 2.17) for SCC. Use of indoor tanning before the age of 25 years was associated with an increased risk of BCC, relative risk 1.40 (95% CI 1.29 to 1.52).

The authors of this meta-analysis did acknowledge that sun-bed users may also undertake behaviours that expose them to more solar UV radiation compared to controls. Some of the primary research did control for this. Conversely, it was suggested that earlier studies might have underestimated the risks associated with indoor tanning because this exposure is a relatively recent phenomenon, and there will be a latent period before melanoma evolves.

4.2 Radiation Exposure Behaviours

Increases in personal exposure to UV radiation are influenced by behaviour. In Caucasian populations there has been a fashion towards having tanned skin. This may be through sunbathing, the use of indoor tanning facilities, or the use of 'sunless' tanning options such as lotions that contain dihydroxyacetone which interacts with cells of the epidermis. Individuals may also increase their solar UV exposure by travelling abroad.

Use of sun-protective measures

The proportion of people undertaking sun-protective measures such as use of sunscreen and shade seeking varies considerable across study populations, as do the factors which influence these behaviours. A systematic review[xlv] found that reported use of sun screen vary from 7% to 90% across countries studied, with the highest rates in Australia. Studies have found that the rate and frequency of sunscreen application is often lower than recommended for adequate protection[xlvi]. Similarly there is wide variation in reported use of protective clothing and avoidance of sun exposure, but overall data suggest that many people do not wear protective clothing or attempt to avoid sun exposure whilst outdoors[xlv]. The variability in findings across study populations may reflect environmental and cultural differences, but may also reflect a lack of standardised measurement in this field of research.

Reviews of factors that influence sun-protective behaviour have found that adherence to preventative sun-protective measures is associated with female gender, skin-sensitive phenotype, greater perceived risk of skin cancer, greater perceived benefit of the benefit of sun-protection and physician recommendation for screening. Use of sunscreen is lower in people who think it is worth the risk in order to get a suntan, and people who perceive that there is a low risk of skin cancer associated with sunbathing, use less sunscreen. People are less likely to use sunscreen if they believe that application is time-consuming and reduces the likelihood of getting a suntan[xlvii,xlviii].

Travel Abroad

Holidays abroad have become increasingly popular for UK residents, with many to hot, sunny destinations. UK residents' travel abroad is analysed by the Office of National Statistics, based on the International Passenger Survey. There is an upward trend in visits made abroad for holidays. In 1993 25 million visits were made, peaking in 2008 at 45 million. Although there was a drop in number of visits abroad which was associated with the recession, numbers now appear to have levelled off, with 38 million visits reported in 2013[xlix]. The most frequent destination is Spain.

Indoor Tanning

Recent systematic review and meta-analysis suggests that exposure to indoor tanning facilities is common in Western countries, especially among young people[l]. The review found that the summary prevalence of 'ever' exposure was 35.7% (95% CI, 27.5%-44.0%) for adults, 55.0% (33.0%-77.1%) for university students, and 19.3% (14.7%-24.0%) for adolescents. The summary prevalence of past-year exposure was 14.0% (95% CI, 11.5%-16.5%) for adults, 43.1% (21.7%-64.5%) for university students, and 18.3% (12.6%-24.0%) for adolescents. The authors calculated that the population proportional attributable risk was 3.0%-21.8% for NMSC and 2.6%-9.4% for melanoma, corresponding to more than 450 000 NMSC cases and more than 10,000 melanoma cases each year attributable to indoor tanning in the United States, Europe, and Australia.

Data published in 2009 suggests that the distribution of sunbed locations varies by level of area deprivation, with higher rates in more deprived areas (the main outcome measure was the rate of sunbed outlets per 100,000 population by deprivation quintile for each Local Authority)[li]. The authors acknowledge that problems with data quality and completeness may have influenced results, but these findings suggest a possible source of health inequalities.

Use of fake tan

Certain artificial tanning agents, such as bronzers, lie on the skin surface and are washed away by water. Others use dihydroxyacetone (DHA) which reacts with the skin. Cancer Research UK recommendations that we need to know more about the effects of DHA; though say that, for the moment, what we know tells us that use of fake tan is safer than tanning in the sun or from artificial UV sources. It was also noted that fake tan does not offer protection from UV radiation, a fact that may not be widely recognised amongst users of fake tan products.

4.3 Individual risk factors for skin cancer

There are a number of factors that increase the risk of developing skin cancer[lii],[liii].

- fair skin; people with skin types I and II burn rapidly;[4]
- children and young people; babies are at greatest risk;
- outdoor workers;
- family history of melanoma;
- people with a lot of moles (more than 50);
- people who are at risk of overexposure to UV radiation through their use of indoor tanning facilities or through their sunbathing behaviour; and
- people who are immunosuppressed[liv].

Other environmental factors that may contribute to the development of BCC and SCC are exposure to petroleum by-products, organophosphate compounds and arsenic. In addition, previous history of non-melanoma skin cancer is strongly associated with subsequent BCC or SCC.

4.4 The genetics of skin cancer

Most cancers arise from several genetic mutations that accumulate in cells of the body over a person's lifetime. These are called somatic mutations and are nonheritable. The majority of human cancers result from an accumulation of somatic mutations which are acquired from exposure to carcinogens and from random unrepaired errors that occur during routine cell division. The chance that such a mutation will occur increases with age.

Cancers may also have germline mutations, which are inherited from parents' germ cells (ovum or sperm). It is reported that approximately 5% to 10% of melanoma may be hereditary in nature[lv]. Individuals who inherit cancer susceptibility mutations inherit a predisposition to cancer.

4.4.1 Genetics of Malignant Melanoma

The genetic understanding of malignant melanoma has advanced rapidly in recent years. Malignant melanoma does not have a single genetic cause, instead it is classified as a multifactorial disorder. This means that it is associated with many contributing factors, resulting from the effect of multiple genes in combination with lifestyle and environmental factors. An overview of these factors, based on several review articles,[lvi,lvii,lviii] is summarized below.

Research is beginning to decipher the complex genomic landscapes, signalling pathways, and immune checkpoints[lix]. CDKN2A, a tumour suppressor gene, is the major high-risk melanoma susceptibility gene identified to date. Loss of function of suppressor genes is a critical step in the development of malignancies. A mutation in the gene has been found to occur in about 50% of all MM, (and in numerous other

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[4] Based on the Fitzpatrick skin pigmentation scale, see Cancer Research UK Sunsmart Resources available at http://www.sunsmart.org.uk/skin-cancer-facts/your-skin-type/

malignancies). Other mutations in specific genes that are associated with melanoma include CDK4, CDK6, TERT, BRAF, MITF and MC1R. As with most malignancies, risk alleles[5] for melanoma span the spectrum from high-risk, high-penetrance[6] alleles that express themselves in familial clustering to low-risk alleles that are quite prevalent in the general population.

Multifactorial disorders often cluster in families, but they do not have a clear-cut pattern of inheritance. This makes it difficult to determine a person's risk of inheriting or passing on these disorders. CDKN2A and CDK4 have been linked to familial melanoma. However, alterations in these two genes only account for a small percentage of familial melanoma. Within melanoma-prone families with known genetic mutations, dysplastic nevi (moles) and sun exposure are independent risk factors for melanoma.

Understanding of the biological relationship between UV exposure and the development of malignant melanoma is incomplete, despite considerable epidemiological evidence of an association. There is evidence that some sporadic and familial malignant melanomas have specific DNA mutations relating to UV exposure, so called 'UV-light signature', such as the UV signature in the TERT gene. Some mutations are believed to be attributable to the preponderance of cytosine-to-thymine nucleotide substitutions as a result of UV radiation exposure. UV radiation has many effects on the skin and related immunosuppressive effects which are likely to have a role in the pathogenesis of the disease. However, current knowledge does not fully explain the pathogenesis of malignant melanoma, which has more gene mutations per cell than any other type of cancer. Despite rapid advances in the understanding of malignant melanoma genetics over the past decade, the full picture remains elusive.

4.4.2 Genetics of basal cell carcinoma and squamous cell carcinoma

Mutations in the gene coding for the transmembrane receptor protein PTCH or PCTH1 are associated with sporadic BCC and Basal Cell Nevus Syndrome (BCNS)[7]. Up to 30% of sporadic BCC demonstrate PTCH mutations, and up to 85% of BCNS demonstrate PTCH mutations. PTCH2 mutations have been demonstrated in BCC.

There are a number of genes that are associated with hereditary disorders where individuals have a predisposition to developing SCC. These syndromes are rare and include Xeroderma Pigmentosum and Oculocutaneous Albinism.

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[5] An allele is an alternative form of a gene (one member of a pair or series) that is located at a specific position on a specific chromosome and control the same characteristic.

[6] The proportion of individuals carrying a mutation who will manifest the disease is referred to as penetrance.

[7] Basal Cell Nevus Syndrome is an hereditary syndrome associated with multiple BCCs, together with characteristic conditions of the skin, endocrine system, nervous system, eyes, and bones.

5. Evidence for effectiveness in primary and secondary prevention of skin cancer

A review of the secondary literature on primary and secondary prevention of skin cancer was been undertaken for this scoping study.

The literature search was undertaken by Julie Arnot (Knowledge Services, NHS Health Scotland) to identify systematic reviews of interventions to prevent skin cancer (see appendix 1 for full details of search strategy). In addition a search for melanoma guidelines was undertaken in December 2013 and updated in July 2015. The search included:

- Google Advanced (for PDF documents, UK only) using the search term: melanoma AND guideline*;
- SIGN;
- NICE;
- RCP / BAD ;
- WHO Guidelines: http://www.who.int/publications/guidelines/en/index.html ; and
- National Guideline Clearinghouse: http://www.guideline.gov/

The findings have been appraised and relevant material collated in sections on primary and secondary prevention. In addition a commentary on policy and legislation (of artificial UV tanning) has been included.

5.1. Primary prevention

5.1.1 Reduce the risks of UV radiation exposure

National Institute for Health and Care Excellence Guidance

NICE issued guidance on skin cancer prevention in January 2011[lx]. The six recommendations aim to raise and maintain awareness – and increase knowledge – of the risks of exposure to natural and artificial ultraviolet (UV) radiation. They also aim to influence attitudes and prompt people to change their behaviour to protect themselves against skin cancer. The NICE recommendations are summarized below and detailed in Appendix 2. The recommendations focus on preventing the first occurrence of skin cancer attributable to over exposure to natural and artificial UV radiation.

- **NICE Recommendation 1.** National mass-media campaigns and the provision of local information, (including verbal advice and printed and visual material).
  Existing national mass-media skin cancer prevention campaigns should continue to be developed, delivered and sustained. Efforts should be made to integrate messages with existing national health promotion programmes. Local practitioners should continue to develop low cost information related activities (1:1, group-based and local media). The need for interventions to be low cost was emphasised.

- **NICE Recommendation 2.** Developing and evaluating information campaigns and interventions.

Local assessment should be used to identify target populations and evidence gathered on their needs and barriers to change. Clear measurable objectives need to be identified for prevention activities.

- **NICE Recommendation 3.** The factual content of information.

The message content is detailed in appendix 2 (p58). This includes an explanation of UV radiation exposure and how it damages skin, how to assess individual risk and options for protection. There needs to be acknowledgement of the risks and benefits of exposure to solar radiation. It is suggested that when planning the recommended activities consideration should be given to the need for regular physical activity and for sufficient exposure to the sun in order to synthesise vitamin D.

- **NICE Recommendation 4.** The tone of messages and how to tailor them for specific audiences.

Ensure messages are appropriate for the target group, for example taking account of cognitive ability, particularly children. Ensure messages address the social and practical barriers to protecting against UV radiation exposure. Messages should be phrased to enhance people's belief in their self-efficacy in relation to behaviour change.

- **NICE Recommendation 5.** The workplace – to help protect children, young people and outdoor workers.

Employers and managers of educational and leisure facilities, and employers of people who work outdoors, should assess if there is a risk of harmful exposure to the sun. If there is, they should develop, implement and monitor tailored policies to ensure people are protected as much as possible. Specific guidance is given in relation to children and young people. It is acknowledged that there may be training needs for staff responsible for making and implementing policy, e.g. teachers.

- **NICE Recommendation 6.** The provision of shade as part of the design of new buildings.

Architects, designers, planners and employers are encouraged to consider providing areas of shade when designing or constructing new buildings, or developing communal outdoor areas.

The provision of shade should be considered at the design stage, rather than once a building has been constructed, so this should not lead to any significant (or additional) costs.

- **Not Recommended.**

The following interventions were not found to be cost effective: specific multi-component interventions (for example combining information with resources such as sun hats or sun screen); or the addition of shade structures to existing buildings.

There is no evidence to support the use of non-information related resources alone: such as provision of sun screen or sunhats (no studies identified).

- Cost implications of implementing the guidance

The NICE costing statement[lxi] suggested that implementation of NICE Guidance ph32 should not lead to significant costs. However, costs will vary according to local practice and both NHS organisations and local authorities are advised to assess what additional resources are needed locally.

- Cost implications of Recommendations 1– 4 Information provision

A skin cancer prevention campaign and the general provision of prevention information must be very low cost to be cost effective. However, similar types of resources are already likely to be available in the home, at school or via health professionals. So any additional costs resulting from providing general information on prevention is expected to be low.

Similarly, national skin prevention campaigns are already in place for many parts of the UK (for example, SunSmart run by Cancer Research UK). NICE suggest that as a result, the recommendations are more likely to be used to reinforce the need for these campaigns – rather than to set up additional ones.

- Cost implications of recommendation 5

Creating or altering existing policies to incorporate sun protection procedures may incur some costs, for example, in terms of training those responsible for writing the policies. However, the guidance refers people to the SunSmart and Health and Safety Executive websites for advice – and this may reduce or negate the need for training.

Managers and employers are advised to review the resource and training requirements for their organisation to establish any likely cost impact.

SIGN Guideline 72. Cutaneous Melanoma[lxii]

The SIGN national clinical guideline on cutaneous melanoma was published in 2003, but has not yet been updated. The guidance promoted a cautious approach to sun exposure, recognising that there is a balance of evidence in terms of the related risks and benefits. The message content was based on the Australian guidelines on melanoma, interpreted in the light of the Scottish climate:

- use clothing as the primary means of protecting against the sun;
- people of fair complexion should be especially careful about sun exposure;
- avoid using sunbeds, tanning booths, and tanning lamps;
- use broad spectrum sunscreens with a minimum sun protection factor (SPF) of 15 as an adjunct to sun avoidance and other sun protective measures, providing this does not lead to increased time spent in the sun;
- avoid exposure to direct, intense sunlight, especially around midday (e.g. seek out shade); and
- provide children with appropriate sun protection for outdoor activities.

The guideline suggested that leaflets, brochures and educational packages can significantly influence increased short term user-knowledge of sun awareness measures. SIGN recommended that these measures should be used to deliver preventive information on melanoma to the general public.

The British Association of Dermatologists

The British Association of Dermatologists, (BAD) also make recommendations in relation to the primary prevention of malignant melanoma[lxiii]. These recommendations relate to the key messages that need to be communicated.

- individuals and particularly children should not get sunburnt. (Level I);
- fair-skinned individuals should limit their recreational sun exposure through life. (Level 1); and
- people at increased risk of melanoma are those with freckles, red or blond hair, skin which burns easily in the sun, increased number of naevi, and those with a family history of melanoma. They should also limit their sun exposure.

5.1.2 Vitamin D – Acknowledging the benefits of UV exposure

Exposure to UVB radiation in sunlight boosts vitamin D supply but it is still unclear how much sunlight is required to maintain adequate levels. The guidance on maintaining adequate vitamin D levels is under review. Current UK government advice is that no dietary intake of vitamin D is necessary for individuals living a 'normal lifestyle'. Only certain groups of the population, who are at risk of vitamin D deficiency, are advised to take a daily supplement: pregnant and breastfeeding women (10 µg), infants and children aged under 4 years (7-8.5 µg); adults over 65 years (10 µg); those with limited exposure to the sun (e.g., if they cover their skin for cultural reasons or are housebound) (10 µg) and people of Asian origin (10 µg).

NICE published guidance (2014) to increase supplement use amongst at-risk groups[lxiv]. This will include the development of activities to increase awareness about vitamin D for the population of England. This work is awaiting the completion of guidance from Scientific Advisory Committee on Nutrition (SACN) which is currently undergoing a period of consultation. The draft SACN guidance recommends that consideration should be given to strategies for the UK population to achieve the Reference Nutrient Intake (RNI) of 10µg/d vitamin D for those aged 4 years and older. For younger children the aim is to achieve a Safe Intake in the range 8.5-10 µg/d at ages 0 to < 1 year and 10 µg/d at ages 1 to < 4 years[lxv]. This is the amount needed for 97.5% of the population to maintain a serum 25(OH)D concentration of 25 nmol/L when UVB sunshine exposure is minimal.

If these draft recommendations are adopted it would change the balance of risk and benefit associated with exposure to solar radiation, given that the whole population over 4 years of age would be encouraged to gain sufficient levels of vitamin D from nutritional intake.

The current advice on solar UV radiation and vitamin D comes in the form of a vitamin D consensus statement[lxvi]. This has been agreed by the BAD, Cancer

Research UK, Diabetes UK, the Multiple Sclerosis Society, the National Heart Forum, the National Osteoporosis Society and the Primary Care Dermatology Society. It states that:

"Vitamin D is essential for good bone health and for most people sunlight is the most important source of vitamin D. The time required to make sufficient vitamin D varies according to a number of environmental, physical and personal factors, but is typically short and less than the amount of time needed for skin to redden and burn. Enjoying the sun safely, while taking care not to burn, can help to provide the benefits of vitamin D without unduly raising the risk of skin cancer. Vitamin D supplements and specific foods can help to maintain sufficient levels of vitamin D, particularly in people at risk of deficiency. However, there is still a lot of uncertainty around what levels qualify as "optimal" or "sufficient", how much sunlight different people need to achieve a given level of vitamin D, whether vitamin D protects against chronic diseases such as cancer, heart disease and diabetes, and the benefits and risks of widespread supplementation".

The BAD suggest that it would be inappropriate to greatly limit sun exposure in people without risk factors for melanoma (fair-skin, freckles, red or blond hair, skin which burns easily, increased numbers of naevi, and those with a family history of naevi). They also suggest that fair-skinned people who avoid the sun rigorously to reduce the risk of melanoma should consider supplementing their intake of vitamin D in the absence of medical contraindications.

In their 2013 guidance BAD suggest that;

- sun exposure is a major source of vitamin D in the UK, but particularly when excessive, is known to be the main cause of both melanoma and non-melanoma skin cancers, which continue to escalate in number in the UK;
- environmental, physical and personal factors influence risk/benefit of sunlight exposure. In white-skinned people, casual short sun exposures a few times per week, taking particular care not to burn and avoiding deliberate tanning, can help provide the benefits of vitamin D while minimising risks; and
- sunbed use increases the risk of skin cancer, and is not recommended as a method for enhancing vitamin D status.[lxvii]

5.1.3 Legislative measures to reduce the risks of UV radiation exposure

The WHO encourages governments to formulate and enforce effective legislation governing the use of artificial tanning facilities. The International Commission on Non-Ionising Radiation Protection has recommended against the use artificial UV tanning equipment for non-medical purposes. Similarly the British Association of Dermatologists recommend that sun-bed use should be avoided (Level Ia), especially for those under the age of 35 years.

Scotland was the first UK country to introduce new legislation on sunbed use which came into force in December 2009[lxviii]. The regulations make it illegal for sunbed operators to allow under 18s to use sunbeds on their premises, to have unsupervised use of sunbeds, bans the sale or hire of sunbeds to under 18s and

requires an operator to display a notice on their premises about the health risks of sunbed use. Operators are also now required under law to provide information to customers on the health risks each time they intend to use a sunbed.

However, there is concern that publicity for indoor tanning facilities may be inappropriately promoting health benefits. For example, that a tan acquired by using a sunbed will provide protection against the sun exposure during a summer holiday. In fact it has been estimated that a sunbed tan offers the same protection as using sunscreen with a sun protection factor (SPF) of 2-3. Similar claims are made in relation to vitamin D. While sunbed use may increase the synthesis of vitamin D, where people require more vitamin D than safe exposure to the sun can provide, this should be supplemented through diet rather than sunbed use[lxix].

5.2 Secondary prevention

The overarching aim of secondary prevention is to detect skin cancer that has not yet become symptomatic.

5.2.1 Early detection of skin cancer in the general population

Raising awareness

Early detection of melanoma is associated with thinner tumour and improved survival. The Detect Cancer Early Programme is an initiative to improve survival for people with cancer in Scotland by diagnosing and treating the disease at an earlier stage[lxx]. Although the programme does not include skin cancer, the first stage of the campaign was developed around the generic 'detecting cancer early benefits'; building belief that you can survive cancer, raising awareness that outcomes significantly improve if cancer is detected early and dispelling any worries about contacting health professionals.

A review of interventions to promote cancer awareness and early presentation was commissioned in 2003 and concluded that there is little research in this area but public cancer awareness campaigns have been associated with some improvement in the awareness and diagnosis of cancer, but long-term benefits were unclear[lxxi].

Population screening

The US Preventative Services Taskforce (USPSTF) concludes that the current evidence is insufficient to assess the balance of benefits and harms of using a whole-body skin examination by a primary care clinician or patient skin self-examination for the early detection of cutaneous melanoma, basal cell cancer, or squamous cell skin cancer in the adult general population[lxxii]. (Grade: I Statement).

A National Screening Programme for melanoma was implemented in Germany 2008. Screening is offered to residents over 35yrs every 2 yrs. The results of this programme will need to be reviewed once they become available but it is unlikely that a mass screening programme would be considered cost-effective in the UK.

However, there is evidence to suggest that targeted intervention for 'at risk populations' may improve outcomes. The current guidance is outlined below.

5.2.2 Early detection of skin cancer in "At Risk" population.

Malignant melanoma

The BAD guideline for the management of cutaneous melanoma[lxiii] sets out the evidence for secondary prevention for moderate and high-risk groups. The guideline was developed using a protocol that is accredited by NICE. The definitions of the levels of evidence used in the preparation of the guideline is provided in appendix 3.

At risk individuals (see below for definitions) should be considered for referral to specialist clinics.

Individuals at moderate risk of melanoma (8-10 times the risk of the general UK population) should be advised of their increased risk and taught how to self-examine for changing naevi. (Level Ia, Grade B)

This group includes:

- patients with atypical mole phenotype; and
- those with previous melanoma and organ transplant recipients.

Individuals at greatly increased risk of melanoma (more than 10 times the general population) should be advised on specific changes that suggest melanoma and encouraged to undertake monthly skin self-examination. (Level III, Grade B).

This group includes:

- patients with giant congenital pigmented naevi are at increased risk of melanoma and require long-term follow-up. (Level IIIa, Grade B); and
- individuals with a family history of three or more cases of melanoma, or of pancreatic cancer, should be referred to a clinical geneticist or specialized dermatology services. Those with two cases in the family may also benefit, especially if one of the cases had multiple primary melanomas or atypical mole syndrome. (Level IIa Grade B)

The 2003 SIGN Guideline 72. Cutaneous Melanoma[lxxiii] commented that the available evidence is insufficient to recommend for or against the routine screening of individuals at higher risk of melanoma. It suggested that interventions to promote the awareness of risk factors and skin self-awareness are probably warranted.
Specifically: Healthcare professionals and members of the public should be aware of the risk factors for melanoma.
Individuals identified as being at higher risk should be

- advised about appropriate methods of sun protection;
- educated about the diagnostic features of cutaneous melanoma; and
- encouraged to perform self-examination of the skin;

Squamous Cell Carcinoma – patients with organ transplants

The BAD Guideline of Management of Squamous Cell Carcinoma[lxxiv] recommend:
People with organ transplants are at high risk of developing cutaneous SCC. Skin surveillance to allow early detection and treatment, and measures to prevent SCC

should be part of their routine care.

Similarly the Scottish Referral Guidelines for Suspected Skin Cancer[lxxv] state that patients who are therapeutically immuno-suppressed after an organ transplant have a high incidence of skin cancers especially squamous cell carcinoma. In transplant patients these tumours can be unusually aggressive and more prone to metastasize. It is strongly recommended that transplant patients are aware of this risk and are urgently referred with any suspicious lesion.

Skin Cancer Referral Guidelines

For the English NHS, recently published NICE guidance offers evidence-based advice on the recognition of and referral for suspected cancer in children, young people and adults[lxxvi]. For suspected skin cancer the guidance is outlined below.

1. Malignant melanoma of the skin

Refer people using a suspected cancer pathway referral (for an appointment within two-weeks) for melanoma if they have a suspicious pigmented skin lesion with a weighted 7-point checklist score of 3 or more.

Weighted 7□point checklist

Major features of the lesions (scoring 2 points each):

- change in size
- irregular shape
- irregular colour.

Minor features of the lesions (scoring 1 point each):

- largest diameter 7mm or more
- inflammation
- oozing
- change in sensation.

Refer people using a suspected cancer pathway referral (for an appointment within two-weeks) if dermoscopy suggests melanoma of the skin.

Consider a suspected cancer pathway referral (for an appointment within 2 weeks) for melanoma in people with a pigmented or non□pigmented skin lesion that suggests nodular melanoma.

2. Squamous cell carcinoma

Consider a suspected cancer pathway referral (for an appointment within two-weeks) for people with a skin lesion that raises the suspicion of squamous cell carcinoma.

3. Basal cell carcinoma

Consider routine referral for people if they have a skin lesion that raises the suspicion of a basal cell carcinoma.

Only consider a suspected cancer pathway referral for people with a skin lesion that raises the suspicion of a basal cell carcinoma if there is particular concern that a delay may have a significant impact, because of factors such as lesion site or size.

Follow the NICE guidance on improving outcomes for people with skin tumours including melanoma: the management of low-risk basal cell carcinomas in the community (2010 update) for advice on who should excise suspected basal cell carcinomas.

6. Discussion

6.1 General considerations

Malignant melanoma and non-melanoma skin cancers are common in the Scottish population compared to other types of cancer. The incidence of both groups of skin cancer have been rising over the past decades. Mortality associated with skin cancer is relatively low, and although mortality rates are increasing, this is occurring at a slower rate than incidence. The epidemiology suggests that Scottish males have a slightly higher risk of malignant melanoma than their contemporaries in the rest of the UK, and the incidence in older males is higher than older females. Mortality and survival statistics for malignant melanoma are worse for Scottish males compared to females. Similarly, Scottish males experience a higher incidence of BCC and SCC than females, and the incidence is increasing for both sexes.

Exposure to UV radiation is the major environmental factor associated with skin cancer. The relationship between UV radiation exposure and skin cancer is complex. The development of skin cancer is a result of interaction between environmental exposure, genetic factors and individual host factors such as skin type. Environmental exposure to sunlight it is not a simple dose-response relationship. It may involve thresholds of UV exposure as well as critical life stages of exposure. For melanoma, studies have suggested divergent causal pathways. Melanoma may be related to intermittent high intensity sun exposure, particularly in fair-skinned individuals, so those at greatest risk are likely to be fair skinned people from higher latitudes who intermittently are exposed to high intensity UV radiation such as when on holidays[lxxvii], and through the use of indoor tanning facilities. However, it may also be associated with cumulative UV radiation damage of chronically exposed body sites for older people.

There is evidence that increases in solar UV exposure reaching the UK may be slowing, in line with ozone-depletion modeling predictions from the 1980s. However, travel for holidays to sunny climates show an increasing trend. Sun-protection behaviour varies considerably across the populations studied, leaving many people at risk of intermittent, high levels of UV exposure. Similarly, although there have been improvements in legislation relating to sunbed use, past surveys have found the prevalence of use of indoor tanning to be high across many population groups, and therefore it is likely that there will still be significant numbers of individuals being exposed to artificial UV radiation.

Changes in environmental exposure to UV radiation, changes in behaviour, and the possibility of different mechanisms for the development of malignant melanoma make it difficult to accurately predict the future incidence of skin cancer. Taking account of the impact of changes in population demographics together with current trends in incidence, the number of cases of skin cancer will continue to increase. The total number of cases of malignant melanoma is predicted to increase annually by 2.8% for females and 3.5% for males until 2030. Projections for the incidence of non-melanoma skin cancer suggests that the number of cases will double between 2000-2030.

Changing behaviour to reduce harmful levels of exposure to UV radiation is the focus of primary prevention of skin cancer. However, our patterns of behaviour are deeply embedded in social and material circumstances, and cultural context. Whilst it is recognised that interventions to change behaviour have great potential to alter the epidemiology of many diseases, they have often been unsuccessful.

Recognising this challenge, NICE was commissioned to develop guidance to provide a set of generic principles that can be used as a basis for planning, delivering and evaluating public health activities aimed at behaviour change[lxxviii]. This guidance, together with the evidence base provided by NICE Public Health Guidance on Skin Cancer Prevention, offers the opportunity to further develop primary prevention interventions for skin cancer in the Scottish population.

The evidence base used by NICE to develop their Skin Cancer Prevention Guidelines incorporates reviews of both quantitative and qualitative research, economic analysis, expert opinion and stakeholder comments. The full evidence bases can be viewed online[lxxix]. It is acknowledged that research into health promotion interventions is challenging. In the context of primary prevention of skin cancer, these include difficulties identifying the effective components of complex interventions, measuring outcomes such as sun exposure and sunscreen use; problems with recall bias, evaluation of important confounders such as the use of sun screen altering exposure behaviour. Also, few of the studies are conducted in the UK, and it is recognized that the social and cultural context of behaviour change is of central importance.

Measures to reduce the risk of skin cancer need to acknowledge that small amounts of solar UV radiation are beneficial for health, particularly in relation to outdoor physical activity and for the production of vitamin D. Physical activity is an important component of a healthy lifestyle and is often undertaken outdoors, exposed to UV radiation. A balance needs to be found between the benefits of physical activity and reducing the risk of harm from exposure to solar radiation.

The draft SACN recommendation to develop strategies for the UK population to achieve specific Reference Nutrient Intake (RNI) in relation to vitamin D will have the potential to change the balance of risk and benefit associated with exposure to sunlight.

NICE is currently working on new guidance - *Sunlight exposure: communicating the benefits and risks to the general population*[lxxx]. This is due to be published in November 2015 and will replace recommendations 1–5 in Skin cancer prevention: information, resources and environmental changes NICE guideline PH32 (2011).

The guidance is about communicating the benefits and risks of sunlight exposure to the general public as opposed to the risks and benefits of sunlight *per se*. Once published, relevant recommendations from SACN and The Advisory Group on Non-ionising Radiation (outlining health effects of UV radiation in relation to vitamin D synthesis) will be referred to in this guideline.

We do not have a comprehensive picture of current levels of Primary Prevention Activity across Scotland. However, there are a number of resources that are available including SunSmart – Cancer Research UK, Young scot – a national youth information and citizenship charity and Sun Awareness Campaigns undertaken by the BAD (including road shows, media campaigns and sun awareness packs).

Secondary prevention of skin cancer (early detection of skin cancer that has not yet become apparent) is recommended for 'at risk groups'. The guidance suggests that individuals at increased risk of malignant melanoma should be referred to specialist clinics where they can be advised of their increased risk and be taught how to self-examine their skin.

The literature suggests that skin self-examination (SSE) can result in earlier detection of melanoma with thinner tumours and improved mortality[lxxxi,lxxxii]. However, the SSE process is not clearly defined. Thus the features of SSE that optimise the accuracy of melanoma identification (such as frequency, thoroughness and proficiency) have not been adequately reviewed[lxxxii]. The components of current practice should be supported by the best available evidence. For example, one element of SSE is the use of visual images. A review of the influence of visual images on SSE skills and performance was conducted in 2013[lxxxiii]. They concluded that images positively influenced knowledge and self-efficacy of SSE, and motivated the performance of SSE improving the accuracy of melanoma detection. Text alone was ineffective. In addition, the uptake of SSE has been found to be relatively low even in high risk groups[xlviii].

Patients with organ transplants are at increased risk of SCC, which can be unusually aggressive. As part of their routine care this group of patients should be aware of the need to take measures to prevent SCC, should have regular skin examination to allow early detection, and should be urgently referred with any suspicious lesion.

6.2 Cost implications

The basic cost implications of primary prevention activity have been outlined in relation to the NICE guidance but have not been examined for other elements of this scoping exercise. Whilst NICE suggest that costs are not likely to be significant, there will be some resource required to maintain and update materials, to develop new materials, and to monitor and evaluate interventions. There will also be cost implications associated with developing, implementing and monitoring policies for educational and leisure facilities, and for outdoor workers.

The cost of managing skin cancer will increase as the incidence increases and new treatment options are introduced. Research has been undertaken to estimate the financial cost of managing skin cancer in the English NHS[lxxxiv]. Three separate approaches were taken; top-down based on health service use data, bottom-up based on a simplified model of skin cancer care, and analysis of total national expenditure on skin cancer provided by the National Programme Budgeting Data project. Although there were acknowledged to be some limitations due to uncertainties surrounding some of the assumptions, the findings were in line with estimates from the Department of Health.

The financial cost to the NHS in England was estimated to range from £106-£112 million in 2008. The expected cost per case was estimated to be £2607 for malignant melanoma and £889 for non-melanoma skin cancer, using the bottom-up approach. Using the top-down approach the expected cost per case was estimated to be £2560 for malignant melanoma and £1226 for non-melanoma skin cancer. Given the increasing trend in incidence, together with additional costs such as new chemotherapy agents, expenditure is predicted to rise considerably.

A more formal exercise to understand the cost-implications in Scotland may be needed to fully understand the consequences of the increases in skin cancer cases and the potential impact of effective primary and secondary presentation.

7. Opportunities for action

This scoping report does not make formal recommendations. However, in the light of the evidence presented and discussed, it was considered appropriate to identify a number of areas where local Directors of Public health and their teams may review current action and consider what opportunities there are for enhancing current actions and strengthening those which may benefit from a renewed sense of urgency.

Opportunity 1: Information provision
Evidence suggests that mass media campaigns and local information can improve knowledge and attitudes about sun protective behaviours and the use of indoor tanning facilities. The information offered to the population of Scotland should be reviewed and developed in line with NICE Recommendations 1-4, and relevant findings from the awaited NICE guidance on Sunlight exposure: communicating the benefits and risks to the general population, including changes to guidance on vitamin D.

Use information gained from this needs assessment to inform primary prevention activity. In particular:

- progress needs to be made to reach middle-aged and older men who suffer a disproportionate burden from malignant melanoma; and
- continue to target advice to those travelling abroad for sunny holidays.

Opportunity 2: The workplace
A strategy should be developed to help protect children, young people and those who work outdoors, to ensure sun-safe outdoor activity. Specifically there should be support for employers and managers of educational and leisure facilities and employers of people who work outdoor:

- to assess the risk of harmful UV radiation exposure to children and employees;
- to develop effective policies to reduce the risk such exposure.

Opportunity 3: Provision of shade
Opportunities to influence the design of new buildings should be explored, for example through discussion with Local Authority Planning Departments.

Opportunity 4: Encourage enforcement of sunbed legislation
Within the context of local Community Planning or other partnership arrangements, encourage local authority partners to use their powers to ensure the sunbed legislation is enacted.

Consider if it is appropriate to request the removal of sunbeds from public authority gyms and leisure centres (if they are there?)

Explore local and national avenues regarding advertising controls. BAD advocates that advertising claims of health benefits of sunbeds should be banned given that

there are no health benefits that cannot be more safely and effectively achieved through other means.

Opportunity 5: Redesign of existing interventions that are not cost-effective
Multi-component interventions (incorporating both information and sun-protection resources such as sunscreen or hats) should be redesigned, because they have not been found to be cost effective.

Opportunity 6: Self-examination
The components of skin self-examination should be reviewed and supported by the best available evidence

Opportunity 7: Early detection
Promoting prompt detection of melanoma is associated with early stage disease and therefore improved survival. Measures to promote awareness of malignant melanoma amongst the general population and targeting those at increased risk of developing melanoma should be reviewed / encouraged.

Opportunity 8: Decreasing referral time
Individuals at increased risk of malignant melanoma should be referred to specialist clinics where they can be advised of their increased risk and be taught how to self-examine their skin.

Opportunity 9: Care of transplant patients
Ensure that patients who have received an organ transplant are offered advice on how to prevent SCC, how to undertake SSE, how to recognise SCC and should be offered prompt referral for the management of any suspicious lesions.

As part of their routine care immuno-suppressed organ transplant patients should be aware of the need to take measures to prevent SCC, should have regular skin examination to allow early detection, and should be urgently referred with any suspicious lesion.

Opportunity 10: Cost implications
Undertake a formal health economic modelling exercise to understand the potential, future costs of skin cancer in Scotland associated with the current growth in changes and the potential effects of effective primary and secondary prevention.

8. Appendices

Appendix 1 Search Strategies

Inequalities

Database: Ovid MEDLINE(R) Daily Update <July 03, 2013>, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R) <1946 to Present>
Search Strategy:
---
1 exp Melanoma/ (73376)
2 exp Socioeconomic Factors/ (337677)
3 depriv*.mp. (79016)
4 (health adj1 inequal*).mp. [mp=title, abstract, original title, name of substance word, subject heading word, keyword heading word, protocol supplementary concept, rare disease supplementary concept, unique identifier] (2480)
5 exp Poverty Areas/ or exp Poverty/ (31012)
6 exp Social Class/ (32819)
7 exp Health Status Disparities/ (7352)
8 2 or 3 or 4 or 5 or 6 or 7 (415034)
9 1 and 8 (384)
10 limit 9 to "review articles" (23)
11 limit 10 to yr="2003 -Current" (13)

****

Database: Embase <1996 to 2013 Week 26>
Search Strategy:
---
1 exp melanoma/ (71472)
2 (health adj1 inequal*).mp. [mp=title, abstract, subject headings, heading word, drug trade name, original title, device manufacturer, drug manufacturer, device trade name, keyword] (2905)
3 exp socioeconomics/ (119249)
4 exp health disparity/ (5479)
5 exp poverty/ (21430)
6 exp social class/ (14649)
7 depriv*.mp. (56661)
8 2 or 3 or 4 or 5 or 6 or 7 (187292)
9 1 and 8 (431)
10 limit 9 to yr="2003 -Current" (360)
11 limit 10 to (meta analysis or "systematic review") (6)

****

Web of Science
Topic=(melanoma) AND Topic=(health next/1 inequal* OR deprivation OR deprived OR socio-economic* OR socioeconomic* OR poverty OR social next/1 class)
Refined by: Document Types=(REVIEW) AND Publication Years=(2010 OR 2009 OR 2007 OR 2003 OR 2011 OR 2008 OR 2005 OR 2012 OR 2004)
Timespan=All years. Databases=SCI-EXPANDED, SSCI.

Cochrane
#1 MeSH descriptor: [Melanoma] explode all trees 999
#2 MeSH descriptor: [Socioeconomic Factors] explode all trees 5703
#3 Enter terms for search depriv* 2254
#4 Enter terms for search health adj1 inequal* 11
#5 MeSH descriptor: [Health Status Disparities] explode all trees 52
#6 MeSH descriptor: [Social Class] explode all trees 437
#7 MeSH descriptor: [Poverty] explode all trees 890
#8Enter terms for searc(#2 or #3 or #4 or #5 or #6 or #7)7884
#9Enter terms for searc(#1 and #2)7

<u>Epidemiology, incidence and prevalence</u>

Database: Ovid MEDLINE(R) Daily Update <July 03, 2013>, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R) <1946 to Present>
Search Strategy:
---
1 exp Melanoma/ (73376)
2 exp Prevalence/ (188181)
3 exp Epidemiology/ (22002)
4 exp Incidence/ (174451)
5 2 or 3 or 4 (366319)
6 1 and 5 (1658)
7 limit 6 to ("review articles" and yr="2003 -Current") (129)

****

Database: Embase <1996 to 2013 Week 26>
Search Strategy:
---
1 exp melanoma/ (71472)
2 exp prevalence/ (330355)
3 exp epidemiology/ (1458916)
4 exp incidence/ (216866)
5 2 or 3 or 4 (1458916)
6 1 and 5 (9110)

7 limit 6 to yr="2003 -Current" (7543)
8 limit 7 to (meta analysis or "systematic review") (196)

****

Cochrane
#1 MeSH descriptor: [Melanoma] explode all trees 999
#2 MeSH descriptor: [Epidemiology] explode all trees 36
#3 MeSH descriptor: [Prevalence] explode all trees 3258
#4 MeSH descriptor: [Incidence] explode all trees 6949
#5Enter terms for searc(#2 or #3 or #4)9873
#6Enter terms for searc(#1 and #5)26

Web of Science
Title=(melanoma) AND Topic=(epidemiology OR prevalence OR incidence)
Refined by: Document Types=(REVIEW) AND Publication Years=(2011 OR 2003 OR 2007 OR 2012 OR 2010 OR 2009 OR 2006 OR 2008 OR 2004 OR 2005 OR 2013) AND Document Types=(REVIEW)
Timespan=All years. Databases=SCI-EXPANDED, SSCI.

Prevention

Database: Ovid MEDLINE(R) Daily Update <July 03, 2013>, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R) <1946 to Present>
Search Strategy:
---
1 exp Melanoma/ (73376)
2 exp Primary Prevention/ (112965)
3 exp Preventive Health Services/ or exp Health Promotion/ (425176)
4 2 or 3 (425176)
5 1 and 4 (1679)
6 limit 5 to ("review articles" and yr="2003 -Current") (117)

****

Database: Embase <1996 to 2013 Week 26>
Search Strategy:
---
1 exp melanoma/ (71472)
2 exp cancer prevention/ or exp prevention/ or exp primary prevention/ (618793)
3 exp health promotion/ (53832)
4 2 or 3 (663184)
5 1 and 4 (5400)
6 limit 5 to yr="2003 -Current" (4334)
7 limit 6 to (meta analysis or "systematic review") (77)

****

Web of Science
Title=(melanoma) AND Topic=(prevent*)
Refined by: Document Types=(REVIEW) AND [excluding] Publication Years=(2002)
Timespan=All years. Databases=SCI-EXPANDED, SSCI.

Cochrane
#1 MeSH descriptor: [Melanoma] explode all trees 999
#2 MeSH descriptor: [Primary Prevention] explode all trees 3093
#3 MeSH descriptor: [Health Promotion] explode all trees 3153
#4 MeSH descriptor: [Preventive Health Services] explode all trees 19355
#5 Enter terms for search (#2 or #3 or #4 or #5)(#2 or #3 or #4) 19355
#6 Enter terms for search (#1 and #6)(#1 and #5) 88 from 2003 to 2013

Appendix 2 Summary of NICE Public Health Guidance 32

Recommendation 1 - Information provision: delivery

What action should they take?

- Commissioners, organisers and planners of national, mass-media skin cancer prevention campaigns should:
  - continue to develop, deliver and sustain these campaigns to raise awareness of the risk of UV exposure and ways of protecting against it
  - try to integrate campaign messages within existing national health promotion programmes or services to keep costs as low as possible. (Examples of initiatives where they could be integrated include Sure Start and the National Healthy Schools Programme)
  - evaluate the impact using a range of knowledge, attitudes, awareness and behavioural measures. (For recommendations on the principles of evaluation see Behaviour change: the principles for effective interventions [NICE public health guidance 6].)
- Local practitioners should continue to deliver low cost, information-related prevention activities to raise awareness of the risks of UV exposure and ways of protecting against it. This may include one-to-one and group-based advice as well as local media campaigns. (A low cost option could involve integrating skin cancer prevention messages into existing local health promotion campaigns and activities. Examples include employee wellbeing initiatives or activities related to the Healthy Child Programme and Sure Start.)
- Ensure national and local messages are repeated over time and regularly revised to keep the audience's attention. They should also be timed appropriately (for example, they should be promoted in the spring and summer) and reinforced each year.

Recommendation 2 - Information provision: developing national campaigns and local activities

What action should they take?

- Use local, regional and national epidemiological data and demographic and risk assessments to identify which groups, behaviours or activities need to be targeted. Groups who may be at higher risk of skin cancer include:
  - those with fair skin: people with skin types I and II burn rapidly (those with skin types III and IV are at risk in strong sunshine and during prolonged UV

exposure, those with skin types V and VI are at risk during prolonged UV exposure)
  - children (babies are at greatest risk of burning and should be kept out of direct sunlight)
  - young people
  - outdoor workers
  - those who are immuno-suppressed
  - those with a personal or family history of skin cancer
    those with a lot of moles (more than 50)
  - those who put themselves at risk of overexposure to UV by sunbathing or by using indoor tanning devices such as sunbeds and sunlamps.

- Ensure national and local prevention activities are based on evidence that details the needs of groups at risk – and the barriers they face in changing their behaviour.

- Establish clear, measurable objectives for national and local prevention activities.

- Ensure the need to tackle health inequalities is taken into account when developing national and local prevention activities. Consider cultural, religious and group norms in relation to sun exposure and delivery preferences (in terms of message format, medium and languages used).

- Develop and pilot the format and content of national campaigns with the target audience. Where feasible, do the same for local activities.

Recommendation 3 - Information provision: message content

What action should they take?

- Ensure messages include a simple explanation of how UV exposure can damage the skin and how environmental factors can affect the level of sun exposure. (Factors include: geographical location, cloud cover, seasonal variations, UV forecasts or solar UV index and the availability of shade.)

- Ensure messages explain how someone can assess their own level of risk (for example, if they have pale skin, red hair, freckles or lots of moles then they should take extra care). They should also stress the importance of checking the skin regularly for any changes (such as changes to any moles) and where to go for further advice if changes are detected.

- Ensure messages give a balanced picture of both the risks of overexposure and the benefits of being out in the sun. (The risks include skin cancer, the benefits include boosting vitamin D levels and increasing the likelihood of being physically active.)

- Ensure messages include a range of options to help protect the skin against UV damage (including details of where to get further advice and information). This could include the following:

  - Avoid getting sunburnt Avoid excess or prolonged sun exposure. This includes staying in the sun until the skin goes red. If you need to be out in the sun (for example, for work purposes), then protect your skin as much as possible to avoid burning.

  - When and how to protect the skin when it is sunny, both in the UK and abroad, by spending time in the shade between 11am and 3pm. Where possible, wear clothing that protects areas which may be vulnerable to burning and apply sunscreen. This includes a broad-brimmed hat that shades the face, neck and ears, a long-sleeved top and trousers. Where possible, choose close-weave fabrics that don't allow the sun through.

  - Sunscreens Sunscreens should not be used as an alternative to clothing and shade, rather they should offer additional protection. (Note, no sunscreen product provides 100% protection against the sun.) Choose a 'broad spectrum' sunscreen which offers both UVA and UVB protection. It should be at least SPF 15 to protect against UVB and offer high UVA protection (in the UK, this is indicated by at least four stars and the circular UVA logo). Use water resistant products if sweating or contact with water is likely.

  - Sunscreen application apply liberally half an hour before and after going out in the sun (don't forget your head, neck and ears). Re-apply at least every 2 hours and immediately after being in water, even if the sunscreen is 'water resistant'. Also re-apply after towel drying. If applied adequately, SPF 15 should be sufficient.

Recommendation 4 - Information provision: tailoring the message

What action should they take?

- Ensure messages are simple, succinct and tailored for the target group. For example, they should be tailored for those with different skin types, those who work outdoors, those taking winter and summer holidays in the sun and the parents of children and young people.

- Ensure messages take account of cognitive ability (in particular, in relation to children). They should also encourage people to be sensible in the sun. For example, they could appeal to carer or parental concerns for their child, or tap into general concerns about the ageing effects of the sun.

- Ensure messages address the social and practical barriers to using sun protection. This includes:

  - acknowledging the common perception that a sun-tanned appearance is attractive

  - acknowledging that sunshine is a good source of vitamin D

  - acknowledging that sunshine encourages people to be physically active

  - stressing how easy it is for people to apply sunscreen and that 'protective', loose fitting and light clothing can be attractive and comfortable to wear

  - acknowledging that people mistakenly believe that the health risks of overexposure are minimal, and that malignant melanoma and squamous cell carcinoma are not serious conditions.

- Phrase messages in such a way that they enhance people's belief in their ability to change – and encourage them to make those changes. Use positive statements such as: 'Using sunscreen with high UVA protection (as indicated by UVA stars and the UVA circle logo) increases the chances of keeping skin healthy and young looking'. Note: negative messages are not so effective. These include, for example, 'Not using sunscreen increases the risk of skin cancer and sun exposure prematurely ages the skin'.

- Ensure messages are delivered in a way that meets the target audience's preferences (for example by radio, text messaging or leaflets).

Recommendation 5 - Protecting children, young people and outdoor workers

Who should take action?

- Employers and managers in leisure or educational settings (examples of the latter include head teachers, healthy schools coordinators and PSHE lead teachers).

- Other employers, managers and practitioners in contact with employees who work outdoors (such as workplace health practitioners and health and safety officers).

What action should they take?

- Assess if there is a risk of harmful exposure to the sun. Where this is the case, develop, implement and monitor a specially tailored policy to ensure people are protected as much as possible.

- Ensure policies aim to prevent children and young people from getting sunburnt by encouraging them to seek shade whenever possible. When it is not possible, they

should be encouraged to wear hats, other clothing and sunscreen to protect themselves. Policies should also encourage parents to provide their children with sunscreen. Guidelines should be provided on how to help children apply it (and how children can help each other to apply it).

- Ensure policies encourage outdoor workers to wear clothing to avoid getting sunburnt (including a hat that shades the face and back of the neck, where possible). They should also be encouraged to stay in the shade when possible, especially during breaks and in the middle of the day (11am to 3pm). When it is not possible to stay in the shade or wear protective clothing (for example, because of work requirements) they should be encouraged to wear a sunscreen with UVA and UVB (at least SPF 15) protection. For more details see recommendation 4. (Further information on the development of education, leisure or workplace-based policies can be obtained from the Sunsmart and Health and Safety Executive websites.)

- Assess the training needs of staff responsible for policy-making in outdoor, educational or leisure environments. Ensure they have the necessary skills and information to give their colleagues advice on sun protection issues. For example, teachers and others working in education may need training in the risk factors, the types of behaviours to avoid and how to encourage children and young people to apply their own sunscreen. Employers and managers may need training in how to carry out risk assessments in relation to sun exposure during the working day.

Recommendation 6 - Providing shade

Who should take action?

- Architects, designers, developers, planners and employers.

What action should they take?

- When designing and constructing new buildings, consider providing areas of shade created either artificially or naturally (for example, by trees).

- When developing or redeveloping communal outdoor areas, check whether it is feasible to provide areas of shade. Shade could be created by constructing a specific structure or by planting trees.

- For all new developments, ensure there is adequate access to areas of shade for people with a disability.

Appendix 3 BAD Guidelines

Definition of the levels of evidence used in the preparation of the BAD Guidelines on the management of cutaneous melanoma.

Level Ia – evidence obtained from meta-analysis of RCTs or epidemiological studies
Level IIa – evidence obtained from at least one well-designed controlled study without randomisation
Level III – Evidence obtained from well-designed non-experimental descriptive studies, such as comparative studies, correlation studies and case studies.

Grade of recommendation
A – there is good evidence to support the use of the intervention
B – there is fair evidence to support the use of the intervention

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