

Skin cancer prevention

Public health guideline

Published: 26 January 2011

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Your responsibility

The recommendations in this guideline represent the view of NICE, arrived at after careful consideration of the evidence available. When exercising their judgement, professionals and practitioners are expected to take this guideline fully into account, alongside the individual needs, preferences and values of their patients or the people using their service. It is not mandatory to apply the recommendations, and the guideline does not override the responsibility to make decisions appropriate to the circumstances of the individual, in consultation with them and their families and carers or guardian.

Local commissioners and providers of healthcare have a responsibility to enable the guideline to be applied when individual professionals and people using services wish to use it. They should do so in the context of local and national priorities for funding and developing services, and in light of their duties to have due regard to the need to eliminate unlawful discrimination, to advance equality of opportunity and to reduce health inequalities. Nothing in this guideline should be interpreted in a way that would be inconsistent with complying with those duties.

Commissioners and providers have a responsibility to promote an environmentally sustainable health and care system and should assess and reduce the environmental impact of implementing NICE recommendations wherever possible.

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Overview

This guideline covers new buildings and communal outdoor areas. The aim is to ensure there are enough shady areas to protect people from overexposure to the sun.

Originally the guideline also covered information and the supply of sun protection resources to prevent skin cancer. In February 2016 recommendations 1 to 5 were updated and replaced by NICE's guideline on [sunlight exposure: risks and benefits](#).

Who is it for?

- Architects, designers, developers, planners and employers
- Members of the public

Introduction

The Department of Health (DH) asked the National Institute for Health and Clinical Excellence (NICE) to produce public health guidance for the NHS and local authorities on the prevention of skin cancer with specific reference to: provision of information, physical changes to the environment and the supply of sun protection resources.

The guidance is for NHS and other commissioners, managers and practitioners who have a direct or indirect role in, and responsibility for, preventing skin cancer. This includes for example, GPs, local authority planners, pharmacists, practice nurses, public health practitioners, school nurses and skin cancer specialists (such as clinical nurse specialists [skin cancer], dermatologists and skin cancer surgeons). It also includes those involved in, or responsible for, employee health and wellbeing.

In addition, it may be of interest to those working in the wider public, private, voluntary and community sectors and to members of the public.

The guidance complements, but does not replace, NICE guidance on detecting and treating skin cancer (for further details, see [section 7](#)).

The Public Health Interventions Advisory Committee (PHIAC) developed these recommendations on the basis of reviews of the evidence, economic analysis, expert advice and stakeholder comments.

Members of PHIAC are listed in [appendix A](#). The methods used to develop the guidance are summarised in [appendix B](#).

Supporting documents used to prepare this document are listed in [appendix E](#). Full details of the evidence collated, including stakeholder comments, are available on the NICE [website](#), along with a list of the stakeholders involved and NICE's supporting process and methods manuals.

This guidance was developed using the NICE public health intervention process.

1 Recommendations

In February 2016 recommendations 1 to 5 were updated and replaced by NICE's guideline on [sunlight exposure: risks and benefits](#).

Introduction

This is NICE's formal guidance on skin cancer: prevention using public information, sun protection resources and changes to the environment. When writing the recommendations, the Public Health Interventions Advisory Committee (PHIAC) (see [appendix A](#)) considered the evidence reviews, expert papers, economic analysis and comments from stakeholders and experts. Full details are available [online](#).

The evidence statements underpinning the recommendations are listed in [appendix C](#).

PHIAC considers that the recommended measures are cost effective.

For the research recommendations and gaps in research, see [section 5](#) and [appendix D](#) respectively.

What the guidance covers

The recommendations focus on preventing the first occurrence (primary prevention) of skin cancer attributable to overexposure to natural and artificial ultraviolet (UV). Unless otherwise stated, the term 'skin cancer' encompasses non-melanoma (basal cell and squamous cell carcinoma) and malignant melanoma.

The recommendations aim to raise and maintain awareness – and increase knowledge – of the risks of UV exposure, influence attitudes and prompt behaviour change. They focus on the following:

- Delivery of national mass-media campaigns and local information provision (including verbal advice and printed and visual material) (recommendation 1).
- How to develop and evaluate information campaigns and interventions (recommendation 2).
- The factual content of information (recommendation 3).
- The tone of messages and how to tailor them for specific audiences (recommendation 4).

- The workplace, to help reinforce recommendations 1 and 2, in particular, to protect children, young people and outdoor workers (recommendation 5).
- Provision of shade as part of the design of new buildings (recommendation 6).

What the guidance does not cover

There are no recommendations on the following interventions as they were found not to be cost effective:

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

In addition, there are no recommendations on the use of non-information related resources alone (such as protective clothing or sunscreen). The absence of recommendations in this area is a result of a lack of evidence (no studies were identified). It should not be taken as a judgement on whether or not such interventions are effective and cost effective.

The following interventions were excluded as they were not part of the remit for this guidance:

- Policy, fiscal or legislative actions (such as banning unsupervised or coin-operated sunbed facilities or reducing VAT on sunscreen products).
- Clinical diagnosis and the detection, treatment and management of skin cancer alongside activities to prevent its re-occurrence.

Factors to consider when planning and delivering the recommended activities

Exposure to the sun has a number of benefits. For example, it increases people's sense of wellbeing, allows them to synthesise vitamin D and provides opportunities for physical activity.

Vitamin D

Vitamin D is essential for bone health and there is ongoing research to assess other positive health benefits. Although the optimum level of vitamin D is subject to debate, it is accepted that a plasma level below 25 nanomoles/litre increases the risk of rickets and osteomalacia. Several population groups in the UK face this risk^[1].

The sun is the predominant source of vitamin D. However, it is difficult to determine how much sunlight is needed to produce a given level, as the length of time needed to synthesise vitamin D depends upon several factors. These include skin type, the amount of skin exposed, the time of day and year and how far someone is from the equator.

Ultimately, a balance needs to be struck to attain an adequate vitamin D status without increasing the risk of skin cancer. (Further information on vitamin D can be obtained from the Department of Health or the Food Standards Agency^[2].)

Physical activity

Regular physical activity is key to a healthy lifestyle. It can help reduce the risk of developing chronic diseases and improves people's overall physical and mental wellbeing. Skin cancer prevention activities may inadvertently reduce physical activity levels as people aim to avoid exposure to the sun. It is important that prevention activities do not discourage outdoor physical activity but, rather, encourage people to use sensible skin protection.

Behaviour change

The principles outlined in NICE's [behaviour change: general approaches](#) guidance (see [section 7](#)) were used as the basis for making recommendations on how to change people's health-related behaviours. That guidance highlights the need for careful planning that takes into account the local and national context and the needs of the target community. It advises building upon the existing skills and resources within a community, and ensuring practitioners have the necessary competencies and skills to support behaviour change. The guidance also recommends evaluating interventions and programmes thoroughly.

Whose health will benefit?

This guidance does not exclude anybody. However, some groups are more likely to benefit (for example, outdoor workers, those who are immune-suppressed, children and young people and those who use sunbeds).

Recommendations 1–5

These recommendations have been replaced by NICE's guideline on [sunlight exposure: risks and benefits](#).

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.

^[1]Ruston D, Hoare J, Henderson L, et al. (2004) The national diet and nutrition survey: adults aged 19–64 years. Volume 4: nutritional status (anthropometry and blood analytes), blood pressure and physical activity. London: The Stationery Office.

Hypponen E, Power C (2007) Hypovitaminosis D in British adults at age 45 y: nationwide cohort study of dietary and lifestyle predictors. *American Journal of Clinical Nutrition* 84: 18–28.

^[2]See [Department of Health](#) or the [Food Standards Agency](#).

2 Public health need and practice

Background

There are two main types of skin cancer:

- Non-melanoma is the most common and is usually less complex to treat. There are two main sorts: basal cell carcinoma (BCC) and the more serious squamous cell carcinoma (SCC):
 - BCC is rarely fatal. However, if it is not diagnosed early enough – or is not properly treated – it can result in tumors that destroy important anatomical structures (such as the nose, eye, ear and lip). As such it can be more challenging to treat and can result in the tumour becoming inoperable (see NICE cancer service guidance 'Skin tumours including melanoma' 2010^[3]). Its development is associated with intensive ultraviolet radiation exposure in childhood and adolescence, particularly in those who burn easily.
 - SCC can be disfiguring and can be fatal if it spreads. Its development is associated with chronic ultraviolet radiation exposure in the earlier decades of life (Leiter and Garbe 2008).
- Malignant melanoma is the most serious and is responsible for the majority of skin cancer deaths. Treatment is more likely to be successful when it is caught early. It has most strongly and consistently been associated with reported 'intermittent sun exposure' mostly accrued through recreational activities (Gallagher and Lee 2006; Gandini et al. 2005; Walter et al. 1999).

In 2002, it was estimated that skin cancer (malignant melanoma and other malignant neoplasms of the skin) cost the NHS approximately £71 million (Morris et al. 2005).

Incidence

Non-melanoma skin cancer is estimated to account for around a third of all cancers detected in the UK. In England more than 69,000 people were registered with it in 2007 (Office for National Statistics 2009a). However, due to incomplete registration, the actual number of cases may be over 100,000 (Cancer Research UK 2010a).

Research has shown that the incidence of non-melanoma is rising in the young, especially among those aged 30–39 (Bath-Hextall et al. 2007).

In England, more than 8800 cases of malignant melanoma were diagnosed in 2007 (Office for National Statistics 2009a). In 2008, it caused 1847 deaths in England and Wales (Office for National Statistics 2009b).

Since the 1970s, the incidence of malignant melanoma has more than tripled in Great Britain. Among males it has increased from around 2.5 per 100,000 in 1975 to 14.6 in 2007. The rate among females has increased from 3.9 to 15.4 per 100,000 during the same period (Cancer Research UK 2010b). Although incidence rates are higher among females, more men die from it (Office for National Statistics 2009b).

Risk factors

Exposure to ultraviolet (UV) radiation is the leading cause of skin cancer. This can occur naturally via sunlight and artificially through the use of sun lamps and tanning beds.

A range of factors can increase the risk of someone developing skin cancer including:

- Age and sex – the number of cases of malignant melanoma increases with age and is more common in women (Cancer Research UK 2010b). Skin damage (sunburn) at any age is associated with an increased risk of developing skin cancer later in life (Elwood and Jopson 1997).
- Ethnicity – although incidence rates are lower among people with darker skin (National Cancer Intelligence Network 2009), it is often diagnosed late, which can increase the risk of death (Cornier et al. 2006).
- Occupation – a range of outdoor workers and people involved in outdoor sports are particularly at risk for example, construction workers, cricketers and golfers, farmers, gardeners, military personnel and postal workers.
- Personal and family history – of skin cancer, lowered immunity or a transplant (Cancer Research UK 2010c).
- Physical characteristics – some people are more likely than others to develop skin cancer, such as those with fair skin that burns easily, those with lots of moles or freckles and those with red or fair hair or light coloured eyes (Cancer Research UK 2010c).
- Regional variation – London and the north have the lowest incidence, while the highest incidence is in the south-west of England (Office for National Statistics 2005).

- Socioeconomic status – malignant melanoma is associated with affluence. There is a 60–70% lower incidence among people from deprived areas compared with their more affluent peers (Cancer Research UK 2010b). However, people from more affluent areas are more likely to survive the condition (Coleman et al. 2001). In addition, it should be noted that sunbed outlets are particularly prevalent in areas of socioeconomic deprivation (Walsh et al. 2009) – and that this could affect the rate among lower socioeconomic groups in the future.

Prevention

The risk of developing skin cancer can be reduced by, for example, avoiding getting burnt, opting to stay in the shade during the middle of the day, wearing protective clothing and using high-SPF products.

In a 2003 survey, 80% of those questioned mentioned using sunscreen to reduce the risk of skin cancer, but less than half (44%) specifically mentioned using a sunscreen with a 15+ SPF (Office for National Statistics 2003).

Policy background

This guidance should be viewed in light of the following policy documents:

- 'Cancer reform strategy' (DH 2007) committed the UK government to increase funding for skin cancer prevention through awareness-raising activities.
- The Local Government and Public Involvement in Health Act (Department of Communities and Local Government 2007) outlines how primary care trusts and local authorities should undertake a joint strategic needs assessment of their population's health and social care needs.
- 'The NHS cancer plan: a plan for investment, a plan for reform' (DH 2000) sets out a comprehensive national cancer programme for England. It covers prevention, screening, diagnosis, treatment and care.

^[3] Available from the NICE [website](#).

3 Considerations

The Public Health Interventions Advisory Committee (PHIAC) took account of a number of factors and issues when developing the recommendations.

Balancing the benefits and risks of sun exposure

- 3.1 PHIAC noted that exposure to the sun has a number of benefits. For example, it gives people an increased sense of wellbeing, allows them to synthesise vitamin D and provides opportunities for physical activity.
- 3.2 PHIAC considered the potentially adverse effects of encouraging people to reduce their exposure to the sun. These include:
- a reduction in physical activity levels
 - an increase in the prevalence of vitamin D deficiency.

PHIAC believes that a balance can be struck by designing and using appropriately tailored messages – and by ensuring that protective measures also outline the benefits of sun exposure. (For example, by encouraging physical activity when promoting the use of shade or other preventive measures.)

Evidence

- 3.3 The majority of studies identified in the evidence reviews were based in countries where the climate is very different to that experienced in the UK (for example, Australia and the USA).
- 3.4 In general, multi-component public health interventions are often considered to be effective and cost effective. (They combine a number of strategies such as information provision alongside the provision of other resources and activities.) However, the evidence on multi-component interventions to prevent skin cancer was weak. None of the identified studies were UK-based. In addition, most of them focused mainly on the provision of information, with only a small component of each intervention devoted to resource provision (such as hats or sunscreen samples). The majority did not assess the effect of individual components and many of those measuring behaviour change relied on self-reporting. In addition, the economic modelling found that none of them

were cost effective. This was primarily because of the small number of malignant melanoma deaths that they prevented^[4]. Consequently, PHAC did not recommend any of the multi-component interventions that were assessed.

Information provision

3.5 A wide range of studies in a variety of settings found that information provision (including for example, one-to-one and group-based verbal advice) has a positive, short-term effect on people's knowledge and attitudes. A small number of studies showed that national mass-media campaigns can help raise awareness of the risks of ultraviolet (UV) exposure. They can also have a positive impact on knowledge, attitudes, behavioural intentions and actual behaviour in the short term.

3.6 National mass-media campaigns and local activities to provide skin cancer prevention information need to be low cost to be cost effective. This is due to the:

- small effects associated with the interventions
- high costs of the interventions assessed
- small, quality-adjusted life year (QALY) gain associated with prevented cases of non-melanoma skin cancer
- small number of avoided cases of malignant melanoma.

For example, a mass-media campaign would need to achieve a 2% change in behaviour (over 5 years) and cost less than 0.5 pence per person per annum to be cost effective. Other forms of information (such as an information booklet) would need to cost less than £2 per person. (Note: the economic analysis suggested that if interventions involving information provision or a mass-media campaign reduce physical activity levels, then they will not be so cost effective).

3.7 There is limited evidence to suggest that media images can influence young people. However, PHAC considered that it would be a positive step if young people's role models could reinforce skin cancer prevention messages.

- 3.8 The way messages are worded – and the medium used – are important. Parents, carers, teachers and those who have experienced skin cancer could help to get positive messages across.
- 3.9 Many of the studies involved children and young people and PHIAC was aware that it is important to consider their cognitive ability when delivering information-related interventions. The evidence suggests that, generally, children under 7 are unable to remember information they have been given previously (even when prompted), whereas from age 7 onwards they can.

Protecting children, young people and outdoor workers

- 3.10 PHIAC recognised the important role that employers and managers in schools, leisure facilities and other workplaces can play in helping to raise awareness of the dangers of skin cancer. This can be achieved by developing policies which cover skin cancer prevention.
- 3.11 PHIAC identified a number of barriers to providing sun protection which are specific to the educational sector. For example, there is a lack of clarity about who is responsible for ensuring children use sun protection cream and clothes – parents or teachers? There are also liability concerns if a child is sunburnt or has an allergic reaction to sunscreen products. Time constraints and difficulties in rescheduling outdoor activities to different times of the day – or moving them to areas of shade – were also identified as potential barriers.

Providing shade

- 3.12 A small number of studies were identified on the effect of providing additional structures to create shade in school grounds. The studies found that these structures were used by children and that they may help reduce their UV exposure. Adding shade structures to the existing built environment was not cost effective. However, if the provision of shade was incorporated into the design and construction of buildings from the outset, then it was a cost-effective option.

Other factors

- 3.13 PHIAC noted that the current systems for registering and monitoring national and local skin cancer incidence and prevalence are not comprehensive. (This is particularly true in relation to non-melanoma.) Consequently, it was not possible to establish the true incidence of basal cell and squamous cell carcinomas – or the demographic features of people who get these skin cancers (such as their occupation group).
- 3.14 PHIAC noted the risks associated with sunbed use and over-exposure to UV or burning. It also noted that the Sunbeds (Regulation) Act 2010 makes it illegal for tanning salons to allow under-18s to use them.
- 3.15 PHIAC noted that organisations in the private sector, for example, sun product manufacturers, could play an important role in helping raise awareness and providing advice on protecting the skin against UV damage.
- 3.16 PHIAC noted that it was important for all organisations involved in skin cancer prevention to use consistent terms and messages to help communicate the key messages.
- 3.17 In view of the economic analysis, PHIAC did not recommend further research into interventions already covered by evidence review 4 (see page 72). If, however, there is a substantive change in the current trends and epidemiology of skin cancer in the UK, particularly in terms of related mortality, then these interventions would be worthy of further investigation.

^[4] While the incidence of melanoma has increased in the UK from 6.3 per 100,000 in 1986 to 14.9 per 100,000 in 2007, the death rates are relatively low compared to those caused by many other cancers in the UK.

4 Implementation

NICE guidance can help:

- NHS organisations, social care and children's services meet the requirements of the DH's revised 'Operating framework for 2010/11'.
- National and local organisations improve quality and health outcomes and reduce health inequalities.
- Local authorities fulfil their remit to promote the wellbeing of communities.
- Local NHS organisations, local authorities and other local partners benefit from any identified cost savings, disinvestment opportunities or opportunities for re-directing resources.
- Provide a focus for multi-sector partnerships for health, such as the integration of health and social care and health improvement.

NICE has developed [tools](#) to help organisations put this guidance into practice.

5 Recommendations for research

The Public Health Interventions Advisory Committee (PHIAC) recommends that the following research questions should be addressed. It notes that 'effectiveness' in this context relates not only to the size of the effect, but also to cost effectiveness and duration of effect. It also takes into account any harmful/negative side effects.

1. What is the incidence and prevalence of, and what are the demographic trends in, skin cancer in the UK? (Demographic variables might include whether someone is an outdoor or indoor worker, their skin type and socioeconomic status.)

2. What types of information provision, including mass-media campaigns, are effective and cost effective in preventing skin cancer in the UK? What factors influence effectiveness and cost effectiveness?

- Does effectiveness and cost effectiveness vary for different population groups? (Groups could be defined by gender, age, race/ethnicity, socioeconomic status or other characteristics such as lifestyle and at-risk behaviours.)
- What impact do they have on knowledge, attitudes, awareness and behaviour, including any impact on physical activity levels and vitamin D-related outcomes?
- What are the key factors that aid or hinder the success of these interventions or campaigns, including for different population groups? In particular, how does changing attitudes to sunbathing and tanning – and perceptions of the risk of skin cancer – influence success? Do attitudes vary for different population groups?

3. Which new (previously not researched) primary prevention interventions (that do not include information provision as a component) are effective and cost effective in preventing skin cancer in the UK? What factors influence effectiveness and cost effectiveness? (For detail see question 2 above.)

4. What proxy outcome measures are suitable for studies of the primary prevention of skin cancer?

More detail on the gaps in the evidence identified during development of this guidance is provided in [appendix D](#).

6 Updating the recommendations

This guidance will be reviewed 3 years after publication to determine whether all or part of it should be updated. Information on the progress of any update will be posted on our [website](#).

7 Related NICE guidance

Published

[Ambulight PDT for the treatment of non-melanoma skin cancer](#) (2011) NICE medical technology guidance 6

[Metastatic malignant disease of unknown primary origin in adults: diagnosis and management](#) (2010) NICE guideline CG104

[Improving outcomes for people with skin tumours including melanoma](#) (2010) NICE cancer service guidance 8

[Physical activity for children and young people](#) (2009) NICE guideline PH17

[Maternal and child nutrition](#) (2008) NICE guideline PH11

[Community engagement](#) (2008) NICE guideline PH9

[Physical activity and the environment](#) (2008) NICE guideline PH8

[Behaviour change: general approaches](#) (2007) NICE guideline PH6

[Referral guidelines for suspected cancer](#) (2005) NICE guideline CG27

Under development

Melanoma (previously untreated unresectable stage III or IV) – ipilimumab in combination with dacarbazine. NICE technology appraisal (publication date to be confirmed)

Melanoma (stage III or IV) – ipilimumab. NICE technology appraisal (publication date to be confirmed)

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Appendix A: Membership of the Public Health Interventions Advisory Committee (PHIAC), the NICE project team and external contractors

Public Health Interventions Advisory Committee

NICE has set up a standing committee, the Public Health Interventions Advisory Committee (PHIAC), which reviews the evidence and develops recommendations on public health interventions. Membership of PHIAC is multidisciplinary, comprising public health practitioners, clinicians, local authority officers, teachers, social care professionals, representatives of the public, academics and technical experts as follows.

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External contractors

Evidence reviews

Review 1: 'Providing public information to prevent skin cancer' was carried out by West Midlands Health Technology Assessment Collaboration (WMHTAC), University of Birmingham. The principal authors were: Kinga Malottki, Dechao Wang, Lazaros Andronis, Pelham Barton, Anne Fry-Smith, Wendy Greenheld and David Moore.

Review 2: 'Synthesis of the West Midland health technology assessment collaboration reports: providing public health information to prevent skin cancer: review of effectiveness and cost effectiveness (dated February 2009) and addendum (dated May 2009) – including before and after studies' was carried out by the University of the West England. The principal author was Lynne Eagle.

Review 3: 'Providing public information to prevent skin cancer: barriers to and facilitators to conveying information to prevent the first occurrence of skin cancer: a systematic review of qualitative literature' was carried out by Peninsula Technology Assessment Group (PenTAG), Universities of Exeter and Plymouth. The principal authors were: Ruth Garside, Mark Pearson, Tiffany Moxham and Rob Anderson.

Review 4: 'Sun protection resources and environmental changes to prevent skin cancer: a systematic review' was carried out by the Centre for Reviews and Dissemination. The principal authors were: Catriona McDaid, Fiona Paton, Kath Wright, Steve Rice, Emma Maund and Amanda Sowden.

Review 5: 'Sun protection resources and changes to the environment to prevent skin cancer: qualitative evidence review' was carried out by Matrix. The principal authors were: Theo Lorenc, Farah Jamal and Chris Cooper.

Economic analysis

Report 1: 'Providing public health information to prevent skin cancer: modelling strategies for primary prevention of skin cancer' was carried out by WMHTAC, University of Birmingham. The principal authors were: Pelham Barton, Lazaros Andronis, Kinga Malottki and David Moore.

Report 2: 'Economic analysis to inform the development of NICE public health intervention guidance on information, sun protection resources and physical changes to the environment to prevent skin cancer (phase 2)' was carried out by Matrix. The principal authors were: Kevin Marsh, Evelina Bertranou and Meena Venkatachalam.

Expert papers

Expert paper 1: 'A summary of key messages to be included in public information resources for the primary prevention of skin cancer' was carried out by the British Association of Dermatologists.

Expert paper 2: 'Summary of current policy drivers and national practice overview' was carried out by South West Public Health Observatory. The principal authors were: Nicola Bowtell and Julia Verne.

Expert paper 3: 'National campaigns (UK and worldwide)' was carried out by the University of the West of England and Cancer Research UK. The principal authors were: Lynne Eagle, Simon Jones,

Gillian Kemp and Sara Hiom (the University of the West of England); and Sara Hiom, Lisa Naumann and Caroline Cerny (Cancer Research UK).

Expert paper 4: 'Vitamin D' was carried out by Cancer Research UK. The principal author was Ed Yong.

Expert paper 5: 'Physical activity and the school environment' was carried out by the South West Public Health Observatory. The principal authors were: Nicola Bowtell and Julia Verne.

Expert paper 6: 'Outdoor workers and sports participants – sun protection challenges' was carried out by the University of the West of England and the South West Public Health Observatory. The principal authors were: Simon Jones, Lynne Eagle and Gillian Kemp (the University of the West of England); and Julia Verne and Rebecca Hughes (South West Public Health Observatory).

Expert paper 7: 'The impact of role models on sun protection behaviours' was carried out by the University of the West of England and the South West Public Health Observatory. The principal authors were: Lynne Eagle, Gillian Kemp and Simon Jones (University of the West of England); and Julia Verne (South West Public Health Observatory).

Appendix B: Summary of the methods used to develop this guidance

The reviews, expert papers and economic modelling reports include full details of the methods used to select the evidence (including search strategies), assess its quality and summarise it.

The minutes of the Public Health Interventions Advisory Committee (PHIAC) meetings provide further detail about the Committee's interpretation of the evidence and development of the recommendations.

All supporting documents are listed in [appendix E](#) and are available [online](#).

Guidance development

The stages involved in developing public health intervention guidance are outlined in the box below.

1. Draft scope(s) released for consultation
2. Stakeholder meeting about the draft scope(s)
3. Stakeholder comments used to revise the scope(s)
4. Final scope(s) and responses to comments published on website
5. Evidence reviews, expert reports and economic modelling undertaken and submitted to PHIAC
6. PHIAC produces draft recommendations
7. Draft guidance (and evidence) released for consultation
8. PHIAC amends recommendations
9. Final guidance published on website
10. Responses to comments published on website

Key questions

The key questions were established as part of two scopes. (The first looked at information provision and the second at environmental changes and provision of resources, including multi-component interventions.)

The key questions formed the starting point for the reviews of evidence and were used by PHIAC to help develop the recommendations. The overarching questions were:

1. What are the most effective and cost-effective ways of providing information to change people's knowledge, awareness and behaviour and so prevent the first occurrence of skin cancer attributable to UV exposure?
2. What content do effective and cost-effective primary prevention messages contain? What is the most effective and cost-effective content?
3. What factors help to convey information to prevent the first occurrence of skin cancer attributable to UV exposure? What factors hinder the communication of primary prevention messages?
4. What changes to the natural or built environment are effective and cost effective at helping prevent the first occurrence of skin cancer attributable to UV exposure?
5. Which methods of supplying sun protection resources to prevent the first occurrence of skin cancer attributable to UV exposure are effective and cost effective?
6. Which multi-component interventions (a combination of one or more of: supply of sun protection resources, physical changes to environment and information provision) are effective and cost effective at helping prevent the first occurrence of skin cancer attributable to UV exposure?
7. What factors help or hinder the provision or use of the following to prevent the first occurrence of skin cancer attributable to UV exposure:
 - sun protection resources
 - physical changes to the natural or built environment (such as shelters and other areas of shade in public spaces or school grounds)
 - multi-component interventions.

These questions were made more specific for each review (see reviews for further details).

Reviewing the evidence

Effectiveness and cost-effectiveness reviews

Three reviews of effectiveness and cost effectiveness were conducted as described in [appendix A](#) (note: review 2 was a synthesis of review 1).

Identifying the evidence

The following databases and websites were searched from 1990 onwards for reviews 1 and 4:

Databases:

- ASSIA
- Cochrane Central Register of Controlled Trials (CENTRAL)
- Cochrane Database of Systematic Reviews (CDSR)
- CRD Databases (Database of Abstracts of Reviews of Effects {DARE})
- Cumulative Index to Nursing and Allied Health Literature (CINAHL)
- EconLIT
- EMBASE
- Health Management Information Consortium (HMIC) Database
- Health Technology Assessment Database (HTA)
- MEDLINE
- NHS Economic Evaluation Database (NHS EED)
- PsycINFO
- Science Citation Index
- Social Science Citation Index.

Websites:

- [Cancer Research UK](#)
- [SunSmart \(Victoria\)](#)

A number of additional databases and websites were searched for review 1 and 4. Reference lists and citations were also searched and experts were contacted for review 4.

Further details of the databases, websites, additional search activities, search terms and strategies are included in each of the reviews.

Selection criteria

Inclusion and exclusion criteria for each review varied and details are [available](#). However, in general:

- Population:
 - Reviews 1 and 2: studies were included if they covered a population in an Organisation for Economic Co-operation and Development (OECD) country.
 - Review 4: studies were included from both OECD and non-OECD countries.
- Interventions:
 - Reviews 1 and 2: universal and targeted interventions from any setting were included. For example:
 - ◊ one-to-one or group-based verbal advice (with or without information resources)
 - ◊ mass-media campaigns
 - ◊ leaflets, other information, teaching resources or printed material including posters
 - ◊ new media including social networking sites, e-media and text messaging.
 - Review 4: Interventions were included from any setting if they covered:
 - ◊ physical or structural changes to the built or natural environment
 - ◊ supply of sun protection resources
 - ◊ multi-component interventions combining either or both of the above with information provision.
- Comparator:
 - Reviews 1 and 2: current information provision, do nothing or any other intervention listed above.

- Review 4: no restrictions on type of comparator.
- Outcomes (reviews 1, 2 and 4):
 - reduction in the incidence of mortality or morbidity from skin cancer, including sunburn
 - change in behaviour or attitudes
 - increase in knowledge and awareness of skin cancer, its causes and how to prevent it
 - costs or cost effectiveness
 - process and implementation details relating to the intervention
 - adverse or unintended effects.
- Study design (reviews 1, 2 and 4):
 - All randomised controlled trials (RCT) and longitudinal studies were eligible for inclusion. Systematic reviews were not eligible, but were used to identify relevant primary studies via the bibliographies.

Other reviews

Two qualitative evidence reviews (reviews 3 and 5) were conducted.

Both reviews aimed to identify qualitative research on interventions to prevent the first occurrence of skin cancer attributable to UV exposure. They also aimed to synthesise the views on and experiences of (including the barriers to and facilitators for) providing this type of intervention.

Identifying the evidence

The following electronic databases and websites were searched from 1990 for reviews 3 and 5.

Databases:

- ASSIA
- Campbell Collaboration Library of Systematic Reviews
- Centre for Reviews and Dissemination databases (including DARE and HTA)
- CINAHL

- Cochrane Library (including CENTRAL)
- EMBASE
- HMIC
- MEDLINE
- PsycINFO
- Social Policy and Practice.

Websites:

- [BiblioMap \(EPPI-Centre\)](#)
- [Cancer Research UK](#)
- [NICE](#)
- [Public Health Observatories](#) (including skin cancer hub)
- [Sun Smart \(Australia\)](#)

A number of additional databases and websites were searched. Reference lists and citations were also searched. Further details of the databases, search terms and strategies are included in each of the reviews.

Selection criteria

Studies were included if they:

- were carried out in OECD countries
- presented qualitative data
- were published in English.

Quality appraisal

Included papers for all five reviews were assessed for methodological rigour and quality. The NICE methodology checklists (or adapted versions of these checklists) were used for quantitative interventions and qualitative studies, as appropriate, and as set out in the NICE technical manual

'Methods for the development of NICE public health guidance' (see appendix F and H). Each study was graded (++, +, -) to reflect the risk of potential bias arising from its design and execution.

Study quality

++ All or most of the checklist criteria have been fulfilled. Where they have not been fulfilled, the conclusions are very unlikely to alter.

+ Some of the checklist criteria have been fulfilled. Those criteria that have not been fulfilled or not adequately described are unlikely to alter the conclusions.

- Few or no checklist criteria have been fulfilled. The conclusions of the study are likely or very likely to alter.

Summarising the evidence and making evidence statements

The review data was summarised in evidence tables (see full reviews).

The findings from the evidence reviews were synthesised and used as the basis for a number of evidence statements relating to each key question. The evidence statements were prepared by the external contractors and public health collaborating centres (see [appendix A](#)). The statements reflect their judgement of the strength (quality, quantity and consistency) of evidence and its applicability to the populations and settings in the scope.

Economic analysis

An economic model was constructed for each phase incorporating data from the reviews of effectiveness and cost effectiveness. The results are reported in:

Report 1: 'Providing public health information to prevent skin cancer: modelling strategies for primary prevention of skin cancer'

Report 2: 'Economic analysis to inform the development of NICE public health intervention guidance on information, sun protection resources and physical changes to the environment to prevent skin cancer (phase 2)'

They are available on our [website](#).

How PHIAC formulated the recommendations

At its meetings in March and July 2009 and May and June 2010, PHIAC considered the evidence reviews, expert reports and economic modelling to determine:

- whether there was sufficient evidence (in terms of strength and applicability) to form a judgement
- where relevant, whether (on balance) the evidence demonstrates that the intervention activity can be effective or cost effective or is inconclusive
- where relevant, the typical size of effect (where there is one)
- whether the evidence is applicable to the target groups and context covered by the guidance.

PHIAC developed draft recommendations through informal consensus, based on the following criteria.

- Strength (type, quality, quantity and consistency) of the evidence.
- The applicability of the evidence to the populations/settings referred to in the scope.
- Effect size and potential impact on the target population's health.
- Impact on inequalities in health between different groups of the population.
- Equality and diversity legislation.
- Ethical issues and social value judgements.
- Cost effectiveness (for the NHS and other public sector organisations).
- Balance of harms and benefits.
- Ease of implementation and any anticipated changes in practice.

Where evidence was lacking, PHIAC also considered whether a recommendation should only be implemented as part of a research programme.

Where possible, recommendations were linked to an evidence statement(s) (see [appendix C](#) for details). Where a recommendation was inferred from the evidence, this was indicated by the reference 'IDE' (inference derived from the evidence).

The draft guidance, including the recommendations, was released for consultation in August 2010. At its meeting in October 2010, PHIAC amended the guidance in light of comments from stakeholders and experts. The guidance was signed off by the NICE Guidance Executive in December 2010.

Appendix C: The evidence

This appendix lists evidence statements from four of the five reviews provided by external contractors and public health collaborating centres (see [appendix A](#)). Please note, evidence statements from review 1, 'Providing public information to prevent skin cancer', were not used as they were superseded by review 2 which provides a synthesis of those findings.

The evidence statements derived from (+) or (++) studies are linked to the relevant recommendations. (See [appendix B](#) for the key to quality assessments.) The evidence statements are presented here without references – these can be found in the reviews and the expert paper (see [appendix E](#) for details).

This appendix also lists seven expert reports and the economic analysis reports and their links to the recommendations. It also sets out a brief summary of findings from the economic analysis.

The reviews from which evidence statements have been derived are:

- Review 2: 'Synthesis of the West Midland health technology assessment collaboration reports: providing public health information to prevent skin cancer: review of effectiveness and cost effectiveness (dated February 2009) and addendum (dated May 2009) – including before and after studies'.
- Review 3: 'Providing public information to prevent skin cancer: barriers to and facilitators to conveying information to prevent the first occurrence of skin cancer: a systematic review of qualitative literature'.
- Review 4: 'Sun protection resources and environmental changes to prevent skin cancer: a systematic review'.
- Review 5: 'Sun protection resources and changes to the environment to prevent skin cancer: qualitative evidence review'.

Evidence statement number ER2.1 indicates that the linked statement is numbered 1 in review 2.

Evidence statement number ER3.5 indicates that the linked statement is number 5 in review 3.

The reviews, expert papers and economic analysis are [available](#). Where a recommendation is not directly taken from the evidence statements, but is inferred from the evidence, this is indicated by IDE (inference derived from the evidence).

Where the Public Health Interventions Advisory Committee (PHIAC) has considered other evidence, it is linked to the appropriate recommendation below. It is also listed in the additional evidence section of this appendix.

Recommendation 1: evidence statement ER3.31; additional evidence: expert paper 2 and 3; economic analysis report 1 and 2; IDE

Recommendation 2: evidence statements ER3.34, ER5.1, ER5.5, ER5.6, ER5.16, ER5.18, ER5.25, ER5.34, ER5.48, ER5.51, ER5.53; additional evidence: expert paper 2, 3, 4, 5, 6 and 7; economic analysis report 1 and 2; IDE

Recommendation 3: evidence statements ER3.2, ER3.5, ER3.10, ER3.27, ER3.28, ER3.32, ER3.33, ER5.16, ER5.18; additional evidence: expert paper 1, 4, 5 and 6

Recommendation 4: evidence statements ER3.2, ER3.5, ER3.6, ER3.9, ER3.10, ER3.12, ER3.13, ER3.14, ER3.15, ER3.16, ER3.17, ER3.18, ER3.19, ER3.20, ER3.23, ER3.24, ER3.25, ER3.27, ER3.28, ER3.29, ER3.31, ER3.32, ER5.2, ER5.4, ER5.5, ER5.6, ER5.8, ER5.9, ER5.10, ER5.11, ER5.12, ER5.13, ER5.14, ER5.15, ER5.16, ER5.17, ER5.19, ER5.20, ER5.21, ER5.22, ER5.23, ER5.24, ER5.26, ER5.27, ER5.28, ER5.30, ER5.31, ER5.35, ER5.36, ER5.38, ER5.44, ER5.45, ER5.47, ER5.48, ER5.51, ER5.53, ER5.57, ER5.58, ER5.60, ER5.61, ER5.62, ER5.63, ER5.64, ER5.65, ER5.67; additional evidence: expert papers 2, 3, 4, 5, 6 and 7; economic analysis report 1 and 2; IDE

Recommendation 5: evidence statements ER3.21, ER3.23, ER3.33, ER5.29, ER5.31, ER5.32, ER5.33, ER5.36, ER5.39, ER5.41, ER5.42, ER5.50, ER5.59; additional evidence: expert papers 2, 5 and 6; IDE

Recommendation 6: evidence statements ER3.22, ER4.1, ER4.2, ER4.5, ER5.41, ER5.53; additional evidence: economic analysis report 2; IDE

Evidence statements

Please note that the wording of some evidence statements has been altered slightly from those in the evidence review(s) to make them more consistent with each other and NICE's standard house style.

Evidence statement ER3.2

Three studies (two [-] and one [+]) report low perceptions of susceptibility to skin cancer among children and older adults.

Evidence statement ER3.5

According to four studies (two [+] and two [-]), perceived severity of sun exposure was low in children, young adults, older adults and sunbed users. Children were more aware of the short-term discomfort of sun exposure than long-term risks (one study [+]). Studies in adults (two [+] and two [-]) found skin cancer was thought to be easily cured, a possible future concern, something people preferred not to think about or outweighed by the perceived short-term benefits of a tan.

Evidence statement ER3.6

Four studies (three [+] and one [-]) suggest that photo-ageing was taken seriously by participants, especially women, in one case suggesting that this was perceived as a more serious and real concern than skin cancer.

Evidence statement ER3.9

One study (+) suggests that knowledge of the benefits of sun protection may not be translated into safe sun practices, as a tan is seen as socially beneficial.

Evidence statement ER3.10

One study (-) found older adults may have misinformation about the causes of skin cancer, limiting their perceptions of the benefits of sun protection. In addition, four studies (two [+], one [++] and one [-]) revealed erroneous beliefs that getting a tan was protective of skin damage and in two studies (both [+]), participants believed that getting burnt was the prelude to a deep tan, and that high protection sunscreen might prevent deep tanning.

Evidence statement ER3.12

Seven studies (two [-], four [+] and one [++]) showed that tanned people are seen as healthy by children, adolescents and adults. One study (+) reported that the sun was positively regarded as a source of vitamin D.

Evidence statement ER3.13

Three studies (from Scotland, Australia and Canada) (two [+] and one [++]) describe negative associations with white, untanned skin, which was described as unhealthy and indicative of being unfit.

Evidence statement ER3.14

Seven studies among children, adolescents and adults (two [-], four [+] and one [++]), describe tanned skin as being physically attractive. Two studies (both [+]) thought that bad skin and acne were cleared up by UV exposure.

Evidence statement ER3.15

Peers are reported as an important influence on UV exposure in three studies among adolescents and sunbed users (two [+] and one [++]) as they may react positively to tans.

Evidence statement ER3.16

Two UK studies (one [-] and one [+]) show that a tan signifies a good holiday, especially a holiday abroad, and could be seen as a necessary 'symbolic souvenir'.

Evidence statement ER3.17

Sun protection through use of sunscreen, wearing hats and covering up with long sleeves all had limitations. Sunscreen use is seen as a hassle in six study reports of qualitative research (three [+] and three [-]) due to its expense, mess, time to apply and potential to cause irritation or allergies.

Evidence statement ER3.18

In three studies (two [-] and one [+]), parents say that children were uncooperative when it came to applying sunscreen.

Evidence statement ER3.19

Four studies (two [-] and two [+]) highlight impracticalities of hat-wearing which limits children's activities, and may be rejected as unfashionable.

Evidence statement ER3.20

In three studies (one [-] and two [+]), covering up through wearing long-sleeved tops was seen as uncomfortable in the heat. Rash vests and wetsuits may be better for young children on the beach, as t-shirts may be repeatedly removed (two [-] studies).

Evidence statement ER3.21

Three studies (two [-] and one [+]) discuss structural or policy limitations to skin cancer prevention in schools, such as limited ability to change scheduling around lunchtime to avoid the hottest part of the day.

Evidence statement ER3.22

Provision of shade outside is seen as a possible strategy, but costly and not always easy to use by playing children (two [-] and one [+]).

Evidence statement ER3.23

Eight studies of qualitative research (four [+], three [-] and one [++]) discuss the limitations of parental responsibility for protecting children from sun exposure.

Evidence statement ER3.24

Four studies (one [-] and three [+]) discuss the responsibility of parents for their children's safe-sun behaviour. This responsibility may be limited by parents' failure to demonstrate sun-safe habits themselves due to ambivalence about their own desire for tanned skin (one [-] and one [+]). In addition, parents aren't always with their children to ensure safe-sun behaviour (one [+] study).

Evidence statement ER3.25

Five studies (one [-], three [+] and one [++]) note that the transition from child to adolescent is marked by increasing independence, or rebellion, and that this may have negative effects on safe-sun behaviour.

Evidence statement ER3.27

'Incidental tanning', obtained by simply being outdoors, was seen positively in seven studies of qualitative research, for both children and adults (three [+], three [-] and one [++]).

Evidence statement ER3.28

Such attitudes to this incidental sun exposure, makes sunscreen use less likely on overcast days (one [+]), in the winter (one [+] and one [-]), and for children when going out to play somewhere other than the beach (one [+]) or for a shorter time than the whole day (one [-]). People in the UK may be more likely to use sunscreen on holiday abroad than when at home (one [-]).

Evidence statement ER3.29

Eleven studies qualitative research (five [+] and six [-]) discuss people's cues to protective action against UV exposure. These include the positive influence of parents and other adults for younger children (one [+] and one [-]) and peers for older children (one [-]), knowing someone who has had skin cancer (two [+] and two [-]), and media campaigns (six [-] and three [+]).

Evidence statement ER3.31

Media campaigns need to engage younger children (two [-] and one [+]) while not alienating older children (one [+] and one [-]), it is also suggested that they need to change regularly to maintain their impact (one [+]) and that shock images may appeal to older boys (one [-]).

Evidence statement ER3.32

Two studies of UK-based qualitative research address self-efficacy in skin cancer prevention with participants reporting examining themselves for signs of skin cancer (one [+] and one [-]). Skin cancer is understood as largely preventable and identifiable early, by those taking personal responsibility for their skin through self-surveillance and personal responsibility (one [+]).

Evidence statement ER3.33

One qualitative study (++) uses the analytic constructs of framing and narrative to understand the differences in the construction of skin cancer public health policy in Australia, Canada and England. While skin cancer is conceived as a growing public health issue in England, public health messages focus on expectations of reasonable protective factors and moderate UV exposure. This is because the population is not considered sensitised to skin cancer and does not want to hear messages that promote avoiding the sun.

Evidence statement ER3.34

One qualitative study (+) uses cognitive interviewing to refine the way questions were asked for a survey tool. The capacity for misunderstanding that it demonstrates underlines the importance of piloting any information material aimed at primary prevention of skin cancer with target groups.

Evidence statement ER4.1

There is a limited body of evidence on the effect of change to the natural or built environment in the prevention of skin cancer in educational settings and no evidence from other settings. No studies were identified that focused solely on the impact of changing the timing of outdoor activities.

Evidence statement ER4.2

There was evidence from a single good quality (++) randomised controlled trial (RCT) undertaken in Australia that adolescents in years 7 to 12 used rather than avoided newly provided sail shade areas at secondary schools, during lunch time periods. An extra 2.7 students were observed to have used the shaded sites (95% confidence interval [CI]: 0.7 to 4.7) during Spring/Summer term compared to unshaded sites in the control schools (p=0.011).

Evidence statement ER4.5

Three studies focused on implementation, one (++) study reported that, on average, only six students used the shaded areas at any one time, despite the relatively large size of the sails. The authors suggest that optimal use of shade sails may be limited by friendship groups avoiding encroaching on other student's space. One (-) study did not contain evidence pertinent to the secondary review questions. Another (-) study reported that all subgroups had lower UVR exposure at the shaded site compared to the unshaded site except for boys aged 1–4 years who were exposed to 23.1% compared to 16.7% of available UVR at the shaded and unshaded sites respectively. In this later (-) study gender and environment (high and low quality) were statistically significant predictors of step count a linear mixed model.

Evidence statement ER5.1

Two studies (both [++]) report that the experience of melanoma or pre-cancerous moles by participants or people they know, or a family history of malignant melanoma, increase perceived risk.

Evidence statement ER5.2

Five studies (three [-] and two [++]) report that the risk of skin cancer is not appreciated or is seen as not of immediate concern. This perception is particularly stated by children (aged 6–8 years) and young people (aged 12–25 years approximately), who view the risk as too distant to be a serious concern.

Evidence statement ER5.4

Three studies of adults (one [++], one [-] and one [+]) report that people are aware of the risks of skin cancer, but avoid thinking about them, or adopt an optimistic framing that minimises their own perceived susceptibility, such as assuming that others' exposure to risk factors must be higher than their own.

Evidence statement ER5.5

One US study (++) discusses the communication of risks within families where a member has had an experience of skin cancer. It found that people diagnosed with cancer usually discussed risk with their families, and that women took a leading role in communication.

Evidence statement ER5.6

Five studies of young people and adults (two [++], two [+] and one [-]) report the belief that sun exposure provides 'resistance' to skin damage, burning or cancer in the future. In particular, outdoor workers reported such beliefs in two studies (one [-] and one [+]), and parents in one (++).

Evidence statement ER5.8

Perceived severity of skin cancer was low in seven studies across a wide range of age groups (aged 6 years to over 60 years) (four [++], two [+] and one [-]). In three studies participants thought that skin cancer was easy to treat (all [++]). In one study (++) with participants aged 6–8 years, there was a lack of understanding about what skin cancer was or the risks of skin cancer. A study of farmers in the USA (+) finds that they did not see skin cancer affecting their day-to-day work.

Evidence statement ER5.9

Seven studies (three [++], three [+] and one [-]) report that skin ageing was seen as a serious consequence of sun exposure. Two studies (one [++] and one [+]) find that skin ageing is perceived as a more serious consequence of sun exposure than is skin cancer. Four studies (two [++] and two [+]) report that skin ageing is seen as a more serious consequence by women than it is by men.

Evidence statement ER5.10

Participants in most studies (two [++] and two [+]) used sun protection, principally sunscreen, in order to offset the perceived risks of sun exposure including skin cancer and skin ageing (two [+] and one [++]). Avoiding sunburn and the sun's heat and glare were mentioned as a benefit of sun protection in three studies (one [+], one [-] and one [++]).

Evidence statement ER5.11

Participants in two studies (one [+] and one [++]) said that using sun protection enabled them to stay in the sun for longer when playing sports.

Evidence statement ER5.12

Two studies (one [-] and one [++]) of parents and school staff stated the benefits of promoting sun protection to young people to help them acquire positive long-term habits.

Evidence statement ER5.13

Twelve studies (six [++], three [+] and three [-]) report positive perceptions of a tanned appearance, that is, that a tanned appearance is perceived as attractive. Two studies (one [++] and one [+]) report that a tanned appearance increases confidence and self-esteem.

Evidence statement ER5.14

Three studies (two [++] and one [+]) report that the degree of tan colour was important in shaping perceptions of tanned appearance, with a deep tan not necessarily seen as desirable.

Evidence statement ER5.15

Nine studies (five [++], two [+] and two [-]) found that a tanned appearance is seen as healthy. Of these, three studies (all [++]) note that a tanned appearance indicates an active, outdoors lifestyle.

Evidence statement ER5.16

Three studies (one [++] and two [+]) report the belief that ultraviolet exposure is beneficial because it provides vitamin D.

Evidence statement ER5.17

Two studies (one [++] and one [+]) report that sun exposure is believed to protect against future skin damage or cancer by increasing 'resistance'.

Evidence statement ER5.18

Three studies discuss the perception that outdoor activities which involve sun exposure are healthier than indoor activities, both among adults (two [++]) and children (one [-]). One study (-) finds this perception to be linked to the freedom to play actively for children.

Evidence statement ER5.19

Participants in three studies (all [++]) distinguished deliberate from incidental tanning, and expressed the belief that incidental tanning was less dangerous or less likely to require protection.

Evidence statement ER5.20

One study (++) finds that participants preferred to see themselves as tanning incidentally, rather than deliberately. This may be because deliberate tanning has 'unhealthy' connotations but incidental tanning from outdoor activities does not.

Evidence statement ER5.21

Three studies (two [+] and one [++]) compared sunbed use to sun exposure. Most of the participants in these studies believed that sunbeds were more dangerous than sun exposure.

Evidence statement ER5.22

Six studies (five [++] and one [-]) identify the unfashionable or unattractive appearance of protective clothing as a barrier to their use among children and young people (aged 6–20). Two studies (one [-] and one [++]) find that protective clothing, such as hats, would be more acceptable if they were fashionable and attractive.

Evidence statement ER5.23

Three studies (one [++] and two [+]) find that young adult and adult participants see sun protection behaviour as not strongly supported by social norms within their communities.

Evidence statement ER5.24

Five studies (one [++], two [+] and two [-]) describe a strong association between sunscreen use and particular contexts, such as the beach and being on holiday.

Evidence statement ER5.25

One study (++) finds that young people (ages 12–17 years) see media messages and parental behaviours regarding sun protection as focused on young children and not relevant to themselves.

Evidence statement ER5.26

One study (+) finds that men see sunscreen use as unmasculine.

Evidence statement ER5.27

Ten studies (four [++], three [+] and three [-]) described the inconvenience of sun protection resources as barriers to their use. The particular issues which contribute to the perception of inconvenience are: the need to carry and remember sun protection resources (one [+], one [-] and one [++]); the 'messiness' of sunscreen (three [+], two [-] and one [++]); the awkwardness of hats and sunglasses which may fall off or interfere with activities (two [++] and one [+]); and the inconvenience of making use of shade structures by children and young people (one [-]).

Evidence statement ER5.28

Four studies (two [++], one [+] and one [-]) describe physical discomfort as a barrier to the use of protective clothing.

Evidence statement ER5.29

One study (++) finds that school staff see a number of practical barriers to encouraging children to use sunscreen before outdoor activities, including monitoring application, touching children to help with application, students sharing sunscreen, and parental permission.

Evidence statement ER5.30

Six studies (three [++], two [+] and one [-]) said that the cost of sun protection resources was a barrier to their use. This primarily concerned sunscreen purchased by individuals, with one study (-) mentioning the cost of hats as a barrier to implementing compulsory hat policies in low

socioeconomic status (SES) schools, and one (++) the cost of installing shade structures in schools. However, one study (+) that focused on farmers in the USA said that cost was not a barrier.

Evidence statement ER5.31

Other practical barriers to sun protection are: children being uncooperative with the application of sunscreen (one [++] and one [+]); the perceived ineffectiveness of sunscreen in stopping burning (one [+]); and the perception of adverse health consequences of sunscreen use such as acne (one [+ and one [++]), allergic reactions (one [++]), and potential long-term toxicity (one [++] and one [+]).

Evidence statement ER5.32

One study (++) reports potential institutional barriers to sun protection in schools, including: the cost of implementing new policies for schools; time constraints on school staff; the difficulty of changing outdoor structures to provide shade; concerns about liability; and the need for staff training.

Evidence statement ER5.33

Two studies (one [++] and one [-]) found that some school staff felt that sun protection was not a high-priority issue, because of the limited time children spent outdoors. Participants in one study (-) felt that sun protection detracted from teaching and in one other study (++) , school staff said they felt overwhelmed with policies and initiatives on a wide range of issues.

Evidence statement ER5.34

Effective communication with parents was identified as a potential barrier in one study (++) . The cost to parents was also mentioned as a concern relating to compulsory hat regulations in one study (-).

Evidence statement ER5.35

Six studies, most in school settings, found that children aged 6–8 years (one [++]), young people aged 12–17 years (three [++] and one [-]), and young adults aged 18–25 years (one [+]) identified parents, especially mothers, as important sources of positive encouragement and practical support for adopting sun protective behaviours. One further study (+) of older women aged 75 to 90 years found that as children, they had also been positively influenced by parents. Other adults, such as teachers and lifeguards, were identified as sources of positive encouragement for children aged

6–8 years (one [++]) and young people aged 8–17 years (one [-] and one [++]) to adopt sun protective behaviours.

Evidence statement ER5.36

Seven studies found differences between children (approximately 8–13 years) and older young people (approximately 14–17 years) in sources of positive encouragement to use various forms of sun protection. One study (++) found that parents or carers apply sunscreen more often to younger children, while older children are more likely to apply it themselves. Five studies (three [++] and two [-]) found that younger children are more likely to listen to parents (or other adults such as teachers) advice to use sun protection such as sunscreen or clothing, because of their role as authority figures. Older young people are more likely to be influenced by their peers. Young people in these studies described the shift towards peer influence as part of a process of asserting their independence from authority. However, the remaining study (++) found that older young people (aged 16–17 years) felt themselves to be more receptive to health messages than younger children.

Evidence statement ER5.38

Adults and young people in five studies (four [++] and one [-]) stated that knowing someone with skin cancer may act as a cue to adopt sun protection behaviours in general.

Evidence statement ER5.39

Two studies from New Zealand and the US (one [-] and one [++]) found that primary school staff were willing to implement school-wide sun protection policies such as: physical shade structures or trees; 'no hat, no play' or 'no hat, play in the shade' rules; provision of free sunscreen; or rescheduling outdoor activities. Obtaining funding for such policies, especially environmental change, was a barrier in some cases. One further Australian study (++) notes that policies such as 'no hat, no play' are common in Australian primary schools, but are rare in secondary schools.

Evidence statement ER5.41

One study (++), a process evaluation of a sun protection intervention ('Pool Cool') at outdoor pools, finds that signs, sunscreen pumps and shade structures were viewed positively and frequently used by pool-goers.

Evidence statement ER5.42

In one study (++) , recreation staff indicated that few sun protection policies had been implemented, and were conscious that staff often did not model good sun practice, but were generally willing to implement sun protection policies.

Evidence statement ER5.44

Three studies (one [++], one [+] and one [-]) of young adults (18 to 25 years) and adults discuss the influence of the media on individuals' behaviour. All of these studies show the belief that representations in the media may have an adverse effect on sun protection behaviours.

Evidence statement ER5.45

Three studies from the USA and Australia (two [++] and one [-]), show people of all age ranges to be more likely to use sun protection in general in summer and in sunny weather.

Evidence statement ER5.47

Two studies (one [++] and one [-]) describe adults (aged 16–54 years) putting on a T-shirt or applying sunscreen only after beginning to burn.

Evidence statement ER5.48

Five studies identify factors which could be addressed by resource provision interventions such as making available sunscreen or protective clothing. These factors include the cost of sunscreen (two [++] and two [+]), and the inconvenience of remembering to carry sunscreen (one [+] and one [-]) or protective clothing (one [++]). These barriers appear to be particularly relevant for children and young people (aged 8 to 25 years).

Evidence statement ER5.50

Two studies (both [++]) investigate service providers' views towards potential resource provision interventions, finding that school staff and leisure staff are positive about the potential to implement sun protection interventions. However, they have concerns relating to practical requirements such as time and funding, and are not always confident that their own roles and responsibilities will be clearly defined.

Evidence statement ER5.51

A wide range of other barriers are identified in the studies. These include physical discomfort (two [++]; one [+] and one [-]), inconvenience of use (four [++], three [+] and three [-]) and social barriers including appearance and prevailing norms (five [++], two [+] and one [-]). Not all resources are acceptable to all targeted populations.

Evidence statement ER5.53

One study (-) found that using environmental shade may reduce the spontaneity of outdoor activities, especially for younger children. One study (++) found that school authorities see the cost of providing environmental shade as a barrier.

Evidence statement ER5.57

Five studies (three [-] and two [++]) found that people do not think skin cancer is a serious risk. Twelve studies (six [++], three [+] and three [-]) found that a tanned appearance is considered attractive.

Evidence statement ER5.58

Three studies (all [++]) found that incidental tanning is perceived as less risky than deliberate tanning. The use of protection is associated with deliberate tanning, such as at the beach, in three further studies (two [+] and one [++]). This suggests that sun protection is seen as less salient where sun exposure is incidental and not deliberate. Two studies (one [++] and one [+]) indicate that this may be particularly true for men.

Evidence statement ER5.59

Three studies found that service providers, including school staff (one [-] and one [++]) and leisure staff (one [++]), have positive attitudes towards resource provision and environmental change interventions. However, two studies (both [++]) report concerns about the potential extension to their responsibilities, and one study (++) raises the prospect of an overload of policies and recommendations.

Evidence statement ER5.60

Two studies (one [+] and one [-]) found that men were less likely than women to deliberately sunbathe, but also less likely to use sun protection. Three studies report the perception that sunbathing (one [++]) or sunbed use (one [++] and one [-]) are unmasculine.

Evidence statement ER5.61

Three studies (two [++] and one [+]) found that women, especially mothers, tend to take the lead role in promoting sun protection behaviours within the family.

Evidence statement ER5.62

Four studies (two [++] and two [+]) found that women were more concerned than men about how the sun affects their appearance, both negatively (skin ageing and wrinkles) and positively (tanned appearance).

Evidence statement ER5.63

Seven studies (four [++], two [+] and one [-]) found that young children are more likely to be influenced by parents, particularly mothers, and school staff.

Evidence statement ER5.64

Four studies (three [++] and one [-]) found that adolescents are less likely to be influenced by authority figures and adults and may assert their independence by not following sun protection messages. One study (++) found that adolescents see sun protection as primarily concerning younger children.

Evidence statement ER5.65

Four studies (two [-], one [++] and one [+]) found that parents of young children are more receptive than the general population to sun protection messages. However, three studies (two [-] and one [++]) found that parental concern relating to young children's sun exposure does not necessarily translate into concern about their own sun exposure, or to that of older children.

Evidence statement ER5.67

Two studies (one [-] and one [+]) focus on the views of outdoor workers. Both these studies found that outdoor workers do not feel that sun protection is a priority, and that they have little awareness of the risks of sun exposure.

Additional evidence

Expert papers

The seven expert papers with explicit links to the recommendations were:

- Expert paper 1: 'A summary of key messages to be included in public information resources for the primary prevention of skin cancer'.
- Expert paper 2: 'Summary of current policy drivers and national practice overview'
- Expert paper 3: 'National campaigns (UK and worldwide)'
- Expert paper 4: 'Vitamin D'
- Expert paper 5: 'Physical activity and the school environment'
- Expert paper 6: 'Outdoor workers and sports participants – sun protection challenges'
- Expert paper 7: 'The impact of role models on sun protection behaviours'.

Economic analysis reports

- Economic analysis report 1: 'Providing public health information to prevent skin cancer: modelling strategies for primary prevention of skin cancer'
- Economic analysis report 2: 'Economic analysis to inform the development of NICE public health intervention guidance on information, sun protection resources and physical changes to the environment to prevent skin cancer (phase 2)'

Economic analysis

Review 1

The review of studies on providing information to prevent skin cancer failed to identify any existing UK-based economic studies. One US study reported that a classroom lesson resulted in a positive change in sun safety behaviour and reduced treatment costs (in terms of cancers averted) compared to no intervention (Kyle, 2008).

Economic analysis report 1

Three types of intervention were modelled:

- provision of a 25-page handbook for parents to use with children in the home
- information delivered to children as part of the school curricula
- interactive group sessions delivered to university students.

It was only possible to develop a causal chain between the intermediate outcomes arising from the home-based intervention and the prevention of skin cancer and thus estimate a cost per quality-adjusted life year (QALY).

For the school and university-based interventions, it was not possible to complete the causal chain. However, it was possible to give a reasonable estimate of the cost per participant and a threshold analysis was undertaken to assess the change in exposure to ultraviolet light that would be needed to make them cost saving or cost effective. Thresholds of £20,000 and £30,000 per QALY were used.

The estimated cost per QALY for the home-based intervention was £6700 (if each handbook cost 90 pence). However, there is considerable uncertainty in these results. The threshold analysis suggests that, if a reasonably inexpensive intervention can achieve similar changes in behaviour in less sunnier climates, then it is likely to be cost effective. (That is, in terms of the benefits of reducing the incidence of skin cancer.)

Review 4

No economic studies were found on the provision of shade or the provision of resources only. One study on the cost effectiveness of a multi-component intervention was identified. The intervention took place in a community setting.

Economic analysis report 2

An economic model was developed to estimate the cost effectiveness of adding shade structures to an existing environment and multi-component interventions in six different settings. In addition, a break-even analysis was undertaken to estimate the effect size needed to ensure a mass-media intervention would be cost effective.

The analysis indicates that none of the interventions modelled are cost effective. The estimated incremental cost-effectiveness ratio (ICER) for the six multi-component interventions far exceeded the £20,000– £30,000 threshold.

However, if the cost of providing shade could be reduced by incorporating it into the design of new buildings and other environments from the outset, this could significantly improve the ICER. For example, when the cost per person was reduced from £1.82 to £0.015 in the threshold analysis, the cost per QALY was just above the £20k threshold (£20,180). (This assumes these shaded areas would be used in similar way in the UK, where the climate is cooler.)

The breakeven analysis for a mass-media campaign indicates that for a 'low' cost campaign to be cost-effective, it would have to increase the percentage of people always using sunscreen by 2 points. For a 'high' cost campaign, there would have to be an increase of 6.6 percentage points. (Note: in 2009, a low cost campaign would have cost an estimated £0.0028 per person per year, compared to £0.0093 per person per year for a high cost campaign.)

The main lesson learned from such analysis is that interventions need to have a very low unit cost to be cost effective.

Appendix D: Gaps in the evidence

The Public Health Interventions Advisory Committee (PHIAC) identified a number of gaps in the evidence related to the programmes under examination based on an assessment of the evidence and expert comment. These gaps are set out below.

1. There was very limited, UK-based evidence on information provision, supply of resources and changes to the physical environment to protect against skin cancer caused by UV rays. (This includes multi-component interventions.) The only available evidence either demonstrated a small effect size or did not provide detail about the population groups that benefited – or how messages should be framed for different population groups. (Source: Evidence reviews 1–5.)
2. Details were often missing from the descriptions of interventions to protect people against skin cancer. This included details on: content (such as what was delivered and by whom), how frequently and for how long the intervention was delivered, the economic costs and benefits, any variation in effectiveness and cost effectiveness in relation to factors such as age and ethnicity and how long the intervention was effective or cost-effective. (Source: Evidence reviews 1, 2 and 4)
3. Evidence on the barriers to, and motivators for, behaviour change for specific population groups (such as outdoor workers) was very limited. In particular, it was not clear what sources of information different population groups use. It was also unclear how information about skin cancer influences the way different groups protect themselves from the sun and what motivates them to change their behaviour. (Source: Evidence reviews 3 and 5.)
4. There was a lack of evidence on the specific components of an intervention that make it effective or cost effective. For example, few studies answered questions such as, 'Does effectiveness depend on the intervener?', 'Does the intensity or duration influence effectiveness or duration of effect?' or 'Which component of the intervention had an effect or most effect?' (Source: Evidence reviews 1, 2 and 4.)
5. Routine data collection (for example, on the overall incidence of non-melanoma skin cancer and on skin cancer rates for different population groups) was not standardised, recorded or made accessible for research. (Source: Expert paper 6.)
6. There was little evidence on which factors help or hinder the provision or use of skin protection resources according to someone's socioeconomic status and ethnicity. (Source: Evidence reviews 3 and 5.)

7. There was no evidence on how interventions to prevent skin cancer affect vitamin D or physical activity levels – generally or for different population groups.

8. No evidence was identified relating to the involvement of private sector organisations (such as sunscreen manufacturers) in the design or delivery of information campaigns and interventions. (Source: evidence reviews 1–5.)

9. There was no evidence on the potential effectiveness of product placement (a form of advertisement where branded goods are placed within television programmes). In particular, there was no evidence to determine if this might be a useful way to communicate sun protection messages to specific at-risk groups. (At-risk groups include young people and outdoor workers. (Source: evidence reviews 1, 2 and 4.)

The Committee made four recommendations for research. These are listed in [section 5](#).

Appendix E: Supporting documents

Supporting documents are [available](#). These include the following.

- Evidence reviews:
 - Review 1: 'Providing public information to prevent skin cancer'
 - Review 2: 'Synthesis of the West Midland health technology assessment collaboration reports: providing public health information to prevent skin cancer: review of effectiveness and cost effectiveness (dated February 2009) and addendum (dated May 2009) – including before and after studies'
 - Review 3: 'Providing public information to prevent skin cancer: barriers to and facilitators to conveying information to prevent the first occurrence of skin cancer: a systematic review of qualitative literature'
 - Review 4: 'Sun protection resources and environmental changes to prevent skin cancer: a systematic review'
 - Review 5: 'Sun protection resources and changes to the environment to prevent skin cancer: qualitative evidence review'
- Economic modelling:
 - Report 1: 'Providing public health information to prevent skin cancer: modelling strategies for primary prevention of skin cancer'
 - Report 2: 'Economic analysis to inform the development of NICE public health intervention guidance on information, sun protection resources and physical changes to the environment to prevent skin cancer (phase 2)'
- Expert papers:
 - Expert paper 1: 'A summary of key messages to be included in public information resources for the primary prevention of skin cancer'
 - Expert paper 2: 'Summary of current policy drivers and national practice overview'
 - Expert paper 3: 'National campaigns (UK and worldwide)'
 - Expert paper 4: 'Vitamin D'

- Expert paper 5: 'Physical activity and the school environment'
- Expert paper 6: 'Outdoor workers and sports participants – sun protection challenges'
- Expert paper 7: 'The impact of role models on sun protection behaviours'

For information on how NICE public health guidance is developed, see:

- ['Methods for development of NICE public health guidance \(second edition, 2009\)'](#)
- ['The NICE public health guidance development process: An overview for stakeholders including public health practitioners, policy makers and the public \(second edition, 2009\)'](#)

Changes after publication

February 2016: Recommendations 1 to 5 were updated and replaced by NICE's guideline on [sunlight exposure: risks and benefits](#).

January 2014: Title of 'Behaviour change: the principles for effective interventions' updated. This guidance was previously entitled 'Behaviour change'.

About this guidance

NICE public health guidance makes recommendations on the promotion of good health and the prevention of ill health.

This guidance was developed using the NICE [public health intervention](#) guidance process.

The recommendations from this guidance have been incorporated into a [NICE pathway](#). Tools to help you put the guidance into practice and information about the evidence it is based on are also [available](#).

Your responsibility

This guidance represents the views of the Institute and was arrived at after careful consideration of the evidence available. Those working in the NHS, local authorities, the wider public, voluntary and community sectors and the private sector should take it into account when carrying out their professional, managerial or voluntary duties.

Implementation of this guidance is the responsibility of local commissioners and/or providers. Commissioners and providers are reminded that it is their responsibility to implement the guidance, in their local context, in light of their duties to avoid unlawful discrimination and to have regard to promoting equality of opportunity. Nothing in this guidance should be interpreted in a way which would be inconsistent with compliance with those duties.

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