NATIONAL INSTITUTE FOR HEALTH AND CARE EXCELLENCE

DRAFT GUIDELINE

Sunlight exposure: communicating the risks and benefits to the general public

What is this guideline about?

This guideline makes recommendations on communicating the risks and benefits of sunlight exposure. Both are important and both can affect people's health and wellbeing.

The guideline will complement NICE's guideline on vitamin D: increasing supplement use among at-risk groups. The aim is to:

- Identify groups at risk of over- or underexposure to sunlight.
- Give people a better understanding of why they may need to modify their behaviour and how.
- Reduce deaths and disease from non-melanoma and melanoma skin cancer caused by overexposure to sunlight.
- Reduce disease from vitamin D deficiency caused by a lack of sunlight exposure. Note: interventions that do not involve sunlight are beyond the remit of this guideline.

The Scientific Advisory Committee on Nutrition (SACN) is reviewing the contribution of vitamin D produced by skin to vitamin D status in the UK. This guideline should be read alongside any recommendations made by SACN.

Background

Sunlight comprises infrared, visible and ultraviolet (UV) rays. This guidance focuses on the balance of risks and benefits from the UV rays, specifically the UVA and UVB rays that reach the earth's surface. Artificial UV light exposure (such as from sunbeds) is beyond the remit of this guideline.

Who this guideline is for

The guideline is for commissioners, managers and practitioners with public health or social care as part of their remit working within the NHS, local authorities and the wider public, private, voluntary and community sectors. (For further details, see Who should take action?)

Note that the guideline recommendations are based on the best available evidence. The evidence base underpinning the sun exposure messages has not been systematically reviewed for this guideline. Supporting information for practitioners in section 2 is based on sun exposure messages from a range of authoritative sources. For more information see Overview of sunlight exposure messages.

See About this guideline for details of how the guideline was developed and its current status.

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1 Draft recommendations

This guideline replaces recommendations 1–5 in Skin cancer prevention: information, resources and environmental changes NICE guideline PH32 (2011).

At risk groups

1.1.1 All public health activities related to over- or underexposure to sunlight should focus on:

- Groups of people who should take extra care to avoid skin damage and skin cancer, including:
  - children (babies are at particular risk of burning)
  - young people
  - older people
  - people who tend to burn rather than tan
  - people with lighter skin, fair or red hair, blue or green eyes, or who have lots of freckles
  - people with many moles
  - people who are immunosuppressed (that is, they have less resistance to skin problems as a result of a disease or use of particular drugs)
  - people with a personal or family history of skin cancer (even if their natural skin colour is darker than that of the family member who had cancer).
- Groups who spend a lot of time in the sun and so are at increased risk of skin cancer, such as:
  - outdoor workers
  - those with outdoor hobbies, for example sailing or golf.
- Groups with high, but intermittent, exposure to sunlight and so are at increased risk of skin cancer. This includes people who sunbathe or take holidays in sunny countries.

- Groups who have little or no exposure to the sun for cultural reasons or because they are housebound or otherwise confined indoors for long periods. These people are at risk of low vitamin D status (for more information see NICE's guideline on Vitamin D: increasing supplement use among at-risk groups).

Message content

The following recommendations are for health and social care practitioners.

1.1.2 Whenever the opportunity arises make people aware that, although sunlight exposure is a normal part of everyday life and some sunlight is good for your health, there are risks from excessive exposure.

1.1.3 Communicate consistent, balanced messages about the risks and benefits of sunlight exposure and the groups at risk (for the latter, see recommendation 1.1.1). Include:

- environmental, biological and behavioural factors
- how to minimise the risks and maximise the benefits of sunlight
- when to go out in the sun
- advice according to people's age
- advice according to people's natural skin colour
- sunscreen
- clarifying common misconceptions about sunlight exposure.

See section 2 for more detail.

1.1.4 Follow the principles of behaviour change when conveying sunlight exposure messages (see NICE's guideline on behaviour change: the principles for effective interventions). This includes ensuring that messages:

- specify the recommended actions
- explain the benefits

- try to enhance people's belief in their ability to adopt the recommended actions.

1.1.5 Use existing community health promotion programmes or services to raise awareness of the risks and benefits of sunlight exposure.

1.1.6 Offer one-to-one or group-based advice, as appropriate, tailored to the type of risks the person or group faces.

1.1.7 Encourage and support people at increased risk of low vitamin D status or skin cancer to contribute to awareness-raising activities.

Mass media campaigns

The following recommendations are for health and public health commissioners.

1.1.8 Develop, deliver and sustain national and local media campaigns to raise awareness of the risks and benefits of sunlight exposure.

1.1.9 Campaign messages should:

- Aim to make people aware of the need to think about their exposure to sunlight on an everyday basis.
- Target at-risk groups (see recommendation 1.1.1) and be consistent (see section 2).
- Address common misconceptions about keeping safe in the sun and the risks and benefits of sunlight exposure.
- Present a balanced picture of the risks and benefits, explaining the need to enjoy the sun safely, for example, using a similar approach to that adopted by the SunSmart campaign.
- Emphasise how the risks and benefits will vary depending on the individual.
- Relate to leisure activities and holidays as well as everyday life.

1.1.10 Campaigns should:

- Use different channels to communicate simple and more complex messages. For example, population-wide messages may focus on sun protection and enjoying the sun safely. More nuanced messages, such as the risk of over- or underexposure for subgroups and individuals, could be included in supporting resources such as leaflets, press statements and websites.
- Be delivered in a way that meets the target audience's preferences (for example, via radio, new media, texts, posters or leaflets).
- Be displayed at prominent locations, for example, airports, schools, travel vaccination clinics, leisure and sporting events, and in travel websites and magazines.
- Be repeated over time and regularly altered to keep the audience's attention.
- Be timed for maximum effect for example, so they take place during spring and summer when the risk of sunburn is highest in the UK, or when people are more likely to travel abroad.

1.1.11 Ensure that the format and content of national campaigns are developed and piloted with the target audience. If feasible, do the same for local activities and supporting resources.

1.1.12 Ensure that campaigns tackle health inequalities by taking into account cultural, religious and group norms about sunlight exposure. Outline what different groups should do to minimise their risks and maximise their benefits and how this may vary on an individual basis. Messages should also be conveyed in languages spoken locally.

1.1.13 Integrate and coordinate campaign messages with existing national and local health promotion programmes or services to keep costs as low as possible. (Examples of initiatives they could be integrated with include Sure Start and Change4Life.)

Local strategic approach

The following recommendations are for commissioners and senior managers in local authorities.

1.1.14 Adopt a consistent, multiagency approach, focusing activities on making at-risk groups aware of the risks and benefits of sunlight exposure (see recommendation 1.1.1).

1.1.15 Work with the NHS, council leaders, elected members, public health teams, local businesses and voluntary and community organisations to:

- address local needs, as identified by the joint strategic needs assessment and other local, regional or national data
- identify local opportunities to increase public awareness about the risks and benefits of sunlight exposure
- ensure the content of all messages is consistent (see section 2).
- target health, social care and other practitioners in contact with at-risk groups (see recommendation 1.1.1)
- carry out culturally appropriate activities (for example, to develop messages that local at-risk groups can relate to)
- ensure that messages related to skin type are relevant for the target audience.

1.1.16 Work with the local and national media to present a balanced view of the health risks and benefits of sunlight exposure.

1.1.17 Establish clear, measurable objectives for prevention and awareness-raising activities.

1.1.18 Work with practitioners in specific settings, such as residential care, schools and workplaces to implement prevention and awareness-raising activities (see section 4).

Training

Health Education England, Public Health England, clinical commissioning groups and local authorities should ensure that health, public health and social care practitioners, as part of their registration and post-registration training and continuing professional development:

1.1.19 Understand the health risks and benefits of sunlight exposure (see section 2). This includes the impact of a range of variables including environmental, biological and behavioural factors. (See section 2.)

1.1.20 Understand the importance of conveying consistent, tailored messages to the public (see section 2).

Evaluation

Policies and strategies to protect the public from over- or underexposure to sunlight

Public Health England and directors of public health should:

1.1.21 Evaluate policies, strategies and media campaigns (local and national) to protect the public from over- or underexposure to sunlight. This includes the effect of both one-to-one and group-based prevention activities. Do this by working with commissioners and senior managers in local authorities and the NHS, council leaders, elected members, public health teams, local businesses and voluntary and community organisations.

1.1.22 Use a range of measures of knowledge, attitudes, awareness and behaviour (see NICE's guideline on behaviour change: the principles for effective interventions).

2 Supporting information for practitioners

The following information is based on authoritative UK sources and the UK consensus vitamin D statement. The evidence base underpinning this

information has not been systematically reviewed for this guideline. For more detail on how it was compiled see Overview of sunlight exposure messages.

Risks and benefits of sunlight exposure

Environmental, biological and behavioural factors

- The intensity of sunlight varies according to:
  - Geographical location: solar UV levels increase nearer to the equator and at higher altitudes.
  - Time of year: between the beginning of April and mid-October, UVB rays help people produce vitamin D but excessive exposure can also cause sunburn. Solar UV levels are highest during the summer (and most intense in late June).
  - Time of day: solar UV levels are highest around the middle of the day when the sun is highest in the sky.
  - Weather conditions: solar UV levels are reduced by cloud cover but they can still be intense enough to cause sunburn (even if it is not warm).
  - Reflection: sunlight reflects off surfaces such as snow, sand, concrete and water. This can increase the risk of sunburn, even in shaded areas.
- UVA penetrates glass (although weakly) and over long periods of exposure will cause skin damage. However, the vitamin D-inducing UVB does not penetrate glass.
- Natural skin tone and skin type affects the potential risks and benefits from sunlight exposure – see advice below on skin type and age.
- Length of time spent in the sun, and whether the person travels to countries nearer to the equator, or to higher altitudes, all influence their potential risks and benefits from sunlight exposure.

How to minimise the risks and maximise the benefits of sunlight

People need to be aware of the following:

- Everybody needs to protect their skin when out in strong sunlight for more than a short period of time, both in the UK and abroad. The UV index provides an indicator of the sun's strength for a given location, date and

time. This information, combined with skin type and behaviour, can be used to assess someone's risk of sunburn. See British Association of Dermatologist's UV index app.

- Only a limited amount of time should be spent in strong sunlight – it is important to spend more time in the shade. Prolonged exposure (for example, leading to burning or tanning) is not necessary to gain vitamin D, and increases the risk of skin cancer.
- How sunlight exposure can affect them on an everyday basis and the importance of taking this into account on a daily basis.
- What their skin looks like normally and how it reacts to sunlight, so they can:
  - know how long they can be exposed without risking sunburn and how to protect their skin accordingly
  - spot any possible signs of cancer, such as a new mole, growth or lump, or any moles, freckles or patches of skin that change in size, shape or colour (people should tell their doctor if they notice any unusual or persistent changes).
- Exposing relatively small areas of skin (including commonly exposed areas, such as forearms and hands) for short periods when in strong sunlight provides vitamin D. (Longer periods of exposure may be needed for those with darker skin.)
- It is important to wear clothing that protects the skin and apply sunscreen. Protective clothing includes a broad-brimmed hat that shades the face, neck and ears, a long-sleeved top, and trousers or long skirts in close-weave fabrics that do not allow sunlight through. It also includes sunglasses with wraparound lenses or wide arms to provide side protection, and have the CE Mark and British Standard (BS EN 1836:2005).
- Skin that is not habitually exposed to sunlight (for example, the back, abdomen and shoulders) is more likely to burn, so extra care is needed.

When to go out in the sun

- In the UK, sunlight is strongest between 11am and 3pm from the beginning of April to mid-October[1]. Between these times:
  - vitamin D production is most efficient (it can occur, but more slowly, before 11am and after 3pm)
  - sunburn is most likely
  - most people can make sufficient vitamin D by going out for short periods (well below the time it takes to get sunburn) and leaving uncovered only small areas of skin that are often exposed (such as forearms, hands or lower legs), longer periods may be needed for those with darker skin.
- It might be better for people with very fair skin (skin type I and II) to go out in the sun before 11am and after 3pm (it will take them longer to synthesise sufficient vitamin D but reduces the risk of sunburn).

Advice according to people's age

- Babies (under 6 months) should be kept out of direct sunlight, especially between 11am and 3pm in the UK.
- Infants and children aged under 5 should be encouraged to spend time in the shade between 11am and 3pm in the UK, from the beginning of April to mid-October[2]. Their parents and carers should be given advice on vitamin D supplements (see NICE's guideline on vitamin D: increasing supplement use among at-risk groups).
- Older people should be:
  - Given consistent, tailored sun safety advice
  - advised on the use of vitamin D supplements
  - made aware that the risk of skin cancer increases with age, so they should tell their doctor about any unusual or persistent changes to their skin (see NHS Choices information on skin cancer symptoms).

[1] SACN is currently reviewing this time period.
[2] SACN is currently reviewing this time period.

Advice according to people's natural skin colour

- People with genetically darker skin (skin types IV, V and VI) are at relatively lower risk of burning and therefore, skin cancer, and perhaps higher risk of vitamin D deficiency in the UK. This means:
  - they may need more time in sunlight in the UK to produce the same amount of vitamin D as people with lighter skin
  - generally they can be exposed for longer before risking sunburn and skin cancer, but should not get to the point where their skin is likely to burn.
  - they need advice on vitamin D supplements (see NICE's guideline on vitamin D: increasing supplement use among at-risk groups.)
- People with naturally very light skin or fair or red hair and freckles (skin types I and II):
  - do not need much time in the sun to benefit from vitamin D and the time needed to benefit is always less than the time it takes to burn
  - are at greater risk of sunburn and skin cancer – including after shorter periods of exposure – than people with darker skins.

Sunscreen

- No sunscreen offers 100% protection. Other sun protection methods, such as clothing and shade, are more effective and cheaper.
- Sunscreen is not a reliable alternative to protective clothing and shade, but does offer additional protection. It can also be useful when other methods of protection are not available, but only if used liberally, carefully and repeatedly on all exposed skin.
- Sunscreen should offer:
  - At least 4-star UVA protection or the letters 'UVA' in a circle logo.
  - At least sun protection factor (SPF)15 to protect against UVB. This needs to be applied liberally (6 teaspoons of lotion for the body of an average adult) according to the manufacturer's instructions. Because this level of coverage is difficult for people to achieve, it is prudent to recommend SPF30 to ensure adequate protection.
- If someone plans to be out in the sun long enough to risk burning, sunscreen needs to be applied twice to exposed areas of skin, half an hour

before and again, around the time they go out in the sun. This includes the face, neck and ears (and head if someone has thinning or no hair), but a wide-brimmed hat is better.

- Sunscreen needs to be reapplied liberally and frequently, including straight after being in water (even if it is 'water-resistant') and after towel drying, sweating, or when it may have rubbed off.
- Water-resistant sunscreen is needed if sweating or contact with water is likely.

Clarifying common misconceptions about sunlight exposure

It is important to note that:

- Even if it is cool or cloudy, it is possible to burn in the middle of the day in summer. It is also possible to burn at other times of the day and year.
- Having a tanned skin may provide some protection against later exposure to sunlight, but the resulting skin damage outweighs any later protective effect.

3 Who should take action?

Introduction

The guideline is for commissioners, managers and practitioners with public health or social care as part of their remit working in the NHS, local authorities and the wider public, private, voluntary and community sectors. It is also aimed at:

- people working in and managing early years settings, educational settings (including preschool, primary and secondary schools) and leisure environments
- employers (including public sector organisations)
- managers and practitioners working in residential or day care settings
- others with a duty of care for people.

In addition, it will be of interest to groups at increased risk of low vitamin D status or skin cancer, their families and carers and other members of the public.

4 Implementation approaches in different settings

This section highlights how the guideline could be implemented by people with a duty of care and by managers and practitioners in different settings. All messages conveyed should be in line with 'supporting information for practitioners'.

Managers and practitioners with a duty of care

Managers and health, public health and social care practitioners who have a duty of care for others (for example, in the workplace, education, residential or day care settings) could develop a policy to promote the risks and benefits of sunlight exposure. This could:

- Outline the benefits of such a policy, for example, in the case of employers this could be fewer days absenteeism because of sunburn or other adverse effects (Sun protection: advice for employers of outdoor workers Health and Safety Executive).
- Advocate tailoring advice according to skin type and age, as well as the physical and mental ability of recipients.
- Cover the needs of all at-risk groups (see recommendation 1.1.1), including people from lower socioeconomic groups and those with specific cultural needs, English language difficulties, or a physical or mental disability.
- Encourage people to manage their own risk, for example, by seeking shade and wearing protective clothing.

The policy could also state that sun-awareness information should:

- Help people and their carers identify their own potential risks and benefits from sunlight exposure and the protective measures they should take.
- Adopt a balanced approach and avoid scaremongering.

- Be conveyed using a range of approaches for example, one-to-one as well as in groups.
- Be clearly displayed in communal locations including airports, schools, travel vaccination clinics and appropriate leisure and sporting events.
- Be available in a variety of formats, including formats suitable for recipients with different physical and mental abilities.

Early years, education and leisure

Managers and staff in early years, education and leisure environments could develop a policy on how to protect children and young people's skin when they are outside for more than a brief period in strong sunlight. This includes those working in preschool settings, primary and secondary schools.

A comprehensive policy would:

- Specify that children and young people should spend time in the shade and wear wide-brimmed hats, protective clothing and sunscreen when out when the sun is strong.
- Encourage parents to provide their children with protective clothing as well as sunscreen and make it clear that spending time in the shade and wearing protective clothing is more reliable than using sunscreen.
- Be consistent with child protection and safeguarding policies, for example, by specifying who should apply sunscreen to children and when.
- Outline the need to take children's individual characteristics for example, their skin type, into account. Be aware that children with skin type V or VI may not need sunscreen protection.
- Raise awareness of the risks and benefits of sunlight exposure among infants, children and young people, their parents and carers. This includes making it clear how important it is to know how their own skin reacts, based on past experience.
- Provide infants, children and young people, their parents and carers with timely information (for example, during the spring and summer holiday season) on the risks and benefits of sunlight exposure in play and leisure

environments. For detail on how the information should be displayed see recommendations 1.1.8 to 1.1.13.

- Encourage children and young people to spend time in the shade and to wear wide-brimmed hats, protective clothing and sunscreen to protect themselves when the sun is strong.

You might also consider using practical, classroom-based activities for example, in personal, social, health and education lessons covering health or diversity. See Cancer Research UK for more information on developing a policy.

Workplaces

Employers, managers and relevant practitioners in the public, private, voluntary and community sectors could implement a policy on sunlight exposure to help meet their responsibilities under the Health and Safety at Work Act. Note: sunlight exposure is an occupational hazard for people working outdoors.

Information on safe sunlight exposure could be incorporated into general practice and routine health and safety training.

Use resources developed for the target audience where available. For example, the Institution of Occupational Safety and Health sun safety film for construction workers.

Residential and day care services

Managers and practitioners who work in residential or day care settings could develop, implement and monitor activities to promote the risks and benefits of sunlight exposure. They could also provide adults, children and their carers with information on those risks and benefits.

Further resources

Further resources will be available from NICE to support implementation of this guideline after publication.

Uptake data about guideline recommendations and quality standard measures will also be available.

5 Context

Introduction

Sunlight exposure offers people a number of health benefits but excessive exposure can also cause health problems.

UVB is needed for the skin to form vitamin D. This is essential for skeletal growth and bone health. The major natural source of vitamin D is from skin synthesis following exposure to sunlight.

The main short-term risk from overexposure to the UV rays from sunlight (both UVA and UVB) is damage to the skin's DNA associated with sunburn. The main long-term risk of sunburn is skin cancer, either built up gradually over a lifetime or due to short bursts of high exposure. Overexposure can also damage the eyes. In addition, it can age the skin leading, for example, to premature wrinkling.

Previous attempts to communicate the risks and benefits of sunlight exposure have resulted in some confusion. On the one hand, people have been advised to keep out of the sun to avoid skin cancer. On the other hand, they have been advised to expose themselves to sunlight to ensure that they get enough vitamin D.

Many people are not exposed to enough sunlight because of cultural practices, an indoor lifestyle or overzealous skin protection methods (Solar ultraviolet radiation: Global burden of disease from solar ultraviolet radiation World Health Organization; Misra et al. 2008).

In addition, from mid-October to the beginning of April in the UK, sunlight contains very little of the ultraviolet B (UVB) wavelength the skin needs to make vitamin D. So people rely on both body stores from sunlight exposure in the summer and dietary sources to maintain vitamin D levels (SACN update on vitamin D – 2007 The Scientific Advisory Committee on Nutrition).

Dietary sources are very limited and oily fish is the only other significant source. Small amounts are provided by egg yolk, red meat and fortified foods, such as formula milks for infants and toddlers, some breakfast cereals and fat spreads (margarine).

Overexposure to sunlight can result from spending long periods in the sun on a daily basis (chronic exposure). It can also occur among people who, for example, spend little time outdoors and then experience short, intense bursts during occasional holidays or weekends away (intermittent exposure).

Chronic exposure is linked more to squamous cell carcinoma, while intermittent exposure is linked to sunburn, basal cell carcinoma and melanoma. Sunlight exposure is also responsible for some common eye diseases, for example cortical cataracts (Yam 2013).

Studies have shown that most people are aware of the risks of overexposure to the sun but need to be frequently reminded to protect themselves (Trends in awareness and behaviour relating to UV and sun protection: 2003 to 2013 Cancer Research UK).Generally, a significant disparity exists between knowledge and behaviour (Hiom 2006). This may reflect the fact that:

- the sun can have a positive effect on psychological wellbeing
- many people like to have a sun tan
- there is a time lag between exposure and the development of skin cancer and features of photoaging, including wrinkling.

Complex health messages

An optimal level of sunlight exposure would allow people to enjoy the sun and gain vitamin D without burning or risking skin cancer. But it can be difficult to communicate the risks and benefits. That is because, unless carefully interpreted, the evidence on the role of sunlight in preventing low vitamin D status[3] can conflict with sun protection messages (see review 2 Synthesis of

[3] In the UK, 25 nmol/litre of serum 25-hydroxyvitamin D concentration is currently used as the lower threshold for vitamin D adequacy. Below this level there is an increased risk of rickets

effectiveness and cost effectiveness evidence from NICE's guideline on skin cancer prevention).

Current messages do not make it easy for people to understand the specific risks they face, resulting in common misconceptions about how to reduce the risks from sunlight and how to benefit. These include, for example the idea that 'applying sun cream is sufficient protection'.

There is also a general belief that skin cancers can easily be treated. This may sometimes be the case, but not always (see skin cancer section below). These misconceptions exist, despite the efforts of a wide range of organisations.

Vitamin D deficiency

The National Diet and Nutrition Survey found that many adults in Britain aged 19 to 64 were reported to have a low vitamin D status (17% of men and 19% of women). It also found that 19% of boys and 20% of girls aged 11 to 18 years were considered to have a low vitamin D status (National diet and nutrition survey: headline results from years 1,2 and 3 (combined) of the rolling programme, 2008/09–2010/11 Department of Health and Food Standards Agency).

There have been reports that rickets, caused by lack of vitamin D, is re-emerging among children in the UK (Pearce and Cheetham 2010). Low vitamin D status is also associated with (but not confirmed as the cause of) other diseases and long-term conditions such as osteoporosis, diabetes and some cancers ('SACN update on vitamin D – 2007').

Skin cancer

Excessive exposure to UV rays is the main cause of skin cancer and is one of the most avoidable causes of cancer risk and death in the UK.

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and osteomalacia and people are considered to have vitamin D deficiency. However, the Scientific Advisory Committee on Nutrition is currently reviewing this threshold.

Skin cancer incidence rates (melanoma and non-melanoma) have increased rapidly in England in the past 30 years partly, perhaps, because of increased travel to sunnier countries (Hiom 2006).

In 2012, 11,281 newly diagnosed cases of melanoma were registered in England (Cancer registration statistics England 2012 Office for National Statistics). In the same year, 102,628 cases of non-melanoma were registered in the UK, although the actual number is estimated at over 250,000 (Skin cancer statistics Cancer Research UK 2014).

In 2012, 1920 people died from melanoma in England and Wales (Mortality statistics: deaths registered in England and Wales (Series DR) 2012 Office for National Statistics). Over 600 (638) died from non-melanoma in the UK ('Skin cancer statistics').

Melanoma is the second most common cancer in those aged 15 to 34 in the UK. But the risk of all skin cancers increases with age, with people aged 65 and older most commonly diagnosed with late-stage melanoma.

In 2008/09, it cost the NHS in England an estimated £105.2 million to treat skin cancer (Measuring current and future cost of skin cancer in England Vallejo-Torres et al. 2013). This is predicted to rise to more than £180 million in 2020 ('Measuring current and future cost of skin cancer in England').

Primary care spending on treatments for low vitamin D status rose from £28 million in 2004 to £76 million in 2011 (Treating vitamin D deficiency to cost £100m a year by 2013 GP online, 13 February 2012; Prescription cost analysis England 2011 Health and Social Care Information Centre).

6 Considerations

This section describes the factors and issues the Public Health Advisory Committee considered when developing the recommendations. Please note: this section does **not** contain recommendations. (See Recommendations.)

Background

6.1 The Committee agreed that sunlight offers risks and benefits according to the population group and a range of other variables. It also agreed that the order of the words 'risks and benefits' does not imply a hierarchy but is used to ensure consistency throughout the document, in line with NICE's house style.

6.2 Determining and quantifying the contribution sunlight makes to vitamin D status (and how high-protection sunscreen may reduce this) was beyond the remit of this guideline. Committee members were aware that the Independent Advisory Group on Non-ionising Radiation (AGNIR) was considering the links between sunlight and vitamin D during development of this guideline. When published, any new findings from the AGNIR report will be taken into account when the guideline is updated. In addition, the Committee noted that NICE has published a guideline on how to increase vitamin D supplement use. Members hoped that these 3 pieces of work will provide the basis for clear, consistent advice to reduce the risk of low vitamin D status among all at-risk groups.

6.3 The causal relationship between vitamin D status and bone health is well established. However, the nature of the association between vitamin D levels and other chronic diseases, such as cancer and multiple sclerosis, is less clear. The Committee was aware that SACN was reviewing vitamin D and health outcomes, and the recommendations in this guideline should be read alongside SACN's final conclusions.

6.4 The Committee acknowledged that people at risk of overexposure to sunlight and those at risk of not having enough vitamin D may be in different groups. So it recommended the need to adapt messages for different groups and individuals. But members also noted that consistent universal messages will help change attitudes and behaviour. The Committee aligned messages in this guideline

with national advice from NHS Choices to achieve some consistency.

6.5 It is not possible to provide a simple definitive message telling different groups how often and how long they can be exposed to sunlight to ensure minimum risk but maximum benefit. That is because the amount of UV someone gets from sunlight depends on a range of biological, environmental and behavioural factors. But the Committee agreed that advice on preventing both skin cancer and low vitamin D status can be combined. It heard that short (less than the time it takes for skin to redden or burn), frequent periods of sunlight exposure are best for vitamin D synthesis. In addition, this type of exposure is less likely to result in skin cancer.

6.6 The Committee agreed that a lack of consensus among relevant national bodies on the content of sunlight exposure messages will make it more difficult to implement this guideline. A consensus would mean the messages could be made available from a central website. This would ensure that they are consistent and minimise duplication of effort.

6.7 The Committee noted that both practitioners and the public find it difficult to judge 'skin type I–VI'. To overcome this problem, the recommendations refer to both skin types and 'lighter and darker' skin.

Sunscreen

6.8 The Committee did not recommend sunscreen as the main way of providing protection for the skin from sunlight. But members did think advice on how to use it was important because often sunscreen is not applied effectively– and people overestimate the protective effect. For this reason it recommended that other sun protection methods, such as clothing and shade, are more effective and cheaper.

6.9 The Committee noted that the use of sunscreen may encourage people to spend a long time in the sun and that will, in turn, increase the risk of sun damage.

6.10 Expert testimony confirmed that frequent, liberal use of high-protection sunscreen may prevent vitamin D synthesis, but only in laboratory conditions. Evidence suggests that it is unlikely to be the case in practice because people tend to apply much less sunscreen than the manufacturers recommend. They also tend to apply it in a patchy fashion.

6.11 The Committee debated whether to recommend SPF15 or SPF30 sunscreen. If SPF15 is applied liberally, according to the manufacturer's instructions, it should offer adequate protection. However, this level of coverage is difficult to achieve. Bearing this in mind, the Committee agreed that SPF30 might provide better protection for some people, particularly those with sensitive skin (skin types I and II).

6.12 The Committee recognised that the cost of sunscreen could be prohibitive for some people. It felt this might prevent people using enough to protect their skin adequately.

Behaviour change

6.13 The Committee was aware that cultural context may influence whether or not people respond to public health messages. Information is usually a necessary precursor to behaviour change, but information alone is not always enough. Members agreed that the best outcome from information provision is a change in behaviour. But they also felt there was some value in using information to alter attitudes for example, towards tanning, because this may eventually lead to behaviour change.

6.14 Report 1 Communicating the benefits and risks of ultraviolet light to the general population: a qualitative documentary analysis of UK

newspapers and magazines (print and online) highlighted a generally positive portrayal of sun tanning in the media. For example, images of sunbathing are usually accompanied by references to a 'healthy tan' and the value of 'escaping to the sun'. The Committee recognised that it is a challenge to change people's knowledge, attitudes and behaviour towards tanning.

6.15 The degree to which people believe they can change their level of risk plays a role in their decision-making process. The time-lag between sunlight exposure and the development of skin cancer and wrinkling also play a part. Members agreed that there is a need to help people more accurately determine how they can achieve vitamin D synthesis while not damaging their skin.

6.16 The Committee recognised the importance of making children aware of the risks and benefits of sunlight. This is partly because of the higher risks they face from both low vitamin D status and, usually in later life, skin cancer (the latter is often associated with sunburn in childhood). It is also because it is important to help children establish life-long health-promoting behaviours when they are most susceptible to habit-forming advice.

6.17 The risk-benefit ratio of sunlight exposure will vary depending on how dark or light someone's skin is. The Committee was particularly concerned about the risks and benefits for darker skinned people because so much of the evidence and existing advice is focused on those with lighter skin.

Evidence

6.18 The evidence base underpinning the content of safe sunlight exposure messages was not systematically reviewed for this guideline because the content of these messages was beyond the remit of the guideline. The advice from NHS Choices was the nearest that could be achieved to a consensus, following a trawl of existing authoritative sources.

6.19 A large volume of evidence suggests sunlight may provide protection against chronic diseases such as cancer, heart disease and diabetes. However, the relationship is associative rather than causative that is, it has not been proven. Sunlight is also associated with improved mental wellbeing. (But this is to do with the visible rather than the UV component.)

6.20 The balance of published evidence suggests that skin with darker pigmentation needs longer sunlight exposure than lighter skin to produce equivalent levels of vitamin D. But further research is needed. In the meantime, the Committee was clear that people of all skin types should not risk burning their skin.

6.21 The evidence on the effectiveness of strategies to communicate complex messages was very limited.

6.22 The Committee noted that there was limited and inconsistent evidence from the review of cost-effectiveness. The review of effectiveness identified a number of interventions that have changed behaviours in the sun, or reduced the incidence of sunburn. But none of the studies focused on delivering a complex message that conveyed both the risks and benefits. The Committee also noted that the interventions in the review tended to have small sample sizes, small effect sizes and measured only short-term outcomes.

6.23 It was not possible to include the health conditions associated with low vitamin D status in the economic model because of insufficient effectiveness evidence. So the model focused on the risks of sunlight exposure.

6.24 Most studies identified in the evidence reviews were based in countries with a very different climate from the UK (for example, Australia and the US). The Committee felt that it would be difficult, for example, to transfer evidence from Australia to the UK context because Australian campaigns have been in place for longer and

are better funded than in the UK. The Committee was also aware that studies on people at risk of low vitamin D status would need to be judged in light of whether the study took place in a country that fortifies food with vitamin D. (Because this would result in the population having higher baseline levels of vitamin D).

6.25 There is growing interest in the use of new technology, including phone and tablet apps, to deliver behaviour change interventions. But the Committee noted a lack of formal evaluations of effectiveness. In addition, although currently there is no evidence to show text messages are cost effective, members were aware that this may change. They suggested that any such change could be captured in an update of this guideline.

6.26 Photoageing interventions were not found to be cost effective at the time of publication, so they were not recommended for NHS settings. But the Committee acknowledged that this did not mean they were not effective.

6.27 The Committee did not look at evidence on the risks and benefits of artificial sources of UV rays because it was beyond the remit of the guideline. The absence of any recommendations on these sources should not be taken as a judgement on whether they are beneficial, cost effective or pose any risks.

6.28 The Committee recognised that it is not easy to understand how to use information from the UV index to assess the risks and benefits people face from sunlight. They agreed that the information it provides is only useful if combined with someone's own skin type and behaviour.

Health inequalities

6.29 The recommendations stress the need for tailored individual advice to back up the universal messages. The Committee noted that universal interventions could result in adverse effects for some

groups and so increase health inequalities. For example, universal messages about protecting the skin from sunlight exposure may inadvertently lead to a reduction in the amount of skin exposed to sunlight among groups at risk of low vitamin D status.

6.30 Many people have photosensitive skins, for various reasons, which means that sunlight exposure has particular implications for their health. The Committee did not discuss the particular needs of these groups for this guideline.

Health economics

6.31 The economic evidence review did not identify any studies applicable to the UK so a bespoke economic model was developed, based on the effectiveness evidence. The interventions included: an information programme for schoolchildren; photoageing; tailored messaging; text messages; and a mass media campaign. The comparator used was 'no intervention' because it was not possible to establish current practice. The outcome measures modelled were: sunburn, basal cell carcinoma, squamous cell carcinoma and malignant melanoma. The incremental cost-effectiveness ratio (ICER) of the information programme for schoolchildren, photoageing and text messages were: £312,744, £316,968 and £65,945 per quality-adjusted life-year (QALY) gained, respectively. Tailored messages had an estimated ICER of £14,249 per QALY gained. The mass media campaign was cheaper and more effective than no intervention because it avoided future expenditure on treatment and the cost saving outweighed the cost of the intervention. The Committee noted that the uncertainties were explored in sensitivity analyses.

6.32 A lack of sunlight exposure is associated with vitamin D deficiency. The lack of evidence on interventions aimed at delivering a complex message covering both the risks and benefits of sunlight exposure meant that the economic model could not assess the cost effectiveness of any such intervention. As a consequence,

conditions associated with vitamin D deficiency are not included in the model. This is because it is not possible to quantify the impact of any of the interventions on the prevalence of vitamin D deficiency.

6.33 The Committee heard evidence on the links between sunlight exposure and cataracts. But members acknowledged that the effects could not be modelled because of a lack of suitable data.

6.34 The Committee discussed differences between the economic model used for this guideline and the one used for NICE's guideline on skin cancer prevention. The model for this guideline used the effectiveness evidence to calculate the relative risks of sunburn. In addition, it used epidemiological evidence to link the use of any kind of protection with the incidence of sunburn. This was important because several interventions showed significant reductions in the incidence of sunburn and these reductions were captured in the economic model.

6.35 It was difficult to link behavioural changes to health outcomes in the economic model because of a lack of relevant evidence. The Committee discussed uncertainties about the duration of effects and how often an intervention needed to be repeated to maintain the size of effect. It also discussed whether assumptions used in the economic model to link study outcomes with health outcomes and healthier behaviours were reasonable, given the lack of evidence. However, the associated uncertainties were sufficiently explored in the sensitivity analyses.

6.36 Assuming a cost effective threshold of £20,000 per QALY, tailored messages should cost a maximum of £5.89 per person and a mass media campaign should cost no more than £2.15 per person. Generally interventions must be cheap to be cost effective. For example, messages delivered as part of practitioners' routine practice could be cost effective.

6.37 Members noted that the information for the economic evaluation was drawn from single studies for each type of intervention.

7 Recommendations for research

The Committee recommends that the following research questions should be addressed. See also the recommendations for research in NICE's guideline on vitamin D: increasing supplement use among at-risk groups. 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 or negative side effects.

All the research should aim to identify differences in effectiveness among groups, based on characteristics such as socioeconomic status, age, gender and ethnicity.

7.1 How can factors that contribute to the balance of health risks and benefits of sunlight exposure for different populations be quantified? What factors should be included in tailored messages for people with different characteristics and levels of exposure to the sun, including skin colour, age, occupation and lifestyle?

7.2 What are the most effective ways of conveying complex risk messages and influencing behaviours in relation to over- and underexposure to sunlight? In particular, what are the most effective ways of using social and digital media? Consideration should be given to the following: how does effectiveness vary according to communicator, message, audience and medium? How does this vary at individual, group and population level in the UK? How does this vary for black and minority ethnic groups in the UK?

7.3 What are the most effective methods of identifying and targeting individuals and groups at risk of either over- or underexposure to sunlight?

7.4 What combinations of interventions are most effective at helping people to reduce their risks of, and benefit from, sunlight exposure? How much does this vary according to the type of intervention for example, the communicator, message, audience and medium?

More detail identified during development of this guideline is provided in Gaps in the evidence.

8 Related NICE guidance

Published

- Vitamin D: increasing supplement use among at-risk groups (2014) NICE guideline PH56
- Behaviour change: individual approaches (2014) NICE guideline PH49
- Ambulight photodynamic therapy for the treatment of non-melanoma skin cancer (2011) NICE medical technology guidance 6
- Skin cancer prevention: information, resources and environmental changes (2011) NICE guideline PH32
- Metastatic malignant disease of unknown primary origin (2010) NICE guideline CG104
- Skin tumours including melanoma (2010) NICE cancer service guidance
- Promoting 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: the principles for effective interventions (2007) NICE guideline PH6
- Referral guidelines for suspected cancer (2005) NICE guideline CG27

Under development

- Healthy Start vitamins: is a targeted or a universal approach more cost effective? NICE special report. Publication date to be confirmed.

- Prisons: physical health of people in prisons. NICE guideline. Publication expected November 2016.

9 Glossary

Low vitamin D status

Low vitamin D status (sometimes called vitamin D deficiency) is defined by the Department of Health as a plasma concentration of 25 hydroxyvitamin D (the main circulating form of the vitamin) of below 25 nmol/litre (equal to 10 ng/ml).

Photoageing

Photoageing results from chronic exposure to UV radiation. It may include any or all of the following: dryness, itching, wrinkling, irregular pigmentation, sallowness, irregular blood vessel dilatation, enlarged blackheads, fragility with easy bruising and loss of skin elasticity.

Protective clothing

Close-weave fabrics that do not allow sunlight through.

Skin type

Cancer Research UK has identified 6 different skin types:

- Type I: Often burns, rarely tans. Tends to have freckles, red or fair hair, blue or green eyes.
- Type II: Usually burns, sometimes tans. Tends to have light hair, blue or brown eyes.
- Type III: Sometimes burns, usually tans. Tends to have brown hair and eyes.
- Type IV: Rarely burns, often tans. Tends to have dark brown eyes and hair.
- Type V: Naturally brown skin. Often has dark brown eyes and hair.
- Type VI: Naturally black-brown skin. Usually has black-brown eyes and hair.

Further information on determining skin type is available from Cancer Research UK (www.sunsmart.org.uk).

Sunburn

Sunburn is pink or red skin caused by sunlight exposure. It usually develops several hours after the start of sun exposure. It may or may not be painful. For those with naturally dark skin, damage may be indicated by their skin getting hot in the sun and then staying hot afterwards, rather than signs of redness. Note: it is not necessary for the skin to burn in order to tan. And although a suntan may offer some protection against further sunlight exposure, while acquiring a tan the skin is damaged. This increases the later risk of skin cancer and outweighs any protective advantage.

UV index

The UV index tells us how strong the sun's UV rays are and when we might be at risk of burning. Further information on determining risk of burning according to the UV Index is available from Cancer Research UK (www.sunsmart.org.uk).

You can check UV index forecasts for different parts of the UK from the Met Office (www.metoffice.gov.uk), or by looking at many weather forecasts.

Vitamin D

Vitamin D is obtained through the action of sunlight on skin and from dietary sources. The action of sunlight (ultraviolet [UV] radiation with a wavelength of about 290–310 nanometres) on skin converts 7-dehydrocholesterol to previtamin D3, which is then metabolised to vitamin D3.

10 References

Hiom S (2006) Public awareness regarding UV risks and vitamin D – the challenges for UK skin cancer prevention campaigns. Progress in Biophysics and Molecular Biology 92: 161–6

Misra M, Pacaud D, Petryk A et al. (2008) Vitamin D deficiency in children and its management: review of current knowledge and recommendations. Pediatrics 122: 3984

Pearce SHS, Cheetham TD (2010) Diagnosis and management of vitamin D deficiency. British Medical Journal 340: 142–7

Shea BJ, Grimshaw JM, Wells GA et al. (2007) Development of AMSTAR: a measurement tool to assess the methodological quality of systematic reviews. BMC Medical Research Methodology 7: 10

Yam JCS and Kwok AKH (2013) Ultraviolet light and ocular diseases. International Ophthalmology (e-print ahead of publication)

11 Summary of the methods used to develop this guideline

Introduction

The reviews, commissioned report and economic modelling report 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 Advisory Committee meetings provide further detail about the Committee's interpretation of the evidence and development of the recommendations.

Guideline development

See the NICE website for details of how NICE guidelines are developed.

Key questions

The key questions were established as part of the scope. They formed the starting point for the reviews of evidence and were used by the Committee to help develop the recommendations. The overarching questions were:

Question 1: What are the most effective and cost-effective ways of presenting and disseminating complex health risk information to help people assess their own level of health benefits and risks from sunlight exposure (or that of others for whom they have a duty of care)?

Question 2: What are the most effective and cost-effective ways to change people's beliefs about the risk of sunlight exposure and to encourage them to change their sun protection practices accordingly? How does this differ for subpopulations, including:

- people with different levels of education
- people with learning disabilities
- people with physical impairments (for example, sight issues if relying on visual representation of risk)
- people who are non-English speaking or whose first language is not English
- people from different religious and cultural backgrounds
- people of different ages?

Question 3: How have the health benefits and risks of sunlight exposure been conveyed in the media?

The subsidiary questions were:

1. What type of evidence sources are news articles based on? How accurate are these sources – and how in line with the source evidence are the articles?

2. How balanced are news articles in terms of outlining vitamin D benefits and skin cancer risks? Is reference made to the role of individual risk factors?

Question 4: What are the barriers to, and facilitators for, risk communication strategies and interventions in optimising safe sunlight exposure knowledge and protection practices? How does this vary by subpopulations?

The subsidiary questions were:

1. What are people's knowledge, beliefs, attitudes and perception of the benefits and risks of sunlight exposure?

2. From what sources do people gain their knowledge regarding safe sunlight exposure (for example, news media, health professionals, peers)? What is the

relationship between the source of knowledge, levels of accurate knowledge and sunlight exposure and protection practices?

3. How do people make judgments about risk from sunlight exposure and how does this influence decisions about sunlight exposure and protection practices?

4. How do people interpret and respond to conflicting messages on sunlight exposure and health? To what extent are they aware that messages differ according to individual risk factors?

5. What has been the impact of increased knowledge of the benefits of vitamin D on sunlight exposure practices?

6. How effective have sun safety messages been in achieving safe sunlight exposure and protection practices? How does this vary by different messages (for example, stay out of the sun at midday, use SPF15) and why?

7. To what extent do people understand the UV Index? How does it affect their sunlight exposure and protection practices?

Question 5: What content do effective and cost effective primary skin cancer prevention message contain? What is the most effective and cost effective content?

These questions were made more specific for each review.

Reviewing the evidence

Effectiveness reviews

Two reviews of effectiveness were conducted:

- Review 1: Overview of systematic reviews exploring complex risk communication
- Review 2: Communicating the benefits and risks of ultraviolet light to the general population: effectiveness and cost-effectiveness review.

Identifying the evidence

Review 1: several databases were searched for systematic reviews (searches were unrestricted by year of publication). Medline was searched from 2009.

Experts in risk communication and the communication of general health messages were also contacted for any relevant systematic reviews.

Review 2: several databases were searched for primary studies and systematic reviews from January 1994 onwards.

In addition, Google search was used to identify health authority reports that have communicated the risks and benefits of sunlight exposure. The search was limited to NHS, local authority, public health observatory and Department of Health sites using the 'site' limit. The webpages of organisations that produce guidance on sunlight exposure risks and benefits, or undertake research on risk communication, were also searched.

Selection criteria

Studies were included in review 1 if they:

- reported on general communication strategies that aimed to convey messages about risk
- reported on communications specifically related to sun-exposure, alcohol, exercise or diet.

Studies were included in review 2 if they were:

- published in English from 2008 onwards
- primary studies conducted in an Organisation for Economic Co-operation and Development (OECD) country
- systematic reviews.

Studies were excluded from review 2 if they were:

- published in abstract form only
- case reports
- case series

- non-systematic reviews
- editorials or opinion papers.

Other reviews

One review of barriers and facilitators was conducted. See review 3: Communicating the benefits and risks of ultraviolet light to the general population: barriers and facilitators review

Identifying the evidence

Several databases were searched in February 2014 for primary studies and systematic reviews from January 1994 onwards. See review 3.

Selection criteria

Studies were included in review 3 if they were:

- published in English from 2008 onwards
- primary studies undertaken in an OECD country that reported on barriers to, and facilitators for conveying the risks or benefits of safe sunlight exposure
- systematic reviews.

Studies were excluded if they were:

- published in abstract form only
- case reports
- case series
- non-systematic reviews
- editorials, opinion papers.

Quality appraisal

Included papers were assessed for methodological rigour and quality using the NICE methodology checklist, as set out in Methods for the development of NICE public health guidance. Each study was graded (++, +, −) to reflect the risk of potential bias arising from its design and execution.

++ All or most of the checklist criteria have been fulfilled. If 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.

Systematic reviews were assessed for methodological rigour and quality using the AMSTAR quality assessment tool (Shea et al 2007).

The systematic reviews were graded as ‘good quality’ if they met 8 or more of the 11 AMSTAR criteria, ‘moderate quality’ if they met 5 to 7 of the criteria, and ‘poor quality’ if they met 4 or fewer criteria.

Summarising the evidence and making evidence statements

The review data were summarised in evidence tables (see the reviews in Supporting evidence).

The findings from the reviews and documentary analysis 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 (see 'Supporting evidence'). 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.

Primary research and commissioned reports

One commissioned report was conducted:

- Report 1: Communicating the benefits and risks of ultraviolet light to the general population: a qualitative documentary analysis of UK newspapers and magazines (print and online).

Identifying the evidence

Several UK national newspapers and monthly magazines (print and online versions) and the Nexis UK news and business database were searched for newspaper and magazine articles published between 1 January 2010 and 17 March 2014.

Selection criteria

Articles were included if they were published in a UK national newspaper or monthly magazine and:

- reported on research evidence or a national guideline or consensus statement about the health risks and benefits associated with sunlight exposure between 1 January 2010 and 17 March 2014.
- contained other material related to the health risks and benefits associated with sunlight exposure published during 2013 only.

Articles were excluded if they:

- were not published in a UK national newspaper or monthly magazine.

Cost effectiveness

There was a review of economic evaluations and an economic modelling exercise. See review 2 and economic modelling report 1 ‘Communicating the benefits and risks of ultraviolet light to the general population: cost effectiveness model technical report’.

Review of economic evaluations

Studies were included in the cost effective section of review 2 if they were:

- cost–utility analyses
- cost-effectiveness analyses
- cost-benefit analyses
- cost-minimisation analyses
- cost-consequences analyses.

The following study types were excluded:

- burden of disease
- cost of illness.

For information on searches and the quality criteria used to assess and score studies see review 2.

Economic modelling

Assumptions were made that could underestimate or overestimate the cost effectiveness of the interventions (see review modelling report for further details).

An economic model was constructed to incorporate data from the reviews of effectiveness and cost effectiveness. The results are reported in economic modelling report 1 Communicating the benefits and risks of ultraviolet light to the general population: cost effectiveness model technical report.

How the Committee formulated the recommendations

At its meetings in April, June, July, September and October 2014 the Public Health Advisory Committee considered the evidence and cost effectiveness to determine:

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

The Committee developed 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.

If evidence was lacking, the Committee also considered whether a recommendation should only be implemented as part of a research programme.

If possible, recommendations were linked to evidence statements (see The evidence for details). If a recommendation was inferred from the evidence, this was indicated by the reference 'IDE' (inference derived from the evidence).

12 The evidence

Introduction

The evidence statements from 3 reviews are provided by external contractors.

This section lists how the evidence statements and expert papers link to the recommendations and sets out a brief summary of findings from the economic analysis.

How the evidence and expert papers link to the recommendations

The evidence statements are short summaries of evidence, in a review, report or paper (provided by an expert in the topic area). Each statement has a short code indicating which document the evidence has come from.

Evidence statement number 1.1 indicates that the linked statement is numbered 1 in review 1. **Evidence statement number 2.1.3** indicates that the linked statement is numbered 1.3 in review 2. **ER1** indicates that expert report

1 is linked to a recommendation. **EP1** indicates that expert paper 1 is linked to a recommendation.

If 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).

If the Public Health Advisory Committee considered other evidence, it is linked to the appropriate recommendation below. It is also listed in the additional evidence section below.

Recommendation 1.1.1: evidence statements 1.1.3; EP2, EP3, EP4, EP5; IDE

Recommendation 1.1.2: evidence statement 2.13; IDE

Recommendation 1.1.3: economics report; EP2, EP3, EP4, EP5, EP7; IDE

Recommendation 1.1.4: evidence statements 2.1.3, 3.6, 3.20; IDE

Recommendation 1.1.5: evidence statement 2.1.3; IDE

Recommendation 1.1.6: evidence statements 2.1.3, 3.6, 3.10, 3.27; economics report

Recommendation 1.1.7: evidence statements 2.13, 3.6, 3.20; IDE

Recommendation 1.1.8: evidence statement 3.6, 3.7, 3.8, 3.9, 3.10, 3.14, 3.16, 3.22, 3.23, 3.27; economics report; EP1; IDE

Recommendation 1.1.9: evidence statements 2.1.3, 3.6, 3.7, 3.8, 3.9, 3.10, 3.14, 3.16, 3.22, 3.23, 3.27; ER1; economics report; EP1; IDE

Recommendation 1.1.10: evidence statements 2.1.3, 3.6, 3.7, 3.8, 3.9, 3.10, 3.14, 3.16, 3.22, 3.23, 3.27, ER1; economics report; EP1; IDE

Recommendation1.1.11: evidence statements 2.1.3, 3.6, 3.7, 3.8, 3.9, 3.10, 3.14, 3.16, 3.22, 3.23, 3.27; ER1; EP1; IDE

Recommendation 1.1.12: evidence statements 2.1.3, 3.6, 3.7, 3.8, 3.9, 3.10, 3.14, 3.16, 3.22, 3.23, 3.27; ER1; EP1; IDE

Recommendation 1.1.13: EP1; IDE

Recommendation 1.1.14: IDE

Recommendation 1.1.15: IDE

Recommendation 1.1.16: IDE

Recommendation 1.1.17: IDE

Recommendation 1.1.18: IDE

Recommendation 1.1.19: IDE

Recommendation 1.1.20: IDE

Recommendation 1.1.21: IDE

Recommendation 1.1.22: IDE

Supporting information for practitioners: evidence statement 3.18; EP2, EP3, EP4, EP5, EP7; IDE

Implementation

Duty of care: evidence statements 2.1.3, 3.10, 3.16, 3.27; IDE

Early years and education: evidence statements 2.1.1, 2.9.1, 3.12, 3.18, 3.19, 3.21, 3.28, 3.29

Workers: evidence statements 2.8.10, 3.2, 3.22

Residential or day care: IDE

Expert report

Report 1

Expert papers

Expert papers 1–7

Economic modelling

Overall, tailored messages and mass media campaigns were cost effective. Information programmes for schoolchildren, photoageing and text messaging interventions were not cost effective.

Cost-effective estimates for the different interventions were wide ranging. The incremental cost-effectiveness ratio (ICER) of tailored messages was £14,249 per quality of life year gained (QALY).

The mass media campaign is less costly and more effective. The ICERs of information programmes for schoolchildren, photoageing and tailored interventions ranged from £65,945 to £316,968 per QALY gained.

All input values used in the model were subject to a degree of uncertainty. Uncertainties associated with the assumptions made were explored in a range of deterministic sensitivity analyses. The one-way sensitivity analysis revealed that the key drivers of cost-effectiveness were the cost of implementing the intervention and its effectiveness.

The specific scenarios considered and the full results can be found in Economic modelling report 1.

13 Gaps in the evidence

The Public Health Advisory Committee 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 is a lack of good quality evidence on the effectiveness of different approaches to communicating, disseminating and presenting risk information.

(Source: Review 1)

2. There is a lack of good quality evidence on the effectiveness of risk communication among different subpopulations.

(Source: Review 1)

3. There is a lack of evidence on how health and social care practitioners and policy makers should convey messages about the risks and benefits of sunlight exposure, particularly in the UK.

(Source: Review 2)

4. There is a lack of evidence on how messages about the risks and benefits of sunlight exposure can be effectively tailored for different groups. In particular, there is a lack of evidence on tailoring messages for: people who are non-English speaking or whose first language is not English, people from different religious or cultural backgrounds, and people with dark skin, or people who have low or no exposure to the sun.

(Source: Reviews 2 and 3)

5. There is a lack of epidemiological evidence linking sunlight exposure to the incidence of cataracts.

(Source: Economic modelling report 1)

6. There is a lack of evidence on interventions aimed at increasing sun-exposure among groups at risk of low vitamin D status.

(Source: Review 3)

14 Membership of the Public Health Advisory Committee and the NICE project team

Public Health Advisory Committee F

NICE has set up several Public Health Advisory Committees. These standing committees consider the evidence and develop public health guidelines. Membership is multidisciplinary, comprising academics, public health

practitioners, topic experts and members of the public. They may come from the NHS, education, social care, environmental health, local government or the voluntary sector. The following are members of Committee F:

Chair

Catherine Law

Professor of Public Health and Epidemiology, UCL Institute of Child Health

Core members

Stuart Lines

Acting Director of Public Health for the Three Boroughs of Public Health Service, London Borough of Hammersmith & Fulham, Royal Borough of Kensington and Chelsea and Westminster City Council

John Macleod

Professor of Clinical Epidemiology and Primary Care, University of Bristol

David McDaid

Senior Research Fellow in Health Economics and Health Policy, London School of Economics and Political Science

Ann Nevinson

Community Member

Topic members

Janis Baird

Associate Professor of Public Health Medicine, MRC Lifecourse Epidemiology Unit, University of Southampton

John Hawk

Emeritus Professor of Dermatological Photobiology, St John's Institute of Dermatology, King's College London; Honorary Consultant Dermatologist, St John's Institute of Dermatology, Guys and St Thomas' NHS Trust, London.

Eugene Healy

Professor of Dermatology, University of Southampton; Honorary Consultant Dermatologist, University Hospital Southampton NHS Foundation Trust

Gary Lipman

Chairman, The Sunbed Association

Shelley Mason

Community Member

Lesley Rhodes

Professor of Experimental Dermatology, University of Manchester; Consultant Dermatologist, Salford Royal NHS Foundation Hospital

Expert co-optees to the Committee

Rashmi Shukla

Regional Director for the Midlands and East of England, Public Health England

Stephen Sutton

Professor of Behavioural Science, University of Cambridge

Expert testimony to the Committee

John Hawk

Emeritus Professor of Dermatological Photobiology, St John's Institute of Dermatology, King's College London; Honorary Consultant Dermatologist, St John's Institute of Dermatology, Guys and St Thomas' NHS Trust, London.

John Marshall

Professor of Ophthalmology, UCL Institute of Ophthalmology in association with Moorfield's Eye Hospital

Miriam McCarthy

Consultant in Public Health Medicine, Public Health Agency, Northern Ireland

John O'Hagan

Group Leader, Laser and Optical Radiation Dosimetry Group, Public Health England

Lesley Rhodes

Professor of Experimental Dermatology, University of Manchester; Consultant Dermatologist, Salford Royal NHS Foundation Hospital

Stephen Sutton

Professor of Behavioural Science, University of Cambridge

NICE project team

Mike Kelly

CPH Director (until December 2014)

Antony Morgan

Associate Director (until May 2015)

Adrienne Cullum

Technical Lead (from June 2015)

Clare Wohlgemuth

Lead Analyst (until June 2015)

Tracey Shield

Analyst (until June 2015); Lead analyst (from June 2015)

James Jagroo

Analyst (until June 2015)

Pete Shearn

Analyst (until June 2015)

Kim Jeong

Technical Adviser – Health Economics (until June 2015)

Emma Doohan

Project Manager

Rukshana Begum
Coordinator

Sue Jelley
Senior Editor

Susan Burlace
Editor

About this guideline

What does this guideline cover?

The Department of Health (DH) asked the National Institute for Health and Care Excellence (NICE) to produce this guideline on communicating the risks and benefits of sunlight exposure to the general public (see the scope).

This guideline is a partial update of Skin cancer prevention: information, resources and environmental changes NICE guideline PH32 (2011). The recommendations in the final guideline will replace recommendations 1 to 5 in 'Skin cancer prevention: information, resources and environmental changes'.

The recommendations in this guideline focus on the effect of ultraviolet rays in natural sunlight on people's health and wellbeing (as opposed to the effects of visible sunlight). It does not provide detail on vitamin D supplementation, or cover treatments for skin cancer. (See Related NICE guidance for other recommendations that may be relevant to sunlight exposure.)

The absence of any recommendations on interventions that fall within the scope of this guideline is a result of lack of evidence. It should not be taken as a judgement on whether they are cost effective.

Other guidance and policies

The guideline should be implemented alongside other guidance and regulations:

- Equity and excellence: liberating the NHS (Department of Health)

- Healthy lives, healthy people: our strategy for public health in England (Department of Health)
- Improving outcomes: a strategy for cancer (Department of Health)
- Public health outcomes framework for England 2013–2016 (Department of Health)
- Update on vitamin D (Scientific Advisory Committee on Nutrition).

How was this guideline developed?

The recommendations are based on the best available evidence. They were developed by the Public Health Advisory Committee.

Members of the Committee are listed in Membership of the Public Health Advisory Committee and the NICE project team.

For information on how NICE public health guidelines are developed, see the NICE public health guideline process and methods guides.

What evidence is the guideline based on?

The evidence that the Committee considered included:

- Evidence reviews:
  - Review 1: 'Overview of systematic reviews exploring complex risk communication' was carried out by York Health Economics Consortium. The principal authors were: Maria Cikalo, Anita Fitzgerald, Sam Brown, Mary Edwards and Julie Glanville.
  - Review 2: 'Communicating the benefits and risks of ultraviolet light to the general population: effectiveness and cost-effectiveness review' was carried out by York Health Economics Consortium. The principal authors were: Anita Fitzgerald, Maria Cikalo, Anne Lethaby, James Mahon, Robert Hodgson, Sam Brown, Jacoby Patterson, Ashwini Sreekanta, Victoria Burley, Hannah Wood, Mary Edwards and Julie Glanville.
  - Review 3: 'Communicating the benefits and risks of ultraviolet light to the general population: barriers and facilitators review' was carried out by York Health Economics Consortium. The principle authors were: Anita Fitzgerald, Anne Morgan, Maria Cikalo, Anne Lethaby, Sam Brown,

Jacoby Patterson, Ashwini Sreekanta, Victoria Burley, Hannah Wood, Mary Edwards and Julie Glanville.

- Review of economic evaluations: see review 2 above.
- Economic modelling report 1 ‘Communicating the benefits and risks of ultraviolet light to the general population: cost effectiveness model technical report’ was carried out by York Health Economics Consortium. The principal authors were: Robert Hodgson, Isobel Carpenter, Michelle Jenks, Sarah Dickinson and Matthew Taylor.
- Primary research and commissioned reports:
  - Report 1 'Communicating the benefits and risks of ultraviolet light to the general population: a qualitative documentary analysis of UK newspapers and magazines (print and online)’ was carried out by York Health Economics Consortium. The principal authors were: Nicola Moran, Bryony Beresford, Hannah Wood and Julie Glanville.
- Expert papers
  - 1 'Key topics in risk communication’ by Stephen Sutton
  - 2 ‘The Independent Advisory Group on Non-ionising Radiation (AGNIR)’ by John O’Hagan
  - 3 ‘Ultraviolet radiation and the eye’ by John Marshall
  - 4 ‘Achieving adequate sun protection with adequate vitamin D status’ by John Hawk
  - 5 ‘Sunlight and vitamin D’ by Lesley Rhodes
  - 6 ‘Northern Ireland Skin Cancer Prevention Strategy and Action Plan 2011–2021’ by Miriam McCarthy.
  - 7 ‘Overview of sunlight exposure messages’ compiled by NICE

Note: the views expressed in the externally produced expert papers above are the views of the authors and not those of NICE.

In some cases the evidence was insufficient and the Committee has made recommendations for future research. For the research recommendations and gaps in research, see Recommendations for research and Gaps in the evidence.

Status of this guideline

This is a draft guideline. The recommendations made in section 1 are provisional and may change after consultation with stakeholders.

This document does not include all sections that will appear in the final guideline. The stages NICE will follow after consultation are summarised below.

- The Committee will consider the comments, reports and any additional evidence that has been submitted.
- The Committee will produce a second draft of the guideline.
- The draft guideline will be signed off by the NICE Guidance Executive.

The key dates are:

- Closing date for comments: 6 August 2015.

The guideline will replace recommendations 1 to 5 in the NICE guideline on skin cancer prevention. (For further details, see Related NICE guidance).

The recommendations should be read in conjunction with existing NICE guidance unless explicitly stated otherwise. They should be implemented in light of duties set out in the Equality Act 2010.

NICE produces guidance, standards and information on commissioning and providing high-quality healthcare, social care, and public health services. We have agreements to provide certain NICE services to Wales, Scotland and Northern Ireland. Decisions on how NICE guidance and other products apply in those countries are made by ministers in the Welsh government, Scottish government, and Northern Ireland Executive. NICE guidance or other products may include references to organisations or people responsible for commissioning or providing care that may be relevant only to England.

Implementation

NICE guidelines can help:

- Commissioners and providers of NHS services to meet the requirements of the NHS outcomes framework 2013–14. This includes helping them to deliver against domain 1: preventing people from dying prematurely.
- Local health and wellbeing boards to meet the requirements of the Health and Social Care Act (2012) and the Public health outcomes framework for England 2013–16.
- Local authorities, NHS services and local organisations determine how to improve health outcomes and reduce health inequalities during the joint strategic needs assessment process.

NICE will develop tools to help organisations put this guideline into practice. Details will be available on our website after the guideline has been issued.

Updating the recommendations

This section will be completed in the final document.