NICE Centre for Public Health Excellence

Sun protection resources and changes to the environment to prevent skin cancer: qualitative evidence review

Final Report

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Declaration of authors' competing interests

No authors have competing interests.

Contents

1.0 Executive summary

1.1 Introduction

This report presents the findings of a systematic review of qualitative evidence concerning the prevention of skin cancer, with particular reference to the following intervention types: the provision of sun protection resources; changes to the physical environment; and multi-component interventions.

The primary research question for the review was:

- 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; and
  - multi-component interventions.

The secondary questions included the following:

- What are the views of people who may use prevention services?
- What are the views of service providers?
- How do these views differ by population characteristics (e.g. age, ethnicity)?
- What environmental, social or cultural factors may prevent or support the uptake or effective use of sun protection resources or use of physical environmental changes made to help prevent skin cancer?
- To what extent are such interventions available and accessible to different groups in the population?

1.2 Methods

To locate evidence, a range of databases and websites indexing relevant literature were searched. Study reports were included if they:

- addressed the primary prevention of skin cancer due to UV exposure, or views relating to skin cancer, sunbathing or tanning;
- presented qualitative research;
- were published in 1990 or later;
- were published in English;
- presented views relating to resource provision, environmental change or multi-component interventions;
- were conducted in an OECD country.

The quality of included studies was assessed, and data were extracted, using the standard tools for NICE public health evidence reviews. Study findings were synthesised thematically using a framework based on the Health Belief Model.

1.3 Findings

Twenty-three study reports, referring to 22 distinct studies, were included in the review. Of these, six came from the UK. The findings of the studies are summarised in the evidence statements below, with the overall quality rating for each study: (++), high quality; (+), medium quality; or (-), low quality.

Evidence statement: perceived susceptibility
ER 5.1 Two studies 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 (Gerbert et al. 1996 [++]; Hay et al. 2009 [++]). ER 5.2 Five studies report that the risk of skin cancer is not appreciated or is seen as not of immediate concern (CRUK n.d.b (*SunSmart*) [-]; Curtis and Pollock 2009 [-]; Gerbert et al. 1996 [++]; Gillespie et al. 1993 [-]; Glanz et al. 1999 [++]). 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. ER 5.3 One study reports that fathers thought that children had a greater risk of developing skin cancer than adults because their skin is more “delicate” (CRUK n.d.c (*Outoor workers*) [-]). ER 5.4 Three studies of adult participants 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 (Calder and Aitken 2008 [++]; CRUK n.d.c (*Outdoor workers*) [-]; Murray and Turner 2004 [+]). ER 5.5 One US study discusses the communication of risks within families where a member has had an experience of skin cancer, finding that people diagnosed with cancer usually discussed risk with their families, and that women took a leading role in communication (Hay et al. 2009 [++]). ER 5.6 Five studies of young people and adults report the belief that sun exposure provides “resistance” to skin damage, burning or cancer in the future (CRUK n.d.c (*Outdoor workers*) [-]; Glanz et al. 1999 [++]; Parrott et al. 1996 [+]; Murray and Turner 2004 [+]; Shoveller et al. 2003 [++]). In particular, outdoor workers reported such beliefs in two studies (CRUK n.d.c (*Outdoor workers*) [-]; Parrott et al. 1996 [+]), and parents in one (Glanz et al. 1999 [++]). ER 5.7 Three studies identify other factors that affect perceived susceptibility to skin cancer. Two studies report the perception that a darker skin colour decreased risk level (CRUK n.d.c *(Outdoor workers)* [-]; Gillespie et al. 1993 [-]). One study finds that participants of higher socioeconomic status were more aware of the risks (CRUK n.d.a (*Sunburn*) [-]). *Applicability* Eight of twelve studies that reported data on perceived susceptibility to skin cancer or skin

damage were from countries other than the UK. Most of the factors identified did not appear to vary substantially between countries. However, it is possible that people in the UK may have lower perceived susceptibility than elsewhere because of differences in climate (see Evidence Statement 14).

Evidence statement: perceived severity

ER 5.8 Perceived severity of skin cancer was low in seven studies across a wide range of age groups (aged 6 years to over 60 years): Calder and Aitken 2008 [++]; Gerbert et al. 1996 [++]; Gillespie et al. 1993 [-]; Glanz et al. 1999 [++]; Murray and Turner 2004 [+]; Parrott et al. 1996 [+]; Paul et al. 2008 [++]). In three studies participants thought that skin cancer was easy to treat (Calder and Aitken 2008 [++]; Glanz et al. 1999 [++]; Paul et al. 2008 [++]). 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 (Glanz et al. 1999 [++]). A study of farmers in the USA finds that they did not see skin cancer affecting their day-to-day work (Parrott et al. 1996 [+]).

ER 5.9 Seven studies report that skin aging was seen as a serious consequence of sun exposure (Abroms et al. 2003 [+]; Clarke and Korotchenko 2009 [+]; Gerbert et al. 1996 [++]; Gillespie et al. 1993 [-]; Lupton and Gaffney 1996 [++]; Murray and Turner 2004 [+]; Paul et al. 2008 [++]). Two studies find that skin aging is perceived as a more serious consequence of sun exposure than is skin cancer (Gerbert et al. 1996 [++]; Murray and Turner 2004 [+]). Four studies report that skin aging is seen as a more serious consequence by women than it is by men (Abroms et al. 2003 [+]; Lupton and Gaffney 1996 [++]; Murray and Turner 2004 [+]; Paul et al. 2008 [++]).

Applicability

Only one study in this group (Murray and Turner 2004 [+]) was conducted in the UK. All other studies were conducted in the USA, New Zealand or Australia. It is possible that knowledge about the severity of skin cancer may be greater in the latter countries than the UK due to previous information campaigns.

Evidence statement: perceived benefits of sun protection

ER 5.10 Participants in most studies used sun protection, principally sunscreen, in order to offset the perceived risks of sun exposure including skin cancer (Abroms et al. 2003 [+]; Clarke and Korotchenko 2009 [+]; Hay et al. 2009 [++]; Paul et al. 2008 [++]) and skin aging (Abroms et al. 2003 [+]; Clarke and Korotchenko 2009 [+]; Paul et al. 2008 [++]). Avoiding sunburn and the sun's heat and glare were mentioned as a benefit of sun protection in three studies (Abroms et al. 2003 [+]; Gillespie et al. 1993 [-]; Paul et al. 2008 [++]).

ER 5.11 Participants in two studies said that using sun protection enabled them to stay in the sun for longer when playing sports (Abroms et al. 2003 [+]) or at the beach (Paul et al. 2008 [++]).

ER 5.12 Two studies of parents and school staff stated the benefits of promoting sun protection

to young people to help them acquire positive long-term habits (Collins et al. 2006 [-]; Glanz et al. 1999 [++]).

Applicability
None of the studies in this section were conducted in the UK or Europe. Hence, it is unclear to what extent findings about the perceived benefits of sun protection may be applicable in the UK context.

Evidence statement: Perceived barriers - positive perceptions of a tanned appearance
ER 5.13 Twelve studies report positive perceptions of a tanned appearance, i.e. that a tanned appearance is perceived as attractive (Calder and Aitken 2008 [++]; Clarke and Korotchenko 2009 [+]; Curtis and Pollock 2009 [-]; Lupton and Gaffney 1996 [++]; Gerbert et al. 1996 [++]; Gillespie et al. 1993 [-]; Grey 1998 [-]; Murray and Turner 2004 [+]; Paul et al. 2008 [++]; Reeder et al. 2000 [+]; Shoveller et al. 2003 [++]; Young et al. 2005 [++]). Two studies report that a tanned appearance increases confidence and self-esteem (Gerbert et al. 1996 [++]; Murray and Turner 2004 [+]). ER 5.14 Three studies report that the degree of tan colour was important in shaping perceptions of tanned appearance, with a deep tan not necessarily seen as desirable (Clarke and Korotchenko 2009 [+]; Lupton and Gaffney 1996 [++]; Shoveller et al. 2003 [++]). ER 5.15 Nine studies find that a tanned appearance is seen as healthy (Calder and Aitken 2008 [++]; Clarke and Korotchenko 2009 [+]; Curtis and Pollock 2009 [-]; Gerbert et al. 1996 [++]; Grey 2008 [-]; Lupton and Gaffney 1996 [++]; Murray and Turner 2004 [+]; Shoveller et al. 2003 [++]; Young et al. 2005 [++]). Of these, three studies note that a tanned appearance indicates an active, outdoors lifestyle (Calder and Aitken 2008 [++]; Lupton and Gaffney 1996 [++]; Shoveller et al. 2003 [++]). *Applicability* Although only two studies reporting a positive perception of a tanned appearance were conducted in the UK (Curtis and Pollock 2009 [-]; Murray and Turner 2004 [+]), these perceptions appear to be consistent across countries.

Evidence statement: Perceived barriers - perceived health benefits of sun exposure
ER 5.16 Three studies report the belief that ultraviolet exposure is beneficial because it provides vitamin D (Clarke and Korotchenko 2009 [+]; Gerbert et al. 1996 [++]; Murray and Turner 2004 [+]). ER 5.17 Two studies report that sun exposure is believed to protect against future skin damage or cancer by increasing “resistance” (Glanz et al. 1999 [++]; Parrott et al. 1996 [+]). ER 5.18 Three study reports discuss the perception that outdoor activities which involve sun exposure are healthier than indoor activities, both among adults (Bergenmar and Brandberg

2001 [++]; Gerbert et al. 1996 [++]) and children (Gillespie et al. 1993 [-]). One study finds this perception to be linked to the freedom to play actively for children (Gillespie et al. 1993 [-]).

Applicability
Only one of the studies in this group was conducted in the UK (Murray and Turner 2004 [+]). It is unclear whether perceptions of the health benefits of sun exposure are generalisable between countries.

Evidence statement: Perceived barriers - routes to tanning

ER 5.19 Participants in three studies distinguished deliberate from incidental tanning, and expressed the belief that incidental tanning was less dangerous or less likely to require protection (Bergenmar and Brandberg 2001 [++]; Lupton and Gaffney 1996 [++]; Shoveller et al. 2003 [++]).

ER 5.20 One study finds that participants preferred to see themselves as tanning incidentally, rather than deliberately (Bergenmar and Brandberg 2001 [++]). This may be because deliberate tanning has 'unhealthy' connotations but incidental tanning from outdoor activities does not.

ER 5.21 Three studies compared sunbed use to sun exposure. Most of the participants in these studies believed that sunbeds were more dangerous than sun exposure (Clarke and Korotchenko 2009 [+]; Murray and Turner 2004 [+]; Shoveller et al. 2003 [+]).

Applicability
Most of the findings in this section come from studies conducted outside the UK. Because of climatic differences, findings regarding incidental tanning may not be readily applicable to the UK context.

Evidence statemenT: Perceived barriers - social barriers

ER 5.22 Six studies identify the unfashionable or unattractive appearance of protective clothing as a barrier to their use among children and young people (aged 6-20: Calder and Aitken 2008 [++]; Gillespie et al. 2003 [-]; Glanz et al. 1999 [++]; Lupton and Gaffney 1996 [++]; Paul et al. 2008 [++]; Shoveller et al. 2003 [++]). Two studies find that protective clothing, such as hats, would be more acceptable if they were fashionable and attractive (Gillespie et al. 2003 [-]; Lupton and Gaffney 1996 [++]).

ER 5.23 Three studies find that young adult and adult participants see sun protection behaviour as not strongly supported by social norms within their communities (Abroms et al. 2003 [+]; Glanz et al. 1999 [++]; Parrott et al. 1996 [+]).

ER 5.24 Five studies describe a strong association between sunscreen use and particular contexts, such as the beach and being on holiday (Abroms et al. 2003 [+]; CRUK n.d.c (*Outdoor workers*) [-]; Gillespie et al. 1993 [-]; Glanz et al. 1999 [++]; Parrott et al. 1996 [+]).

ER 5.25 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 (Paul et al. 2008 [++]).

ER 5.26 One study finds that men see sunscreen use as unmasculine (Abroms et al. 2003 [+]).

Applicability
Most studies in this section were carried out outside the UK, and it is unclear to what extent the findings are generalisable. However, there is no specific reason to think that the social barriers identified are not applicable to the UK.

Evidence statement: Perceived barriers - practical barriers

ER 5.27 Ten study reports described the inconvenience of sun protection resources as barriers to their use (Abroms et al. 2003 [+]; CRUK n.d.c (*Outdoor workers*) [-]; Curtis and Pollock 2009 [-]; Geller et al. 2008 [++]; Gerbert et al. 1996 [++]; Gillespie et al. 1993 [-]; Glanz et al. 1999 [++]; Parrott et al. 1996 [+]; Paul et al. 2008 [++]; Reeder et al. 2000 [+]). The particular issues which contribute to the perception of inconvenience are: the need to carry and remember sun protection resources (three studies: Abroms et al. 2003 [+]; Gillespie et al. 1993 [-]; Paul et al. 2008 [++]); the 'messiness' of sunscreen (six studies: Abroms et al. 2003 [+]; CRUK n.d.c (*Outdoor workers*) [-]; Curtis and Pollock 2009 [-]; Gerbert et al. 1996 [++]; Parrott et al. 1996 [+]; Reeder et al. 2000 [+]); the awkwardness of hats and sunglasses which may fall off or interfere with activities (three studies: Glanz et al. 1999 [++]; Parrott et al. 1996 [+]; Paul et al. 2008 [++]); and the inconvenience of making use of shade structures by children and young people (one study: Gillespie et al. 1993 [-]).

ER 5.28 Four study reports describe physical discomfort as a barrier to the use of protective clothing (Gillespie et al. 1993 [-]; Glanz et al. 1999 [++]; Parrott et al. 1996 [+]; Paul et al. 2008 [++]).

ER 5.29 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 (Geller et al. 2008 [++]).

ER 5.30 Six study reports said that the cost of sun protection resources was a barrier to their use (Abroms et al. 1999 [+]; Collins et al. 2006 [-]; Geller et al. 2008 [++]; Glanz et al. 1999 [++]; Paul et al. 2008 [++]; Reeder et al. 2000 [+]). 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-SES schools (Collins et al. 2006 [-]), and one the cost of installing shade structures in schools (Geller et al. 2008 [++]). However, one study that focused on farmers in the USA said that cost was not a barrier (Parrott et al. 1996 [+]).

ER 5.31 Other practical barriers to sun protection are: children being uncooperative with the application of sunscreen (two studies: Glanz et al. 1999 [++]; Reeder et al. 2000 [+]); the

perceived ineffectiveness of sunscreen in stopping burning (one study: Abroms et al. 2003 [+]); and the perception of adverse health consequences of sunscreen use such as acne (two studies: Abroms et al. 2003 [+]; Lupton and Gaffney 1996 [++]), allergic reactions (one study: Geller et al. 2008 [++]), and potential long-term toxicity (two studies: Gerbert et al. 1996 [++]; Reeder et al. 2000 [+]).

Applicability
Most studies in this section were carried out outside the UK, and it is unclear to what extent the findings are generalisable. However, there is no specific reason to think that the social barriers identified are not applicable to the UK.

Evidence statement: Perceived barriers - institutional barriers
ER 5.32 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 (Geller et al. 2008 [++]). ER 5.33 Two studies find that some school staff felt that sun protection was not a high-priority issue, because of the limited time children spent outdoors (Geller et al. 2008 [++]; Collins et al. 2006 [-]). Participants in one study felt that sun protection detracted from teaching (Collins et al. 2006 [-]) and in one other study, school staff said they felt overwhelmed with policies and initiatives on a wide range of issues (Geller et al. 2008 [++]). ER 5.34 Effective communication with parents was identified as a potential barrier in one study (Geller et al. 2008 [++]). The cost to parents was also mentioned as a concern relating to compulsory hat regulations in one study (Collins et al. 2006 [-]). *Applicability* The two studies (Collins et al. 2006 [-]; Geller et al. 2008 [++]) described in this section were conducted in New Zealand and the USA respectively. Due to differences in school governance and funding systems between countries, the findings may not be readily applicable to the UK.

Evidence statement: Cues to action - sources of positive influence
ER 5.35 Six studies, most in school settings, find that children aged 6-8 years (Glanz et al. 1999 [++]), young people aged 12-17 years (Paul et al. 2008 [++]; Shoveller et al. 2003 [++]; Young et al. 2005 [++]; Gillespie et al. 1993 [-]), and young adults aged 18-25 years (Abroms et al. 2003 [+]) 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 (Clarke and Korotchenko 2009 [+]). Other adults, such as teachers and lifeguards, were identified as sources of positive encouragement for children aged 6-8 years (Glanz et al. 1999 [++]) and young people aged 8-17 years (Gillespie et al. 1993 [-]; Paul et al. 2008 [++]) to adopt sun protective behaviours.

ER 5.36 Seven study reports find 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 (Glanz et al. 1999 [++]). Five studies find 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, while older young people are more likely to be influenced by their peers (CRUK n.d.a (*Sunburn*) [-]; Gillespie et al. 1993 [-]; Lupton and Gaffney 1996 [++]; Shoveller et al. 2003 [++]; Young et al. 2005 [++]). 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 one study found that older young people (aged 16-17 years) felt themselves to be more receptive to health messages than younger children (Paul et al. 2008 [++]).

ER 5.37 One US study which interviewed recreation staff finds that they felt that they had not been an effective source of encouragement to encourage positive sun protective behaviour such as wearing clothes or applying sunscreen (Glanz et al. 1999 [++]. Another study of farmers in the USA notes that doctors rarely acted as a source of encouragement for positive sun protection behaviour (Parrott et al. 1996 [+]).

Applicability
Most of the studies in this section were not conducted in the UK. However, findings regarding sources of influence appear to be consistent across countries, and there are no specific reasons to think that these findings may not be generalisable to the UK context.

Evidence statement: Cues to action - knowing people that have had skin cancer
ER 5.38 Adults and young people in five study reports stated that knowing someone with skin cancer may act as a cue to adopt sun protection behaviours in general (Calder and Aitken 2008 [++]; Gerbert et al. 1996 [++]; Gillespie et al. 1993 [-]; Hay et al. 2009 [++]; Paul et al. 2008 [++]). *Applicability* None of the studies in this section were conducted in the UK. It is unclear to what extent the findings may be generalisable to the UK context.

Evidence statement: Cues to action - policies in schools and leisure facilities
ER 5.39 Two studies from New Zealand and the US find 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 (Collins et al. 2006 [-]; Geller et al. 2008 [++]). 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 (Paul et al. 2008 [++]).

ER 5.40 One study reports that the scheduling of outdoor school activities such as lunch breaks and sports events, typically at hotter times of day, is outside the control of students (Gillespie et al. 1993 [-]).

ER 5.41 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 (Escoffery et al. 2008 [++])

ER 5.42 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 (Glanz et al. 1999 [++]).

ER 5.43 Participants in one study suggested the use of venues such as community centres to diffuse sun protection messages beyond schools to facilitate better sun protection practices. Potential barriers to positive outcomes at community venues included low attendance and perceived low priority of skin cancer as a health subject. (Geller et al. 2008 [++]).

Applicability
None of the studies included in this section were from the UK. Since policies and forms of governance in schools and other institutions may vary between countries, the findings may not be readily applicable to the UK context.

Evidence statement: Cues to action - media messages
ER 5.44 Three study reports , of young adults (18 to 25 years) and adults discuss the influence of the media on individuals' behaviour (Abroms et al. 2003 [+]; Gerbert et al. 1996 [++]; Gillespie et al. 1993 [-]). All of these studies show the belief that representations in the media may have an adverse effect on sun protection behaviours. *Applicability* None of the studies in this section are from the UK. However, it is likely that media messages are similar across countries.

Evidence statement: Cues to action - specific triggers of sun protection behaviour
ER 5.45 Three study reports, from the USA and Australia, show people of all age ranges to be more likely to use sun protection in general in summer and in sunny weather (Gerbert et al. 1996 [++]; Gillespie et al. 1993 [-]; Glanz et al. 1999 [++]). ER 5.46Two study reports from the UK, one of male outdoor workers (aged 20-50 years) and the other of young women (aged 12-15 years), report the belief that sun protection measures are not required in the UK due to the lack of hot, sunny weather (CRUK n.d.c (*Outdoor workers*) [-]; Curtis and Pollock 2009 [-]).

ER 5.47 Two study reports describe adults (aged 16-54 years) putting on a T-shirt or applying sunscreen only after beginning to burn (Bergenmar and Brandberg 2001 [++]; Grey 2008 [-]).

Applicability
Studies from the UK indicate a particular perception that the weather in the UK does not call for sun protection. Other findings from non-UK studies are also likely to be applicable to the UK context.

Evidence statement: barriers and facilitators – resource provision

ER 5.48 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 (Abroms et al. 2003 [+]; Glanz et al. 1999 [++]; Paul et al. 2008 [++]; Reeder et al. 2000 [+]), and the inconvenience of remembering to carry sunscreen (Abroms et al. 2003 [+]; Gillespie et al. 1993 [-]) or protective clothing (Paul et al. 2008 [++]). These barriers appear to be particularly relevant for children and young people (aged 8 to 25 years).

ER 5.49 Two studies present process data on multi-component interventions with a resource provision component, including sunscreen and clothing provision as well as environmental change and information (Collins et al. 2006 [-]; Escoffery et al. 2008 [++]). Both these studies find that resource provision is feasible and acceptable for service providers in these settings, and that there is substantial uptake of resource provision. Potential barriers include the fact that not all staff who are involved in delivering interventions see sun protection as a high priority (Collins et al. 2006 [-]).

ER 5.50 Two studies investigate service providers' views towards potential resource provision interventions, finding that school staff (Geller et al. 2008 [++]) and leisure staff (Glanz et al. 1999 [++]) 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.

ER 5.51 A wide range of other barriers are identified in the studies. These include physical discomfort (Gillespie et al. 1993 [-]; Glanz et al. 1999 [++]; Parrott et al. 1996 [+]; Paul et al. 2008 [++]), inconvenience of use (Abroms et al. 2003 [+]; CRUK n.d.c (*Outdoor workers*) [-]; Curtis and Pollock 2009 [-]; Geller et al. 2008 [++]; Gerbert et al. 1996 [++]; Gillespie et al. 1993 [-]; Glanz et al. 1999 [++]; Parrott et al. 1996 [+]; Paul et al. 2008 [++]; Reeder et al. 2000 [+]) and social barriers including appearance and prevailing norms (Abroms et al. 2003 [+]; Calder and Aitken 2008 [++]; Gillespie et al. 2003 [-]; Glanz et al. 1999 [++]; Lupton and Gaffney 1996 [++]; Parrott et al. 1996 [+]; Paul et al. 2008 [++]; Shoveller et al. 2003 [++]). Not all resources are acceptable to all targeted populations.

Applicability
Most of the studies cited here were not conducted in the UK. It is possible that barriers to the implementation and uptake of interventions will be greater in the UK than elsewhere, due to

service providers and targeted populations having less awareness of sun protection.

Evidence statement: barriers and facilitators – environmental change
ER 5.52 One study looks at multi-component interventions in schools including the provision of environmental shade, finding that such interventions are practicable and acceptable (Collins et al. 2006 [-]). These interventions formed part of broader programmes which also included resource provision, regulatory and scheduling changes, and education. ER 5.53 One study finds that using environmental shade may reduce the spontaneity of outdoor activities, especially for younger children (Gillespie et al. 1993 [-]). One study finds that school authorities see the cost of providing environmental shade as a barrier (Geller et al. 2008 [++]). *Applicability* None of the studies cited here were conducted in the UK. It is unclear to what extent findings relating to environmental change may be applicable to the UK context.

Evidence statement: barriers and facilitators – multi-component interventions
ER 5.54 Five studies find that people do not think skin cancer is a serious risk, and that awareness of the risks of sun exposure is generally low (CRUK n.d.b (*SunSmart*) [-]; Curtis and Pollock 2009 [-]; Gerbert et al. 1996 [++]; Gillespie et al. 1993 [-]; Glanz et al. 1999 [++]); this perception could be addressed by multi-component interventions. ER 5.55 Seven studies identify appearance (the risk of skin aging, moles, wrinkles, or visible sunburn) as a potential motivation for sun protection behaviour (Abroms et al. 2003 [+]; Clarke and Korotchenko 2009 [+]; Gerbert et al. 1996 [++]; Gillespie et al. 1993 [-]; Lupton and Gaffney 1996 [++]; Murray and Turner 2004 [+]; Paul et al. 2008 [++]). This motivation could be addressed by sun protection messages as part of multi-component interventions. ER 5.56 Three studies find that incidental tanning is perceived to be less risky than deliberate tanning (Bergenmar and Brandberg 2001 [++]; Lupton and Gaffney 1996 [++]; Shoveller et al. 2003 [++]).Six studies find that sun exposure, or a tanned appearance, are associated with a healthy, active lifestyle (Bergenmar and Brandberg 2001 [++]; Gerbert et al. 1996 [++]; Gillespie et al. 1993 [-]; Calder and Aitken 2008 [++]; Lupton and Gaffney 1996 [++]; Shoveller et al. 2003 [++]). These perceptions may have implications for the design of interventions. *Applicability* Most of the studies cited here were not conducted in the UK. It is possible that barriers to the implementation and uptake of interventions will be greater in the UK than elsewhere, due to service providers and targeted populations having less experience of sun protection interventions, and less awareness of sun protection.

Evidence statement: views of people who may use prevention services
ER 5.57 Five studies find that people do not think skin cancer is a serious risk (CRUK n.d.b

(*SunSmart*) [-]; Curtis and Pollock 2009 [-]; Gerbert et al. 1996 [++]; Gillespie et al. 1993 [-]; Glanz et al. 1999 [++]). Twelve studies find that a tanned appearance is considered attractive (Calder and Aitken 2008 [++]; Clarke and Korotchenko 2009 [+]; Curtis and Pollock 2009 [-]; Lupton and Gaffney 1996 [++]; Gerbert et al. 1996 [++]; Gillespie et al. 1993 [-]; Grey 1998 [-]; Murray and Turner 2004 [+]; Paul et al. 2008 [++]; Reeder et al. 2000 [+]; Shoveller et al. 2003 [++]; Young et al. 2005 [++]).

ER 5.58 Three studies find that incidental tanning is perceived as less risky than deliberate tanning (Bergenmar and Brandberg 2001 [++]; Lupton and Gaffney 1996 [++]; Shoveller et al. 2003 [++]). The use of protection is associated with deliberate tanning, such as at the beach, in three further studies (Abroms et al. 2003 [+]; Glanz et al. 1999 [++]; Parrott et al. 1996 [+]). This suggests that sun protection is seen as less salient where sun exposure is incidental and not deliberate. Two studies indicate that this may be particularly true for men (Abroms et al. 2003 [+]; Lupton and Gaffney 1996 [++]).

Applicability
Most of the studies cited here were not conducted in the UK. However, the findings appear to be consistent across countries.

Evidence statement: views of service providers

ER 5.59 Three studies find that service providers, including school staff (Collins et al. 2006 [-]; Geller et al. 2008 [++]) and leisure staff (Glanz et al. 1999 [++]), have positive attitudes towards resource provision and environmental change interventions. However, two studies report concerns about the potential extension to their responsibilities (Geller et al. 2008 [++]; Glanz et al. 1999 [++]), and one study raises the prospect of an overload of policies and recommendations (Geller et al. 2008 [++]).

Applicability
None of the studies cited here were conducted in the UK. There may be differences between countries in the organisational context of service delivery, which may create barriers to the applicability of these findings to the UK context.

Evidence statement: Differences by population - gender

ES 5.60 Two studies find that men were found to be less likely than women to deliberately sunbathe, but also less likely to use sun protection (Abroms et al. 2003 [+]; CRUK n.d.a (*Sunburn*) [-]). Three studies report the perception that sunbathing (Lupton and Gaffney 1996 [++]) or sunbed use (Calder and Aitken 2008 [++]; CRUK n.d.c (*Outdoor workers*) [-]) are unmasculine.

ER 5.61 Three studies find that women, especially mothers, tend to take the lead role in promoting sun protection behaviours within the family (Abroms et al. 2003 [+]; Hay et al. 2009 [++]; Paul et al. 2008 [++]).

ER 5.62 Four studies find that women were more concerned than men about how the sun affects their appearance, both negatively (skin aging and wrinkles) and positively (tanned appearance) (Abroms et al. 2003 [+]; Lupton and Gaffney 1996 [++]; Murray and Turner 2004 [+]; Paul et al. 2008 [++]).

Applicability
Most of the studies cited in this section were not conducted in the UK. However, the findings appear to be consistent across countries.

Evidence statement: Differences by population – age

ER 5.61 Seven studies find that young children are more likely to be influenced by parents, particularly mothers and school staff (Abroms et al. 2003 [+]; Clarke and Korotchenko 2009 [+]; Gillespie et al. 1993 [-]; Glanz et al. 1999 [++]; Paul et al. 2008 [++]; Shoveller et al. 2003 [++]; Young et al. 2005 [++]).

ER 5.62 Four studies find that adolescents are less likely to be influenced by authority figures and adults and may assert their independence by not following sun protection messages (CRUK n.d.a (*Sunburn*) [-]; Lupton and Gaffney 1996 [++]; Shoveller et al. 2003 [++]; Young et al. 2005 [++]). One study finds that adolescents see sun protection as primarily concerning younger children (Paul et al. 2008 [++]).

ER 5.63 Four studies find that parents of young children are more receptive than the general population to sun protection messages (CRUK n.d.a (*Sunburn*) [-]; CRUK n.d.c (*Outdoor workers*) [-]; Glanz et al. 1999 [++]; Reeder et al. 2000 [+]). However, three studies find 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 (CRUK n.d.c (*Outdoor workers*) [-]; Grey 2008 [-]; Paul et al. 2008 [++]).

Applicability
Most of the studies cited in this section were not conducted in the UK. However, the findings appear to be consistent across countries.

Evidence statement: Differences by population – socioeconomic status and occupation

ER 5.64 One UK study finds that people from higher-SES groups were more aware of long-term health risks from sun exposure than those from lower-SES groups (CRUK n.d.a (*Sunburn*) [-]).

ER 5.65 Two studies focus on the views of outdoor workers (CRUK n.d.c (*Outdoor workers*) [-]; Parrott et al. 1996 [+]). Both these studies find that outdoor workers do not feel that sun protection is a priority, and that they have little awareness of the risks of sun exposure.

Applicability
Two of the three studies in this section come from the UK, and the findings of the other (from the USA) are consistent with the UK research. Hence, findings are applicable to the UK context.

1.4 Discussion

1.4.1 Evidence gaps

A number of gaps were found in the available qualitative evidence, including:

- a lack of data of direct relevance to interventions;
- a limited number of studies, particularly high-quality studies, conducted in the UK;
- a lack of data on the determinants of different sun protection behaviours; and
- limited data on the differences between ethnic or socioeconomic groups.

1.4.2 Conclusions

Resource provision, environmental change and multi-component interventions to prevent skin cancer may benefit from taking the public's and other stakeholders' views into account. The findings of this review suggest a number of barriers which could usefully be addressed by interventions, including the cost and inconvenience of sun protection resources, and social norms concerning their use.

However, especially in the UK, most people are not concerned about skin cancer, and often do not see their own UV exposure as risky. There are some exceptions, particularly parents of young children, who appear to be more receptive to sun protection interventions than other groups. Concerns about appearance and visible skin damage may be as important a facilitator for sun protection as the risk of cancer. Men are consistently less concerned than women about sun exposure risk, and less aware of the need for protection. Some data indicate that people from lower-SES groups, and people who work outdoors, are less concerned than others. These perceptions may create a barrier to the uptake and successful implementation of sun protection interventions.

In addition, the perception of a tanned appearance as attractive and healthy is strongly held across a wide range of populations. Other potential barriers to intervention uptake include concerns about the practicality of sun protection, and the ease of use of sun protection resources. Social norms about sun protection and sun exposure, and concerns about maintaining an attractive or fashionable appearance, are also salient, particularly for young people and young adults (teens to early twenties).

These findings indicate that uptake of interventions may face a range of barriers in particular populations and settings. In particular, the acceptability of resource provision interventions may depend on the specific characteristics of the resources offered. For example, protective clothing which is seen to be unattractive may be rejected. Careful targeting of interventions to particular settings and populations may be required to overcome these barriers. Nonetheless, to the extent that they are aware of the risks, many people appear to be willing to make changes in behaviour, and are supportive of sun protection interventions.

In institutions such as schools, potential barriers include a lack of funding, unclear definitions of responsibility, and an overload of policies and recommendations. Again, however, potential service providers, such as teachers and other school staff, and staff at leisure facilities, are generally optimistic about their own role in promoting sun protection behaviour.

While the risks involved in deliberate tanning, particularly sunbed use, are widely recognised, there is less awareness of the dangers of incidental sun exposure. Outdoor activities, particularly physical activities, are seen as healthy, and the risks involved in sun exposure during such activities are often not considered. The perception of a tanned appearance as healthy and attractive also appears to owe something to the connotation of an active lifestyle. These views may have implications for the design and targeting of interventions.

The data included in this review indicate that there is substantial scope for resource provision and multi-component interventions to impact on sun protection behaviour. The picture regarding environmental change alone is less clear, although there are some promising indications that such interventions may be valuable, particularly as part of holistic strategies in particular contexts.

2.0 Aims and background

2.1 Objectives and rationale

This review is intended to inform the development of NICE guidance on public information, sun protection resources and changes to the environment for the prevention of skin cancer. A series of evidence reviews and reports are being produced in two phases to inform the development of this guidance. This review forms one component of phase 2 of the research for this guidance (phase 2 also includes a review of effectiveness and cost-effectiveness of interventions, and economic modelling). Phase 1 investigated the provision of public information and education, while phase 2 focuses on resource provision, environmental change and multi-component interventions.

This report systematically reviews and synthesises relevant qualitative research to inform this topic.

2.2 Research questions

The primary research question for the review was:

- 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); and
  - multi-component interventions.

The following secondary research questions were also developed to interrogate the data further, to the extent that relevant data were available:

- What are the views of people who may use prevention services?
- What are the views of service providers?
- How do these views differ by population characteristics (e.g. age, ethnicity)?
- What environmental, social or cultural factors may prevent or support the uptake or effective use of sun protection resources or use of physical environmental changes made to help prevent skin cancer? (For example, these factors might include people's perceptions of the risks and benefits of UV exposure, including knowledge that exposure to the sun is a source of vitamin D.)
- To what extent are such interventions available and accessible to different groups in the population?

3.0 Methods

The review was conducted in accordance with the second edition of *Methods for the development of NICE public health guidance* (NICE 2009).

3.1 Searching

The following database sources were searched for this review:

- ASSIA
- Campbell Collaboration Library of Systematic Reviews
- Centre for Reviews and Dissemination databases (including DARE and HTA)
- CINAHL
- Cochrane Library (including CENTRAL)
- Embase
- ERIC
- HMIC
- Medline
- PsycInfo
- Social Policy and Practice

The full search strategies for each database source can be found in Appendix A.

The following websites were also searched:

- BiblioMap (EPPI-Centre)
- Cancer Council New South Wales
- Cancer Council Victoria
- Cancer Research (including Sun Smart Micro site)
- Health and Safety Executive
- Health Protection Agency
- Intute
- Macmillan Skin Cancer Micro site (including former Cancer Backup resources)
- Melanoma Foundation
- Melanoma International Foundation
- National Cancer Institute
- NHS Evidence
- NICE
- Public Health Observatories (including skin cancer hub)
- Skin Cancer Foundation
- Sun Smart (Australia)
- TRIP

In addition, the team who conducted the review of effectiveness and cost-effectiveness evidence for phase 2 of the guidance supplied a list of potentially relevant records from their searches.

To supplement the database and website searches the following were also undertaken to identify additional potential relevant records:

- scanning of citation lists of included studies obtained through database searching;
- 'forward' citation chasing on these studies using ISI Web of Knowledge, locating studies which cited them (citations were not chased from studies found through citation chasing, nor from those identified by the effectiveness review team);
- scanning lists of included studies from all systematic reviews which met the inclusion criteria at the full text screening stage.

These records were entered into the database and screened as for the original searches.

3.2 Screening

All records from the searches were uploaded into a database and duplicate records were removed. Initially the records were screened on title and abstract. Where no abstract was available, a web search was first undertaken to locate one; if no abstract could be found, records were screened on title alone. All records were screened by two reviewers independently using the abstract inclusion checklist in Appendix B and any differences resolved by discussion and reference to a third reviewer if necessary. Agreement before reconciliation for the abstract screening was 95.9% and inter-rater reliability (Cohen's kappa) was κ=0.472.[1]

The full text of records whose abstracts met the inclusion criteria, or for which it was unclear whether they met the criteria, were retrieved. The full text papers were then re-screened by two reviewers independently using the full text inclusion checklist in Appendix B and any differences resolved by discussion and reference to a third reviewer if necessary. Agreement before reconciliation for the full text screening was 89.5% and inter-rater reliability (Cohen's kappa) was κ=0.757.

In summary, the inclusion criteria were:

- Does the study address the primary prevention of skin cancer due to UV exposure, or views relating to skin cancer, sunbathing or tanning?
- Does the study present qualitative research (e.g. surveys (with open-ended questions), interviews, case studies, observational studies (participant observation) or ethnographic or action research)?
- Was the study published in 1990 or later?
- Is the study published in English?

[1] It has been argued that Cohen's kappa or similar measures may under-rate reliability where scores are highly asymmetrical, i.e. numbers for one code (e.g. exclude) are much higher than for the other(s) (e.g. include) (Feinstein and Cicchetti 1990). This is the case here, because inclusion rates were fairly low, and hence there were many more studies excluded than included. For this reason, the kappa score is lower than standard guidance would indicate is acceptable, even though rates of agreement were high.

- Does the study present (i) views relating to environmental change; (ii) views relating to resource provision; (iii) views relating to multi-method interventions including combination of (i) and (ii); (iv) a combination of either (i) or (ii) or both of these with provision of information; (v) views on the potential barriers or facilitators relating to skin cancer prevention activities?
- Was the study conducted in a country which is a current member of the OECD?

3.3 Quality assessment

All included studies were quality-assessed using the tool in Appendix H of the *Methods for the development of NICE public health guidance* (NICE 2009). This tool contains 12 questions which can be answered 'yes', 'no', or 'can't tell / not reported'. On the basis of the answers to these questions, each study was given an overall quality rating: (++), high quality; (+), medium quality; or (-), low quality. Linked studies (studies reporting data from the same research project) were quality-assessed separately. The tool was completed independently by two reviewers for a randomly selected sample of 10% of records (N=3). For the other records, the tool was completed by one reviewer and checked by another, with any disagreements resolved by discussion. The results of quality assessment are presented in section 4.3 below; an example completed quality assessment form is presented in Appendix C

3.4 Data extraction

Data were extracted from included studies using the tool for qualitative studies in Appendix K of the *Methods for the development of NICE public health guidance* (NICE 2009). The tool was completed independently by two reviewers for a randomly selected sample of 10% of records (N=3). For the other records, the tool was completed by one reviewer and checked by another, with any disagreements resolved by discussion. Data for each included study were extracted and are presented in the evidence tables (Appendix D). Linked studies (studies reporting data from the same research project) were quality-assessed separately where the data presented was substantively different in the two studies.

For those studies which were also included in the phase 1 qualitative evidence review, the completed data extraction forms from the phase 1 review were used as the basis of data extraction for this review; however, in some cases, further data were extracted and added to the evidence tables. (The quality assessment conducted on these studies was entirely new for this review, since the authors of the phase 1 review used a different tool for quality assessment.)

3.5 Data synthesis and presentation

A framework based on the Health Belief Model was used to synthesise the data, in line with the approach adopted for the phase 1 qualitative review. In addition, two extra themes were added to the model in order to allow the synthesis to address the primary and secondary research questions more directly. These were, first, barriers and facilitators to the implementation of interventions, and second, differences in views between subgroups of the population.

The findings data which had been extracted from the studies were read, and coded according to the thematic headings of the model, by two reviewers. The data extracted from the phase 1 studies were included in this process, and it did not rely on the analysis of these studies presented in the phase 1 review report. Hence, the thematic analysis of the phase 1 studies included in this review is unique and may have identified different themes from those presented in the phase 1 review.

Within the headings, subheadings were developed inductively where appropriate. The findings under each code were then drawn together in a narrative synthesising the study findings. For each theme, this report presents first an overview of relevant studies, then a detailed narrative covering the studies, followed by a summary in the form of an evidence statement.

4.0 Summary of included studies

4.1 Flow of literature through the review

Database searches located 2998 records. A further 80 records were located by forward citation chasing. A further 26 records were supplied by the team conducting the review of effectiveness and cost-effectiveness. Thus, 3104 abstracts were entered into the database. Of these, 1118 were duplicate records and were removed from the database. Thus, 1986 abstracts were screened for inclusion.

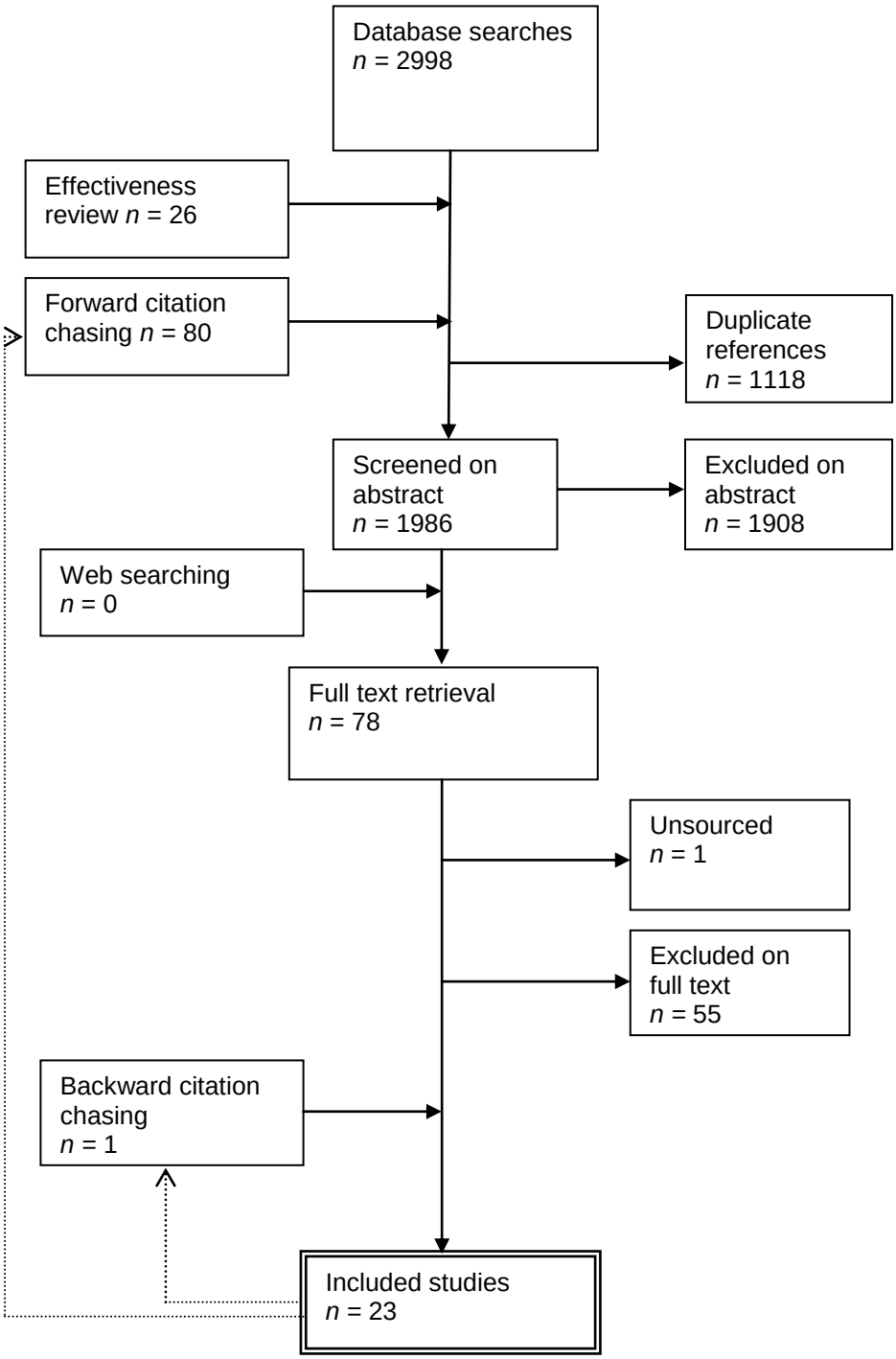
A total of 1908 references were excluded following screening of titles and abstracts. The remaining 78 references proceeded to full text retrieval. One reference was added from backward citation chasing. No references were located through website searching. Fifty-five records were excluded on full text (details of these are presented in Appendix E). Of these, one (2%) was excluded because it was a review of research, 41 (75%) because they did not present qualitative research, and 13 (24%) because they were not relevant to resource provision, environmental change or multi-component interventions. The full text of one record could not be located. The remaining 22 studies (reported in 23 papers) were included in the review (see section 7.1 below for the reference details of all included studies). The flow of literature through the review is illustrated in Figure 1.

Two study reports (Shoveller et al. 2003; Young et al. 2005) presented data from the same study. Hence, the 23 papers in the review represent a total of 22 studies.

4.1.1 Overlap with phase 1 review

Of the 23 papers included in our review, nine (Geller et al. 2008; Gerbert et al. 1996; Gillespie et al. 1993; Glanz et al. 1999; Lupton and Gaffney 1996; Murray and Turner 2004; Reeder et al. 2000; Shoveller et al. 2003; Young et al. 2005) were also included in the phase 1 review. As noted above, the data extraction for these studies was based on that carried out for the phase 1 review, but the thematic analysis was carried out without reference to that undertaken for phase 1. The relation of our review to phase 1 is discussed further in section 6.2.1 below.

Figure 1. Flow of literature through the review



4.2 Summary of included studies

The 23 included papers report studies conducted in the following countries:

- six in the UK (CRUK n.d.a; CRUK n.d.b; CRUK n.d.c; Curtis and Pollock 2009; Grey 2008; Murray and Turner 2004);
- seven in the USA (Abroms et al. 2003; Escoffery et al. 2008; Geller et al. 2008; Gerbert et al. 1996; Glanz et al. 1999; Hay et al. 2009; Parrott et al. 1996);
- three in Australia (Gillespie et al. 1993; Lupton and Gaffney 1996; Paul et al. 2008);
- three in Canada (Clarke and Korotchenko 2009; Shoveller et al. 2003; Young et al. 2005);
- three in New Zealand (Calder and Aitken 2008; Collins et al. 2006; Reeder et al. 2000); and
- one in Sweden (Bergenmar and Brandberg 2001).

All studies used some form of interview or focus group methodology to collect qualitative data. Five studies combined qualitative methods with quantitative methods such as closed-question surveys; only qualitative data was extracted from these studies (Bergenmar and Brandberg 2001; Escoffery et al. 2008; Glanz et al. 1999; Hay et al. 2005; Parrott et al. 1996).

Only one study was specifically intended as a process evaluation of an intervention; this study presented limited qualitative data (Escoffery et al. 2008). A further two studies elicited views on interventions as part of a broader investigation into attitudes (Collins et al. 2006; Lupton and Gaffney 1996). Five studies were undertaken as formative research to inform the development of interventions, but did not present evaluation or process data (CRUK n.d.b; Gillespie et al. 1993; Glanz et al. 1999; Grey 2008; Parrott et al. 1996).

The majority of studies sampled from the general population. One study investigated the families of people diagnosed with malignant melanoma (Hay et al. 2009), and one sampled people known to be at elevated clinical risk for skin cancer (Bergenmar and Brandberg 2001).

Study population characteristics consisted of the following:

- nine had a focus on children and young people (under 18 years: CRUK n.d.a; CRUK n.d.b; Curtis and Pollock 2009; Gillespie et al. 1993; Glanz et al. 1999; Lupton and Gaffney 1996; Paul et al. 2008; Shoveller et al. 2003; Young et al. 2005);
- six on young adults (18-30 years: Abroms et al. 2003; Bergenmar and Brandberg 2001; Calder and Aitken 2008; CRUK n.d.a; CRUK n.d.b; Murray and Turner 2004);
- one on older people (over 70 years: Clarke and Korotchenko 2009);
- four on parents of children or young people (Glanz et al. 1999; Reeder et al. 2000; Shoveller et al. 2003; Young et al. 2005);
- two on school staff (Collins et al. 2006; Geller et al. 2008);
- two on staff in leisure facilities (Escoffery et al. 2008; Glanz et al. 1999);
- two on women (Clarke and Korotchenko 2009; Curtis and Pollock 2009); and
- one on men (CRUK n.d.c).

The details of the methodology and populations of the included studies are summarised in Table 1. Full study details are presented in the evidence tables (Appendix D).

Table 1. Study characteristics

	Aim	Method and population	Location	Programme
Abroms et al. 2003	To understand the behavioural and normative beliefs underlying sunscreen use, and differences between men and women in these beliefs	Focus groups with men and women; ages 18-25 years; light (63%) to medium skin-tone (37%)	Baltimore, Maryland; Orlando, Florida; and Denver, Colorado, USA	None
Bergenmar and Brandberg 2001	To investigate perceptions of sun related behaviour, attitudes toward sunbathing and sun protection (among young people with hereditary risk of malignant melanoma)	Interviews with non-melanoma patients from pigmented lesion clinic; ages 18-30 years; ethnicity not stated (NS)	Stockholm-Gotland, Sweden	None
Calder and Aitken 2008	To understand the influences on UV risk behaviours and barriers to adopting protective behaviours	Focus groups; ages 18-20 years; ethnicity NS	New Zealand	None
Clarke and Korotchenko 2009	To examine older women's experiences and perceptions of sunbathing, sun avoidance, and suntanned appearances	Semi-structured interviews; female; ages 70-95; mostly fair-skinned persons	Western Canada	None
Collins et al. 2006	To assess how primary schools respond to public health messages regarding sun protection	Interviews with principals, associate principals and teachers from schools in low- and high-socioeconomic-status (SES) areas; ages NS; ethnicity NS	Auckland, New Zealand	School-based programmes (evaluation)

Key: NS=Not Stated

	Aim	Method and population	Location	Programme
Cancer Research UK n.d.a (*Sunburn*)	To assess the knowledge, attitudes and understanding of sunburn among adults and young people. The study addresses the following: the experience of sunburn and language used to describe burn; understanding of sunburn beliefs; health risks of sunburn; messages around sunburn	Focus groups; adults ages 19-30 years, young people ages 13-18 years; most have fair skin	Leeds, Manchester, Bristol, North London, Sunbury, UK	None
Cancer Research UK n.d.b (*SunSmart*)	To identify motivations for seeking a tan and using sunbeds; factors that will deter young people from using sunbeds; factors that encourage them to stay safe in the sun	Focus groups (with ages 12-24 years) and in-depth interviews (with ages 18 years and younger); ethnicity NS	UK	SunSmart campaign (formative)
Cancer Research UK n.d.c (*Outdoor workers*)	To conduct qualitative research among men, with a focus on outdoor workers, to investigate their attitudes towards the sun, sun protection and skin cancer	Focus groups, online interviews, in-depth interviews; male; ages 20-50 years; ethnicity NS	UK	None
Curtis and Pollock 2009	To explore influences on the sun exposure behaviours of girls in the UK, aged 12–15 years, and reflect on the role of the school nurse in relation to the study findings.	Focus groups; females ages 12-15 years; ethnicity NS	Nottinghamshire, UK	None

Key: NS=Not Stated

	Aim	Method and population	Location	Programme
Escoffery et al. 2008	To carry out a process evaluation of the Pool Cool Diffusion Trial	Site visits; observations; interviews of leisure facility staff and patrons; ages NS; ethnicity NS	USA	Pool Cool Diffusion (evaluation)
Geller et al. 2008	To understand the factors that may influence sun protection policy development in elementary schools that would be required if the CDC guidelines were to be implemented	Interviews with elementary school superintendents, principals, teachers, school nurses, parent-teacher organisation presidents and chairs; 94% of students in school districts were White	Massachusetts, USA	None
Gerbert et al. 1996	To assess people's attitudes and beliefs about skin cancer	Focus group; ages early 20s to mid-60s; people of 'Caucasian' family origin	California, USA	None
Gillespie et al. 1993	To describe the first phase of a larger project designed to develop and evaluate a school based sun protection initiative	Focus group with students in primary and secondary schools; ages 8-16 years; ethnicity NS	Australia	School based program (formative)

Key: NS=Not Stated

	Aim	Method and population	Location	Programme
Glanz et al. 1999	To learn what children know and think about skin cancer and sun protection, to inform development of a health promotion (HP) campaign; to get ideas from them about the appeal and feasibility of various materials and strategies.	Focus group and interviews with children, parents and recreation staff; children age 6-8 years; family origin: 1/3 'Caucasian', 1/3 fair skinned Asian/ mixed, 1/5 dark skinned Asian/ Filipino/ Native Hawaiian. Parents' family origin: 'Caucasian' (27%), Filipino (40%), Japanese (13%), Native Hawaiian/ mixed (20%). Recreation staff family origin: 48% Caucasian, Japanese (24%) Filipino 12%, Native Hawaiian/ mixed/ other (16%)	Hawaii, USA	Sun Smart (formative)
Grey 2008	To develop and test a 'Sun Safe Code'	Individual and group interviews; ages 16-54 years; fair skin to olive skin tones	UK	Sun Safe Code (formative)
Hay et al. 2009	To examine communication in families after malignant melanoma diagnosis, family members' responses and processes by which families encourage protective behaviours	Open-ended semi-structured interviews with melanoma patients and their adult children; ages over 18 years; people of 'Caucasian' family origin	USA	None

Key: NS=Not Stated

	Aim	Method and population	Location	Programme
Lupton and Gaffney 1996	To identify discourses and practices about sun protection and tanning among young people	Focus groups with secondary school students; ages 11-16; “English speaking backgrounds”	Australia	Me No Fry (evaluation)
Murray and Turner 2004	To explore the reasoning behind sun bed use and why people use tanning facilities	Interviews with adult sun bed users; ages 18-32; ethnicity NS	Merseyside, UK	None
Parrott et al. 1996	Formative research for the GHHH (Georgia's Harvesting Healthy Habits) project. To assess determinants of farmers' sun protection behaviours	Field observation; in-depth interviews (qualitative data) with farmers, service providers (public health nurses) and other stakeholders; average age 50 years; white ethnicity (farmers)	Georgia, USA	GHHH (Georgia's Harvesting Healthy Habits) project (formative)
Paul et al. 2008	To explore adolescents’ sun protection behaviours and compare by age and gender	Focus groups with adolescents; ages 12-17 years; majority medium- and some fair-skinned persons	New South Wales, Australia	None
Reeder et al. 2000	To investigate parental opinions, understandings and practices concerning sun protection for young children	Semi-structured focus groups with parents; ages 35-40 years; ethnicity NS	New Zealand	None

Key: NS=Not Stated

	Aim	Method and population	Location	Programme
Shoveller et al. 2003	To describe how adolescents make decisions about sunbathing during transition from childhood to adolescence	Interviews with adolescents (ages 12-16 years) and parents (ages 34-50 years); ethnicity NS	Canada	None
Young et al. 2005[2]	To explore the characteristics of family sun-protection projects as they occur in families with adolescents, and any differences across families	Same as Shoveller et al. 2003	Canada	None

Key: NS=Not Stated

[2] Shoveller et al. (2003) and Young et al. (2005) are linked studies (i.e. they present data from the same study). However, the data presented in the two papers is largely distinct and the two were treated separately for the purposes of data extraction.

4.3 Quality of the included studies

The results of quality assessment are presented in Table 2. Eleven papers were rated high (++), five medium (+) and seven low (-). Areas where many papers received low scores include: the role of the researcher; the description of context; the reliability of analysis; and the 'richness' of the data reported. Of particular note here is the fact that of the six UK studies, five received a low quality rating. This may be partly due to the fact that only summary reports could be retrieved for three studies (CRUK n.d.a; CRUK n.d.b; CRUK n.d.c). The low quality of the UK studies indicates that there may be issues relating to the applicability of the study findings (see section 4.4 below).

Table 2. Quality of the included studies

	Overall score	Is a qualitative approach appropriate?	Is the research question clear?	How defensible/ rigorous is the research design?	How well was the data collection carried out?	Is the role of the researcher clearly described?	Is the context clearly described?	Were the methods reliable?	Is the data analysis sufficiently rigorous?	Is the data rich?	Is the analysis reliable?	Are the findings convincing?	Are the findings relevant to the aims of the study?	Conclusions	How clear /coherent is the reporting of ethics?
Abroms et al. 2003	+	Y	Y	Y	Y	N	N	CT	Y	CT	Y	Y	Y	Y	CT
Bergenmar and Brandberg 2001	++	Y	Y	CT	Y	N	Y	Y	Y	CT	N	Y	Y	Y	Y
Calder and Aitken 2008	++	Y	Y	Y	Y	N	N	Y	Y	Y	CT	Y	Y	Y	CT
CRUK n.d.a (Sunburn)	-	Y	Y	CT	CT	N	N	CT	CT	N	CT	N	N	N	CT
CRUK n.d.b (SunSmart)	-	Y	Y	CT	CT	N	N	CT	CT	N	CT	N	N	N	CT
CRUK n.d.c (Outdoor workers)	-	Y	Y	CT	CT	N	N	CT	CT	N	CT	N	N	N	CT
Clarke and Korotchenko 2009	+	Y	Y	Y	CT	N	Y	N	CT	Y	N	Y	Y	Y	Y
Collins et al. 2006	-	Y	Y	Y	Y	N	CT	CT	N	CT	CT	Y	Y	Y	CT
Curtis & Pollock 2009	-	Y	Y	Y	CT	N	N	N	N	N	N	Y	Y	Y	Y
Escoffery et al. 2006	++	Y	Y	Y	Y	N	N	Y	Y	N	Y	CT	Y	Y	Y
Geller et al. 2008	++	Y	Y	Y	Y	N	CT	Y	Y	CT	Y	CT	Y	Y	Y
Gerbert et al. 1996	++	Y	Y	Y	Y	N	CT	Y	Y	Y	N	Y	Y	Y	CT
Gillespie et al. 1993	-	Y	Y	Y	Y	N	N	N	N	N	N	N	Y	Y	CT
Glanz et al. 1999	++	Y	Y	Y	Y	N	CT	Y	Y	CT	Y	Y	Y	Y	CT
Grey 2008	-	Y	Y	Y	Y	N	N	CT	CT	N	CT	CT	Y	Y	CT

	Overall score	Is a qualitative approach appropriate?	Is the research question clear?	How defensible/ rigorous is the research design?	How well was the data collection carried out?	Is the role of the researcher clearly described?	Is the context clearly described?	Were the methods reliable?	Is the data analysis sufficiently rigorous?	Is the data rich?	Is the analysis reliable?	Are the findings convincing?	Are the findings relevant to the aims of the study?	Conclusions	How clear /coherent is the reporting of ethics?
Hay et al. 1999	++	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y
Lupton and Gaffney 1996	++	Y	Y	Y	Y	N	CT	Y	Y	Y	CT	Y	Y	Y	CT
Murray and Turner 2004	+	Y	Y	Y	Y	CT	N	N	CT	N	N	Y	Y	Y	Y
Parrott et al. 1996	+	Y	Y	Y	Y	N	Y	Y	CT	N	N	N	Y	Y	CT
Paul et al. 2008	++	Y	Y	Y	Y	CT	Y	Y	Y	Y	Y	Y	Y	Y	Y
Reeder et al. 2000	+	Y	Y	CT	Y	N	Y	Y	N	N	CT	Y	Y	Y	CT
Shoveller et al. 2003	++	Y	Y	Y	Y	N	N	CT	Y	Y	Y	Y	Y	Y	Y
Young et al. 2005	++	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	CT

Key: Y = Yes N = No CT = Can't tell

4.4 Applicability

Six studies were conducted in the UK (CRUK n.d.a; CRUK n.d.b; CRUK n.d.c; Curtis and Pollock 2009; Grey 2008; Murray and Turner 2004). As noted above, most of these received a low quality rating, and none was rated high. This indicates that there may be barriers to the applicability of their findings, particularly relating to incomplete reporting of study methods and contexts.

Most of the other studies were conducted in locations with considerably higher levels of sun exposure than the UK. This difference in climate is likely to have an impact on risk factors, attitudes and patterns of behaviour, and may limit the generalisability of the study findings to the UK context. Most British people are likely to receive a substantial proportion of their total annual UV exposure during holidays to warmer locations (Diffey 2008); we located a very limited amount of data regarding behaviour during holidays, which may also have an impact on applicability.

In addition, some other countries, particularly Australia, have implemented much more extensive legislative and educational programmes for skin cancer prevention than have been attempted in the UK, which are likely to have had an impact on attitudes.

Our analysis indicates that there are considerable differences between age groups, and between men and women, in attitudes and behaviour. These factors should therefore be taken into account in assessing the applicability of study findings to other populations.

5.0 Study findings

We used a framework based on the Health Belief Model to synthesize the study findings, in line with the approach used for the phase 1 qualitative evidence review. The Health Belief Model is a framework which categorises the potential determinants of health behaviours into six themes: perceived susceptibility (risk); perceived severity; perceived benefits; perceived barriers; cues to action; and self-efficacy. We did not locate data on self-efficacy, and so this theme was not used in the framework. Three of the included primary studies used the Health Belief Model as an analytic framework (Gerbert et al. 1996; Gillespie et al. 1993; Glanz et al. 1999).

In addition to the Health Belief Model, two additional thematic headings were added derived from the review questions. These covered the barriers and facilitators of interventions, and the views of different groups, including service users, service providers, and different socio-demographic subgroups of the population.

The themes and subthemes derived from the Health Belief Model, and the number of studies in the review relevant to each, are shown in Table 3.

Table 3. Synthesis framework based on the Health Belief Model

Theme	Definition in this review	Subthemes	Number of studies discussing theme
Perceived susceptibility	Risk of getting skin cancer	- Risk communication	12
Perceived severity	Seriousness of skin cancer or skin damage from UV exposure	- Cancer vs appearance	10
Perceived benefits	The benefits to be gained from skin cancer prevention or sun protection activities		8
Perceived barriers	Factors which may make it less likely that individuals will engage in preventive activity	- Positive perceptions of a tanned appearance - Perceived health benefits of sun exposure - Routes to tanning - Social barriers to sun protection - Practical barriers - Institutional barriers	20
Cues to action	Factors which may help to trigger	- Sources of positive influence - Knowing people who have had	17

	preventive activity	skin cancer - Policies in schools and leisure facilities - Media messages - Specific triggers	

5.1 Perceived susceptibility

Twelve studies discuss perceived susceptibility to skin cancer (Calder and Aitken 2008; CRUK n.d.a (*Sunburn*); CRUK n.d.b (*SunSmart*); CRUK n.d.c *(Outdoor workers)*; Curtis and Pollock 2009; Gerbert et al. 1996; Gillespie et al. 1993; Glanz et al. 1999; Hay et al. 2009; Murray and Turner 2004; Parrott et al. 1996; Shoveller et al. 2003).

Two studies mention that health 'scares' experienced by themselves or friends or family members (such as having potentially cancerous moles removed), or a family history of malignant melanoma, increased perceived risk (Gerbert et al. 1996; Hay et al. 2009).

In four studies, children (aged 6-8 years) or young people (aged 12-25 years approximately) saw skin cancer as a problem for older people and did not see themselves as at risk in the foreseeable future (CRUK n.d.b (*SunSmart*); Curtis and Pollock 2009; Gillespie et al. 1993), or did not understand the risk of cancer (Glanz et al. 1999).

> *You don't think about it happening … we are young, and the possibility is so far in the future. (participant, Year 8, Curtis and Pollock 2009).*

Adults (aged 20-70 approximately) expressed a similar view in one study (Gerbert et al. 1996).

> *I'll deal with it when it happens, you know, 50 years or so. (participant, low-concern group, Gerbert et al. 1996)*

Conversely, fathers in one study expressed the belief that children were at greater risk from the sun than adults because of the perceived delicacy of children's skin (CRUK n.d.c (*Outdoor workers*)).

> *The kids … you are very aware of them not getting burnt … more delicate skin. (participant, CRUK n.d.c*)

People with darker skin were seen as less at risk in two studies (CRUK n.d.c *(Outdoor workers)*; Gillespie et al. 1993). Participants in one study believed that because they did not burn, they were not at risk of skin damage or cancer (Glanz et al. 1999). In one study, people from higher-socioeconomic-status (SES) groups were more likely to be aware of the health risks of sun exposure than people from lower-SES groups (CRUK n.d.a (*Sunburn*)).

Participants in five studies expressed the belief that sun exposure reduced subsequent risk of sun damage or cancer by increasing "resistance" (CRUK n.d.c (*Outdoor workers*); Glanz et al.

1999; Parrott et al. 1996), or that getting a tan reduced the risk of burning (Murray and Turner 2004; Shoveller et al. 2003).

> *The children are always in the sun and they rarely get sick... the more exposure they get to whatever, the more resistant they are. (parent, participant, Glanz et al. 1999)*

> *[Farmers] get toughened to the sun pretty fast, so they don't need it [sun protection]. (participant, Parrott et al. 1996)*

Three studies found that participants were aware of the danger of skin cancer, but tended to avoid thinking about it, or to adopt optimistic framings which minimised the dangers of continuing sunbed use or sun exposure (Calder and Aitken 2008; CRUK n.d.c (*Outdoor workers*); Murray and Turner 2004).

> *Well I mean, the obvious risk is skin cancer but I tend not to think about it, you just seem to put it to the back of your mind and hope that you won't get it. (participant, Murray and Turner 2004)*

> *I've read of people getting skin cancer, in magazines, and blaming it on their use of sunbeds, but they seemed to use the sunbeds a lot more than I do. (participant, Murray and Turner 2004)*

One study found this attitude to be the most common, while a minority were fatalistic about the risk, and few engaged with risk and modified their behaviour accordingly (CRUK n.d.c (*Outdoor workers*)).

Hay et al. (2009) found that many participants had an "all-or-nothing" view of the determinants of cancer risk. For example, some participants diagnosed with melanoma viewed their melanoma as directly related to sun exposure, and thought that this environmental cause precluded genetic factors. As a result, those participants were less likely to communicate information about risk to family members.

In one study, young women aged 12-15 years in the UK said that they thought skin cancer was a less serious concern than other health issues, such smoking and healthy eating (Curtis and Pollock 2009).

5.1.1 Risk communication

One study (Hay et al. 2009) focused particularly on the communication of risk within families who had experienced skin cancer. This study found that people diagnosed with skin cancer usually discussed risk factors and susceptibility with family members soon after diagnosis. Participants who saw genetic factors as important were more likely to communicate with their family members about risk. Women tended to take the leading role in communicating risk to family members, even where they were not the person diagnosed with cancer.

A number of factors affected the decision about whether, and to what extent, to communicate risk. People used information about individuals' risk factors (e.g. skin tone, risk behaviours), and their perceived receptiveness to health information generally, in deciding whether to communicate about risk. In some cases individuals were seen as "too smart" to need such communication.

> *Because she's a highly educated girl, I mean, she should be able to put one and one together and, I don't think she'd use it anymore, let me put it to you that way. I don't think it needs to be discussed, that she would use [tanning] salons. (participant, Hay et al. 2009)*

Evidence statement: perceived susceptibility
ER 5.1 Two studies 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 (Gerbert et al. 1996 [++]; Hay et al. 2009 [++]). ER 5.2 Five studies report that the risk of skin cancer is not appreciated or is seen as not of immediate concern (CRUK n.d.b (*SunSmart*) [-]; Curtis and Pollock 2009 [-]; Gerbert et al. 1996 [++]; Gillespie et al. 1993 [-]; Glanz et al. 1999 [++]). 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. ER 5.3 One study reports that fathers thought that children had a greater risk of developing skin cancer than adults because their skin is more "delicate" (CRUK n.d.c (*Outoor workers*) [-]). ER 5.4 Three studies of adult participants 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 (Calder and Aitken 2008 [++]; CRUK n.d.c (*Outdoor workers*) [-]; Murray and Turner 2004 [+]). ER 5.5 One US study discusses the communication of risks within families where a member has had an experience of skin cancer, finding that people diagnosed with cancer usually discussed risk with their families, and that women took a leading role in communication (Hay et al. 2009 [++]). ER 5.6 Five studies of young people and adults report the belief that sun exposure provides "resistance" to skin damage, burning or cancer in the future (CRUK n.d.c (*Outdoor workers*) [-]; Glanz et al. 1999 [++]; Parrott et al. 1996 [+]; Murray and Turner 2004 [+]; Shoveller et al. 2003 [++]). In particular, outdoor workers reported such beliefs in two studies (CRUK n.d.c (*Outdoor workers*) [-]; Parrott et al. 1996 [+]), and parents in one (Glanz et al. 1999 [++]). ER 5.7 Three studies identify other factors that affect perceived susceptibility to skin cancer. Two studies report the perception that a darker skin colour decreased risk level (CRUK n.d.c *(Outdoor workers)* [-]; Gillespie et al. 1993 [-]). One study finds that participants of higher

socioeconomic status were more aware of the risks (CRUK n.d.a (*Sunburn*) [-]).

Applicability
Eight of twelve studies that reported data on perceived susceptibility to skin cancer or skin damage were from countries other than the UK. Most of the factors identified did not appear to vary substantially between countries. However, it is possible that people in the UK may have lower perceived susceptibility than elsewhere because of differences in climate (see Evidence Statement 14).

5.2 Perceived severity of consequences of exposure

The perceived severity of skin cancer is discussed in seven studies (Calder and Aitken 2008; Gerbert et al. 1996; Gillespie et al. 1993; Glanz et al. 1999; Murray and Turner 2004; Parrott et al. 1996; Paul et al. 2008). All these studies find that most participants did not see skin cancer as a serious threat. Children ages 6-8 years in one study did not understand what skin cancer was or the consequences of skin cancer (Glanz et al. 1999). Participants in three studies expressed a belief that skin cancers are easily treatable (Calder and Aitken 2008; Glanz et al. 1999; Paul et al. 2008).

> *I think I'll get cancer, I know I'll get cancer, because I don't care about protection now. I won't die of cancer – I'll just have a few things taken out. (female, 16-17 years, participant, Paul et al. 2008)*

The farmers who participated in Parrott et al.'s (1996) study, while agreeing that the consequences of sun exposure are serious, also believed that getting skin cancer would not affect their ability to work.

5.2.1 Cancer vs appearance

Concerns relating to appearance fall into two groups: the short-term effects of sunburn; and the longer-term effects of skin aging.

Concern regarding the short-term effects of sun exposure on appearance, such as red or peeling skin, was expressed by participants in two studies (Abroms et al. 2003; Paul et al. 2008).

Skin aging was mentioned as a concern in seven studies (Abroms et al. 2003; Clarke and Korotchenko 2009; Gerbert et al. 1996; Gillespie et al. 1993; Lupton and Gaffney 1996; Murray and Turner 2004; Paul et al. 2008). In two studies skin aging was perceived by some participants to be as serious a consequence of sun exposure as the risk of cancer (Gerbert et al. 1996; Murray and Turner 2004). Concern about skin aging and its effects on appearance may be more likely to motivate sun protection behaviours than concern about skin cancer.

> *I did nothing [for sun protection when I was young]. Now I am beginning to put sun block on my face because I can see the effects. I can see wrinkles and my skin isn't as clear as it used to be. (female, participant, Abroms et al. 2003)*

In four studies, concern about skin aging was found to be more prevalent among female than male participants (Abroms et al. 2003; Lupton and Gaffney 1996; Murray and Turner 2004; Paul et al. 2008). In Abroms et al.'s (2003) study, some men were concerned about the short-term effects of sunburn (e.g. discomfort), but none expressed concern about skin aging.

Evidence statement: perceived severity
ER 5.8 Perceived severity of skin cancer was low in seven studies across a wide range of age groups (aged 6 years to over 60 years): Calder and Aitken 2008 [++]; Gerbert et al. 1996 [++]; Gillespie et al. 1993 [-]; Glanz et al. 1999 [++]; Murray and Turner 2004 [+]; Parrott et al. 1996 [+]; Paul et al. 2008 [++]). In three studies participants thought that skin cancer was easy to treat (Calder and Aitken 2008 [++]; Glanz et al. 1999 [++]; Paul et al. 2008 [++]). 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 (Glanz et al. 1999 [++]). A study of farmers in the USA finds that they did not see skin cancer affecting their day-to-day work (Parrott et al. 1996 [+]). ER 5.9. Seven studies report that skin aging was seen as a serious consequence of sun exposure (Abroms et al. 2003 [+]; Clarke and Korotchenko 2009 [+]; Gerbert et al. 1996 [++]; Gillespie et al. 1993 [-]; Lupton and Gaffney 1996 [++]; Murray and Turner 2004 [+]; Paul et al. 2008 [++]). Two studies find that skin aging is perceived as a more serious consequence of sun exposure than is skin cancer (Gerbert et al. 1996 [++]; Murray and Turner 2004 [+]). Four studies report that skin aging is seen as a more serious consequence by women than it is by men (Abroms et al. 2003 [+]; Lupton and Gaffney 1996 [++]; Murray and Turner 2004 [+]; Paul et al. 2008 [++]). *Applicability* Only one study in this group (Murray and Turner 2004 [+]) was conducted in the UK. All other studies were conducted in the USA, New Zealand or Australia. It is possible that knowledge about the severity of skin cancer may be greater in the latter countries than the UK due to previous information campaigns.

5.3 Perceived benefits of sun protection

Eight studies discuss the perceived benefits of sun protection (Abroms et al. 2003; Clarke and Korotchenko 2009; Collins et al. 2006; Gillespie et al. 1993; Glanz et al. 1999; Hay et al. 2009; Lupton and Gaffney 1996; Paul et al. 2008). In most cases participants used sun protection in order to offset the perceived risks of sun exposure including skin cancer and skin aging.

Avoiding cancer was explicitly stated as a benefit in four studies (Abroms et al. 2003; Clarke and Korotchenko 2009; Hay et al. 2009; Paul et al. 2008).

> *I'll put some sunscreen on. I don't want to get too tan because the next thing you know, I will be having tumours lanced. (male, participant, Abroms et al. 2003)*

The avoidance of visible skin aging was stated as a benefit, particularly by women, in three studies (Abroms et al. 2003; Clarke and Korotchenko 2009; Paul et al. 2008).

Avoiding the discomfort from the sun's heat and glare, or avoiding sunburn, was stated as a benefit in three studies (Abroms et al. 2003; Gillespie et al. 1993; Paul et al. 2008). In one study, male participants mentioned that using eye protection helped to improve sporting performance (Paul et al. 2008).

A fashionable appearance was stated as a benefit of wearing a hat in one study (Lupton and Gaffney 1996). However, it should be noted that a number of other studies found that hats and other protective clothing are unfashionable and not desirable (see section 5.4.4 below).

In two studies, participants said that using sun protection enabled them to stay in the sun for longer when playing sports (Abroms et al. 2003) or at the beach (Paul et al. 2008).

In two studies, school staff (Collins et al. 2006) and parents and recreation staff (Glanz et al. 1999) emphasised the benefits of promoting sun protection to young children in order to 'start them young' and lay down good habits for later life (Collins et al. 2006; Glanz et al. 1999). Participants in Collins et al. (2006) saw this possibility as contributing to the success of school-based interventions, while those in Glanz et al. (1999) saw it as a potential facilitator.

> *[Young children may establish] good life-long habits*. *(participant, school representative, Collins et al. 2006)*

Evidence statement: perceived benefits of sun protection
ER 5.10. Participants in most studies used sun protection, principally sunscreen, in order to offset the perceived risks of sun exposure including skin cancer (Abroms et al. 2003 [+]; Clarke and Korotchenko 2009 [+]; Hay et al. 2009 [++]; Paul et al. 2008 [++]) and skin aging (Abroms et al. 2003 [+]; Clarke and Korotchenko 2009 [+]; Paul et al. 2008 [++]). Avoiding sunburn and the sun's heat and glare were mentioned as a benefit of sun protection in three studies (Abroms et al. 2003 [+]; Gillespie et al. 1993 [-]; Paul et al. 2008 [++]). ER 5.11. Participants in two studies said that using sun protection enabled them to stay in the sun for longer when playing sports (Abroms et al. 2003 [+]) or at the beach (Paul et al. 2008 [++]). ER 5.12. Two studies of parents and school staff stated the benefits of promoting sun protection to young people helped them acquire positive long-term habits (Collins et al. 2006 [-]; Glanz et al. 1999 [++]). *Applicability* None of the studies in this section were conducted in the UK or Europe. Hence, it is unclear to

what extent findings about the perceived benefits of sun protection may be applicable in the UK context.

5.4 Perceived barriers to sun protection

The perceived barriers to using sun protection resources, such as sunscreen and protective clothing, have been divided into the following sub-categories:

- Positive perceptions of a tanned appearance
- Perceived health benefits of sun exposure
- Routes to tanning
- Social barriers to sun protection
- Practical barriers
- Institutional barriers

5.4.1 Positive perceptions of a tanned appearance

A tanned appearance was seen as attractive or aesthetically pleasing by participants in twelve studies (Calder and Aitken 2008; Clarke and Korotchenko 2009; Curtis and Pollock 2009; Lupton and Gaffney 1996; Gerbert et al. 1996; Gillespie et al. 1993; Grey 1998; Murray and Turner 2004; Paul et al. 2008; Reeder et al. 2000; Shoveller et al. 2003; Young et al. 2005). Conversely, white skin was viewed as unattractive in three studies, with participants using terms such as "*ugly*" and "*pasty*" to describe untanned skin (Clarke and Korotchenko 2009; Curtis and Pollock 2009; Lupton and Gaffney 1996).

The older women, ages 70 to 95 years, interviewed by Clarke and Korotchenko (2009) described how perceptions of a tan had changed in their lifetimes: as children they were encouraged to associate a tanned appearance with being working-class or of non-white ethnicity. Nonetheless, most of these women preferred a tanned appearance (*"I like a good, healthy glow on somebody"*), whether or not they actively sunbathed.

> *When I was a child, anybody that was brown, they were labourers. This is an awful thing to admit, but the upper class was never brown. And it was paleness that showed that we were a different class. (participant, Clarke and Korotchenko 2009)*

In particular, a tanned appearance was described as 'healthy' in nine studies (Calder and Aitken 2008; Clarke and Korotchenko 2009; Curtis and Pollock 2009; Gerbert et al. 1996; Grey 1998; Lupton and Gaffney 1996; Murray and Turner 2004; Shoveller et al. 2003; Young et al. 2005). In most cases the 'healthy' appearance of a tan was simply stated as a perception. However, in three studies, participants identified a causal link, whereby tanned skin was seen as an indicator of an active, outdoors lifestyle (Calder and Aitken 2008; Lupton and Gaffney 1996; Shoveller et al. 2003). A related point, although not directly linked to appearance, is that being outdoors is perceived as intrinsically healthier than being indoors. This is because being outdoors is seen to correspond with an active lifestyle, while being indoors is seen as lazy or anti-social (see section 5.4.2 below).

> *[A tan] represents that you are active, you don't just sit inside at a computer all day. (male, 21, participant, Calder and Aitken 2008)*

> *I have got a friend and she is really pale, and it really describes the way she lives. Because I mean, she doesn't go bike riding or to the beach or anything, that's why she is not tanned, and you can tell who's sport and who goes out a lot and who just stays in. (female, participant, Lupton and Gaffney 1996)*

> *Like, if you don't have a tan, most people think, 'Well gee, this person must not go outside because if they went outside more often, they'd have a tan'. So, they [think you] stay inside, just watch TV or do nothing… [they] think you're a couch potato. (male, 15, participant, Shoveller et al. 2003)*

In one Australian study, untanned skin was seen as artificial due to the special effort required to remain untanned in summer.

> *If you have got white skin, it looks sort of fake. (participant, Lupton and Gaffney 1996)*

Participants in this study also associated a tan with being Australian, while white skin was characteristic of 'Pommies' (Lupton and Gaffney 1996).

Participants in two studies said they felt more confident, or had greater self-esteem, with a tan (Gerbert et al. 1996, Murray and Turner 2004). In one further study, a participant described tanning in terms of personality change (Curtis and Pollock 2009).

> *It's a change in a person, so you get to see a different side to them. (female, 14-15 years, participant, Curtis and Pollock 2009)*

However, participants in three studies indicated that a deep tan was not automatically desirable and did not suit everyone (Clarke and Korotchenko 2009; Lupton and Gaffney 1996; Shoveller et al. 2003). Participants in one study used sun protection primarily to get the 'right' level of tan, one which was neither too dark nor too light (Shoveller et al. 2003). Participants in one study saw a deep tan as indicative of health risks and preferred a lighter tan (Clarke and Korotchenko 2009).

> *I think a bit of a tan does make you look healthier. But … I don't really like dark, dark skins from tanning anymore. (participant, Clarke and Korotchenko 2009)*

Evidence statement: Perceived barriers - positive perceptions of a tanned appearance
ER 5.13 Twelve studies report positive perceptions of a tanned appearance, i.e. that a tanned appearance is perceived as attractive (Calder and Aitken 2008 [++]; Clarke and Korotchenko 2009 [+]; Curtis and Pollock 2009 [-]; Lupton and Gaffney 1996 [++]; Gerbert et al. 1996 [++]; Gillespie et al. 1993 [-]; Grey 1998 [-]; Murray and Turner 2004 [+]; Paul et al. 2008 [++]; Reeder et al. 2000 [+]; Shoveller et al. 2003 [++]; Young et al. 2005 [++]). Two studies report that a tanned appearance increases confidence and self-esteem (Gerbert et al. 1996 [++]; Murray and

Turner 2004 [+]).

ER 5.14 Three studies report that the degree of tan colour was important in shaping perceptions of tanned appearance, with a deep tan not necessarily seen as desirable (Clarke and Korotchenko 2009 [+]; Lupton and Gaffney 1996 [++]; Shoveller et al. 2003 [++]).

ER 5.15 Nine studies find that a tanned appearance is seen as healthy (Calder and Aitken 2008 [++]; Clarke and Korotchenko 2009 [+]; Curtis and Pollock 2009 [-]; Gerbert et al. 1996 [++]; Grey 2008 [-]; Lupton and Gaffney 1996 [++]; Murray and Turner 2004 [+]; Shoveller et al. 2003 [++]; Young et al. 2005 [++]). Of these, three studies note that a tanned appearance indicates an active, outdoors lifestyle (Calder and Aitken 2008 [++]; Lupton and Gaffney 1996 [++]; Shoveller et al. 2003 [++]).

Applicability
Although only two studies reporting a positive perception of a tanned appearance were conducted in the UK (Curtis and Pollock 2009 [-]; Murray and Turner 2004 [+]), these perceptions appear to be consistent across countries.

5.4.2 Perceived health benefits of sun exposure

Seven studies report specific perceived health benefits associated with sun exposure, or a general perception of outdoor activity as healthy, that inhibits sun protective behaviours such as applying sunscreen, covering up or taking shelter (Bergenmar and Brandberg 2001; Clarke and Korotchenko 2009; Gerbert et al. 1996; Gillespie et al. 1993; Glanz et al. 1999; Murray and Turner 2004; Parrott et al. 1996).

Participants in three studies mentioned that ultraviolet exposure increased vitamin D (Clarke and Korotchenko 2009, Gerbert et al. 1996, Murray and Turner 2004).

Participants in one study expressed the view that sunbed use was good for their skin, in particular that it reduced acne (Murray and Turner 2004).

As noted in section 5.1 above, participants in two studies also expressed a belief that sun exposure was protective against subsequent skin damage and cancer, by increasing “resistance” (Glanz et al. 1999; Parrott et al. 1996).

In addition, participants in three studies said that being outdoors 'feels healthier' than being indoors (Bergenmar and Brandberg 2001; Gerbert et al. 1996; Gillespie et al. 1993). Primary-school-aged children interviewed in an educational setting linked this perception to being free to run and play (Gillespie et al. 1993). A related point, made in one study, is that being outdoors in sunny weather improves people's mood (Calder and Aitken 2008).

> *It's pleasant and feels healthy to be outdoors in the sun and the breeze. (participant, Bergenmar and Brandberg 2001)*

Evidence statement: Perceived barriers - perceived health benefits of sun exposure
ER 5.16 Three studies report the belief that ultraviolet exposure is beneficial because it provides vitamin D (Clarke and Korotchenko 2009 [+]; Gerbert et al. 1996 [++]; Murray and Turner 2004 [+]). ER 5.17 Two studies report that sun exposure is believed to protect against future skin damage or cancer by increasing "resistance" (Glanz et al. 1999 [++]; Parrott et al. 1996 [+]). ER 5.18 Three study reports discuss the perception that outdoor activities which involve sun exposure are healthier than indoor activities, both among adults (Bergenmar and Brandberg 2001 [++]; Gerbert et al. 1996 [++]) and children (Gillespie et al. 1993 [-]). One study finds this perception to be linked to the freedom to play actively for children (Gillespie et al. 1993 [-]). *Applicability* Only one of the studies in this group was conducted in the UK (Murray and Turner 2004 [+]). It is unclear whether perceptions of the health benefits of sun exposure are generalisable between countries.

5.4.3 Routes to tanning

Participants in eight studies (Bergenmar and Brandberg 2001; Calder and Aitken 2008; Clarke and Korotchenko 2009; CRUK n.d.a (*Sunburn*); CRUK n.d.c (*Outdoor workers*); Lupton and Gaffney 1996; Murray and Turner 2004; Shoveller et al. 2003) distinguished between different ways in which they could get a tan: deliberate compared with incidental tanning; and sun exposure compared with sunbed use.

Deliberate vs incidental tanning

In three studies, participants made a distinction between deliberately setting out to get a tan and getting one incidentally in the course of being outdoors, usually with the implication that sun protection was more appropriate for the former (Bergenmar and Brandberg 2001; Lupton and Gaffney 1996; Shoveller et al. 2003).

Participants in one study made the distinction between incidental and deliberate tanning while recognising that it was of little practical significance (Bergenmar and Brandberg 2001).

> *Planning to sunbathe gives me a guilty conscience. I don't consider myself one who would sunbathe on a pier; I lie on a pier reading a book. I realize there is not much difference. (participant, Bergenmar and Brandberg 2001)*

The importance of the distinction may be linked to the idea that outdoor activities are healthy in themselves, in contrast to deliberate sunbathing (Bergenmar and Brandberg 2001; see section 5.4.2 above). Young people in one study believed that incidental tanning was less damaging, and associated it with outdoor physical activity and sports (Shoveller et al. 2003).

> *I don't really see that sun tanning can really damage you … [if] you get it from an outdoor activity. (male, 13 years, participant, Shoveller et al. 2003)*

> *I wasn't like really trying to get a tan … I'd wear my bathing suit. I'd go swimming and just play volleyball or something like that ... (female, 15 years, participant, Shoveller et al. 2003)*

In one study, male participants felt that deliberately trying to become tanned was unmasculine, but getting a tan as an incidental result of engaging in outdoor activities, particularly sports, was acceptable (Lupton and Gaffney 1996).

A further issue related to deliberate tanning is the perception that becoming sunburnt is a necessary part of the tanning process, stated by participants in two studies (CRUK n.d.a (*Sunburn*); Lupton and Gaffney 1996).

Sun vs sunbeds

Participants in three studies distinguished the effects of sun exposure from those of sunbed use (Clarke and Korotchenko 2009; Murray and Turner 2004; Shoveller et al. 2003). Using sunbeds was seen as unnatural and dangerous, and associated with excessive or risky patterns of behaviour, in one study (Clarke and Korotchenko 2009).

> *I put on sunscreen now and I'll do, basically, a little light tanning. Nothing too extreme. I would never go and sit on one of those tanning beds … We're all very conscious healthwise about the dangers of tanning … I wouldn't say I would stop completely … I think you have to strike a healthy medium and do what's safe. (participant, Clarke and Korotchenko 2009)*

Some of the sunbed users interviewed by Murray and Turner (2004) expressed the view that sunbeds were more dangerous than sun exposure, although one pointed out that the effects of sun exposure are harder to monitor. Participants in Shoveller et al.'s (2003) study generally believed that sunbed use was more dangerous than sun exposure.

In addition, in two studies participants thought that women were more likely to use sunbeds than men (Calder and Aitken 2008; CRUK n.d.c (*Outdoor workers*)).

Evidence statement: Perceived barriers - routes to tanning
ER 5.19 Participants in three studies distinguished deliberate from incidental tanning, and expressed the belief that incidental tanning was less dangerous or less likely to require protection (Bergenmar and Brandberg 2001 [++]; Lupton and Gaffney 1996 [++]; Shoveller et al. 2003 [++]). ER 5.20 One study finds that participants preferred to see themselves as tanning incidentally, rather than deliberately (Bergenmar and Brandberg 2001 [++]). This may be because deliberate

tanning has 'unhealthy' connotations but incidental tanning from outdoor activities does not.

ER 5.21. Three studies compared sunbed use to sun exposure. Most of the participants in these studies believed that sunbeds were more dangerous than sun exposure (Clarke and Korotchenko 2009 [+]; Murray and Turner 2004 [+]; Shoveller et al. 2003 [+]).

Applicability
Most of the findings in this section come from studies conducted outside the UK. Because of climatic differences, findings regarding incidental tanning may not be readily applicable to the UK context.

5.4.4 Social barriers to sun protection

Ten studies (Abroms et al. 2003; Calder and Aitken 2008; CRUK n.d.c (*Outdoor workers*); Gillespie et al. 2003; Glanz et al. 1999; Grey 2008; Lupton and Gaffney 1996; Parrott et al. 1996; Paul et al. 2008; Shoveller et al. 2003) reference social barriers to using sun protection resources, such as protective clothing and sunscreen.

The unfashionable or unattractive appearance of protective clothing such as hats was mentioned in six studies (Calder and Aitken 2008; Gillespie et al. 2003; Glanz et al. 1999; Lupton and Gaffney 1996; Paul et al. 2008; Shoveller et al. 2003). This perception is particularly prominent among children and young people (aged 8-20). One study (Calder and Aitken 2008) suggests that this perception is more salient among women, but others (Lupton and Gaffney 1996; Paul et al. 2008) find that both male and female participants are concerned about appearance.

> *You don't see anyone wearing wide brimmed hats. Except as a joke. (participant, Paul et al. 2008)*

Among children and young people, the use of protective clothing, particularly hats, was regarded more favourably if the clothing was fashionable and attractive (Gillespie et al. 2003; Lupton and Gaffney 1996). However, one school in one study had adopted a fashionable baseball cap as part of its uniform to encourage protective clothing, but found that once the institution adopted the cap, it was perceived by students as unfashionable and lost its positive associations (Lupton and Gaffney 1996).

Adult participants in three studies noted that people around them generally did not use sun protection, or that there was little social support for using it (Abroms et al. 2003; Glanz et al. 1999; Parrott et al. 1996).

> *You rarely see local people putting on sunscreen. (parent, participant, Glanz et al. 1999)*

Sunscreen was seen as linked to particular contexts, especially the beach, in four studies, with the implication that protection was less likely to be used in other contexts (Abroms et al. 2003; Gillespie et al. 1993; Glanz et al. 1999; Parrott et al. 1996). In one study, participants said that they were more likely to use sun protection on holiday (CRUK n.d.c (*Outdoor workers*)).

> *Well if I'm going to the beach, I will put [sunscreen] on. But other than that, if I'm just going outside for an outdoor activity, I really don't think about it. (male, participant, Abroms et al. 2003)*

In one of these studies, participants said sunscreen was easier to remember when they were deliberately planning to spend the day in the sun (Gillespie et al. 1993). Glanz et al. (1999) note that sunscreen was much more frequently mentioned by participants than other forms of sun protection, and was the only type of sun protection mentioned by some participants.

Participants in one study said they were more concerned with sun protection for their children than for themselves (Grey 2008).

> *I put cream on my son every half hour, but for me I put it on once and then I think that's OK. (female, 19-24 years, Grey 2008)*

Similarly, young people (aged 12-17 years) in Paul et al.'s (2008) study saw media messages, and parental concern, about sun protection as narrowly focused on young children and of limited relevance to themselves.

Sunscreen use was seen as unmasculine by some young adult men in one study (Abroms et al. 2003).

> *[I don't like sunscreen] . . . because we're men. . . . We don't like to put oil on. Then you get the stuff on your hands and you smell like a coconut. (male, participant, Abroms et al. 2003)*

In particular, men in this study expressed discomfort with the idea of other men applying sunscreen (Abroms et al. 2003).

> *I think it's like a masculine thing . . . I mean it's all right for [your girlfriend] to put suntan lotion on your back [at the beach], but if you're down there with the guys, you're not going to be saying, "Hey, buddy, rub some lotion on me." (male, participant, Abroms et al. 2003)*

Evidence statement: Perceived barriers - social barriers
ER 5.22 Six studies identify the unfashionable or unattractive appearance of protective clothing as a barrier to their use among children and young people (aged 6-20: Calder and Aitken 2008 [++]; Gillespie et al. 2003 [-]; Glanz et al. 1999 [++]; Lupton and Gaffney 1996 [++]; Paul et al. 2008 [++]; Shoveller et al. 2003 [++]). Two studies find that protective clothing, such as hats, would be more acceptable if they were fashionable and attractive (Gillespie et al. 2003 [-];

Lupton and Gaffney 1996 [++]).

ER 5.23 Three studies find that young adult and adult participants see sun protection behaviour as not strongly supported by social norms within their communities (Abroms et al. 2003 [+]; Glanz et al. 1999 [++]; Parrott et al. 1996 [+]).

ER 5.24 Five studies describe a strong association between sunscreen use and particular contexts, such as the beach and being on holiday (Abroms et al. 2003 [+]; CRUK n.d.c (*Outdoor workers*) [-]; Gillespie et al. 1993 [-]; Glanz et al. 1999 [++]; Parrott et al. 1996 [+]).

ER 5.25. 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 (Paul et al. 2008 [++]).

ER 5.26. One study finds that men see sunscreen use as unmasculine (Abroms et al. 2003 [+]).

Applicability
Most studies in this section were carried out outside the UK, and it is unclear to what extent the findings are generalisable. However, there is no specific reason to think that the social barriers identified are not applicable to the UK.

5.4.5 Practical barriers to sun protection

Inconvenience, time, effort

The inconvenience of sun protection products, or the time and effort involved in remembering to carry and use them, was mentioned as a practical barrier in ten studies (Abroms et al. 2003; CRUK n.d.c (*Outdoor workers*); Curtis and Pollock 2009; Geller et al. 2008; Gerbert et al. 1996; Gillespie et al. 1993; Glanz et al. 1999; Parrott et al. 1996; Paul et al. 2008; Reeder et al. 2000).

Several more specific issues were mentioned. The inconvenience of carrying resources such as sunscreen, or the difficulty of remembering to do so, was mentioned in three studies, especially for children, young people and young adults (8-25 years). Both sunscreen (Abroms et al. 2003; Gillespie et al. 1993) and protective clothing (Paul et al. 2008) were described as inconvenient to carry and remember. Sunscreen was described as 'messy' or inconvenient to apply in six studies (Abroms et al. 2003; CRUK n.d.c (*Outdoor workers*); Curtis and Pollock 2009; Gerbert et al. 1996; Parrott et al. 1996; Reeder et al. 2000). Participants in two of these studies noted that sand or dirt became mixed into the sunscreen (CRUK n.d.c (*Outdoor workers*); Curtis and Pollock 2009). School staff mentioned 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 (Geller et al. 2008).

Hats or sunglasses were felt to be physically awkward, because they fall off or get in the way, by participants in three studies (Glanz et al. 1999; Parrott et al. 1996; Paul et al. 2008).

Structural features such as shade were felt to be sometimes inconvenient to use by children and young people in one study (Gillespie et al. 1993).

Discomfort

Protective clothing was found to be uncomfortable by participants in four studies (Gillespie et al. 1993, Glanz et al. 1999, Parrott et al. 1996, Paul et al. 2008). Participants in one study mentioned that sunscreen caused discomfort when it 'sweated off' and got into their eyes (Abroms et al. 2003).

Cost

The expense of sun protection, particularly sunscreen, was mentioned as a barrier in four studies (Abroms et al. 1999, Glanz et al. 1999, Paul et al. 2008; Reeder et al. 2000). However, Parrott et al. (1996) found that cost was not a barrier to using sun protection resources among the farmers in their study.

One further study found that staff in schools in disadvantaged areas would like to implement compulsory hat policies, but were concerned that some families would not be able to afford it; one school in this study provided hats free of charge (Collins et al. 2006).

The cost of providing shade structures in school grounds, or distributing free sunscreen, was seen as a barrier to implementing these policies by school staff in one study (Geller et al. 2008).

Child co-operativeness

Parents of young children in two studies mentioned that children's unco-operativeness was a barrier to applying sunscreen (Glanz et al. 1999; Reeder et al. 2000).

> *The reason I don't put it on my oldest is because he complains so horribly and he's always in such a hurry. (participant, Glanz et al. 1999)*

Perceived ineffectiveness

Participants in one study said that they found sunscreen ineffective in protecting against burning (Abroms et al. 2003).

Health consequences

Participants in two studies said that sunscreen caused acne (Abroms et al. 2003; Lupton and Gaffney 1996). The possibility of allergic reactions to sunscreen was mentioned as a barrier to providing free sunscreen in one study (Geller et al. 2008). Participants in two studies expressed concern about possible toxicity and the long-term health effects of regular sunscreen use (Gerbert et al. 1996; Reeder et al. 2000).

Evidence statement: Perceived barriers - practical barriers
ER 5.27. Ten study reports described the inconvenience of sun protection resources as barriers to their use (Abroms et al. 2003 [+]; CRUK n.d.c (*Outdoor workers*) [-]; Curtis and Pollock 2009 [-]; Geller et al. 2008 [++]; Gerbert et al. 1996 [++]; Gillespie et al. 1993 [-]; Glanz et al. 1999 [++]; Parrott et al. 1996 [+]; Paul et al. 2008 [++]; Reeder et al. 2000 [+]). The particular issues which contribute to the perception of inconvenience are: the need to carry and remember sun protection resources (three studies: Abroms et al. 2003 [+]; Gillespie et al. 1993 [-]; Paul et al. 2008 [++]); the 'messiness' of sunscreen (six studies: Abroms et al. 2003 [+]; CRUK n.d.c (*Outdoor workers*) [-]; Curtis and Pollock 2009 [-]; Gerbert et al. 1996 [++]; Parrott et al. 1996 [+]; Reeder et al. 2000 [+]); the awkwardness of hats and sunglasses which may fall off or interfere with activities (three studies: Glanz et al. 1999 [++]; Parrott et al. 1996 [+]; Paul et al. 2008 [++]); and the inconvenience of making use of shade structures by children and young people (one study: Gillespie et al. 1993 [-]). ER 5.28 Four study reports describe physical discomfort as a barrier to the use of protective clothing (Gillespie et al. 1993 [-]; Glanz et al. 1999 [++]; Parrott et al. 1996 [+]; Paul et al. 2008 [++]). ER 5.29 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 (Geller et al. 2008 [++]). ER 5.30. Six study reports said that the cost of sun protection resources was a barrier to their use (Abroms et al. 1999 [+]; Collins et al. 2006 [-]; Geller et al. 2008 [++]; Glanz et al. 1999 [++]; Paul et al. 2008 [++]; Reeder et al. 2000 [+]). 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-SES schools (Collins et al. 2006 [-]), and one the cost of installing shade structures in schools (Geller et al. 2008 [++]). However, one study that focused on farmers in the USA said that cost was not a barrier (Parrott et al. 1996 [+]). ER 5.31 Other practical barriers to sun protection are: children being uncooperative with the application of sunscreen (two studies: Glanz et al. 1999 [++]; Reeder et al. 2000 [+]); the perceived ineffectiveness of sunscreen in stopping burning (one study: Abroms et al. 2003 [+]); and the perception of adverse health consequences of sunscreen use such as acne (two studies: Abroms et al. 2003 [+]; Lupton and Gaffney 1996 [++]), allergic reactions (one study: Geller et al. 2008 [++]), and potential long-term toxicity (two studies: Gerbert et al. 1996 [++]; Reeder et al. 2000 [+]). *Applicability* Most studies in this section were carried out outside the UK, and it is unclear to what extent the findings are generalisable. However, there is no specific reason to think that the social barriers identified are not applicable to the UK.

5.4.6 Institutional barriers

Two studies interviewed school staff concerning the perceived barriers faced by schools in implementing and encouraging sun protection practices (Collins et al. 2006; Geller et al 2008). One study (Collins et al. 2006) presented data regarding currently implemented policies; the other (Geller et al. 2008) focused on potential future policies.

The cost of implementing new policies, and the limited availability of staff time, were identified as barriers in one study (Geller et al. 2008). Concerns about the liability of staff (in the event of an allergic reaction to sunscreen, for example), and about the staff training required to implement sun protection policies, were also identified as barriers in this study (Geller et al. 2008).

In both these studies, not all staff felt that sun protection was a high priority. Some participants believed that because students did not spend long outdoors, sun protection was not a major concern; they also saw their options for implementing policies such as re-scheduling outdoor activities, or making changes to the physical environment, as limited (Geller et al. 2008). Some participants felt that sun protection detracted from the school's core tasks such as teaching (Collins et al. 2006). Staff also felt that they and parents were "*bombarded*" with policies and initiatives about different issues, creating a sense of overload (Geller et al. 2008). One participant argued that policies such as 'no hat, no play' regulations were an infringement of children's rights (Collins et al. 2006).

> *Well I see schools that have detentions for children who do not wear hats which I think is just ridiculous. I think it is an intrusion on the children's rights. (participant, Collins et al. 2006)*

Effective communication with parents was identified as a potential barrier in one study (Geller et al. 2008). The cost to parents was also mentioned as a concern relating to compulsory hat regulations in one study (Collins et al. 2006).

Evidence statement: Perceived barriers - institutional barriers
ER 5.32 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 (Geller et al. 2008 [++]). ER 5.33 Two studies find that some school staff felt that sun protection was not a high-priority issue, because of the limited time children spent outdoors (Geller et al. 2008 [++]; Collins et al. 2006 [-]). Participants in one study felt that sun protection detracted from teaching (Collins et al. 2006 [-]) and in one other study, school staff said they felt overwhelmed with policies and initiatives on a wide range of issues (Geller et al. 2008 [++]). ER 5.34 Effective communication with parents was identified as a potential barrier in one study (Geller et al. 2008 [++]). The cost to parents was also mentioned as a concern relating to

compulsory hat regulations in one study (Collins et al. 2006 [-]).

Applicability
The two studies (Collins et al. 2006 [-]; Geller et al. 2008 [++]) described in this section were conducted in New Zealand and the USA respectively. Due to differences in school governance and funding systems between countries, the findings may not be readily applicable to the UK.

5.5 Cues to action

The potential cues which may trigger individuals' use of sun protection resources have been divided into five categories:

- Sources of positive influence;
- Knowing people who have had skin cancer;
- Policies in schools and leisure facilities;
- Media messages;
- Specific triggers.

5.5.1 Sources of positive influence

Ten studies (Abroms et al. 2003; Clarke and Korotchenko 2009; CRUK n.d.a (*Sunburn*); Gillespie et al. 1993; Glanz et al. 1999; Hay et al. 2009; Lupton and Gaffney 1996; Paul et al. 2008; Shoveller et al. 2003; Young et al. 2005) discuss the sources of encouragement to adopt sun safety behaviours. Parents, particularly mothers, were cited as an important source of encouragement in seven studies (Abroms et al. 2003; Clarke and Korotchenko 2009; Gillespie et al. 1993; Glanz et al. 1999; Paul et al. 2008; Shoveller et al. 2003; Young et al. 2005). Other sources of encouragement included teachers, lifeguards and coaches (Gillespie et al. 1993; Glanz et al. 1999; Paul et al. 2008). Parents' and other adults' roles in these studies were not limited to encouragement but included practical support.

> *When I'm packing she'll [mother] make sure I've got the sunscreen in the bag and then when I'm ready to go, she'll make me put it on again and put zinc on my lips. (male, participant, Paul et al. 2008)*

Seven studies described differences between age groups in terms of who functions as a source of encouragement (CRUK n.d.a (*Sunburn*); Gillespie et al. 1993; Glanz et al. 1999; Lupton and Gaffney 1996; Paul et al. 2008; Shoveller et al. 2003; Young et al. 2005). Glanz et al. (1999) found that parents or carers apply sunscreen more often to younger children, while older children are more likely to apply it themselves.

Gillespie et al. (1993) found that older children are more likely to listen to their peers, while younger children are more likely to be encouraged by authority figures such as teachers. Four further studies (CRUK n.d.a (*Sunburn*); Lupton and Gaffney 1996; Shoveller et al. 2003; Young et al. 2005) report similar findings, and in addition, see young people's shift from parents and teachers to peers as sources of encouragement as part of a broader process by which they

assert their independence. One participant in Lupton and Gaffney's (1996) study argued that young people are, in general, less likely to passively accept authority figures' advice than in the past, but want the rationales for specified behaviours to be explicitly set out, giving this as a reason why they may not listen to parents or teachers.

On the other hand, some participants in Paul et al. (2008) saw themselves as having become more responsible with age, and hence more inclined to listen to health messages.

> *When you are at that age at primary, sometimes you like to do the opposite to what you are told. That's how it is. But as you get older, you reason with yourself and realize that it's stupid. (male, 16-17 years, participant, Paul et al. 2008)*

Young adult participants in one study said that parental encouragement had little impact on their behaviour (Abroms et al. 2003).

> *[My mom says,] "You're going to die [from working as a lifeguard without sunscreen]. You're going to get skin cancer." All right, mom. Have a good day. I'm going to work. Leave me alone. (male, participant, Abroms et al. 2003)*

The recreation staff interviewed by Glanz et al. (1999) said that they had not been as effective in encouraging sun protection behaviour as they could be. Parrott et al. (1996) found that doctors rarely acted as a source of encouragement.

Two studies (Abroms et al. 2003; CRUK n.d.a (*Sunburn*)) examined gender differences in sources of influence. One study found that girlfriends and friends were the most influential sources for men (Abroms et al. 2003). Girlfriends and friends were noted to be more likely than parents to be with men when sunscreen decisions were made. For women, it was found that mothers were the most influential, providing verbal encouragement and in some cases supplying resources such as sunscreen. Most female participants also saw their friends and peers as sources of encouragement; their boyfriends or husbands, however, were generally indifferent to sunscreen use, although a few discouraged it. The other study also found that young men often rely on their girlfriend or mother for protection (CRUK n.d.a (*Sunburn*)).

One study found that people who have been diagnosed with skin cancer actively acted as sources of encouragement for other family messages, reminding them to use sun protection and, in some cases, using forceful personal messages: "*you don't want to end up like me*" (Hay et al. 2009). However, a participant in one study who had been diagnosed with malignant melanoma said that she had not actively passed on the message to colleagues (Glanz et al. 1999).

Evidence statement: Cues to action - sources of positive influence
ER 5.35 Six studies, most in school settings, find that children aged 6-8 years (Glanz et al. 1999 [++]), young people aged 12-17 years (Paul et al. 2008 [++]; Shoveller et al. 2003 [++]; Young et al. 2005 [++]; Gillespie et al. 1993 [-]), and young adults aged 18-25 years (Abroms et al. 2003 [+]) 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 (Clarke and Korotchenko 2009 [+]). Other adults, such as teachers and lifeguards, were identified as sources of positive encouragement for children aged 6-8 years (Glanz et al. 1999 [++]) and young people aged 8-17 years (Gillespie et al. 1993 [-]; Paul et al. 2008 [++]) to adopt sun protective behaviours.

ER 5.36 Seven study reports find 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 (Glanz et al. 1999 [++]). Five studies find 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, while older young people are more likely to be influenced by their peers (CRUK n.d.a (*Sunburn*) [-]; Gillespie et al. 1993 [-]; Lupton and Gaffney 1996 [++]; Shoveller et al. 2003 [++]; Young et al. 2005 [++]). 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 one study found that older young people (aged 16-17 years) felt themselves to be more receptive to health messages than younger children (Paul et al. 2008 [++]).

ER 5.37 One US study which interviewed recreation staff finds that they felt that they had not been an effective source of encouragement to encourage positive sun protective behaviour such as wearing clothes or applying sunscreen (Glanz et al. 1999 [++]. Another study of farmers in the USA notes that doctors rarely acted as a source of encouragement for positive sun protection behaviour (Parrott et al. 1996 [+]).

Applicability
Most of the studies in this section were not conducted in the UK. However, findings regarding sources of influence appear to be consistent across countries, and there are no specific reasons to think that these findings may not be generalisable to the UK context.

5.5.2 Knowing people who have had skin cancer

Participants in five studies, from the whole range of age groups, said that knowing someone with skin cancer, such as a friend or relative, had led them to increase their overall sun protection behaviours (Calder and Aitken 2008; Gerbert et al. 1996; Gillespie et al. 1993; Hay et al. 2009; Paul et al. 2008).

Evidence statement: Cues to action - knowing people that have had skin cancer
ER 5.38 Adults and young people in five study reports stated that knowing someone with skin cancer may act as a cue to adopt sun protection behaviours in general (Calder and Aitken 2008 [++]; Gerbert et al. 1996 [++]; Gillespie et al. 1993 [-]; Hay et al. 2009 [++]; Paul et al. 2008 [++]).

Applicability
None of the studies in this section were conducted in the UK. It is unclear to what extent the findings may be generalisable to the UK context.

5.5.3 Policies in schools and leisure facilities

Six studies discuss the role of institutional policies as cues to action, with four looking at schools (Collins et al. 2006; Geller et al. 2008; Gillespie et al. 1993; Paul et al. 2008) and two at leisure facilities (Escoffery et al. 2008; Glanz et al. 1999).

Two studies mention the role of messages or policies within schools as a cue to action (Collins et al. 2006; Geller et al. 2008). Collins et al. (2006) found that most of the schools in their sample from New Zealand implemented school-wide policies, including: constructing physical shade structures or planting trees; introducing 'no hat, no play' or 'no hat, play in the shade' rules; providing free sunscreen to students; and rescheduling outdoor activities to early morning or late afternoon. For some schools, addressing UV exposure and the risks associated with it forms a part of a larger initative to promote students' health at a 'whole-school' level. School staff were generally positively disposed to these policies, seeing them in the context of an integrated health promotion effort, and implemented them effectively. Schools in New Zealand are largely self-governing and responsible for funding interventions themselves. Finding outside funding was problematic in nine schools and they therefore could not provide shade. This was true of schools in disadvantaged areas as well as those with populations of higher socioeconomic status. Some schools took particular measures to encourage sun protection among pupils from minority ethnic groups (Maori and Pacific Islander).

In contrast, the US schools studied by Geller et al. (2008) generally did not have formal sun protection policies, and staff were less confident about their role in implementing change; nonetheless, most staff were willing to introduce such policies, and in particular to create physical shade structures.

Both the studies cited above concern primary schools; little data were available on secondary school policies, and a participant in one study observed that policies such as 'no hat, no play' which are common in primary schools in Australia are rare in secondary schools (Paul et al. 2008).

Children and young people in one study observed that the scheduling of outdoor school activities including lunch breaks and sports events was outside their control, and that such activities are frequently scheduled during the hottest part of the day (Gillespie et al. 1993).

Two studies examined leisure facilities such as outdoor swimming pools or sports facilities (Escoffery et al. 2008; Glanz et al. 1999). One study reports a process evaluation of a sun protection intervention ('Pool Cool') that targets patrons of outdoor pools (Escoffery et al. 2008). This study finds that signs, sunscreen pumps and shade structures were generally viewed

positively and frequently used by pool-goers. The programme also had a positive effect on staff, making them more conscious of sun safety (Escoffery et al. 2008). The recreation staff interviewed by Glanz et al. (1999) indicated that few sun protection policies had been implemented at their workplaces, and were conscious that staff often did not model good sun protection practices, but were generally willing to implement such policies.

In addition, participants in one further study suggested the use of venues such as community centres to diffuse sun protection messages beyond schools (Geller et al. 2008). They saw some potential barriers to positive outcomes at community venues, including low attendance and a perceived low priority of skin cancer as a health subject.

Evidence statement: Cues to action - policies in schools and leisure facilities
ER 5.39 Two studies from New Zealand and the US find 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 (Collins et al. 2006 [-]; Geller et al. 2008 [++]). 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 (Paul et al. 2008 [++]). ER 5.40 One study reports that the scheduling of outdoor school activities such as lunch breaks and sports events, typically at hotter times of day, is outside the control of students (Gillespie et al. 1993 [-]). ER 5.41 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 (Escoffery et al. 2008 [++]) ER 5.42 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 (Glanz et al. 1999 [++]). ER 5.43 Participants in one study suggested the use of venues such as community centres to diffuse sun protection messages beyond schools to facilitate better sun protection practices. Potential barriers to positive outcomes at community venues included low attendance and perceived low priority of skin cancer as a health subject. (Geller et al. 2008 [++]). *Applicability* None of the studies included in this section were from the UK. Since policies and forms of governance in schools and other institutions may vary between countries, the findings may not be readily applicable to the UK context.

5.5.4 Media messages

Three studies mention the influence of the media on individuals' behaviour (Abroms et al. 2003; Gerbert et al. 1996; Gillespie et al. 1993). Some participants mentioned that publicity concerning the negative effects of sunlight was a motivating factor to increase sun screen use, although it only had a short-term effect on behaviour.

> *When there was first the big scare about the hole on the ozone layer, about how we were all going to get skin cancer… for a while I was wearing sunscreen… But that lasted maybe three weeks. (participant, Gerbert et al. 1996)*

However, participants in three studies believed that popular media's representation of the attractiveness of a tan had an adverse effect on sun protection behaviour (Abroms et al. 2003; Gerbert et al. 1996; Gillespie et al. 1993). A respondent in one study of young people (aged 18-25 years) pointed out that characters on television, for example in *Baywatch*, are never seen using sunscreen (Abroms et al. 2003).

Evidence statement: Cues to action - media messages
ER 5.44 Three study reports, of young adults (18 to 25 years) and adults discuss the influence of the media on individuals' behaviour (Abroms et al. 2003 [+]; Gerbert et al. 1996 [++]; Gillespie et al. 1993 [-]). All of these studies show the belief that representations in the media may have an adverse effect on sun protection behaviours. *Applicability* None of the studies in this section are from the UK. However, it is likely that media messages are similar across countries.

5.5.5 Specific triggers of sun protection behaviour

Participants in three studies said that they are more likely to use sun protection in summer than in winter (Gillespie et al. 1993; Glanz et al. 1999), or in sunny weather more than on overcast days (Gerbert et al. 1996). In two UK studies, one of male outdoor workers (aged 20-50 years) and the other of young women (aged 12-15 years), participants said that the weather in the UK does not demand sun protection (CRUK n.d.c (*Outdoor workers*); Curtis and Pollock 2009).

Participants in two studies mentioned that they are more likely to use sun protection when they notice that they are already beginning to burn (Bergenmar and Brandberg 2001; Grey 2008).

Evidence statement: Cues to action - specific triggers of sun protection behaviour
ER 5.45 Three study reports, from the USA and Australia, show people of all age ranges to be more likely to use sun protection in general in summer and in sunny weather (Gerbert et al. 1996 [++]; Gillespie et al. 1993 [-]; Glanz et al. 1999 [++]). ER 5.46Two study reports from the UK, one of male outdoor workers (aged 20-50 years) and

the other of young women (aged 12-15 years), report the belief that sun protection measures are not required in the UK due to the lack of hot, sunny weather (CRUK n.d.c (*Outdoor workers*) [-]; Curtis and Pollock 2009 [-]).

ER 5.47 Two study reports describe adults (aged 16-54 years) putting on a T-shirt or applying sunscreen only after beginning to burn (Bergenmar and Brandberg 2001 [++]; Grey 2008 [-]).

Applicability
Studies from the UK indicate a particular perception that the weather in the UK does not call for sun protection. Other findings from non-UK studies are also likely to be applicable to the UK context.

5.6 Barriers and facilitators to the use of interventions

In this section, evidence relating to barriers and facilitators of interventions is summarised. This includes both data from studies which directly focused on interventions, and data from other studies which may be relevant to interventions.

5.6.1 Provision of sun protection resources

The findings of this review show a number of barriers to sun protection that could potentially be addressed by resource provision interventions, such as making available free sunscreen or protective clothing. Five studies note that the cost of sunscreen (Abroms et al. 1999; Glanz et al. 1999; Paul et al. 2008; Reeder et al. 2000), and the inconvenience of remembering to carry sunscreen (Abroms et al. 2003; Gillespie et al. 1993) or protective clothing (Paul et al. 2008), particularly among children and young people (8 to 25 years), may be barriers to their use.

Two studies present data on the implementation of interventions with a resource provision component. Collins et al. (2006) look at school-based programmes including free sunscreen and hat provision as well as environmental shade provision, regulatory and scheduling changes, and education. Escoffery et al. (2008) look at an intervention in swimming pools including free sunscreen provision as well as environmental shade provision, signage and staff training. Both these studies find that resource provision is feasible and acceptable for service providers in these settings, and that there is substantial uptake of resource provision by targeted populations. Some barriers were found in these studies, including dissenting views from some school staff who did not see sun protection as a high priority (Collins et al. 2006).

In two studies, service providers' views on potential interventions, including resource provision, were elicited. These studies find that school staff (Geller et al. 2008) and leisure staff (Glanz et al. 1999) are generally aware of the value of sun protection interventions and optimistic about their own role in promoting sun protection behaviour. However, they have concerns around practicability (funding; limited scheduling options) and issues of the definition of their responsibilities (monitoring; allergies to sunscreen; parental permission; liability in case of

sunburn). Many service providers have ideas about how sun protection could be incorporated into their role (Glanz et al. 1999), which may be valuable in designing interventions.

The studies identified a number of other barriers to resource use including:

- Physical discomfort (Gillespie et al. 1993; Glanz et al. 1999; Parrott et al. 1996; Paul et al. 2008)
- Inconvenience of use (Abroms et al. 2003; CRUK n.d.c (*Outdoor workers*); Curtis and Pollock 2009; Geller et al. 2008; Gerbert et al. 1996; Gillespie et al. 1993; Glanz et al. 1999; Parrott et al. 1996; Paul et al. 2008; Reeder et al. 2000)
- Social barriers including appearance and prevailing norms (Abroms et al. 2003, Glanz et al. 1999, Parrott et al. 1996; Calder and Aitken 2008; Gillespie et al. 2003, Glanz et al. 1999, Lupton and Gaffney 1996, Paul et al. 2008, Shoveller et al. 2003)

Different populations are likely to have different barriers. For example, appearance or fashionability is particularly important for young people (Calder and Aitken 2008; Gillespie et al. 2003; Glanz et al. 1999; Lupton and Gaffney 1996; Paul et al. 2008; Shoveller et al. 2003). This indicates that the nature of the resources provided should be carefully considered. Different resources may be appropriate to different populations: for example, families with young children have different needs to older young people.

Evidence statement: barriers and facilitators – resource provision
ER 5.48 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 (Abroms et al. 2003 [+]; Glanz et al. 1999 [++]; Paul et al. 2008 [++]; Reeder et al. 2000 [+]), and the inconvenience of remembering to carry sunscreen (Abroms et al. 2003 [+]; Gillespie et al. 1993 [-]) or protective clothing (Paul et al. 2008 [++]). These barriers appear to be particularly relevant for children and young people (aged 8 to 25 years). ER 5.49 Two studies present process data on multi-component interventions with a resource provision component, including sunscreen and clothing provision as well as environmental change and information (Collins et al. 2006 [-]; Escoffery et al. 2008 [++]). Both these studies find that resource provision is feasible and acceptable for service providers in these settings, and that there is substantial uptake of resource provision. Potential barriers include the fact that not all staff who are involved in delivering interventions see sun protection as a high priority (Collins et al. 2006 [-]). ER 5.50 Two studies investigate service providers' views towards potential resource provision interventions, finding that school staff (Geller et al. 2008 [++]) and leisure staff (Glanz et al. 1999 [++]) 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. ER 5.51 A wide range of other barriers are identified in the studies. These include physical discomfort (Gillespie et al. 1993 [-]; Glanz et al. 1999 [++]; Parrott et al. 1996 [+]; Paul et al. 2008 [++]), inconvenience of use (Abroms et al. 2003 [+]; CRUK n.d.c (*Outdoor workers*) [-];

Curtis and Pollock 2009 [-]; Geller et al. 2008 [++]; Gerbert et al. 1996 [++]; Gillespie et al. 1993 [-]; Glanz et al. 1999 [++]; Parrott et al. 1996 [+]; Paul et al. 2008 [++]; Reeder et al. 2000 [+]) and social barriers including appearance and prevailing norms (Abroms et al. 2003 [+]; Calder and Aitken 2008 [++]; Gillespie et al. 2003 [-]; Glanz et al. 1999 [++]; Lupton and Gaffney 1996 [++]; Parrott et al. 1996 [+]; Paul et al. 2008 [++]; Shoveller et al. 2003 [++]). Not all resources are acceptable to all targeted populations.

Applicability
Most of the studies cited here were not conducted in the UK. It is possible that barriers to the implementation and uptake of interventions will be greater in the UK than elsewhere, due to service providers and targeted populations having less awareness of sun protection.

5.6.2 Physical changes to natural or built environment

We located relatively little data relevant to environmental change interventions such as constructing shade structures or planting trees, with only three studies providing clearly relevant data (Collins et al. 2006; Gillespie et al. 1993; Geller et al. 2008). Such interventions appear to be feasible in schools, and may be most promising as part of a holistic 'whole school' approach to health promotion, combined with educational curricula and changes to school regulations and policies (Collins et al. 2006). However, uptake of environmental shade may be incompatible with the freedom to engage in outdoor activities, which is valued especially by younger children (Gillespie et al. 1993). Lack of funding may be a barrier to implementing such interventions (Geller et al. 2008).

Outside the school context, where there is less supportive policy infrastructure, we found no data directly relevant to environmental change interventions. The low perceived salience of sun protection for incidental sun exposure, and the emphasis on sunscreen as the primary mode of protection (Glanz et al. 1999), mean that the availability of shade in the environment is rarely discussed. Nonetheless, it is possible that the use of environmental shade where it is available is higher than the findings of qualitative research would suggest.

Evidence statement: barriers and facilitators – environmental change

ER 5.52 One study looks at multi-component interventions in schools including the provision of environmental shade, finding that such interventions are practicable and acceptable (Collins et al. 2006 [-]). These interventions formed part of broader programmes which also included resource provision, regulatory and scheduling changes, and education.

ER 5.53 One study finds that using environmental shade may reduce the spontaneity of outdoor activities, especially for younger children (Gillespie et al. 1993 [-]). One study finds that school authorities see the cost of providing environmental shade as a barrier (Geller et al. 2008 [++]).

Applicability
None of the studies cited here were conducted in the UK. It is unclear to what extent findings relating to environmental change may be applicable to the UK context.

5.6.3 Multi-component interventions

Five studies find that people do not think skin cancer is a serious risk, and that sun protection is of low importance (CRUK n.d.b (*SunSmart*); Curtis and Pollock 2009; Gerbert et al. 1996; Gillespie et al. 1993; Glanz et al. 1999). This suggests that multi-component interventions, combining information or education (such as media campaigns, signage or point-of-sale prompts) with resource provision and/or environmental change, may constitute a promising strategy.

Seven studies indicate that concerns about appearance (the risk of visible skin aging, moles, wrinkles, or visible sunburn) are highly salient in terms of the perceived risks of sun exposure (Abroms et al. 2003; Paul et al. 2008; Clarke and Korotchenko 2009; Gerbert et al. 1996; Gillespie et al. 1993; Lupton and Gaffney 1996; Murray and Turner 2004). Two of these find that visible skin aging is perceived by some participants to be as serious a consequence of sun exposure as the risk of cancer (Gerbert et al. 1996; Murray and Turner 2004). Multi-component interventions might therefore seek to emphasise appearance-related messages rather than focusing on skin cancer, which is perceived to be distant and improbable. Addressing social norms around tanning, and the attractiveness of a tanned appearance, may also have a role to play in multi-component interventions. However, there is a risk that such messages may alienate men, who are reluctant to be seen to be motivated by concerns about their appearance, even when the latter are important to them (Abroms et al. 2003; Lupton and Gaffney 1996; see section 5.7.3 below).

An important potential barrier to the uptake of interventions is the perception that incidental tanning is less risky than deliberate tanning (Bergenmar and Brandberg 2001; Lupton and Gaffney 1996; Shoveller et al. 2003). Interventions could therefore be tailored in such a way as to re-frame sun protection messages away from deliberate sunbathing and beach settings, and towards the mitigation of incidental sun damage. For example, providing sun protection resources or environmental shade in settings such as parks or pedestrian areas could be combined with information on the risks of incidental sun exposure.

A potential concern here is the potential for conflict with other aspects of the health promotion agenda, particularly physical activity. The association of tanning with a healthy, active lifestyle (Bergenmar and Brandberg 2001; Calder and Aitken 2008; Gerbert et al. 1996; Gillespie et al. 1993; Lupton and Gaffney 1996; Shoveller et al. 2003) – as well as the practical barriers to using sun protection in conjunction with physical activities such as sport or active transport – means that sun protection interventions will need to be carefully designed in order not to inadvertently undermine the promotion of physical activity.

Evidence statement: barriers and facilitators – multi-component interventions
ER 5.54 Five studies find that people do not think skin cancer is a serious risk, and that awareness of the risks of sun exposure is generally low (CRUK n.d.b (*SunSmart*) [-]; Curtis and Pollock 2009 [-]; Gerbert et al. 1996 [++]; Gillespie et al. 1993 [-]; Glanz et al. 1999 [++]); this

perception could be addressed by multi-component interventions.

ER 5.55 Seven studies identify appearance (the risk of skin aging, moles, wrinkles, or visible sunburn) as a potential motivation for sun protection behaviour (Abroms et al. 2003 [+]; Clarke and Korotchenko 2009 [+]; Gerbert et al. 1996 [++]; Gillespie et al. 1993 [-]; Lupton and Gaffney 1996 [++]; Murray and Turner 2004 [+]; Paul et al. 2008 [++]). This motivation could be addressed by sun protection messages as part of multi-component interventions.

ER 5.56 Three studies find that incidental tanning is perceived to be less risky than deliberate tanning (Bergenmar and Brandberg 2001 [++]; Lupton and Gaffney 1996 [++]; Shoveller et al. 2003 [++]). Six studies find that sun exposure, or a tanned appearance, are associated with a healthy, active lifestyle (Bergenmar and Brandberg 2001 [++]; Gerbert et al. 1996 [++]; Gillespie et al. 1993 [-]; Calder and Aitken 2008 [++]; Lupton and Gaffney 1996 [++]; Shoveller et al. 2003 [++]). These perceptions may have implications for the design of interventions.

Applicability
Most of the studies cited here were not conducted in the UK. It is possible that barriers to the implementation and uptake of interventions will be greater in the UK than elsewhere, due to service providers and targeted populations having less experience of sun protection interventions, and less awareness of sun protection.

5.7 Views of different groups

In this section we examine the public's views; service providers' views; and differences between population groups.

5.7.1 Views of people who may use prevention services

A consistent finding of this review is that the perceived risks of sun exposure, and the perceived severity of skin cancer, are generally low (CRUK n.d.b (*SunSmart*); Curtis and Pollock 2009; Gerbert et al. 1996; Gillespie et al. 1993; Glanz et al. 1999), and a tanned appearance is considered attractive (Calder and Aitken 2008; Clarke and Korotchenko 2009; Curtis and Pollock 2009; Lupton and Gaffney 1996; Gerbert et al. 1996; Gillespie et al. 1993; Grey 1998; Murray and Turner 2004; Paul et al. 2008; Reeder et al. 2000; Shoveller et al. 2003; Young et al. 2005). There are exceptions: parents of young children appear to be more receptive to sun protection messages, and women more than men (see section 5.7.3). Nonetheless, it appears that sun protection interventions are likely to have a low perceived salience for much of the population. For this reason, it may be of value to combine resource provision or environmental interventions with education or information, in order to maximise their impact.

Within this general point, one issue of interest is the difference between deliberate and incidental tanning. The risk involved in deliberate tanning is often recognised, at least in theory, but that involved in outdoor activities which result in 'incidental' tanning are not, partly because

of the healthy connotations of outdoor physical activity (Bergenmar and Brandberg 2001; Lupton and Gaffney 1996; Shoveller et al. 2003). Because of this healthy connotation, and because sun protection is associated with deliberate tanning such as at the beach (Abroms et al. 2003; Glanz et al. 1999; Parrott et al. 1996), incidental tanning is not perceived as calling for sun protection. This appears to be particularly relevant for men, who reject the idea of deliberately tanning, but value a tanned appearance gained as a result of 'incidental' sun exposure (Abroms et al. 2003; Lupton and Gaffney 1996; see section 5.7.3 below). There is a potential risk that interventions focused on high-exposure settings such as beaches may inadvertently strengthen the perceived distinction between deliberate and incidental tanning.

Evidence statement: views of people who may use prevention services
ER 5.57 Five studies find that people do not think skin cancer is a serious risk (CRUK n.d.b (*SunSmart*) [-]; Curtis and Pollock 2009 [-]; Gerbert et al. 1996 [++]; Gillespie et al. 1993 [-]; Glanz et al. 1999 [++]). Twelve studies find that a tanned appearance is considered attractive (Calder and Aitken 2008 [++]; Clarke and Korotchenko 2009 [+]; Curtis and Pollock 2009 [-]; Lupton and Gaffney 1996 [++]; Gerbert et al. 1996 [++]; Gillespie et al. 1993 [-]; Grey 1998 [-]; Murray and Turner 2004 [+]; Paul et al. 2008 [++]; Reeder et al. 2000 [+]; Shoveller et al. 2003 [++]; Young et al. 2005 [++]). ER 5.58 Three studies find that incidental tanning is perceived as less risky than deliberate tanning (Bergenmar and Brandberg 2001 [++]; Lupton and Gaffney 1996 [++]; Shoveller et al. 2003 [++]). The use of protection is associated with deliberate tanning, such as at the beach, in three further studies (Abroms et al. 2003 [+]; Glanz et al. 1999 [++]; Parrott et al. 1996 [+]). This suggests that sun protection is seen as less salient where sun exposure is incidental and not deliberate. Two studies indicate that this may be particularly true for men (Abroms et al. 2003 [+]; Lupton and Gaffney 1996 [++]). *Applicability* Most of the studies cited here were not conducted in the UK. However, the findings appear to be consistent across countries.

5.7.2 Views of service providers

Service providers, or potential service providers such as teachers, other school staff and staff at leisure facilities, are generally optimistic about the prospects for intervention and policy change, and willing to take an active role in implementing policy (Collins et al. 2006; Geller et al. 2008; Glanz et al. 1999). Staff in schools who have implemented integrated sun-protection policies are actively engaged in modelling and encouraging good sun protection practices (Collins et al. 2006). However, in some cases, potential service providers are concerned about the potential extension to their responsibilities, and about the boundaries and expectations around this extended role (Geller et al. 2008; Glanz et al. 1999). There is also the risk, particularly in schools, of an overload of policies and recommendations leading to unclarity about what activities to prioritise (Geller et al. 2008).

Evidence statement: views of service providers
ER 5.59 Three studies find that service providers, including school staff (Collins et al. 2006 [-]; Geller et al. 2008 [++]) and leisure staff (Glanz et al. 1999 [++]), have positive attitudes towards resource provision and environmental change interventions. However, two studies report concerns about the potential extension to their responsibilities (Geller et al. 2008 [++]; Glanz et al. 1999 [++]), and one study raises the prospect of an overload of policies and recommendations (Geller et al. 2008 [++]). *Applicability* None of the studies cited here were conducted in the UK. There may be differences between countries in the organisational context of service delivery, which may create barriers to the applicability of these findings to the UK context.

5.7.3 Differences by population

Gender

In two studies, men were found to be less likely than women to deliberately sunbathe to tan, but also less likely to use sun protection (Abroms et al. 2003; CRUK n.d.a (*Sunburn*)). A theme in several studies is that actions taken in order to protect or improve one's appearance are perceived as unmasculine. This applies both to deliberate sunbathing (Lupton and Gaffney 1996) and sunbed use (Calder and Aitken 2008; CRUK n.d.c (*Outdoor workers*)), but also to the use of sun protection such as sunscreen (Abroms et al. 2003).

As already noted, these gender differences may be linked to other perceptions, in particular the perception of incidental tanning as less harmful than deliberate tanning, and the association of a tanned appearance with a healthy, outdoor lifestyle (see section 5.7.1 above). Men appear to value a tan gained as a result of outdoor activities, especially sports, but do not see themselves as engaging in 'tanning' as a distinct activity. Hence, men are likely to be less receptive to sun protection messages which focus on the dangers of deliberate sunbathing or sunbed use. Women appear to be more aware of the risks involved in incidental sun exposure, and hence more receptive to sun protection messages, but are also more likely to engage in deliberate tanning.

In addition, women, especially mothers, tend to take the lead role in promoting sun protection behaviours within the family, particularly for children but also for other adults (Abroms et al. 2003; Hay et al. 2009; Paul et al. 2008).

Women were found to be more concerned than men about appearance, including both perceived positive aspects of sun exposure (tanning) and negative effects (skin aging), in four studies (Abroms et al. 2003; Lupton and Gaffney 1996; Murray and Turner 2004; Paul et al. 2008). Very few male participants in the studies expressed concern about the long-term effects of sun exposure on appearance.

These differences between men's and women's attitudes appear to emerge early, with some differences visible as early as age 12 to 14 (Paul et al. 2008). Further, we would suggest that these differences do not arise in isolation from the broader culture, but are linked to deeply-rooted gender norms which code concern with appearance, in general, as feminine: "men act, women appear" (Berger 1972). As noted above, these differences indicate that different strategies may be appropriate to men and women. However, it is difficult to operationalise such differences within social or community-based intervention strategies. Our findings suggest that women are more likely to be receptive to sun protection messages, and to pass these messages on to family members.

Evidence statement: Differences by population - gender
ER 5.60 Two studies find that men were found to be less likely than women to deliberately sunbathe, but also less likely to use sun protection (Abroms et al. 2003 [+]; CRUK n.d.a (*Sunburn*) [-]). Three studies report the perception that sunbathing (Lupton and Gaffney 1996 [++]) or sunbed use (Calder and Aitken 2008 [++]; CRUK n.d.c (*Outdoor workers*) [-]) are unmasculine. ER 5.61 Three studies find that women, especially mothers, tend to take the lead role in promoting sun protection behaviours within the family (Abroms et al. 2003 [+]; Hay et al. 2009 [++]; Paul et al. 2008 [++]). ER 5.62 Four studies find that women were more concerned than men about how the sun affects their appearance, both negatively (skin aging and wrinkles) and positively (tanned appearance) (Abroms et al. 2003 [+]; Lupton and Gaffney 1996 [++]; Murray and Turner 2004 [+]; Paul et al. 2008 [++]). *Applicability* Most of the studies cited in this section were not conducted in the UK. However, the findings appear to be consistent across countries.

Age

Our findings indicate that different age groups, particularly among children and young people, have different views. For younger children, sun protection behaviours are likely to be strongly influenced by parents and teachers and other school staff (Abroms et al. 2003; Clarke and Korotchenko 2009; Gillespie et al. 1993; Glanz et al. 1999; Paul et al. 2008; Shoveller et al. 2003; Young et al. 2005). Nonetheless, younger children are aware of the need for sun protection and willing to encourage others (Gillespie et al. 1993), and may be usefully targeted by sun protection interventions.

Older children and adolescents may be more difficult to reach effectively, as they are engaged in a process of gaining independence which may lead to the rejection of simplistic messages from adults and authority figures (CRUK n.d.a (*Sunburn*); Lupton and Gaffney 1996; Shoveller et al. 2003; Young et al. 2005). They may see sun protection as a matter for younger children

(Paul et al. 2008). They are also strongly influenced by concerns about appearance and 'coolness' and by social norms, including gender norms. These findings suggest that peer-led interventions may be a promising strategy with this age group.

The one study with a focus on older people (Clarke and Korotchenko 2009) found certain views which may be characteristic of this age group, including a strong belief in sun exposure as healthy in itself. On the other hand, older people are aware at first-hand of the long-term effects of sun exposure, and of the contingency of social expectations around tanning.

Parents of young children appear to be more receptive than the general population to sun protection messages (CRUK n.d.a (*Sunburn*); CRUK n.d.c (*Outdoor workers*); Glanz et al. 1999; Reeder et al. 2000). However, some data suggest that parental concern relating to young children's sun exposure may not extend to their own sun exposure, or to that of older children (CRUK n.d.c (*Outdoor workers*); Grey 2008; Paul et al. 2008). This suggests that sun protection messages targeted at parents may have had an impact on the protection of young children, but less influence on behaviour more broadly.

Evidence statement: Differences by population – age
ER 5.63 Seven studies find that young children are more likely to be influenced by parents, particularly mothers and school staff (Abroms et al. 2003 [+]; Clarke and Korotchenko 2009 [+]; Gillespie et al. 1993 [-]; Glanz et al. 1999 [++]; Paul et al. 2008 [++]; Shoveller et al. 2003 [++]; Young et al. 2005 [++]). ER 5.64 Four studies find that adolescents are less likely to be influenced by authority figures and adults and may assert their independence by not following sun protection messages (CRUK n.d.a (*Sunburn*) [-]; Lupton and Gaffney 1996 [++]; Shoveller et al. 2003 [++]; Young et al. 2005 [++]). One study finds that adolescents see sun protection as primarily concerning younger children (Paul et al. 2008 [++]). ER 5.65 Four studies find that parents of young children are more receptive than the general population to sun protection messages (CRUK n.d.a (*Sunburn*) [-]; CRUK n.d.c (*Outdoor workers*) [-]; Glanz et al. 1999 [++]; Reeder et al. 2000 [+]). However, three studies find 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 (CRUK n.d.c (*Outdoor workers*) [-]; Grey 2008 [-]; Paul et al. 2008 [++]). *Applicability* Most of the studies cited in this section were not conducted in the UK. However, the findings appear to be consistent across countries.

Ethnicity

We found little data regarding ethnicity. One study suggests that certain beliefs, for example in the value of sun exposure for children to increase 'resistance' to sun damage, may be more

prevalent among certain ethnic or cultural groups; however, this study does not directly explore differences in belief between ethnic groups, so this point is of limited reliability (Glanz et al. 1999). One study found that some schools had specifically targeted minority ethnic pupils with sun protection policies (Collins et al. 2006).

Our findings do not allow us to say to what extent sun protection interventions may need to be tailored to people of different ethnicities, as a result either of socio-cultural factors, or of phenotypic differences in skin tone which may impact on (actual or perceived) skin cancer risk.

Socioeconomic status (SES) and occupation

We found little data regarding SES. One study found that people from higher-SES groups were more aware of long-term health risks from sun exposure than those from lower-SES groups (CRUK n.d.a (*Sunburn*)). One study found that schools in low-SES areas were able to implement sun protection policies as successfully as those in high-SES areas (Collins et al. 2006). Other than this, our findings do not allow us to say how barriers or facilitators of interventions may differ for people of different SES.

One occupational group of particular concern is outdoor workers. Two included studies had a focus on outdoor workers (CRUK n.d.c (*Outdoor workers*); Parrott et al. 1996). Both these studies found a generally low perceived severity of and susceptibility to skin cancer (including the belief that sun exposure would increase 'resistance' to sun damage). Parrott et al.'s (1996) study of farmers in the southern USA found that they had limited access to resources for preventing skin cancer resources. Inconvenience was a more salient barrier than cost for this population, which may suggest that the potential for resource provision interventions is limited; there is also concern about the accessibility of interventions for dispersed rural populations. The other study, of outdoor workers in the UK (CRUK n.d.c (*Outdoor workers*)), similarly found that most thought they were not at risk, and were unwilling to use sun protection. Some felt that sun protection was not a priority for their employers. However, employees in larger organisations were amenable to changing behaviour if the necessary policies were led and financed by management. These studies suggest that the skin cancer risk of outdoor workers is a cause for concern; interventions in the workplace might be promising, but are likely to be challenging to implement.

Evidence statement: Differences by population – socioeconomic status and occupation
ER 5.66 One UK study finds that people from higher-SES groups were more aware of long-term health risks from sun exposure than those from lower-SES groups (CRUK n.d.a (*Sunburn*) [-]). ER 5.67 Two studies focus on the views of outdoor workers (CRUK n.d.c (*Outdoor workers*) [-]; Parrott et al. 1996 [+]). Both these studies find that outdoor workers do not feel that sun protection is a priority, and that they have little awareness of the risks of sun exposure. *Applicability* Two of the three studies in this section come from the UK, and the findings of the other (from the USA) are consistent with the UK research. Hence, findings are applicable to the UK context.

6.0 Discussion and summary

6.1 Strengths and weaknesses of the review

This review was systematic in nature, based on the guidance set out in the second edition of *Methods for the development of NICE public health guidance* (NICE 2009). Our search strategies were highly sensitive and included a wide range of potentially relevant sources. However, we did not include studies from the phase 1 review if they were not located by our searches (see section 6.4.1). The use of a cluster of terms referring to intervention types in our search strategy, although justified by the scope and purpose of the review, may have led to relevant studies not being located.

We used the Health Belief Model as a framework, which provided a coherent structure for the data synthesis (apart from the category of self-efficacy which was found not to be useful). Our synthesis was essentially thematic in nature, seeking to identify and collate common themes across the studies, and involved the elaboration of higher-order constructs only to a limited extent. Such thematic synthesis was supported by the nature of most of the primary studies, and helps to maintain the transparency of the synthesis process. However, further synthesis to develop these constructs would be of value. For example, the relation observed in our findings between 'health' and 'attractiveness' is a complex one; further exploration of this relationship and its links to other key concepts (e.g. gender norms) would be illuminating, and potentially of value in drawing out implications for interventions.

A further limitation of thematic synthesis, also noted by the phase 1 reviewers, is that it tends to weight review findings as a function of frequency and study quality, which may not be an accurate guide to the importance or reliability of the given finding. Again, however, the potential loss of depth in the synthesis must be set against the gains in transparency.

6.2 Gaps in the evidence

This review located a substantial amount of robust qualitative data on the barriers and facilitators of resource provision, environmental change and multi-component interventions for skin cancer prevention. However, there are some areas which are not well covered. Key gaps in the evidence include the following.

Few studies elicited data on study participants' views relating specifically to the delivery and implementation of interventions. While many of our findings have implications for the design and implementation of interventions, only in a small number of cases were these implications explicitly drawn out by primary study participants.

Few studies were conducted in the UK, and those that were, were not of high quality. Most studies were conducted in locations with warmer, sunnier climates, and with a longer history of skin cancer prevention programmes. There are likely to be challenges in generalising such evidence to the UK context. We found little data on holidays as a context of sun exposure,

which may be problematic, since UK residents are likely to receive much of their annual UV exposure on holiday.

Most studies did not focus on understanding the differences between factors which may influence different kinds of sun protection behaviour and resources (e.g. sunscreen, shade, or protective clothing). Of the data which did elicit views about specific behaviours, sunscreen use was predominant over other protective behaviours.

Information on subgroups of the population was mixed, with a substantial amount of data available on differences between men and women and between age groups (at least among children and young people), but little on socio-economic status and virtually none on ethnicity.

6.2.1 Relation of this review to the phase 1 review

This review did not locate all the studies included in the phase 1 review due to the different search terms used; of those located, some were excluded due to our different inclusion criteria. (Conversely, we included some studies not included in the phase 1 review.) We also did not screen all the studies in the phase 1 review for inclusion: this represents an exception to our search strategy. As a result, this review overlaps partially with that undertaken for phase 1.

The quality assessment tool used for this review (that set out in the second edition of *Methods for the development of NICE public health guidance*) was different to that used for phase 1. As a result, the quality scores for the studies which were included in both reviews are not always identical.

We used the same overarching framework for synthesis (the Health Belief Model) as phase 1. This helps to make the findings comparable across the two reviews. However, due to the differences in the data examined, we did not use exactly the same arrangement of sub-themes within the framework. Even for overlapping studies and themes, our synthesis may be different owing to the different contexts of analysis.

6.3 Conclusions

Resource provision, environmental change and multi-component interventions to prevent skin cancer may benefit from taking the public's and other stakeholders' views into account. The findings of this review suggest a number of barriers which could usefully be addressed by interventions, including the cost and inconvenience of sun protection resources, and social norms concerning their use.

However, especially in the UK, most people are not concerned about skin cancer, and often do not see their own UV exposure as risky. There are some exceptions, particularly parents of young children, who appear to be more receptive to sun protection interventions than other groups. Concerns about appearance and visible skin damage may be as important a facilitator

for sun protection as the risk of cancer. Men are consistently less concerned than women about sun exposure risk, and less aware of the need for protection. Some data indicate that people from lower-SES groups, and people who work outdoors, are less concerned than others. These perceptions may create a barrier to the uptake and successful implementation of sun protection interventions.

In addition, the perception of a tanned appearance as attractive and healthy is strongly held across a wide range of populations. Other potential barriers to intervention uptake include concerns about the practicality of sun protection, and the ease of use of sun protection resources. Social norms about sun protection and sun exposure, and concerns about maintaining an attractive or fashionable appearance, are also salient, particularly for young people and young adults (teens to early twenties).

These findings indicate that uptake of interventions may face a range of barriers in particular populations and settings. In particular, the acceptability of resource provision interventions may depend on the specific characteristics of the resources offered. For example, protective clothing which is seen to be unattractive may be rejected. Careful targeting of interventions to particular settings and populations may be required to overcome these barriers. Nonetheless, to the extent that they are aware of the risks, many people appear to be willing to make changes in behaviour, and are supportive of sun protection interventions.

In institutions such as schools, potential barriers include a lack of funding, unclear definitions of responsibility, and an overload of policies and recommendations. Again, however, potential service providers, such as teachers and other school staff, and staff at leisure facilities, are generally optimistic about their own role in promoting sun protection behaviour.

While the risks involved in deliberate tanning, particularly sunbed use, are widely recognised, there is less awareness of the dangers of incidental sun exposure. Outdoor activities, particularly physical activities, are seen as healthy, and the risks involved in sun exposure during such activities are often not considered. The perception of a tanned appearance as healthy and attractive also appears to owe something to the connotation of an active lifestyle. These views may have implications for the design and targeting of interventions.

The data included in this review indicate that there is substantial scope for resource provision and multi-component interventions to impact on sun protection behaviour. The picture regarding environmental change alone is less clear, although there are some promising indications that such interventions may be valuable, particularly as part of holistic strategies in particular contexts.

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8.0 Appendix A. Search Strategies

8.1 Development of search strategies

The search strategy was developed within the Centre for Evidence and Policy at King's College London. The terms were further defined through extensive testing and consultation with Matrix Evidence prior to submission to NICE in the form of a draft search protocol formatted for Medline and a list of resources.

The strategy was re-tested upon return from NICE with the final protocol and list of resources being approved on Thursday, 17 December 2010. Searching commenced on Monday, 21 December 2010.

The Medline strategy was applied across all of the medical databases that could interpret the mix of MeSH and free-text language. Where MeSH terms worked in Medline and did not translate to similar themed but subject specific resources, Psychinfo for instance, the initial terms were retained for the sake of methodological consistency even if some of the lines did not achieve results.

In the social science databases, which generally do not support MeSH, it was necessary to re-draft the lines of the Medline strategy into formatted search clusters. The terms were simplified by removing the MeSH terms and leaving the terms to operate as free-text. In the resources for which it was possible, MeSH logic was applied though without the precise formatting.

All of the search results were imported into a reference management tool for the purposes of de-duplication and screening.

8.2 ASSIA

Assia (CSA)

Date search Conducted: Wednesday, December 30th 2009

1. (skin cancer or (skin and (neoplasm* or cancer* or carcinoma* or adenocarcinom* or tumour* or tumor* or malignan*)) or skin neoplasms or non melanoma or malignant melanoma or melanoma or basal cell carcinoma)
2. (sun* or sunburn* or tan* or infrared* or solar* or damage or ultra violet* or ultraviolet* or ultra-violet*)
3. (prevent* or primary prevent* or health education* or health promotion* or protect* or precaution* or reduc* or natural* or protection or seeking shade or age or life style* or lifestyle* or life-style* or life style* or health)
4. (built environment* or structural chang* or physical chang* or shade or purpose built or sun trap* or architect* or consult* or design or construction or surrounding* or shelter or seat* or static* or pub* place or park* or garden* or public event* or

event* or concert* or outdoor* or walk* or (sport and (water* or winter*)) or build* or house* or flats or tent* or veranda* or blind* or umbrella* or awning* or cover* or shelter* or foliage or green* or tree* or plant* or nature or wind break* or barrier* or purpose* or childhood or secondary* or college or univ* or work* or lunch* or play* or game* or beach* or bathing beaches or swimming* or swimming pools or environmental exposure* or school* or universities or university or work*)

5. (provi* or distribut* or prescri* or free or hand out or give*) and (hat* or sunhat* or glasses or sunglass* or visor* or sun screen* or sunscreen* or sun block* or cover up or protective clothing)
6. (qualitative* or focus* or discussion* or case stud* or interview* or questionnaire* or evaluat* or (research* and (participant* or action* or priorit* or activit*)) or observation* or verbal interaction* or process or implementation or perception* or attitude* or view)

#1 AND #2 AND #3 AND (#4 OR #5) AND #6

Limit to earliest to 2010

8.3 Campbell Library

Search Conducted: Wednesday, December 30th 2009

1. (skin cancer or (skin and (neoplasm* or cancer* or carcinoma* or adenocarcinom* or tumour* or tumor* or malignan*)) or skin neoplasms or non melanoma or malignant melanoma or melanoma or basal cell carcinoma)
2. (sun* or sunburn* or tan* or infrared* or solar* or damage or ultra violet* or ultraviolet* or ultra-violet*)
3. (prevent* or primary prevent* or health education* or health promotion* or protect* or precaution* or reduc* or natural* or protection or seeking shade or age or life style* or lifestyle* or life-style* or life style* or health)
4. (built environment* or structural chang* or physical chang* or shade or purpose built or sun trap* or architect* or consult* or design or construction or surrounding* or shelter or seat* or static* or pub* place or park* or garden* or public event* or event* or concert* or outdoor* or walk* or (sport and (water* or winter*)) or build* or house* or flats or tent* or veranda* or blind* or umbrella* or awning* or cover* or shelter* or foliage or green* or tree* or plant* or nature or wind break* or barrier* or purpose* or childhood or secondary* or college or univ* or work* or lunch* or play* or game* or beach* or bathing beaches or swimming* or swimming pools or environmental exposure* or school* or universities or university or work*)
5. (provi* or distribut* or prescri* or free or hand out or give*) and (hat* or sunhat* or glasses or sunglass* or visor* or sun screen* or sunscreen* or sun block* or cover up or protective clothing)
6. (qualitative* or focus* or discussion* or case stud* or interview* or questionnaire* or evaluat* or (research* and (participant* or action* or priorit* or activit*)) or

observation* or verbal interaction* or process or implementation or perception* or attitude* or view)

1 AND 2 AND 3 AND (4 OR 5) AND 6

Notes: Results structured by Campbell's date limits 2002-2009

8.4 Centre for Reviews and Dissemination databases

Date search conducted: Wednesday, December 30th 2009

1. (skin cancer or (skin and (neoplasm* or cancer* or carcinoma* or adenocarcinom* or tumour* or tumor* or malignan*)) or skin neoplasms or non melanoma or malignant melanoma or melanoma or basal cell carcinoma)

2. (sun* or sunburn* or tan* or infrared* or solar* or damage or ultra violet* or ultraviolet* or ultra-violet*)

3. (prevent* or primary prevent* or health education* or health promotion* or protect* or precaution* or reduc* or natural* or protection or seeking shade or age or sunscreening agent* or life style* or lifestyle* or life-style* or life style* or health)

4. (built environment* or structural chang* or physical chang* or shade or purpose built or sun trap* or architect* or consult* or design or construction or surrounding* or shelter or seat* or static* or pub* place or park* or garden* or public event* or event* or concert* or outdoor* or walk* or (sport and (water* or winter*)))

5. (build* or house* or flats or tent* or veranda* or blind* or umbrella* or awning* or cover* or shelter* or foliage or green* or tree* or plant* or nature or wind break* or barrier* or purpose* or childhood or secondary* or college or univ* or work* or lunch* or play* or game* or beach* or bathing beaches or swimming* or swimming pools or environmental exposure* or school* or universities or university or work*)

6. ((provi* or distribut* or prescri* or free or hand out or give*) and (hat* or sunhat* or glasses or sunglass* or visor* or sun screen* or sunscreen* or sun block* or cover up or protective clothing))

7. (qualitative* or focus* or discussion* or case stud* or interview* or questionnaire* or evaluat* or (research* and (participant* or action* or priorit* or activit*)) or observation* or verbal interaction* or process or implementation or perception* or attitude* or view)

#4 or #5 = 8

Strategy 1: #1 AND #2 AND #3 AND #8 AND #7

Strategy 2: #1 AND #2 AND #3 AND #6 AND 7

limit to 1990 to 2009

Strategy 1 = 29
Strategy 2 = 10

Notes: Cluster 4 and 5 were split and run as two separate strategies due to interface limitations.

8.5 CINAHL

via EBSCOHost.

Date Search Conducted: Wednesday, December 23rd 2009

S1: skin cancer.tx
S2: (skin and (neoplasm$ or cancer$ or carcinoma$ or adenocarcinom$ or tumour$ or tumor$ or malignan$)).tx
S3: exp skin neoplasms/
S4: non melanoma.tx
S5: malignant melanoma.tx
S6: exp melanoma/
S7: exp carcinoma, basal cell/
S8: or/S1-S7
S9: sun$.tx
S10: sunburn/
S11: tan$.tx
S12: infrared rays/ or infrared$.tx
S13: (solar$ or damage or ultra violet$).tx
S14: or/S9-S13
S15: prevent$.tx
S16: exp primary prevent/
S17: exp health education/ or health education$.tx
S18: exp health promotion/ or health promotion$.tx
S19: (protect$ or precaution$ or reduc$ or natural$ or protection or seeking shade or age).tx
S20: exp sunscreening agents/ or sun screening agents.tx
S21: life style/ or (lifestyle$ or life-style$ or life style$)
S22: health/
S23: or/S15-S22
S24: (built environment$ or structural chang$ or physical chang$ or shade or purpose built or sun trap$ or architect$ or consult$ or design or construction or surrounding$ or shelter or seat$ or static$ or pub$ place or park$ or garden$ or public event$ or event$ or concert$ or outdoor$ or walk$ or (sport and (water$ or winter$)) or build$ or house$ or flats or tent$ or veranda$ or blind$ or umbrella$ or awning$ or cover$ or shelter$ or foliage or green$ or tree$ or plant$ or

nature or wind break$ or barrier$ or purpose$ or childhood or secondary$ or college or univ$ or work$ or lunch$ or play$ or game$).tx
S25: bathing beaches/ or beach$.tx
S26: swimming/ or swimming.tx
S27: swimming pools/
S28: environmental exposure.tx
S29: schools/ or school$.tx
S30: universities/ or university.tx
S31: work$
S32: or/S24-S31
S33: (provi$ or distribut$ or prescri$ or free or hand out or give$).tx
S34: (hat$ or sunhat$ or glasses or sunglass$ or visor$ or sun screen$ or sunscreen$ or sun block$ or cover up).tx
S35: protective clothing/
S36: S33 and (S34 or S35)
S37: qualitative research/
S38: (qualitative$ or focus or discussion$ or case stud$ or interview$ or questionnaire$ or evaluat$ or (research$ and (participant$ or action$ or priorit$ or activit$)) or observation$ or focus$ or case stud$ or verbal interaction$ or process or implementation or perception$ or attitude$ or view).tx
S39: or/S37-S38
S40: (chemical or nuclear or biolog$ or throat$ or lung$ or bowel$ or liver$ or colon$ or breast$ or cervical$ or pancre$ or testic$ or bone$ or recta$ or laryn$ or prostate or stomach$)
S41: S8 and S14 and S23 and (S32 or S36) and S39
S42: S41 NOT S40
S43: limit S42 yr=”1990 – 2009”

8.6 Cochrane Library

via Wiley Interscience.

Date search conducted: Wednesday, December 30th 2009

1. (skin cancer or (skin and (neoplasm* or cancer* or carcinoma* or adenocarcinom* or tumour* or tumor* or malignan*)) or skin neoplasms or non melanoma or malignant melanoma or melanoma or basal cell carcinoma)
2. (sun* or sunburn* or tan* or infrared* or solar* or damage or ultra violet* or ultraviolet* or ultra-violet*)
3. (prevent* or primary prevent* or health education* or health promotion* or protect* or precaution* or reduc* or natural* or protection or seeking shade or age or life style* or lifestyle* or life-style* or life style* or health)
4. (built environment* or structural chang* or physical chang* or shade or purpose built or sun trap* or architect* or consult* or design or construction or surrounding* or shelter or seat* or static* or pub* place or park* or garden* or public event* or event* or concert* or outdoor* or walk* or (sport and (water* or winter*)) or build* or house* or flats or tent* or veranda* or blind* or umbrella* or awning* or cover* or

shelter* or foliage or green* or tree* or plant* or nature or wind break* or barrier* or purpose* or childhood or secondary* or college or univ* or work* or lunch* or play* or game* or beach* or bathing beaches or swimming* or swimming pools or environmental exposure* or school* or universities or university or work*)

5. (provi* or distribut* or prescri* or free or hand out or give*) and (hat* or sunhat* or glasses or sunglass* or visor* or sun screen* or sunscreen* or sun block* or cover up or protective clothing)
6. (qualitative* or focus* or discussion* or case stud* or interview* or questionnaire* or evaluat* or (research* and (participant* or action* or priorit* or activit*)) or observation* or verbal interaction* or process or implementation or perception* or attitude* or view)

#1 AND #2 AND #3 AND (#4 OR #5) AND #6

Notes: 469 hits but 23 of these were Cochrane groups and not exportable files. Thus 446 hits imported via endnote.
The entire Cochrane library was searched for ease of process. DARE and HTA were searched separately through CRD (above).

8.7 Embase

EMBASE 1980 to 2009 Week 51

Date search conducted: Monday, December 21st 2009

1. skin cancer.mp
2. (skin and (neoplasm$ or cancer$ or carcinoma$ or adenocarcinom$ or tumour$ or tumor$ or malignan$)).mp
3. exp skin neoplasms/
4. non melanoma.mp
5. malignant melanoma.mp
6. exp melanoma/
7. exp carcinoma, basal cell/
8. or/1-7
9. sun$.mp
10. sunburn/
11. tan$.mp
12. infrared rays/ or infrared$.mp
13. (solar$ or damage or ultra violet$).mp
14. or/9-13
15. prevent$.mp
16. exp primary prevent/
17. health education$.mp or exp health education/
18. health promotion$.mp or exp health promotion/

19. (protect$ or precaution$ or reduc$ or natural$ or protection or seeking shade or age).mp
20. exp sunscreening agents/ or sun screening agents.mp
21. life style/ or (lifestyle$ or life-style$ or life style$).mp
22. health/
23. or/15-22
24. (built environment$ or structural chang$ or physical chang$ or shade or purpose built or sun trap$ or architect$ or consult$ or design or construction or surrounding$ or shelter or seat$ or static$ or pub$ place or park$ or garden$ or public event$ or event$ or concert$ or outdoor$ or walk$ or (sport and (water$ or winter$)) or build$ or house$ or flats or tent$ or veranda$ or blind$ or umbrella$ or awning$ or cover$ or shelter$ or foliage or green$ or tree$ or plant$ or nature or wind break$ or barrier$ or purpose$ or childhood or secondary$ or college or univ$ or work$ or lunch$ or play$ or game$).mp
25. beach$.mp or bathing beaches/
26. swimming/ or swimming.mp
27. swimming pools/
28. environmental exposure.mp
29. schools/ or school$.mp
30. universities/ or university.mp
31. work$.mp
32. or/24-31
33. (provi$ or distribut$ or prescri$ or free or hand out or give$).mp
34. (hat$ or sunhat$ or glasses or sunglass$ or visor$ or sun screen$ or sunscreen$ or sun block$ or cover up).mp
35. protective clothing/
36. 33 and (34 or 35)
37. qualitative research/
38. (qualitative$ or focus or discussion$ or case stud$ or interview$ or questionnaire$ or evaluat$ or (research$ and (participant$ or action$ or priorit$ or activit$)) or observation$ or focus$ or case stud$ or verbal interaction$ or process or implementation or perception$ or attitude$ or view).mp
39. or/37-38
40. (chemical or nuclear or biolog$ or throat$ or lung$ or bowel$ or liver$ or colon$ or breast$ or cervical$ or pancre$ or testic$ or bone$ or recta$ or laryn$ or prostate or stomach$).mp
41. 8 and 14 and 23 and (32 or 36) and 39
42. 41 NOT 40
43. limit 42 yr=”1990 – Current”

8.8 ERIC

ERIC via CSA

Date search conducted: Wednesday, December 30th 2009

1. (skin cancer or (skin and (neoplasm* or cancer* or carcinoma* or adenocarcinom* or tumour* or tumor* or malignan*)) or skin neoplasms or non melanoma or malignant melanoma or melanoma or basal cell carcinoma)
2. (sun* or sunburn* or tan* or infrared* or solar* or damage or ultra violet* or ultraviolet* or ultra-violet*)
3. (prevent* or primary prevent* or health education* or health promotion* or protect* or precaution* or reduc* or natural* or protection or seeking shade or age or life style* or lifestyle* or life-style* or life style* or health)
4. (built environment* or structural chang* or physical chang* or shade or purpose built or sun trap* or architect* or consult* or design or construction or surrounding* or shelter or seat* or static* or pub* place or park* or garden* or public event* or event* or concert* or outdoor* or walk* or (sport and (water* or winter*)) or build* or house* or flats or tent* or veranda* or blind* or umbrella* or awning* or cover* or shelter* or foliage or green* or tree* or plant* or nature or wind break* or barrier* or purpose* or childhood or secondary* or college or univ* or work* or lunch* or play* or game* or beach* or bathing beaches or swimming* or swimming pools or environmental exposure* or school* or universities or university or work*)
5. (provi* or distribut* or prescri* or free or hand out or give*) and (hat* or sunhat* or glasses or sunglass* or visor* or sun screen* or sunscreen* or sun block* or cover up or protective clothing)
   (qualitative* or focus* or discussion* or case stud* or interview* or questionnaire* or evaluat* or (research* and (participant* or action* or priorit* or activit*)) or observation* or verbal interaction* or process or implementation or perception* or attitude* or view)

   #1 AND #2 AND #3 AND (#4 OR #5) AND #6

   Limit to earliest to 2010

8.9 HMIC

HMIC Health Management Information Consortium November 2009

Date Search conducted: Monday, December 21st 2009

1. skin cancer.mp
2. (skin and (neoplasm$ or cancer$ or carcinoma$ or adenocarcinom$ or tumour$ or tumor$ or malignan$)).mp
3. exp skin neoplasms/
4. non melanoma.mp
5. malignant melanoma.mp
6. exp melanoma/
7. exp carcinoma, basal cell/
8. or/1-7
9. sun$.mp

10. sunburn/
11. tan$.mp
12. infrared rays/ or infrared$.mp
13. (solar$ or damage or ultra violet$).mp
14. or/9-13
15. prevent$.mp
16. exp primary prevent/
17. health education$.mp or exp health education/
18. health promotion$.mp or exp health promotion/
19. (protect$ or precaution$ or reduc$ or natural$ or protection or seeking shade or age).mp
20. exp sunscreening agents/ or sun screening agents.mp
21. life style/ or (lifestyle$ or life-style$ or life style$).mp
22. health/
23. or/15-22
24. (built environment$ or structural chang$ or physical chang$ or shade or purpose built or sun trap$ or architect$ or consult$ or design or construction or surrounding$ or shelter or seat$ or static$ or pub$ place or park$ or garden$ or public event$ or event$ or concert$ or outdoor$ or walk$ or (sport and (water$ or winter$)) or build$ or house$ or flats or tent$ or veranda$ or blind$ or umbrella$ or awning$ or cover$ or shelter$ or foliage or green$ or tree$ or plant$ or nature or wind break$ or barrier$ or purpose$ or childhood or secondary$ or college or univ$ or work$ or lunch$ or play$ or game$).mp
25. beach$.mp or bathing beaches/
26. swimming/ or swimming.mp
27. swimming pools/
28. environmental exposure.mp
29. schools/ or school$.mp
30. universities/ or university.mp
31. work$.mp
32. or/24-31
33. (provi$ or distribut$ or prescri$ or free or hand out or give$).mp
34. (hat$ or sunhat$ or glasses or sunglass$ or visor$ or sun screen$ or sunscreen$ or sun block$ or cover up).mp
35. protective clothing/
36. 33 and (34 or 35)
37. qualitative research/
38. (qualitative$ or focus or discussion$ or case stud$ or interview$ or questionnaire$ or evaluat$ or (research$ and (participant$ or action$ or priorit$ or activit$)) or observation$ or focus$ or case stud$ or verbal interaction$ or process or implementation or perception$ or attitude$ or view).mp
39. or/37-38
40. (chemical or nuclear or biolog$ or throat$ or lung$ or bowel$ or liver$ or colon$ or breast$ or cervical$ or pancre$ or testic$ or bone$ or recta$ or laryn$ or prostate or stomach$).mp

41. 8 and 14 and 23 and (32 or 36) and 39
42. 41 NOT 40
43. limit 42 yr="1990 – Current"

8.10 Medline

Ovid MEDLINE(R) 1950 to November Week 3 2009

Date Search Conducted: Monday, December 21st 2009

1. skin cancer.mp
2. (skin and (neoplasm$ or cancer$ or carcinoma$ or adenocarcinom$ or tumour$ or tumor$ or malignan$)).mp
3. exp skin neoplasms/
4. non melanoma.mp
5. malignant melanoma.mp
6. exp melanoma/
7. exp carcinoma, basal cell/
8. or/1-7
9. sun$.mp
10. sunburn/
11. tan$.mp
12. infrared rays/ or infrared$.mp
13. (solar$ or damage or ultra violet$).mp
14. or/9-13
15. prevent$.mp
16. exp primary prevent/
17. health education$.mp or exp health education/
18. health promotion$.mp or exp health promotion/
19. (protect$ or precaution$ or reduc$ or natural$ or protection or seeking shade or age).mp
20. exp sunscreening agents/ or sun screening agents.mp
21. life style/ or (lifestyle$ or life-style$ or life style$).mp
22. health/
23. or/15-22
24. (built environment$ or structural chang$ or physical chang$ or shade or purpose built or sun trap$ or architect$ or consult$ or design or construction or surrounding$ or shelter or seat$ or static$ or pub$ place or park$ or garden$ or public event$ or event$ or concert$ or outdoor$ or walk$ or (sport and (water$ or winter$)) or build$ or house$ or flats or tent$ or veranda$ or blind$ or umbrella$ or awning$ or cover$ or shelter$ or foliage or green$ or tree$ or plant$ or nature or wind break$ or barrier$ or purpose$ or childhood or secondary$ or college or univ$ or work$ or lunch$ or play$ or game$).mp
25. beach$.mp or bathing beaches/
26. swimming/ or swimming.mp

27. swimming pools/
28. environmental exposure.mp
29. schools/ or school$.mp
30. universities/ or university.mp
31. work$.mp
32. or/24-31
33. (provi$ or distribut$ or prescri$ or free or hand out or give$).mp
34. (hat$ or sunhat$ or glasses or sunglass$ or visor$ or sun screen$ or sunscreen$ or sun block$ or cover up).mp
35. protective clothing/
36. 33 and (34 or 35)
37. qualitative research/
38. (qualitative$ or focus or discussion$ or case stud$ or interview$ or questionnaire$ or evaluat$ or (research$ and (participant$ or action$ or priorit$ or activit$)) or observation$ or focus$ or case stud$ or verbal interaction$ or process or implementation or perception$ or attitude$ or view).mp
39. or/37-38
40. (chemical or nuclear or biolog$ or throat$ or lung$ or bowel$ or liver$ or colon$ or breast$ or cervical$ or pancre$ or testic$ or bone$ or recta$ or laryn$ or prostate or stomach$).mp
41. 8 and 14 and 23 and (32 or 36) and 39
42. 41 NOT 40
43. limit 42 yr="1990 – Current"

8.11 PsycInfo

via Ovid 1806 to December Week 3 2009

Date search conducted: Monday, December 21st 2009

1. skin cancer.mp
2. (skin and (neoplasm$ or cancer$ or carcinoma$ or adenocarcinom$ or tumour$ or tumor$ or malignan$)).mp
3. exp skin neoplasms/
4. non melanoma.mp
5. malignant melanoma.mp
6. exp melanoma/
7. exp carcinoma, basal cell/
8. or/1-7
9. sun$.mp
10. sunburn/
11. tan$.mp
12. infrared rays/ or infrared$.mp
13. (solar$ or damage or ultra violet$).mp
14. or/9-13

15. prevent$.mp
16. exp primary prevent/
17. health education$.mp or exp health education/
18. health promotion$.mp or exp health promotion/
19. (protect$ or precaution$ or reduc$ or natural$ or protection or seeking shade or age).mp
20. exp sunscreening agents/ or sun screening agents.mp
21. life style/ or (lifestyle$ or life-style$ or life style$).mp
22. health/
23. or/15-22
24. (built environment$ or structural chang$ or physical chang$ or shade or purpose built or sun trap$ or architect$ or consult$ or design or construction or surrounding$ or shelter or seat$ or static$ or pub$ place or park$ or garden$ or public event$ or event$ or concert$ or outdoor$ or walk$ or (sport and (water$ or winter$)) or build$ or house$ or flats or tent$ or veranda$ or blind$ or umbrella$ or awning$ or cover$ or shelter$ or foliage or green$ or tree$ or plant$ or nature or wind break$ or barrier$ or purpose$ or childhood or secondary$ or college or univ$ or work$ or lunch$ or play$ or game$).mp
25. beach$.mp or bathing beaches/
26. swimming/ or swimming.mp
27. swimming pools/
28. environmental exposure.mp
29. schools/ or school$.mp
30. universities/ or university.mp
31. work$.mp
32. or/24-31
33. (provi$ or distribut$ or prescri$ or free or hand out or give$).mp
34. (hat$ or sunhat$ or glasses or sunglass$ or visor$ or sun screen$ or sunscreen$ or sun block$ or cover up).mp
35. protective clothing/
36. 33 and (34 or 35)
37. qualitative research/
38. (qualitative$ or focus or discussion$ or case stud$ or interview$ or questionnaire$ or evaluat$ or (research$ and (participant$ or action$ or priorit$ or activit$)) or observation$ or focus$ or case stud$ or verbal interaction$ or process or implementation or perception$ or attitude$ or view).mp
39. or/37-38
40. (chemical or nuclear or biolog$ or throat$ or lung$ or bowel$ or liver$ or colon$ or breast$ or cervical$ or pancre$ or testic$ or bone$ or recta$ or laryn$ or prostate or stomach$).mp
41. 8 and 14 and 23 and (32 or 36) and 39
42. 41 NOT 40
43. limit 42 yr=”1990 – Current”

8.12 Social Policy & Practice

via Ovid

Date search conducted: Monday, December 21st 2009

1. skin cancer.mp
2. (skin and (neoplasm$ or cancer$ or carcinoma$ or adenocarcinom$ or tumour$ or tumor$ or malignan$)).mp
3. exp skin neoplasms/
4. non melanoma.mp
5. malignant melanoma.mp
6. exp melanoma/
7. exp carcinoma, basal cell/
8. or/1-7
9. sun$.mp
10. sunburn/
11. tan$.mp
12. infrared rays/ or infrared$.mp
13. (solar$ or damage or ultra violet$).mp
14. or/9-13
15. prevent$.mp
16. exp primary prevent/
17. health education$.mp or exp health education/
18. health promotion$.mp or exp health promotion/
19. (protect$ or precaution$ or reduc$ or natural$ or protection or seeking shade or age).mp
20. exp sunscreening agents/ or sun screening agents.mp
21. life style/ or (lifestyle$ or life-style$ or life style$).mp
22. health/
23. or/15-22
24. (built environment$ or structural chang$ or physical chang$ or shade or purpose built or sun trap$ or architect$ or consult$ or design or construction or surrounding$ or shelter or seat$ or static$ or pub$ place or park$ or garden$ or public event$ or event$ or concert$ or outdoor$ or walk$ or (sport and (water$ or winter$)) or build$ or house$ or flats or tent$ or veranda$ or blind$ or umbrella$ or awning$ or cover$ or shelter$ or foliage or green$ or tree$ or plant$ or nature or wind break$ or barrier$ or purpose$ or childhood or secondary$ or college or univ$ or work$ or lunch$ or play$ or game$).mp
25. beach$.mp or bathing beaches/
26. swimming/ or swimming.mp
27. swimming pools/
28. environmental exposure.mp
29. schools/ or school$.mp
30. universities/ or university.mp
31. work$.mp

32. or/24-31
33. (provi$ or distribut$ or prescri$ or free or hand out or give$).mp
34. (hat$ or sunhat$ or glasses or sunglass$ or visor$ or sun screen$ or sunscreen$ or sun block$ or cover up).mp
35. protective clothing/
36. 33 and (34 or 35)
37. qualitative research/
38. (qualitative$ or focus or discussion$ or case stud$ or interview$ or questionnaire$ or evaluat$ or (research$ and (participant$ or action$ or priorit$ or activit$)) or observation$ or focus$ or case stud$ or verbal interaction$ or process or implementation or perception$ or attitude$ or view).mp
39. or/37-38
40. (chemical or nuclear or biolog$ or throat$ or lung$ or bowel$ or liver$ or colon$ or breast$ or cervical$ or pancre$ or testic$ or bone$ or recta$ or laryn$ or prostate or stomach$).mp
41. 8 and 14 and 23 and (32 or 36) and 39
42. 41 NOT 40
43. limit 42 yr="1990 – Current"

9.0 Appendix B. Screening checklists

9.1 Screening checklist – abstracts

1.	Does the study address the primary prevention of skin cancer due to UV exposure, or views relating to skin cancer, sunbathing or tanning? Studies that include a small proportion of participants who have had an episode of skin cancer will be included here.	YES/UNCLEAR – go to Q2	NO – exclude
2.	Does the study present qualitative research (e.g. surveys (with open-ended questions), interviews, case studies, observational studies (participant observation) or ethnographic or action research)? Intervention studies which report qualitative data on perceptions ('process evaluations') will be included here. Systematic reviews including such studies will be included at abstract stage and proceed to retrieval.[3]	YES/UNCLEAR – go to Q3	NO – exclude
3.	Was the study published in 1990 or later?	YES/UNCLEAR – go to Q4	NO – exclude
4.	Is the study published in English?	YES/UNCLEAR – go to Q5	NO – exclude
5.	Does the study present views relating *only* to skin-cancer-related information and/or education interventions?	YES – exclude	UNCLEAR/NO – go to Q6
6.	Was the study conducted in a country which is a current member of the OECD?[4]	YES/UNCLEAR – include	NO – retain in 'non-OECD' list for review later

[3] A systematic review is defined as one which clearly reports its search strategies and inclusion criteria. Systematic reviews will not be included in the review, but will be retained and their lists of included primary studies screened for inclusion once the first stage of full text screening is completed.

[4] Current members of the OECD are: Australia; Austria; Belgium; Canada; Czech Republic; Denmark; Finland; France; Germany; Greece; Hungary; Iceland; Ireland; Italy; Japan; Luxembourg; Mexico; Netherlands; New Zealand; Norway; Poland; Portugal; Slovakia; South Korea; Spain; Sweden; Switzerland; Turkey; UK; USA.

9.2 Screening checklist – full text articles

1.	Does the study address the primary prevention of skin cancer due to UV exposure, or views relating to skin cancer, sunbathing or tanning? Studies that include a small proportion of participants who have had an episode of skin cancer will be included here; studies focused primarily on secondary prevention (ie aiming to prevent a re-occurrence of skin cancer), screening programmes (which solely aim to detect the occurrence of skin cancer or activities to assess its incidence among specific groups of people), diagnosis, treatment or management of skin cancer will be excluded.	YES/UNCLEAR – go to Q2	NO – exclude
2.	Was the study published in 1990 or later?	YES/UNCLEAR – go to Q3	NO – exclude
3.	Is the study published in English?	YES/UNCLEAR – go to Q4	NO – exclude
4.	Does the study present (i) views relating to environmental change; (ii) views relating to resource provision; (iii) views relating to multi-method interventions including combination of (i) and (ii); (iv) a combination of either (i) or (ii) or both of these with provision of information[5]; (v) views on the potential barriers or facilitators relating to skin cancer prevention activities?	YES/UNCLEAR – go to Q5	NO (views relate only to skin cancer-related information or education) – exclude
5.	Is the study a primary qualitative study (e.g. surveys (with open-ended questions), interviews, case studies, observational studies (participant observation) or	Primary qualitative study – go to Q6 Review including qualitative studies – retain for references	Other – exclude

[5] Includes information provided via: one-to-one or group-based advice; mass media campaigns; leaflets and other printed information such as posters and teaching resources; new media such as the internet and text-messaging.

	ethnographic or action research), or a review including such studies? Intervention studies which report qualitative data on perceptions ('process evaluations') will be included here. Systematic reviews including such studies will be retained for references. [6]		
6.	Was the study conducted in a country which is a current member of the OECD?[7]	YES/UNCLEAR – include	NO – retain in 'non-OECD' list for review later

[6] A systematic review is defined as one which clearly reports its search strategies and inclusion criteria. Systematic reviews will not be included in the review, but will be retained and their lists of included primary studies screened for inclusion once the first stage of full text screening is completed.

[7] Current members of the OECD are: Australia; Austria; Belgium; Canada; Czech Republic; Denmark; Finland; France; Germany; Greece; Hungary; Iceland; Ireland; Italy; Japan; Luxembourg; Mexico; Netherlands; New Zealand; Norway; Poland; Portugal; Slovakia; South Korea; Spain; Sweden; Switzerland; Turkey; UK; USA.

10.0 Appendix C. Example Quality Appraisal form

Study identification Include author, title, reference, year of publication	Paul, C., Tzelepis, F., Parfitt, N. et al. (2008) How to improve adolescents' sun protection behaviour? Age and gender issues. American Journal of Health Behaviour. 32:4: 387 – 98
Guidance topic:	Sun protection resources and changes to the environment to prevent skin cancer: qualitative evidence review.
Checklist completed by:	FJ, TL

Theoretical Approach		
1. Is a qualitative approach appropriate? For example: • Does the research question seek to understand processes or structures, or illuminate subjective experiences or meanings? • Could a quantitative approach better have addressed the research question?	✓ Appropriate ○ Inappropriate ○ Not sure	**Comments:** This study illuminates subjective experiences and meanings by investigating why people behave towards sun practice the way they do. The qualitative approach fits the research question well.
2. Is the study clear in what it seeks to do? For example: • Is the purpose of the study discussed aims/objectives/research question/s?	✓ Clear ○ Unclear ○ Mixed	**Comments:** The aim of the study is clearly stated: To explore adolescents' self-reported reasons for sun protection, as adolescents as a group continue to have poor

• Is there adequate /appropriate reference to the literature? • Are underpinning values/assumptions/theory discussed?		sun protection practices.

Study design		
3. How defensible/rigorous is the research design/methodology? For example: • Is the design appropriate to the research question? • Is a rationale given for using a qualitative approach? • Are there clear accounts of the rationale/justification for the sampling, data collection and data analysis techniques used? • Is the selection of cases/sampling strategy theoretically justified?	✓ Defensible ○ Indefensible ○ Not sure	**Comments:** The study design is appropriate for research question. Sampling, data collection and analysis information are set out coherently with a rationale for the methods chosen.

Data collection		
4. How well was the data		**Comments:**

collection carried out? For example: • Are the data collection methods clearly described? • Were the appropriate data collected to address the research question? • Was the data collection and record keeping systematic?	✓ Appropriate ○ Inappropriate ○ Not sure/ inadequately reported	The authors clearly describe how data has been collected. For example, the questions posed during the focus group was provided and described.

Trustworthiness		
5. Is the role of the researcher clearly described? For example: • Has the relationship between the researcher and the participants been adequately considered? • Does the paper describe how the research was explained and presented to the participants?	○ Clearly described ✓ Unclear ○ Not described	**Comments:** Little information is provided relating to the role of the researcher or the relationship/instruction between the researcher and participant.
6. Is the context clearly described? For example: • Are the characteristics of the participants and settings clearly defined?	✓ Clear ○ Unclear ○ Not sure	**Comments:** The characteristics of the participants are described well including age, skin colour, socio-demographic information.

• Were observations made in a sufficient variety of circumstances? • Was context bias considered?		Observations have been made in two sets of circumstances: male and female.
7. Were the methods reliable? For example: • Was data collected by more than one method? • Is there justification for triangulation, or for not triangulating? • Do the methods investigate what they claim to?	✓ Reliable ○ Unreliable ○ Not sure	**Comments:** Auditing involved verifying that the transcripts were consistent with the extracted themes; another CP independently analyzed the data and reconciliation by discussion was reached in the events of disagreements.

Analysis		
8. Is the data analysis sufficiently rigorous? For example: • Is the procedure explicit – i.e. is it clear how the data was analysed to arrive at the results? • How systematic is the analysis, is the procedure reliable/dependable? • Is it clear how the themes	✓ Rigorous ○ Not rigorous ○ Not sure/ not reported	**Comments:** The procedure is explicit and it is clear how themes were derived.

and concepts were derived from the data?		
9. Is the data 'rich'? For example: • How well are the contexts of the data described? • Has the diversity of perspective and content been explored? • How well has the detail and depth been demonstrated? • Are responses compared and contrasted across groups/sites?	✓ Rich ○ Poor ○ Not sure/ not reported	**Comments:** The diversity of perspectives and content has been explored in detail; responses have been compared across different groups.
10. Is the analysis reliable? For example: • Did more than one researcher theme and code transcripts/data? • If so, how were differences resolved? • Did participants feed back on the transcripts/data if possible and relevant? • Were negative/discrepant results addressed or	✓ Reliable ○ Unreliable ○ Not sure/ not reported	**Comments:** Two researchers coded the data and reconciliation was reached by discussion in the event of disagreements.

ignored?		
11. Are the findings convincing? For example: • Are the findings clearly presented? • Are the findings internally coherent? • Are extracts from the original data included? • Are the data appropriately referenced? • Is the reporting clear and coherent?	✓ Convincing ○ Not convincing ○ Unsure	**Comments:** The findings presented in this study are coherent and clear. Extracts from the original data have been inserted where applicable to support the statements of findings.
12. Are the findings relevant to the aims of the study?	✓ Relevant ○ Irrelevant ○ Partially relevant	**Comments:** Findings concern adolescents' self-reported sun practice behaviours and perceptions, which is consistent with the aims of the study.
13. Conclusions For example: • How clear are the links between data, interpretation and conclusions?	✓ Adequate ○ Inadequate ○ Not sure	**Comments:** The authors are clear about what information is from study participants, what has been interpreted and what conclusions have been made. Conclusions are set out

• Are the conclusions plausible and coherent? • Have alternative explanations been explored and discounted? • Does this enhance understanding of the research topic? • Are the implications of the research clearly defined? • Is there adequate discussion of any limitations encountered?		thematically, consistent with the study findings. Implications of the findings are set out. Little information on limitations is offered.

Ethics		
14. How clear and coherent is the reporting of ethics? For example: • Have ethical issues been taken into consideration? • Are they adequately discussed e.g. do they address consent and anonymity? • Have the consequences of the research been	✓ Appropriate o Inappropriate o Not sure	**Comments:** Consent was sought.

considered i.e. raising expectations, changing behaviour? • Was the study approved by an ethics committee?		

Overall Assessment		
As far as can be ascertained from the paper, how well was the study conducted? (see guidance notes)	✓ ++ ○ + ○ -	**Comments:** Overall this study is well-conducted and clearly reported.

11.0 Appendix D. Evidence tables – Please see separate document

12.0 Appendix E. Studies excluded at full text stage

Study	Abstract	Reason for exclusion
Barankin et al. (2001)	Excessive sun exposure in childhood is considered a risk factor for later development of skin cancer, so sun awareness programs targeting children have been developed. Objective was to assess the benefits of involving parents at home in the sun protection program received by their children at school. The existing "Sun and the Skin" program was enhanced in two ways. Parents were educated both about their child's program and with supplemental information. Also, sunscreen was distributed to each child. Certain methods of sun protection, particularly the use of sunscreen, are being practiced by the majority of children, while others, such as protective clothing, have not been readily adopted. The enhanced group of students showed improvement over control and standard groups in their attitude toward tanning. There is a need for teachers to remind their students to practice protective measures. While a sun-awareness curriculum has been shown to be beneficial for elementary school children, the adjunct of parental and school involvement in this process can improve the results and ultimately decrease the risk of skin cancer in the children.	EX 5. Not qualitative research
Bergenmar, Hanson and Brandberg (2009)	The aim was to prospectively explore experiences related to genetic testing for malignant melanoma among unaffected previously untested members of melanoma-prone families in which germline CDKN2A mutations had been identified. Method Consecutive members of families with CDKN2A mutation attending a pigmented lesion clinic (n = 11) were interviewed and completed questionnaires at four occasions: before genetic testing, at disclosure of genetic test result and six months and one year after disclosure. The following areas were measured: anxiety and depression, risk perception, and sun-related habits. Disclosure of the test result did not seem to change family members' perception of their risk of developing melanoma. Few members reported anxiety of clinical significance and no one were depressed. All family members with biological children expressed concerns regarding their children and emphasized the importance of sun protection and surveillance. Sun burns and blisters were rather commonly reported by the family members. Routines regarding the procedure for conveying test result were requested. Genetic testing of the members of melanoma families with CDKN2A mutations attending a pigmented lesion clinic did not appear to induce behavioral changes related to sun habits or emotional	EX 4. Not relevant to intervention

	problems. Concerns about the future of their children were commonly expressed by participants.	
Berret et al. (2002)	The hazards due to sun exposure are well known. Many recent studies have emphasized the protection against the harmful effects of the sun by the use of sunscreens and, moreover, by staying in the shade and wearing long-sleeved shirts, hats and sunglasses. Switzerland has one of the highest rates of skin cancer induction in Europe and the incidence of melanoma in Switzerland is constantly increasing with an incidence of 10-12/100,000 inhabitants/year. Interestingly, some studies have evoked the possibility that sunscreen use can increase the risk of melanoma by increasing overall sun exposure. In this context, the aim of our study was to estimate the amount of sun exposure of children, and their parents, living in Switzerland and to give a description of how they protect themselves against sun irradiation. Questionnaires were provided to pediatricians in every state (canton) in Switzerland and were given to families coming for consultation. A total of 328 forms including 1,285 individuals were returned from most of the cantons in Switzerland. The majority of the Swiss families had 2 children under 16 years of age with middle-aged parents (30-45 years) and a central European skin type (light skin of type II-III, brown or blue eyes, and brown to blond hair). An important sun exposure was noted even though the population seems to be conscious of the associated dangers. Sunscreens were the first-line defense against sun exposure with clothing and shielding oneself from the sun not being highly used. Moreover, sunscreens tended to be misused with most people applying them at the beach or swimming pool (instead of 15 min before exposure) and few applications throughout the day. Prevention should imperatively be emphasized for lower overall sun exposure as sunscreens are primarily used at the beach and not in routine daily exposure. In addition, it is agreed that prevention campaigns would be better directed towards children because up to 80% of detrimental sun exposure occurs during childhood.	EX 5. Not qualitative research
Brodkin and Altman (1993)	There is evidence that the mortality rate associated with malignant melanoma can be decreased by early identification of the risk factors for melanoma and precursor lesions and by reducing sun exposure in young patients at higher risk. Many of the risk factors for malignant melanoma are seen in the pediatric age group. To determine pediatricians' awareness of risk factors for melanoma and their ability to recognize the precursors of melanoma, we studied three departments of pediatrics--at an urban and a suburban medical center and a medical college. Ninety-six members of the audience, which included full-time faculty, practicing pediatricians, and pediatrics residents, responded to questionnaires before and after a presentation on the risk factors for melanoma. Based on the results of the questionnaires, this group of pediatricians believed that they were not sufficiently knowledgeable about the risk factors for	EX 4. Not relevant to intervention

	melanoma and did not routinely examine their patients for these risk factors or counsel them on proper sunlight protection. These findings indicate a need for making pediatricians aware of the risk factors for melanoma and of the critical role they play in decreasing the incidence and mortality rate associated with this disease.	
Buendia-Eisman, Feriche and Ortega (1999)	Most campaigns for the prevention of skin cancer have detected more new cases and decreased the number of advanced cancers. Since the incidence of skin cancer continues to increase, however, we believe that primary prevention is the best way to control it. It must be kept in mind that sunlight exposure is the main changeable risk factor for skin cancer and that this exposure is most significant in childhood and adolescence. The aim of this study was to evaluate the need for a campaign and design one if necessary. We therefore proposed to determine the level of awareness and the behaviour of students with respect to sunlight exposure. We surveyed 628 teenage students from 9 high schools in the city of Granada (Spain). The questions were grouped into four sections: 1. Relationship Sun and Skin, 2. Relationship Sun and Environment, 3. Relationship Sun and Health, 4. Evaluation of Attitudes and Behaviour. More than 60% of the students gave satisfactory answers with regard to awareness, in contrast to the responses for attitudes and behaviour. Prevention campaigns for students are definitely necessary, keeping in mind in their design that a high level of awareness does not translate into healthy habits with regard to sunlight. Intervention to change behaviour patterns should be the main goal of primary prevention campaigns	EX 5. Not qualitative research
Buller et al. (2002)	The objective was to assess current sun protection policies and the receptiveness to new policies at elementary schools in the United States. In 1998, a random sample of 1000 public elementary schools in the United States was selected (proportional to population size) from 27 metropolitan areas chosen from the 58 US cities regularly reporting the UV index in 1997. A final sample of principals from 412 elementary schools completed the survey. Only 3.4% of schools had a sun protection policy. The most common reasons for not having a policy included the principal's lack of awareness (n = 113) or organizational barriers in the school districts (n = 77). Most principals (84.2%) said that students were outdoors during midday hours. Many principals (48.3%) were willing to adopt a sun protection policy. Most schools (72.8%) had shade structures but the majority (67.3%) reportedly covered less than one fifth of the grounds. Most principals (76.4%) were willing to increase the amount of shade structures. The low frequency of sun protection policies and shade structures calls for national efforts to change policies and environments to increase sun protection at US schools. Research is needed to demonstrate the	EX 5. Not qualitative research

	efficacy of these changes	
Buller, Goldberg and Buller (1997)	Excessive exposure to the sun's ultraviolet radiation (UVR) contributes to the etiology of melanoma and nonmelanoma skin cancers. Many behaviors that increase lifetime risk of skin cancer--sun exposure, sunburn, and lack of sun protection--occur early in childhood. A 1-day school-based skin cancer prevention effort--Sun Smart Day--was implemented and evaluated in three elementary schools to improve fourth-graders' knowledge, attitudes, and behaviors related to skin cancer prevention. A classroom-based skin cancer prevention lesson was compared to an interactive sun safety fair was vehicles for promoting comprehensive photoprotection. Sun Smart Day interventions had their greatest impact on fourth-graders' awareness and knowledge of skin cancer and children's increased knowledge persisted through the summer break. While both the classroom curriculum and the health fair boosted awareness and knowledge of sun safety among fourth graders, the classroom curriculum demonstrated a slight immediate advantage over the health fair on these outcomes. Also the curriculum was less difficult to implement, but the health fair was more engaging. A Sun Smart Day program may be an important first step in increasing public awareness and understanding of skin cancer and its prevention.	EX 4. Not relevant to intervention
Campbell et al. (1999)	This was an extensive review of identified literature, using a broadly-defined study question.	EX 5. Not qualitative research
Correia et al. (2006)	The incidence of skin cancer has been increasing steadily, and a direct correlation with sun exposure has long been recognised. Primary prevention actions, mainly directed at children, are important to promote behavioural changes regarding sun exposure. A questionnaire-based enquiry, followed by a sensitisation action, with distribution of didactic material, was carried out in several private and public schools, in June 2003. A significant number of children reported the existence of only a few trees at their schools' playground and the practice of outdoor gymnastics during risky hours. Although they admitted to usually applying sunscreens when going to the beach, this was not a normal practice when going to school on sunny days. A history of sunburn was reported by 53% of the children. We found some changes in behaviour after the summer holidays following the sensitisation action, which emphasizes the importance of this type of campaigns.	EX 5. Not qualitative research
Crane et al. (1999)	This paper describes the evaluation of a skin cancer prevention program for preschools and daycare centers. The intervention was targeted primarily at staff of child care centers, with the aim of increasing use of sun protection practices for young children while attending these centers. Secondary target groups included parents and the children themselves. The intervention, which adopted the slogan, 'Block the	EX 5. Not qualitative research

	Sun, Not the Fun,' included workshops for child care center staff, and information/activity packets for parents. Twenty-seven preschools and daycare centers were randomly assigned to an intervention or wait-list control group. The intervention group received the intervention during the spring of 1994; the wait-list control group received the intervention during the spring of 1995. Evaluation consisted of interviews with center directors, observations of practices, and review of written policies before the intervention (in summer, 1993) and after the intervention (in summer, 1994). A survey of 201 parents was conducted during late summer 1994. While the intervention did not appear to change the sun protection attitudes or practices of parents, or use of clothing and shade at child care centers, results suggested significant changes in the sun protection knowledge/attitudes of center directors and the use of sunscreen at child care centers. Additionally, parents with children attending centers in the intervention group were more likely to be satisfied with sun protection practices at their centers. Conclusion: This low-intensity intervention appears to be effective at changing sun protection attitudes and sunscreen use at child care centers, and can be easily replicated. However, high staff turnover at child care centers would suggest that 'boosters' will be necessary to sustain the impact. More intensive efforts directed at social norms are likely to be necessary to change clothing and outdoor play practices.	
Dietrich et al. (1998)	Evaluated the impact of an intervention promoting sun protection behavior among children 2 to 11 years of age through schools and day care centers, primary care practices, and recreation areas. Ten towns in New Hampshire were paired, then assigned randomly to intervention or control status. The multicomponent SunSafe intervention was provided to children and caregivers through primary care practices, day care centers, schools, and beach recreation areas. Training support and materials were provided by the SunSafe project, but project staff had no direct contact with children or parents in providing the intervention. All intervention components promoted the same message: avoid the sun between 11 AM and 3 PM, cover up using hats and protective clothing, use sun block with a sun protection factor >/=15, and encourage sun protection among family and friends. The impact of the intervention was determined by observing children's sun protection behavior at the beach during baseline compared with 1 year later. The primary outcomes of interest were changes in the proportion of children per town using at least some sun protection and changes in the proportion of children fully protected. Children were clustered by town, with the town thus being the unit of analysis. We observed 1930 children. Use of some sunscreen on at least one body area increased in all 5 intervention towns compared with paired control towns. In intervention towns, this mean proportion increased from 0.56 of	EX 5. Not qualitative research

	those observed at baseline to 0.76 of those observed postintervention, with a minimal increase among control town children.	
Dixon (2007)	Case study: Mrs LF, 71 years of age, presents with numerous squamous cell carcinomas (SCCs) on her hands (Figure 1). She comments that she had 'perfect' hands until recent years and had never been an 'outdoors person'. On questioning her about trauma or exposure to her hands she commented that she had frequently experienced 'sunburn' on her hands after assisting her son with his welding business	EX 4. Not relevant to intervention
Dunn, Lynch and Dip (2001)	Two hundred thirty-one spectators at a Cricket match in Brisbane, Australia, were interviewed and observed to determine their sun protective behaviors, and these behaviors were compared to the temperature and amount of cloud cover at the time of the study.	EX 5. Not qualitative research
Escoffery et al. (2009)	This article describes process evaluation methods for the Pool Cool diffusion trial across 4 years. Pool Cool is a skin cancer prevention program that was found to improve behaviors and environments for sun protection at swimming pools in a randomized efficacy trial, which was followed by a national diffusion trial. The process evaluation focus shifted from measuring program satisfaction to assessing widespread program implementation, barriers and facilitators to implementation, and program maintenance and sustainability. Data collection methods include training surveys, database tracking, field coordinator activity logs, e-mails, surveys of parents, lifeguards and pool managers, and process evaluation interviews and site visits. The data revealed high levels of implementation of major program components when disseminated in the diffusion trial, including sun safety lessons, sun safety signs, and sunscreen use. This article describes program features and participant factors that facilitated local implementation, maintenance and sustainability across dispersed pools such as linkage agents, a packaged program, and adaptations of program elements.	EX 4. Not relevant to intervention
French and Hevey (2008)	There is little information concerning what people think about when completing questionnaires that assess perceptions of risk, and even less for questionnaires assessing unrealistic optimism. The thoughts of 40 participants who displayed unrealistic optimism about risks of skin cancer were elicited using think aloud methods, when completing both direct and indirect ratings of unrealistic optimism. The most common thoughts overall concerned exposure to the sun, and features such as skin colouring. Thoughts concerning prevalence, reasons for risky behaviour and admissions of ignorance were more common for indirect measures of unrealistic optimism than for direct measures. The direct unrealistic optimism measures yielded more optimistic ratings for those participants who did not mention symptoms or signs of skin damage, and those who mentioned thoughts about prevalence. Participants seem to be drawing	EX 4. Not relevant to intervention

	upon different sources of information when completing superficially similar direct and indirect measures of unrealistic optimism, which may explain why these measures are usually only modestly associated. People do not seem to think about numerical probabilities when estimating risk, but instead appear to focus on issues such as exposure to risk, and concrete bodily symptoms and signs. This may at least partially explain why attempts to influence behaviour by providing probabilistic information are generally unsuccessful.	
Garvin and Eyles (2001)	This paper employs the policy analytic approaches of framing and narrative to examine national differences in public health policies using a case study of Sun Safety programs in Australia, Canada and England. The study shows how a single public health issue identified at the global scale (rising skin cancer rates) is framed differently based upon specific social, cultural and political situations. The result is a different story, or narrative, embedded in each national policy. This study provides an example of how health policy is defined, constrained and limited through the process of problem identification and policy resolution. The paper concludes that framing and narrative analysis are powerful tools for understanding the place-specific implementation of public health policies and initiatives.	EX 4. Not relevant to intervention
Glanz, Buller and Saraiya (2007)	Outdoor workers have high levels of exposure to ultraviolet radiation and the associated increased risk of skin cancer. This paper describes a review of: 1) descriptive data about outdoor workers' sun exposure and protection and related knowledge, attitudes, and policies and 2) evidence about the effectiveness of skin cancer prevention interventions in outdoor workplaces. Systematic evidence-based review. We found variable preventive practices, with men more likely to wear hats and protective clothing and women more likely to use sunscreen. Few data document education and prevention policies. Reports of interventions to promote sun-safe practices and environments provide encouraging results, but yield insufficient evidence to recommend current strategies as effective. Additional efforts should focus on increasing sun protection policies and education programs in workplaces and evaluating whether they improve the health behavior of outdoor workers.	EX review. Literature review
Glanz et al. (2002)	Skin cancer is the most common type of cancer in the United States. Since 1973, new cases of the most serious form of skin cancer, melanoma, have increased approximately 150%. During the same period, deaths from melanoma have increased approximately 44%. Approximately 65%-90% of melanomas are caused by ultraviolet (UV) radiation. More than one half of a persons lifetime UV exposure occurs during childhood and adolescence because of more opportunities and time for exposure. Exposure to UV radiation during childhood plays a role in the future development of skin cancer. Persons with a history of	EX 5. Not qualitative research

	> or = 1 blistering sunburns during childhood or adolescence are two times as likely to develop melanoma than those who did not have such exposures. Studies indicate that protection from UV exposure during childhood and adolescence reduces the risk for skin cancer. These studies support the need to protect young persons from the sun beginning at an early age. School staff can play a major role in protecting children and adolescents from UV exposure and the future development of skin cancer by instituting policies, environmental changes, and educational programs that can reduce skin cancer risks among young persons. This report reviews scientific literature regarding the rates, trends, causes, and prevention of skin cancer and presents guidelines for schools to implement a comprehensive approach to preventing skin cancer. Based on a review of research, theory, and current practice, these guidelines were developed by CDC in collaboration with specialists in dermatology, pediatrics, public health, and education; national, federal, state, and voluntary agencies; schools; and other organizations. Recommendations are included for schools to reduce skin cancer risks through policies; creation of physical, social, and organizational environments that facilitate protection from UV rays; education of young persons; professional development of staff involvement of families; health services; and program evaluation	
Glanz et al. (2008)	Objective: To develop, in a collaborative project, core measures of sun exposure and sun protection habits, since the lack of standard outcome measures hampers comparison of population surveys and interventions used in skin cancer prevention research. Design: A work group of investigators evaluated available questionnaire measures of sun exposure and protection. Their deliberations led to a proposed set of core questionnaire items for adults, adolescents aged 11 to 17 years, and children 10 years or younger. These core items were used in cognitive testing by the investigators. Cross-site summaries of methods, response samples, and descriptive data were prepared. Setting: Nine locations across the United States. Participants: The study population comprised 81 individuals. Results: No unusual response patterns were detected in any of the respondent groups or for any specific question. Some revisions to the survey items resulted from the need for clarification or emphasis of frames of reference such as adding or underlining key phrases in a question. Conclusions: The combination of expert review followed by cognitive interviewing yielded standardized core survey items with good clarity and applicability for measuring sun exposure and sun protection behaviors across a broad range of populations. They are appropriate for studies tracking morbidity and/or mortality and evaluating prevention program effects.	EX 4. Not relevant to intervention

Godkin (1991)	The use of consumer advertising and marketing techniques to increase skin cancer protective behaviour was tested amongst outdoor workers employed by Telecom Australia. The program was based upon a set of communication principles that had previously been shown to be effective in the medical profession. The program's impact was evaluated and it was found to have been an effective tool in encouraging outdoor workers to increase their sun protection. The principles used in developing and implementing the program may also have application in other areas of occupational health and safety.	EX 5. Not qualitative research
Grant-Petersson et al. (1999)	Elementary schools and child care settings in rural New Hampshire participated in a sun protection program that reached more than 4,200 children. The program was part of a successful multifaceted community intervention targeting children ages 2-9. Program components included curricular materials, training and support for school/child care staff, and parent outreach. Evaluation showed good uptake of the curriculum by teachers and child care providers, improvements in sun protection policy in participating schools and child care settings, and significant knowledge and attitude improvements in fourth grade children tested, as well as actual behavior change. The study highlighted the importance of flexible, developmentally appropriate curricular materials and active engagement of principals and directors in policy review. In addition, for parent outreach programs to be successful, children needed to participate.	EX 5. Not qualitative research
Grin et al. (1994)	Sun exposure in childhood has been implicated as a risk factor for the development of melanoma and nonmelanoma skin cancers. As an increasing number of young children are cared for in day-care centers, we were interested in examining the sun-protection practices in this setting. In our study of day-care centers, we found that while most day-care center staff were aware of the adverse effect of excess sun exposure and the need for sun protection, the use of sunscreen and protective clothing and avoidance of midday sun were limited. We conclude that intensive education of day-care center staff and parents regarding sun exposure and sun protection is necessary if we are to attempt to reduce the frequency of melanoma and nonmelanoma skin cancer.	EX 5. Not qualitative research
Grob et al. (1993)	Excessive sun exposure in the first 15 years of life has been shown to be a determinant risk factor for melanoma. This study was conducted on a randomly selected sample of 200 adolescents (13-14 years old) and 150 children (3 years old) in Marseille (South of France). Children and adolescents were examined and interviewed (mothers answered for young children). Our results show that a large number of highly sensitive children were not identified as such by their parents and most adolescents do not realize or at least admit being highly sun sensitive. Adequate sun protection measures were used in only 63% of 3-year-olds and 38% of adolescents. With reference to their constitutional skin sensitivity and	EX 5. Not qualitative research

	taking into account their possible use of effective sun protection measures, 33% of the children and 62% of the adolescents were highly overexposed. Only good sun protection habits of the mother were predictive of acceptable sun exposure in children. In the adolescents the predictive variables were sun protection habits of the father and sunbathing only to obtain a tan. The main reason why adolescents sunbathed was embellishment. Conversely, most mothers said that they exposed their young children to the sun for health. Many adolescents and mothers were reasonably well informed but considered the risk of sun exposure to be exaggerated by the media. These results may be important to determine the targets of future melanoma prevention campaigns	
Hancock et al. (1996)	This paper describes the rationale, aims, design and methods of a large-scale community action cancer prevention project, Cancer Action in Rural Towns (CART). The primary aim of the CART project is to evaluate the effectiveness of a community action program in increasing community rates of preventive and screening behaviours relating to breast, cervical, smoking-related and skin cancer. Twenty towns in rural New South Wales, Australia (population 5001-15,000) were selected for inclusion in the CART project. A matched-pairs design was used, with one town from each pair randomly allocated to either experimental or control condition. In experimental towns, community action is being promoted through established community networks and within key access-points (schools, workplaces, community organisations, health care providers, retailers and the media), to encourage uptake of cancer-related preventive and screening behaviours. Outcome evaluation includes self-report measures of adult smoking quit rates, Health Insurance Commission provider presentations data, surveys of adolescent smoking and solar protection practices, and direct observation of solar protection practices at schools and community venues. Economic evaluation includes cost-effectiveness, travel cost, and contingent valuation methods of cost analysis. Process measures for the project include media monitoring, measures of change in institutional policies, and records of CART intervention activities. The evaluation of CART will be completed by the end of 1997.	EX 5. Not qualitative research
Harrison, Buttner and Nowak (2005)	Women reported a high prevalence of beliefs that may result in their infant being intentionally exposed to sunlight, and which could increase their child's future risk of skin cancer.	EX 5. Not qualitative research
Hill and Boulter (1996)	In principle, the sun-related behaviour of individuals can moderate the effects of stratospheric ozone depletion in increasing potential exposure of populations to UVR. In this paper, we present key results from a program of research on an Australian population's sun related behaviour together with a	EX 5. Not qualitative research

	comprehensive review of the literature published to date in this subject. Males and young people are most likely to be out in the sun and least likely to engage in protective behaviour. However, females are most likely to deliberately sunbathe, yet they make greater use of sunscreens than males. Knowledge about skin cancer is now generally high, particularly among females, but there are specific deficiencies such as in knowledge of times of day and season when UVR is greatest. Most people accept they are at some risk of skin cancer but a worrying minority persist in denying the risk. Favourable attitudes to suntans are prevalent, though declining, and there is some evidence that people believe suntans are more attractive than others actually see them to be. Factors that predispose towards sunprotective behaviour include health knowledge (weakly), social norms and negative beliefs about suntans (more strongly). People with sensitive skin take more precautions yet suffer more sunburn and certain activities (particularly water sports) are associated with a high probability of sunburn. A number of efficacy and evaluation studies have shown: (a) mixed effects of school-based sun protection programs, and positive effects of (b) work place programs for outdoor workers, (c) positive effects of programs for mothers of newborns, (d) skin cancer patients, (e) hospital outpatients, and (f) samples drawn from populations exposed to mass campaigns. A comprehensive and long running evaluation of a solar protection campaign has been conducted in Victoria, where significant changes in dispositional and behavioural factors have occurred over time in association with reduced sunburn. As well, survey data indicate high levels of public concern about ozone depletion and many people claiming to take extra precautions because of it.	
Hughes (1994)	Reports results from an evaluation of "Living with Sunshine," a resource to help teachers encourage positive sun-related conduct by children ages 6-8. Results indicate that children who used the materials were knowledgeable about the sun's effects and aware of sun protection methods. Both teachers and students responded enthusiastically to the resource.	EX 4. Not relevant to intervention
Hughes et al. (1996)	Excessive sunlight in early childhood is thought to be a risk factor for skin cancer. We report the use of the 'draw and write' technique for determining changing perceptions, attitudes and knowledge of young children (aged 4-12 years) to the sun and skin cancer. Children were asked to draw pictures and label them in response to a series of carefully worded invitations and questions. The captions were then analysed to assess changing views and perceptions about particular issues in relation to behaviour in the sun. Four hundred and sixty children completed the exercise. An increasing spiral of knowledge with age about effects of the sun and appropriate behaviour was demonstrated. The study revealed a relatively	EX 5. Not qualitative research

	high level of knowledge. Misconceptions and stereotypes were demonstrated. This technique is a simple and effective way of eliciting information from children about health issues. It provides baseline data for producing material for health education for children in relation to sun and skin. It is also a method of assessing the effectiveness in young children of health promotion initiatives.	
Ing et al. (2002)	Farmers are at higher risk for skin cancer; US studies indicate that they do not use adequate sun protection. Little data on Canadian farmers' sun exposure are available, and a literature review suggests a strong need to develop a comprehensive, easy to complete farmers' sun safety survey in order to identify sun safety issues in the farming community. A literature review contributed to the development of a draft farmers' sun safety survey. Preliminary testing of the survey with 207 Ontario farmers supported the usefulness of the questionnaire, but weaknesses remained in phrasing and missed concepts. To augment the questionnaire's development, focus groups were held with farmers in four Ontario communities to clarify the phrasing of survey questions concerning the amount of sun exposure, the use of sun protection practices, family/personal history of skin cancer, and skin cancer attitudes and knowledge. This paper reports on what was learned substantively from these focus groups.	EX 5. Not qualitative research
Johnson et al. (2001)	Objective was to examine the frequency with which sun protection is used by parents for their children. Descriptive survey conducted at a university medical clinic in Florida. Parents of children aged 1 to 16 years were approached in the waiting area, and 77 of 100 were successfully interviewed. Parents' self-reported use of sun protection measures for their children and their attitudes and beliefs about sun protection. Fewer than half of respondents (43%) reported regularly using sun protection for their child. Regular use of sun protection was reported more frequently by female caretakers and those with more favorable attitudes regarding sun protection use. Sunscreen was the most frequently used measure, and preventing sunburn was the primary reason for using sun protection. Respondents held several unfavorable sun protection attitudes, including the belief that sun exposure was healthy, that children looked better with a tan, and that it was okay to stay out in the sun longer if the child wore sunscreen. Regular use of sun protection for children is infrequent and consists primarily of applying sunscreen rather than methods that reduce sun exposure. Parents primarily use sunscreen to prevent sunburn and may increase their children's overall sun exposure as a result.	EX 5. Not qualitative research
Jones, Harrison and Chrispin (2000)	This study, conducted at the end of a UK heat wave, used qualitative and quantitative questionnaire measures to investigate sun protection in the context of the potentially conflicting attractions of sun exposure. It examined attitudes to the good weather, beliefs about the benefits and harmful effects of the	EX 5. Not qualitative research

	sun and perceptions of risk amongst a sample of 80 college students (aged 18-52 yrs) in the UK. Participants could think of more benefits than harmful effects of the sun for both their health and appearance. Most enjoyed sunbathing, protected themselves inadequately and did not intend to change this behavior. Those who knew someone who had suffered skin cancer, who perceived higher risk and who wrote more about the harmful effects of skin cancer on their appearance (but not their health) were more likely to engage in skin protective behaviors.	
Kamin, O'Neill and Ahearn (1994)	The authors describe the development, field testing, and initial evaluation of a skin cancer prevention program targeted for high school students. They developed a curriculum based on input from focus groups conducted with biology teachers and student representatives from high schools throughout Texas. The module contained a teacher's guide, video, posters, slides, handouts, and hands-on activities; an achievement test and attitude survey measured student outcomes. During 1991, more than 1,000 students from private and public schools completed the module. Results indicated a significant improvement in the pre- to posttest achievement scores. Evaluation of attitudes after the module indicated that only 2.5% of the students did not believe that a change in sun behaviors was necessary; 72% of the students were contemplating or ready to change their sun behaviors.	EX 5. Not qualitative research
LaBat, DeJong and Gahring (2005)	The goal of this research was to determine the long-term viability of a sun health message. A multi-part educational intervention on hazards of sun exposure and methods of protection was delivered to fifth- and sixth-grade students, followed by a questionnaire to assess learning of the message. Four years later, participants were tracked and a questionnaire administered to assess retention of the sun health message. No formal sun health educational programs were delivered over the 4-year period. Participants retained the knowledge that sun can cause cancer and skin damage; however, the importance of appearance to these teens seems to have affected decisions about sun protection methods. Four years later, as teens, the students preferred a sun-tanned appearance and rejected methods of sun protection, especially the use of sun-protective clothing.	EX 4. Not relevant to intervention
Lamanna (2004)	Skin cancer is the most commonly occurring cancer in the United States. Primary prevention practices for skin cancer are fully documented in the literature for reducing the damaging effects of ultraviolet radiation on skin. Late adolescents, inherent to their young age and risk-taking behaviors, are more likely to sunbathe. The cancer attitudes and suntanning knowledge, attitudes, perceptions, beliefs, and behaviors among college students were examined. Gender-specific interventions for educating this age group are recommended.	EX 5. Not qualitative research

McWhirter et al. (2000)	Eleven schools in the south of England took part in a trial of 'Safe in the Sun', a curriculum programme for primary school aged pupils. Case study methodology and the 'draw and write' technique were combined to evaluate changes in pupils' perceptions of the effects of the sun on their skin.	EX 4. Not relevant to intervention
Michielutte et al. (1996)	The incidence of skin cancer in the United States is rapidly increasing, and current estimates suggest that about one in five persons will be diagnosed with skin cancer in their lifetime. However, comparatively little is still known about the prevention and early detection behaviors of healthy individuals. This study presents information on prevention and early detection practices for a sample of non-Hispanic rural white women. Interviews were conducted with 1,295 women age 20 or older who were patients in six public health departments and one primary-care clinic serving a low-income population, all located in rural western North Carolina. Both prevention and early detection behaviors were found to be infrequent in this population. Low knowledge of skin cancer, younger and older ages, and low education characterized women least likely to practice prevention. Low knowledge, younger age, and low education characterized women least likely to practice early detection. Perceived barriers to cancer screening including cost, lack of symptoms, and denial also were predictive of a low likelihood of both prevention and early detection behavior. Fatalism and fear of the stigma associated with cancer also were predictive of lower participation in selected early detection behaviors. A summary general barriers score was significantly associated with all prevention and early detection behaviors examined in the study. The results indicate a need for skin cancer education among this population.	EX 5. Not qualitative research
Milne et al. (1995)	"Kidskin" is an intervention study involving children at 33 primary schools in Perth, Western Australia. This study includes measurement of changes in implementation of schools' sun protection policies. This paper reports on measurement of observable aspects of sun protection. Hat use was assessed from videos of children in the playground. Shade use was measured using UVR-sensitive polysulfone badges worn by a random sample of children. Shade provision was measured from aerial photographs of the schools. Principals were surveyed about school policies and practices. Eighty-seven percent of children wore a hat during lunch time at school, although only 14% wore the most protective styles of hats. The mean proportion of ambient UVR exposure received by Year 1 children was 15.5%; children spent less time in the sun on sunnier days. On average, 14.5% of the playground was shaded; this was not associated with children's sun exposure. Correlations between these results and the principals' estimates were poor. Children should be encouraged to wear more protective styles of hats and to avoid sun exposure, even on less sunny days during spring and summer. Principals' estimates of shade provision	EX 5. Not qualitative research

	and children's sun protection behavior at school are of little value.	
Morris, Bandaranayake and McGee (1998)	To investigate awareness of sun protection behaviours in a sample of primary school children in New Zealand. Information was collected from 824 primary school children in New Zealand using a drawing and writing technique. The data revealed a bias towards sunscreen as a method of sun protection compared with other methods such as clothing and the use of shade. Comparisons between results obtained from children resident in Australia and England indicated a greater awareness of sun protection methods amongst the children from Australia and New Zealand compared with those children living in England. Children as young as 5 and 6 can describe the consequences of overexposure to the sun, and can illustrate methods of sun protection. Sunscreen is seen as the main method of sun protection	EX 5. Not qualitative research
Morris et al. (2005)	Recent evidence indicates that there are significant numbers of cases of malignant melanoma in the UK. In order to assess the current position with regard to sun awareness in Cornwall, a questionnaire survey of all state primary school heads (n = 123) and a survey of a random sample of GP practices (n = 9) was carried out. The data obtained were supported by visits to libraries and Tourist Information Centres at urban and rural centres--this enabled the identification of sun awareness literature. Key health professionals who worked within the field of health promotion were also contacted. The findings showed that in Cornwall public campaigns organized around the issue of sun protection took place only sporadically, although GP surgeries usually organize a display at the appropriate time of the year. None of the public places (e.g. Tourist Information Centres, libraries) surveyed had sun protection messages on display. It is concluded that insufficient sun awareness initiatives were being undertaken in Cornwall. Although most primary schools included sun awareness education in their curriculum in a form based on the Sun Awareness Guidelines produced by the Department of Health in 1995, few schools considered further measures to protect pupils on hot and sunny days. In particular the provision of shade, the scheduling of outdoor activities and the use of sunscreen and protective clothing were not standard.	EX 5. Not qualitative research
Morrison (1996)	To mark Sun Awareness Week next week, this article highlights the fact that the major contributory factor in the development of skin cancer is exposure to ultraviolet radiation, and nurses are ideally placed to promote care in the sun and raise awareness of moles. The aim of this study was to determine whether there are any gaps in nurses' knowledge about the prevention and early detection of skin cancer. A total of 142 nurses were questioned about their own attitudes towards sun exposure, sun protection and mole awareness. The study showed that the nurses surveyed have a responsible attitude towards avoiding sunburn and the need for adequate sun protection, particularly when abroad. However, the study also	EX 5. Not qualitative research

	revealed that they do not fully appreciate the extent to which the sun can cause skin cancer and they lack understanding about the need to protect the skin from sunburn and avoid long term sun exposure in the UK.	
Nelson and Luczon-Peterman (2001)	A descriptive study was conducted to examine the knowledge of and behaviors related to sun-protection among parents of youth soccer players. A convenience sample of 56 parents at community soccer events completed an 18-item instrument designed by the researchers. Results indicated that female respondents were more responsive to skin protection than males. In addition, advice from health care providers was shown to make an impact on the behavior of parents related to skin self-examinations and the use of sunscreen. Family history of skin cancer significantly promoted the use of protective clothing in the sun. Nurse practitioners can make a difference by educating clients about sun protection and practices that can lower the risk of skin cancer and by teaching parents how to perform skin self-examinations.	EX 5. Not qualitative research
Newton et al. (1997)	The objective of this study was to determine the perceptions of primary school children about sun exposure and skin cancer, and the language they use about these issues, as a basis for the design of health promotional materials. In all, 2857 children in five European countries took part in the study and were compared with 641 Australian children participating in a similar study, since the latter have been exposed to more intensive health education about the sun. The 'draw and write' technique was used. In Europe the level of awareness about the risks of excessive sun exposure and the need to protect the skin was considerably lower than in Australia, although there was some variation within northern Europe. Amongst the European children acknowledging a need to protect the skin, the principal means of protection quoted was the use of suncreams, with inadequate awareness of the value of clothing, hats and shade. European children expressed greater approval of suntans than did the Australian children. Some methodological problems were encountered as a result of nuances in the languages involved, emphasizing difficulties in international research of this type.	EX 5. Not qualitative research
Parrott et al. (1999)	Efforts to increase the sun-protective behaviors of children were extended to outdoor recreational sports and youth soccer settings in this study. The pretest results of a pilot survey of coaches (n = 12), parents (n = 50), and youths (n = 61) on eight soccer teams in south Georgia were used to guide the development of a health education program for coaches. In the pilot programs, half the coaches were trained to be involved in soccer-playing youths' sun protection by acting as positive role models and promoting sun protection to youths and their parents. The pilot demonstrated coaches' willingness to participate in sun protection promotion to youth: Youths indicated that coaches and parents were more	EX 4. Not relevant to intervention

	likely to tell youths to wear sunscreen after the training than before, and coaches perceived getting youths to wear sunscreen to be less difficult than before.	
Parrot et al. (1998)	Although health campaigns promote avoidance of behaviors that pat an individual's health at risk, often these behaviors cannot be avoided, and campaign messages designed to encourage behavior adaptation afford greater likelihood of success. With that in mind, a model of health risk behavior adaptation was proposed and tested using four different behaviors in a communication campaign aimed or reducing farmers' risk for skin cancer. Farmers and farm wives answered a series of questions about their skin cancer prevention and detection behaviors and attitudes. Interpersonal expectancies, social resources, and actual procedural knowledge predicted perceived procedural knowledge and public commitment, which, in turn, predicted behavior adaptation.	EX 5. Not qualitative research
Paul et al. (2003)	Conclusions: The strong mnemonic value and remembered appeal of previous campaigns provides a foundation that future campaigns might build on, while taking into consideration adolescents' desire to distance themselves from the childlike associations of such messages.	EX 4. Not relevant to intervention
Pion et al. (1997)	Childhood exposure to sunlight is a risk factor for melanoma. To formulate a meaningful program to educate children about the ill effects of the sun, their extant knowledge base must be determined. We have used the "draw-and-write" technique to assess children's perceptions about the sun, suntans, and skin cancer. A total of 693 school children aged 4 to 13 years were asked to draw pictures and label them in response to a series of carefully worded questions. Awareness of the need to apply sunscreen increased from 44% in children aged 4 to 6 years to 95% in children aged 9 to 10 years. Ten percent of children aged 4 to 6 years already perceived a suntan as attractive. While almost all children were aware of the negative immediate effects of sun exposure, namely sunburn, just 30% of American children aged 11 to 13 were aware that sun exposure is a risk for skin cancer. No differences between boys and girls were seen. The "draw-and-write" technique allows assessment of the attitudes and perceptions of children regarding the sun and skin cancer. It also provides valuable information on which to base health education and evaluate its cost-effectiveness.	EX 5. Not qualitative research
Pratt and Borland (1995)	Interviewed 92 adolescents on a surf beach in Victoria to find predictors of sun-protection (SP) behavior. 46 females and 46 males (aged 15-20 yrs) were interviewed during the Australian summer of 1990 to 1991. Shade use, cloth cover, observed sunburn, and tan level were recorded. Interview questions included sunscreen usage, tan preferences (from a series of 4 photographs of a model with different tan levels), and days planned at the beach during the summer. Results demonstrated that a majority of the	EX 5. Not qualitative research

	Ss were not taking adequate SP measures. The level of tan and the intention to sunbathe were seen as the best determinants of how well the Ss would protect themselves against the sun. Indirect predictors for SP behavior were tan preferences and social norms. A need is noted for education about the long-term and short-term risks of sun exposure.	
Rademaker et al. (1996)	To assess whether young children understand the dangers and results of sun exposure, a novel Draw and Write technique was used to survey a group of 5-8 year old primary school children. One hundred and ninety-four children were invited to draw and write comments to six scenarios involving sun exposure. Of the children surveyed, 84% gave a negative sentiment to sunburn, with only 6% displaying positive sentiments towards sunbathing. Sixty-five per cent of children suggested the use of sun blocks, 69% the use of protective clothing, 45% the wearing of hats and 43% the use of shade as a mechanism for protecting the skin from sun damage. Only 2% of children made any reference to skin cancer. The primary school children surveyed had a good level of awareness of the dangers of sunburn and the need to take appropriate actions to avoid sun damage.	EX 5. Not qualitative research
Reynolds (2007)	Lifetime exposure to ultraviolet radiation is a major risk factor for all types of skin cancer. The purpose of this manuscript is to examine theory-guided empirical studies examining adolescent tanning practices.	EX 5. Not qualitative research
Richtig et al. (2009)	Understanding the public's perception of nevi and sunburn is crucial to melanoma prevention efforts. Methods: We investigated the knowledge and perception of melanocytic nevi and sunburns in 77 children 6 to 10 years old (mean 8.2) in two elementary schools in Styria, Austria. The children were interviewed by specially trained psychologists about the number of their moles and how they felt having them. Additionally questions about sunburn history and sunburn perception were asked. The spontaneous answers of the children were recorded, there were no pregiven answers. Afterwards the children were examined by dermatologists clinically and with dermatoscopes. The 96% of the children could describe a nevus (the term "mole" was translated to "nevus") and 91% did not feel bothered about theirs. Only 26% had noted the appearance of new nevi within the last year. The 67% of all children had at least one sunburn and remembered the clinical features. The 20% of the children knew that sunburns could provoke skin cancer. All children felt comfortable during the clinical and dermatoscopic examination. Conclusion: Children aged from 6 to 10 years know exactly why they had suffered from sunburn, can describe the sunburn and how to avoid it. They do not feel bothered by their nevi and are alert to the appearance of new nevi.	EX 5. Not qualitative research
Schofield,	With rising rates of skin cancer in Australia, there is a need to examine strategies to reduce sun exposure	EX 5.

Edwards and Pearce (1997)	among children. This study aimed to determine the effectiveness of a multifaceted dissemination strategy compared with a simple mail-out strategy in promoting the adoption of comprehensive SunSmart skin protection policies and practices in primary and secondary schools in New South Wales. It also aimed to examine characteristics of the primary and secondary schools that adopted a comprehensive SunSmart policy before and after the intervention. Four hundred randomly selected primary schools and all 381 high schools in New South Wales were randomised to one of two intervention groups. Pretest and post-test surveys of principals were undertaken in 1991 and 1992. Intervention 1 was a simple mail-out of a sample sun-protection policy kit. Intervention 2 comprised the mail-out of the policy kit and a follow-up mail-out of a staff development module. There was a strong intervention effect on adoption of a comprehensive sun-protection policy in primary schools (21 per cent for the 'mail' group compared with 44 per cent for 'mail and staff support' group) but not in high schools (6 per cent and 11 per cent). There was little relationship between adoption of a comprehensive sun-protection policy and sun-protection practices in primary or secondary schools. Further research is needed to determine the most effective ways of ensuring that adoption of a comprehensive sun-protection policy results in effective implementation of sun-protection practices in schools.	Not qualitative research
Schofield et al. (1991)	This study presents findings on solar protection policies and practices in primary and secondary schools in New South Wales, Australia. The findings suggest that policies have been more fully articulated in primary schools than in secondary schools and that there is wide scope for further public health initiatives to protect children from the risk of skin cancer. Little attention has been given to the potential benefits of timetable changes and provision of shade in school environments, although school principals considered the latter would be a successful means of increasing protection. The level of solar education provided in the schools surveyed in our study was minimal, suggesting that urgent attention should be given to incorporating these issues in the school curriculum. Observations of school children's solar protection behaviours suggest that the majority of children used some form of protection in the middle of the day, but the form of protection changed with age. Consideration of more structural and environmental changes is needed to maximise the opportunities for solar protection in schools.	EX 5. Not qualitative research
Scott et al. (2008)	This is the story of Go Sun Smart, a worksite wellness program endorsed by the North American Ski Area Association and funded by the National Cancer Institute. Between 2000 and 2002 we designed and implemented a large-scale worksite intervention at over 300 ski resorts in North America with the objective of reducing ski area employees and guests risk for skin cancer by adopting sun safe practices.	EX 5. Not qualitative research

	The following narrative describes the intervention in toto from its design and implementation through assessment. Our theory driven, experimentally tested intervention was successful in reducing employees' risks for skin cancer during and after the' ski season. We also succeeded in making ski area guests more aware of the need to take sun safe precautions with both themselves and their children	
Stanton et al. (2004)	The incidence of skin cancer is increasing worldwide. Protecting the skin from the sun by wearing protective clothing, using a sunscreen with appropriate sun protection factor, wearing a hat, and avoiding the sun are recommended as primary preventive activities by cancer agencies. In this paper the recent data relating to skin cancer primary preventive behaviour in Australia and other countries is reviewed. Comparison of the studies in a table format summarizing the methods, objectives, participants, findings and implications may be obtained from the corresponding author. The sun protection knowledge, attitudes and behaviour patterns observed in Australia are similar in other countries, although Australian studies generally report higher knowledge levels about skin cancer and higher levels of sun protection. The findings suggest that sunscreen is the most frequent method of sun protection used across all age groups, despite recommendations that it should be an adjunct to other forms of protection. While young children's sun protective behaviour is largely influenced by their parents' behaviours, they are still under protected, and sun protective measures such as seeking shade, avoiding the sun and protective clothing need to be emphasized. Adolescents have the lowest skin protection rates of all age groups. Within the adult age range, women and people with sensitive skin were most likely to be using skin protection. However, women were also more likely than men to sunbath deliberately and to use sun-tanning booths. The relationship between skin protection knowledge and attitudes, attitudes towards tanning and skin protection behaviour needs further investigation. Further studies need to include detailed assessments of sunscreen use and application patterns, and future health promotion activities need to focus on sun protection by wearing clothing and seeking shade to avoid increases in the sunburn rates observed to date.	EX 5. Not qualitative research
Wetton (1996)	Describes the evolution of a draw and write research project to investigate children's perceptions of sun exposure and skin cancer in five northern European countries. Findings showed that primary school children acknowledged a need to protect themselves, but thought the main way to do this was to use sun creams. There was little mention of protective clothing or the value of shade. A comparison with children in Australia and New Zealand showed much less approval of sun tans and greater awareness of prevention strategies. Concludes that European countries need to mount coherent sun protection	EX 5. Not qualitative research

	programmes in schools.	