

ORIGINAL RESEARCH

COMPARING THE SUN-RELATED BELIEFS AND BEHAVIOURS OF MEN AND WOMEN ACROSS AGE GROUPS: A QUALITATIVE STUDY IN A TROPICAL REGION

TORRES WOOLLEY, PETRA G BUETTNER and JOHN LOWE

Skin Cancer Research Group within North Queensland Centre for Cancer Research, School of Public Health, Tropical Medicine and Rehabilitation Sciences, Townsville; and School of Health and Sport Sciences, University of the Sunshine Coast, Queensland, Australia.

Corresponding author: Dr Torres Woolley (Torres.Woolley@jcu.edu.au)

ABSTRACT

Objective: To explore gender and age differences in North Queensland (NQ) adult's sun protection knowledge, beliefs, attitudes and behaviours. **Methods:** A qualitative 'grounded theory' approach was used to develop concepts out of data collected from 42 men and 22 women via interviews and focus groups. **Results and Discussion:** In contrast to NQ men, the women in this study often had accurate knowledge about the causes and prevention of skin cancer, a strong sense of personal susceptibility and the seriousness of skin cancer, and a variety of motivators but few barriers to using sun protection. As a result, many NQ women regularly used recommended sun protection strategies, while the men did not. NQ men's use of sun protection was often influenced by their social environment, and level of UVR-induced skin damage experience and skin cancer. **Conclusions:** Differences in skin cancer prevention knowledge, attitudes and behaviours were found between the sexes. These differences may explain why NQ men experience much higher skin cancer rates than the women. Workplaces having outdoor working employees are potentially important sites for skin cancer interventions in NQ. To overcome NQ men's poor attitudes, perceived barriers and lack of motivators to using sun protection, the most effective strategy may be to make it mandatory for outdoor workers to wear long-sleeved shirts and wide brimmed hats when in working in the sun.

Key Words: Qualitative research; Skin cancer; Sun protection; Gender; Age; Knowledge; Attitude; Behaviour.

SUBMITTED: 25 September 2010; **ACCEPTED:** 5 October 2010

INTRODUCTION

Sun exposure is regarded as the major environmental risk factor for cutaneous melanoma, basal cell carcinoma (BCC) and squamous cell carcinoma (SCC) (Rosso et al., 1996; Krickler et al., 1994; Gallagher et al., 1995a; Gallagher et al., 1995b). Cumulative sun damage is considered responsible for the development of SCC (Rosso et al., 1996; Krickler et al., 1994), while mixed effects of cumulative and intermittent sun damage seem to account for the development of BCC and melanoma (Rosso et al., 1996; Gallagher et al., 1995a; Gallagher et al., 1995b; AIHW, 1997; Lee, 1998).

Incidence rates of skin cancer are high in Australia as a whole and extremely high in North Queensland (NQ) (Buettner & Raasch, 2001; Staples et al., 2006), which is a likely consequence of the population consisting of predominantly white individuals susceptible to skin cancer, and a tropical location with high, year round levels of ambient ultra-violet radiation (UVR) (Bernhard et al., 1997). Between 1997 and 2002, age-standardised incidence rates of BCC and SCC together rose in NQ men from 3,134 to 3,385 per 100,000, while falling in NQ women from 1,713 to 1,688 per 100,000 (Buettner & Raasch, 2001).

NQ men have more than two times the risk of developing skin cancer than women, and are three times more likely to develop multiple skin cancer (Buettner & Raasch, 2001). Similar trends of men having higher rates of epithelial skin cancer than women are found in all Caucasian populations (Staples et al., 1998; Gallagher et al., 1990; Levi et al., 1998; Roberts, 1990; Scott et al., 1981). As both gender experience the same ambient level of sunshine, gender differences in both sun exposure and sun protection practices must occur. Indeed, studies have found that

men spend more time in the sun at work and during recreational activities, experience more sun-induced skin damage, and use less sun protection (Godar et al., 2001; Schofield et al., 2001). Age is a second major factor that influences sun exposure and sun protection practices. Previous studies have shown that younger persons report more at-risk sun behaviours (Coups et al., 2008; Hall et al., 1997), and demonstrate an increased likelihood to intentionally tan (Robinson et al., 1997).

This study explored gender and age differences with sun exposure and sun protection in the NQ population. Identifying gender and age related barriers and motivators may increase the potential to develop more appropriate sun protection messages and interventions.

METHODS

Design

This study used a qualitative 'grounded theory' approach to develop concepts out of data collected in participant interviews. Interview questions were framed using components of the Health Belief Model (HBM) (Janz & Becker, 1984; Gerbert et al., 1996; Carmel et al., 1994), a model found to predict sun protective behaviours. Thematic analysis was used to inductively extract themes from participant responses, and then to develop these themes into theory by identifying the organizing concepts which linked themes (Patton, 1990; Mays & Pope, 1995). Ethical approval was obtained from the James Cook University Ethics Committee, number H1014.

Recruitment

Four strategies were used to recruit participants. Eighteen participants agreed to participate during a project involving

workplace skin examinations (Woolley et al., 2008), 12 participants consented to be involved in further research when replying to a cross-sectional skin cancer survey (Woolley et al., 2003), 14 responded to weekly advertisements in a local newspaper, and 20 James Cook University students were recruited using the University's employment service.

Sample

All study participants were residing in Townsville (latitude 19.16°S; population 143,328), a regional coastal city located in the dry tropics of northern Australia. Townsville averages more than 170 days of at least 8 hours of sunshine each year. Forty-two men and 22 women participated overall. Of the men, 25 were aged between 18 to 30 years; of the women, 14 were aged 18 to 30 years. Thirteen of the men but none of the women worked outdoors; the other participants classed themselves as indoor workers (31) or students (20).

Participants reported having personal experience with skin cancer, and/or that they spend significant time out in the tropical sun at work or on weekends. Therefore, all participants were considered to be information-rich cases that allowed the research questions to be adequately explored (Sandelowski, 1995).

Data collection

Interviews were conducted between September 2000 and May 2003. Focus group participants were sent a cover letter or e-mail describing the project, the topics to be covered, and an informed consent form. Focus group participants received a small honorarium to help offset transportation costs or provide compensation for their time. Food was also provided at the focus group sessions. Participants in one-on-one telephone interviews were verbally provided information about the study and gave verbal consent to participate; while those having face-to-face interviews were provided with written information and a consent form. Interviewees were not given compensation for their time.

Overall, four one-on-one interviews were conducted face-to-face and eight were conducted over the telephone; the strategy chosen was at the convenience of the respondent. These interviews lasted approximately 20 minutes, and were transcribed in note fashion by the first author. Focus group data were obtained from six face-to-face group discussions and seven Internet chat-group discussions. The 13 focus groups included: five groups of younger (18 – 30 years) men, four groups of younger women, two groups of older (above 30 years) outdoor working men, one group of older indoor working men, and one group of older women. Five of the seven younger people's focus groups were run over the Internet via the James Cook University "WebBoard" chat-room software. Chat-groups were used predominantly for younger persons as it was thought the associated anonymity would result in more frank and open discussion of psycho-social factors such as peer pressure and masculinity. Focus group sessions lasted approximately one hour. Participant numbers in the male focus groups varied between three and four, and numbers in the female groups varied between three and six.

To facilitate free and open discussions, focus groups were designed to be as homogenous as possible, based on the respondent's age and gender and, when possible, whether they worked indoors or outdoors. This information was collected

when consent was obtained, and used later to designate participants to focus groups.

A facilitator (TW) and an assistant were present during each face-to-face focus group. The facilitator led the group discussions, while the assistant transcribed detailed notes. Only the facilitator was involved in taking notes and asking questions for the telephone interviews and Internet focus groups. Face-to-face focus groups were audio-taped and fully transcribed with participant permission, while Internet focus groups were electronically transcribed.

The focus group and individual interviews involved a limited set of predefined, open-ended questions functioning as prompts to provoke discussion combined with brainstorming opportunities. The three main areas of questioning undertaken during the research were knowledge of the causes and prevention of skin cancer, attitudes to sun exposure and sun damage, and use of recommended sun protective behaviours.

Data analysis

Focus groups and one-on-one interviews were conducted sequentially and analysed after each group to build an inductive understanding of participant responses, so that data from earlier groups or individuals were shared and expanded with subsequent participants. To ensure consistency, the facilitator and assistant debriefed after each focus group to cross-check notes about the main themes and organizing concepts.

Every discussion or interview was transcribed to an electronic format. Initial analysis involved reading through the electronic transcripts repeatedly, using immersion to develop a high level of familiarity with the data, manually coding the data into separate summary concepts or key words, and categorising and linking these into recurrent themes. In this way, all transcripts were organised around emerging themes.

After data were grouped thematically, emerging themes were checked with further groups, and all negative cases explored in-depth. From group to group, the facilitator modified, deleted, and/or added questions as necessary to pursue all topics until no additional information could be elicited. Some quotes were included directly into the results if they illustrated concepts held by the majority of participants.

Reliability and rigor

The level of participation during focus groups was high, and all participants enthusiastically shared their views and experiences. Consistency was enhanced by having the same facilitator involved in all focus group discussions and interviews. Only the facilitator was involved in analysis. Themes were explicitly tested by exploring in some depth those responses which did not follow typical themes, and by directly asking participants in later interviews if they agreed with the major themes that emerged in previous discussions, and then suggesting alternative explanations. The larger sample size in the study allowed a "theory-saturation point" to be reached, where new discussions no longer produced new information (Sandelowski, 1995).

In addition, the mix of focus group and interview participants across age, gender and indoor/outdoor working status allowed data source triangulation, while mixing qualitative methodologies – face-to-face and internet focus groups *and* face-to-face and phone interviews – allowed methodological triangulation.

Table 1: Summary of responses to the theme "Threat of skin cancer – perceptions of susceptibility and seriousness" from participants grouped with regard to gender and age (18-30 years or older than 30 years)

Predominant beliefs of younger women (18–30 years)	Predominant beliefs of younger men (18 – 30 years)	Predominant beliefs of older women (> 30 years)	Predominant beliefs of older men (> 30 years)
<ul style="list-style-type: none"> • Belief that people usually start developing skin cancer in their 30s. All people in NQ are at risk of skin cancer because of tropical location, in particular, those with fair skin. 	<ul style="list-style-type: none"> • Belief that people usually start developing skin cancer in their 50s. Living in NQ means skin cancer is an "acceptable" risk for young men: indoor workers believe "I will only get one or two at most"; outdoor workers with fair skin report they are at high risk, but outdoor workers with 'good genetics' do not ("Dad's spent all his life working in the sun and he only had two removed, so I reckon the most I'm going to get is two."). 	<ul style="list-style-type: none"> • Belief that they are personally susceptible to developing skin cancer, though if they continue to use sun protection diligently, then their future susceptibility will be lower. 	<ul style="list-style-type: none"> • Belief that they are personally susceptible to developing skin cancer, especially if they have fair skin and work outdoors.
<ul style="list-style-type: none"> • Belief that melanoma skin cancer is very dangerous because it kills or "results in a large amount of skin having to be taken out". 	<ul style="list-style-type: none"> • Belief that melanoma skin cancer is only dangerous if detected late and has "spread deeply". 	<ul style="list-style-type: none"> • Belief that melanoma skin cancer is very dangerous. 	<ul style="list-style-type: none"> • Belief that skin cancer is more of an inconvenience than a serious danger.
<ul style="list-style-type: none"> • Belief that non-melanoma skin cancers can be easily treated by excision or being burnt off, though young women are very concerned about associated scarring. 	<ul style="list-style-type: none"> • Belief that skin cancers can be easily treated by excision or being burnt off, and any scarring is not a problem unless on face, which can be fixed by plastic surgery. 	<ul style="list-style-type: none"> • Belief that non-melanoma skin cancers can be easily treated, though older women are very concerned about associated scarring. 	<ul style="list-style-type: none"> • Belief that skin cancer is easily treated ("just like going to the dentist"), with some men waiting so they can remove a number at one time; no concerns about scarring unless on the face.
<ul style="list-style-type: none"> • Belief that skin cancer is caused by any excessive sun exposure (dark suntan, skin redness or peeling over a person's life, needing about 20 peeling sunburns before you have enough skin damage to develop skin cancer. 	<ul style="list-style-type: none"> • Belief that the occasional peeling sunburn after about 20 years of age does not increase risk of skin cancer – nor do episodes of skin redness or having a suntan ("though it doesn't hurt to avoid the sun") - takes 50 - 60 peeling sunburns before people receive enough sun damage to develop skin cancer. 	<ul style="list-style-type: none"> • Belief that skin cancer is caused by any excessive sun exposure throughout a person's life. 	<ul style="list-style-type: none"> • Belief that peeling sunburns after about 20 years of age do not increase risk of skin cancer, nor do episodes of skin redness or having a suntan.
<ul style="list-style-type: none"> • Belief that light tans are safe if you are careful and use sunscreen, but peeling sunburns and dark tans are undesirable as they increase risk of skin cancer, and cause short- and long-term beauty problems (freckles, wrinkles, "leathery skin", "I don't want to peel on my face and get the motley look"). 	<ul style="list-style-type: none"> • Beliefs that the discomfort of peeling sunburn is the worst risk of sun exposure, while freckles and prematurely aged skin is not an issue – "a weather-beaten look is good for guys". A tan is safe as long as you don't peel to get one. 	<ul style="list-style-type: none"> • Belief that any sun exposure is undesirable and will increase your risk of skin cancer. 	<ul style="list-style-type: none"> • Belief that skin redness is "not a sunburn" and will not increase their risk of skin cancer; belief that suntan is not a risk factor for skin cancer. Many older men experience skin redness regularly and have a suntan, especially outdoor workers who have dark suntans.
<ul style="list-style-type: none"> • Young women try to avoid the midday sun because "It's the worst time to damage your skin". 	<ul style="list-style-type: none"> • Young men do not avoid going out in the sun around midday. 	<ul style="list-style-type: none"> • Older women rarely exposed their unprotected skin to the sun, and never around the midday hours. 	<ul style="list-style-type: none"> • Older men still go out in the sun around the midday hours, but less than when younger.
<ul style="list-style-type: none"> • Most young women deliberately tan to "look better and feel better", while a significant number of young women do not as "it's not worth the risks". 	<ul style="list-style-type: none"> • Few younger men deliberately tan, but all had a tan for other reasons – unprotected sun exposure, because they believed it reduced risk of skin cancer, made them feel more attractive, "created vitamins for good health". 	<ul style="list-style-type: none"> • Older women did not deliberately tan, as having a suntan for vanity was no longer important to them since they had heard about, or experienced, skin cancer and sun damaged skin. 	<ul style="list-style-type: none"> • Older men do not deliberately suntan, but all had a tan.

RESULTS AND DISCUSSION

Most female participants in the study tended to have accurate knowledge about the causes and prevention of skin cancer, a heightened sense of susceptibility to skin cancer and the seriousness of skin cancer, few barriers that prevented them from using sun protection, habitually used the recommended combination of sun protection, and avoided going out in the sun around the midday hours. Irrespective of age, most men in this study had few motivators to use sun protection, were likely to mention barriers to using sun protection at work and during recreational activities, had a risk-taking attitude to their health,

and rarely reported using sun protection when out in the sun for longer than 30 minutes.

These findings are consistent with previous studies which showed that women engage in more sun protective behaviours (Keesling & Friedman, 1987; Cockburn et al., 1989) and have fewer barriers to sun protection than men (Cody & Lee, 1990; Hill et al., 1984). These findings can be categorised into three main themes for what influences NQ men and women to use sun protection: (1) perceived threat of developing skin cancer and other skin damage based on beliefs of personal susceptibility to skin cancer and seriousness of skin cancer; (2) factors that

motivate individuals to use sun protection, and (3) perceived barriers to using sun protection.

Tables 1 to 3 summarise the predominant responses for each of the three main themes, stratified by gender and age (18-30 years; older than 30 years). The three main themes identified from the participant's responses closely correspond with those anticipated by the HBM. The HBM proposes health-related behaviours are based on three main influencers: people's perceptions of the threat posed by the disease and their susceptibility to the disease, cues to action (motivators), and barriers to using the appropriate preventive actions (Gerbert et al., 1996). Of these, the HBM suggests perceived barriers is the most powerful component influencing whether or not people practice a particular health behaviour, with perceived susceptibility to a disease also strongly contributing (Gerbert et al., 1996).

Perceived threat of developing skin cancer

Younger NQ women, in particular, women in late teens and early twenties, often deliberately tanned. However, by their mid-twenties and older, most NQ women reported using the recommended combination of sun exposure practices and had positive sun protection beliefs and attitudes when they went out in the sun for significant periods. Many older NQ women commented that they had reduced their exposure of unprotected skin to the sun almost completely. NQ women of all ages believed skin cancer was a serious health issue, in particular, melanoma skin cancer.

While some older NQ men (aged 30 years or more) reported a positive attitude to using sun protection, their level of knowledge of what is presently known to cause skin cancer was usually not high, and older men often did not perceive skin cancer to be a serious health issue, even if they had experience of skin cancer. Men of all ages in this study still reported high levels of unprotected sun exposure and non-peeling sunburn, which would be significantly increasing their risk of developing skin cancer (Rosso et al., 1996; Kricke et al., 1994). The study found men had few concerns about experiencing a suntan, sunburn or skin cancer. Younger men often preferred to have a tan because they considered a tan gave them a more masculine appearance, as did scarring that may result from skin cancer excision. Many NQ men of all ages considered developing skin cancer to be an acceptable risk associated with work or an outdoor lifestyle, thought that skin cancers were easily treated by excision, and melanoma was only dangerous if discovered late and was deeply spreading. Participating NQ men often had poor knowledge, beliefs and attitudes towards skin cancer prevention, and voiced little concern about the risks of sun exposure, irrespective of age. Even when participating in high-sun exposure activities where unprotected sun exposure was likely to result in sunburn, many men admitted to using sun protection only after their skin had turned red from the sun. Relatively few men in the study believed that skin cancer was caused by skin redness or having a dark suntan. In addition, younger NQ men in this study all considered skin cancer to be a long-term health issue; believing people start developing skin cancers only after 50 years of age. Individuals are known to under-value long-term risks for health problems occurring more than 15 years into the future (Svenson, 1984; Bonieki, 1980), even less when health protective actions to prevent illness need to be taken during an asymptomatic state (Kasl & Cobbs, 1966).

As a consequence, younger NQ men may under-value skin cancer as a health concern. It is likely that NQ men's lack of concern about skin cancer is at least partly a result of having a

paucity of factual information on skin cancer. In contrast, NQ women reported acquiring skin cancer information from more factual and detailed sources – General Practitioners and women's magazines – and, as a consequence, had more accurate knowledge. These findings are consistent with previous studies which show women are exposed to more skin cancer information, and have a high level of knowledge of skin cancer, than men (Keesling & Friedman, 1987; Cody & Lee, 1990; Borland et al., 1990). It appears essential that NQ men receive more factual information about skin cancer to overcome their misconceptions of its causes and prevention, and increase a sense of their own personal susceptibility to the disease.

Therefore, perceptions of susceptibility to skin cancer and seriousness of skin cancer in NQ women seem to be based on their strong knowledge of the link between sun exposure, sun damage and skin cancer, and their concerns about the consequences of skin cancer. In contrast, many NQ men do not have this knowledge, nor these concerns of the consequences of skin cancer.

Factors that motivate individuals to use sun protection

Many NQ women in the present study had two important motivators for using sun protection. Older women often improved their sun protection behaviour because they wanted to set a good example for their children. In addition, nearly all women in their mid-twenties and older were strongly motivated to avoid sun damage to their skin for vanity reasons: wanting to avoid scarring as a result of skin cancer excision, wanting to avoid short-term skin damage that affected appearance such as a peeling face, and wanting to avoid long-term skin damage such as wrinkles, freckles and "leathery skin". Vanity concerns usually arose from the women noticing prematurely aged sun damaged skin in family members or friends, from information contained in magazines, or, when they were older, from their own experiences.

In contrast, few NQ men had such vanity concerns, and there was a common attitude that wrinkles and a weather-beaten face contributed to a more masculine look; particularly in the younger men. The main motivator for NQ men to use sun protection in this study was significant negative experience with skin cancer and other sun-induced skin damage when older. However, by the time this occurs, these men will likely have received sufficient UVR damage to their skin that further skin cancer is virtually unavoidable, even with regular use of sun protection. Another motivator for men in this study was from observing the use of sun protection by family, friends and peers. Bandura suggests in his Social Cognitive Theory that individuals can acquire important information merely by observing other individuals (Bandura, 1977). Therefore, social environments with family, friends and work colleagues will support (or impede) sun protective behaviour.

Barriers to using sun protection

Few NQ women in the study had barriers to using sun protection, while the men often reported a variety of perceived barriers. Many outdoor working men in this study also felt that sunscreen is too slippery to use in the workplace, and many men commented that long-sleeved shirts are too hot and uncomfortable to wear over the tropical summer. In addition, many NQ men in this study believed that using sun protection is only necessary when undertaking long periods of sun exposure; this belief was associated with poor knowledge of the causes of BCC and SCC.

Table 2: Summary of responses to the theme "Factors that motivate the use of sun protection" from participants grouped with regard to gender and age (18-30 years or older than 30 years)

Predominant beliefs and actions of younger women (18–30 years)	Predominant beliefs and actions of younger men (18 – 30 years)	Predominant beliefs and actions of older women (> 30 years)	Predominant beliefs and actions of older men (> 30 years)
<ul style="list-style-type: none"> • Most young women habitually used sun protection because of positive influence from mothers very early in childhood (especially if skin cancer in the family) and from school; a few also had negative influences from family members: "I never had protection as a child. Nona always encouraged me to sun-bake or told me I looked unhealthy." • Motivated to use sun protection after experience with peeling sunburns in early/late teens, teaching them how easily you can get sunburn in the tropics, and how to use sun protection optimally. 	<ul style="list-style-type: none"> • Few young men habitually use sun protection; those who did were often influenced by their mother. • Young men who did not habitually use sun protection often experienced sunburn because they neglected to bring it along: "I was stuck in this boat in the middle of nowhere, slowly roasting", or did not use it until too late: "I only thought about protection when I started to get burnt." 	<ul style="list-style-type: none"> • Older women always habitually used sun protection. • Encouraged to use sun protection after experience with sunburn, then later premature aging of their skin from sun damage, and then later still, from experiencing a skin cancer. 	<ul style="list-style-type: none"> • Some older men used sun protection more if they had experienced skin cancer. • Motivated to use sun protection if they were around their children, though their female partner was usually the one responsible for putting sun protection on the children and on the man.
<ul style="list-style-type: none"> • Encouraged to use sun protection from messages on the TV, which made them more aware of the risks of sun exposure and the danger of melanoma. 	<ul style="list-style-type: none"> • Messages on the TV had little impact on improving their sun protection behaviours as these were emotive, low on facts and of little practical benefit: "scare tactics don't work for me", "More facts and less bullshit", "I don't know what to look for to identify a melanoma". 	<ul style="list-style-type: none"> • Encouraged to use sun protection to set a good example for their children: "I want to protect my kids from anything harmful, so I was really keen to make them cover up and warn them about the sun." 	<ul style="list-style-type: none"> • Older men usually only knowledgeable about skin cancer if they had a skin cancer previously excised.
<ul style="list-style-type: none"> • Encouraged to use sun protection after exposure to factual information in magazines (young women are well aware of the damaging effects of sun on their skin, and are knowledgeable about skin cancer in general). 	<ul style="list-style-type: none"> • A few young men with fair skin were motivated to use sun protection habitually because of their susceptibility to sunburn. Encouraged to use sun protection in the short term after experiencing peeling sunburn, but became less motivated over time: "you get slacker the longer it has been". Encouragement to use sun protection in the long term usually came from observing others using sun protection. • Outdoor workers commented that workplaces rarely make a serious attempt at advertising the dangers of sun exposure: "Sunscreen use is recommended in the staff manual, but it isn't provided by my boss. I think it's just there in the manual to cover occupational health and safety.", "There's sunscreen there [at my workplace], so I guess we're supposed to use it, but they don't advocate it." 	<ul style="list-style-type: none"> • Encouraged to use sun protection after exposure to factual information in magazines and from doctors if they had a skin cancer excised; very knowledgeable about skin cancer. 	<ul style="list-style-type: none"> • Most are encouraged by their female partner to use sun protection, though this encouragement usually takes a significant period of time before being successful (if at all): "She gave up a long time ago.", "It took ten years, but finally she wore me down."

Another perceived barrier was men's risk-taking attitudes towards health issues; in particular, when they were young adults (as alluded to - in hindsight - by some of the older participants). Neglecting sun protection seemingly provides to peers an appearance of bravado against a potentially fatal, though unlikely, scenario of developing melanoma later in life. Peer influences are a further perceived barrier for NQ men – some male outdoor workers in this study told of how sun protection is not considered 'masculine' in the workplace, and that their work colleagues made negative comments when they used sun protection. A number of men also commented that

their work environment was not supportive of sun protective behaviours; workplaces sometimes did not supply sunscreen, and only one workplace enforced the use of sun protective clothes. Other studies have found socio-demographic, personal and workplace factors reduce use of sun protection by outdoor workers (Hammond et al., 2008; McCool et al., 2009). However, the comments of older outdoor working men showed they sometimes developed a more positive attitude to using sun protection over time, though usually as a result of developing sun-induced skin damage.

Table 3: Summary of responses to the theme "Barriers to using sun protection" from participants grouped with regard to gender and age (18-30 years or older than 30 years)

Predominant beliefs and actions of younger women (18–30 years)	Predominant beliefs and actions of younger men (18–30 years)	Predominant beliefs and actions of older women (> 30 years)	Predominant beliefs and actions of older men (> 30 years)
<ul style="list-style-type: none"> All young women reported issues with using sun protection – "sunscreen is greasy on your skin", "sunscreen runs into your eyes if you sweat", "long sleeved shirts make you hot and sweaty", but most said these annoyances were not enough to stop them using it, as: "You can always wash it off your hands", and "maybe it makes the sand stick to you a bit more but I don't care about that". Some young women did not use protection on days which were cool or cloudy, even when they were going outdoors for long periods: "the day didn't feel hot enough to get burnt", "Don't usually wear it when it is cloudy...more a heat association"; instead, they usually wore a "skimpy dress style" during these times. 	<ul style="list-style-type: none"> All young men reported issues with using sunscreen – greasiness and running into your eyes when you sweat – these were the most important factors in why they often did not use it at work: "It [sunscreen] is sticky so the dirt and sawdust sticks and makes me sweat"; "My hands become slippery when holding tools like the nail gun, which is dangerous.", "You don't want to drop things on people's heads." Most young men reported issues with using long sleeved shirts (LSS) – "hot and uncomfortable in summer" was the most important factor why many did not use LSS. Two outdoor workers who worked for a company that enforced sun protective behaviours were more positive about wearing sunscreen and LSS: "they're a bit of a hassle, but I guess it will stop skin cancer"; "LSS are actually not that hot once you've sweated in them for a while." 	<ul style="list-style-type: none"> All older women reported some unpleasantness with using sun protection, but never enough to stop them from using it any time they went out in the sun. 	<ul style="list-style-type: none"> While they had more positive attitudes to using sun protection, many older men reported issues with its use; in particular, with using sunscreen, but also with using LSS to a lesser extent.
<ul style="list-style-type: none"> Belief that using the 'Slip, Slop, Slap!' strategy should be sufficient to avoid or reduce future skin cancer. 	<ul style="list-style-type: none"> Belief that they do not need to use sun protection when going out in the sun for periods of less than an hour because: "It's too short a time to get a sunburn". Belief that you would develop skin cancer "only if you used no sun protection at all for at least 10 years". Some young men alluded to peer pressure issues: "At work the guys don't use sun protection, so I'd be ridiculed if I used the work's sunscreen." 	<ul style="list-style-type: none"> All older women strongly believe, from their own personal experiences, that using 'Slip, Slop, Slap!' will avoid or reduce future skin cancers, and will reduce the visible signs of sun damaged skin. 	<ul style="list-style-type: none"> More positive attitudes to using sun protection than when they were younger. Older men reported fewer barriers to using sun protection because they were now less risk-taking than when they were younger: "I no longer feel ten-foot tall and bullet-proof", "I've realized I'm not immortal".

Interestingly, two of the male respondents in this study worked for a company which enforced the use of sun protection by outdoor workers. Both individuals had positive attitudes to using sunscreen, perceived skin cancer to be a serious health issue, and did not think wearing a long-sleeved shirt was much of a barrier in hot and humid weather because these shirts cooled down once they became wet with sweat. Therefore, managements should consider adopting a mandatory workplace sun protection policy, as it is likely that significant numbers of outdoor working NQ men choose not to use sun protection based on misconceptions about comfort over summer, negative peer influences, and their own risk-taking attitude. Supporting this proposed strategy, a recent study has shown that employees from a NQ workplace which adopted a mandatory workplace sun protection policy had lighter suntan levels, fewer solar keratoses on hands and arms, and fewer self-reported skin cancers and recent sunburns than employees working under a voluntary sun protection policy (Woolley et al., 2008). This reduced sun-induced skin damage is a likely consequence of these outdoor working employees being made to use recommended sun protection practices over a long period.

Limitations of the study

Generalising the findings from this study to the broader NQ population should be possible, as the three main themes identified for what influences NQ men and women to use sun protection closely correspond with those predicted by the HBM (Janz & Becker, 1984; Gerbert et al., 1996; Carmel et al., 1994), and the study has a relatively large sample size (Sandelowski, 1995). However, a limitation of this study which may affect generalisability was the predominant use of university students in the younger age groups, given that demographic characteristics of this group (level of education and other socio-economic characteristics) have been found to influence knowledge, attitudes and behaviours toward skin cancer prevention Hill et al., 1992).

Further, participants were not specifically asked how often and how long they went out in the sun during a typical week, or how long they had lived in the tropics. Therefore, it is unclear how representative participants were in regards to their level of exposure to the tropical sun. However, all participants gave extensive insights into their outdoor activities, their sun-related

attitudes, beliefs and behaviours, and their experienced sun-induced skin damage.

Conclusions

There were significant differences in the knowledge, attitudes and behaviours towards skin cancer prevention between the sexes in NQ, and these differences help explain why NQ men are experiencing much higher skin cancer rates than the women. NQ women had a greater sense of threat posed by epithelial and melanoma skin cancer, a greater sense of personal susceptibility to the disease (based on accurate knowledge about the causes of skin cancer), a number of strong motivators and few personal barriers to using sun-protective behaviours.

In contrast, NQ men often had erroneous beliefs about the causes of skin cancer, perceived skin cancer as easy to treat and not serious, and reported a variety of psycho-social barriers to use sun protection, yet relatively few appearance- or health-based motivators. The main motivator for more regular use of sun protection in NQ men was significant negative experience with skin cancer and other UVR-induced skin damage. However, by the time this has occurred, many men will have already received sufficient UVR damage to their skin such that further skin cancer is virtually unavoidable, no matter how regularly they now use sun protection.

Simply improving NQ men's knowledge or providing them with sunscreen, hats and long sleeved shirts will likely not be sufficient to overcome these many factors. Making it mandatory for NQ workplaces to use long-sleeved shirts, wide brimmed hats and sunscreen may be the most effective strategy to reduce the likelihood of outdoor working men developing skin cancer, as this would overcome the men's poor knowledge, strong negative perceptions, barriers and lack of motivators associated with using sun protection.

ACKNOWLEDGEMENTS

This study was supported by the Parkes Bequest and by a Doctoral Merit Grant of James Cook University, Townsville, Australia. Dr Torres Woolley was the George Roberts PhD Scholar for North Queensland, granted by the Queensland Cancer Fund, Brisbane, Australia, between 1998 and 2001. We would like to thank Ms Sue Devine for her significant contribution in critically revising the manuscript.

REFERENCES

- AIHW. (1997) Australian Institute of Health and Welfare, and Commonwealth Department of Health and Family Services. First report on national Health Priority Areas, 1996. AIHW Cat. No. PHE 1. Canberra: AIHW and DHFS.
- Bandura A. (1977) Self-efficacy: Toward a unifying theory of behavioral change. *Psychology Review* 84:191-215.
- Bernhard G, Mayer B, Seckmeyer G, Moise A. (1997) Measurements of spectral solar UV irradiance in tropical Australia. *Journal of Geophysical Research* 102:8719-30.
- Boniewski G. (1980) What are the limits to man's time and space perspectives? Toward a definition of a realistic planning horizon. *Technical Forecasting and Social Change* 17:161-7.
- Borland R, Hill D, Noy S. (1990) Being SunSmart: Changes in community awareness and reported behaviour following a primary prevention program for skin cancer control. *Behavioural Change* 7:126-35.
- Buettner PG and Raasch BA. (2001) Incidence rates of skin cancer in Townsville, Australia. *International Journal of Cancer* 1998; 78:587-93. Erratum in *International Journal of Cancer* 93(2):302-3.

Carmel S, Shani E, Rosenberg L. (1994) The role of age and an expanded Health Belief Model in predicting skin cancer protective behaviour. *Health Education Research* 9(4):433-47.

Cockburn J, Hennrikus D, Scott R, Sanson-Fisher R. (1989) Adolescent use of sun protection measures. *Medical Journal of Australia* 151:136-40.

Cody R and Lee C. (1990) Behaviours, beliefs and intentions in skin cancer prevention. *Journal of Behavioural Medicine* 13:373-89.

Coups EJ, Manne SL, Heckman CJ. (2008) Multiple skin cancer risk behaviors in the U.S. population. *American Journal of Preventive Medicine* 34(2):87-93.

Gallagher RP, Hill GB, Bajdik CD, Fincham S, Coldman AJ, McLean DI, Threlfall WJ. (1995a) Sunlight exposure, pigmentary factors, and risk of nonmelanocytic skin cancer. I. Basal cell carcinoma. *Archives of Dermatology* 131:157-63.

Gallagher RP, Hill GB, Bajdik CD, Fincham S, Coldman AJ, McLean DI, Threlfall WJ. (1995b) Sunlight exposure, pigmentary factors, and risk of nonmelanocytic skin cancer. II. Squamous cell carcinoma. *Archives of Dermatology* 131:164-9.

Gallagher RP, Ma B, McLean DI, Yang CP, Ho V, Carruthers JA, Warshawski LM. (1990) Trends in basal cell carcinoma, squamous cell carcinoma, and melanoma of the skin from 1973 through 1987. *Journal of American Academy of Dermatology* 23:413-21.

Gerbert B, Johnston K, Bleecker T, McPhee S. (1996) Attitudes about skin cancer prevention: A qualitative study. *Journal of Cancer Education* 11(2):96-101.

Godar DE, Wengraitis SP, Shreffler J, Sliney DH. (2001) UV doses of Americans. *Photochemistry and Photobiology* 73(6):621-9.

Hall HI, May DS, Lew RA, Koh HK, Nadel M. (1997) Sun protection behaviors of the U.S. white population. *Preventive Medicine* 26(4):401-7.

Hammond V, Reeder AI, Gray AR, Bell ML. (2008) Are workers or their workplaces the key to occupational sun protection? *Health Promotion Journal of Australia* 19(2):97-101.

Hill D, Rassaby J, Gardner G. (1984) Determinants of intentions to take precautions against skin cancer. *Community Health Studies* 8:33-44.

Hill D, White V, Marks R, Theobald T, Borland R, Roy C. (1992) Melanoma prevention: behavioural and non-behavioural factors in sunburn amongst an Australian urban population. *Preventive Medicine* 21:654-69.

Janz NK and Becker MH. (1984) Health belief model: A decade later. *Health Education Quarterly* 11:1-47.

Kasl SV, Cobbs S. (1966) Health behaviour, illness behaviour and sick role behaviour: 1 Health and illness behaviour. *Archives of Environmental Health* 12:246-66.

Keesling B, Friedman HS. (1987) Psychosocial factors in sunbathing and sunscreen use. *Health Psychology* 6:477-93.

Kricker A, Armstrong BK, English DR. (1994) Sun exposure and nonmelanocytic skin cancer. *Cancer Cause and Control* 5:367-92.

Lee C. (1998) Overview of the pathology and treatment of malignant melanoma. *Cancer Forum* 22(3):175.

Levi F, La Vecchia C, Te VC, Mezzanotte G. (1998) Descriptive epidemiology of skin cancer in the Swiss canton of Vaud. *International Journal of Cancer* 42:811-6.

Mays N and Pope C. (1995) Rigour and qualitative research. *British Medical Journal* 11:109-12.

- McCool JP, Reeder AI, Robinson EM, Petrie KJ, Gorman DF. (2009) Outdoor workers' perceptions of the risks of excess sun-exposure. *Journal of Occupational Health* 51(5):404-11.
- Patton MQ. (1990) *Qualitative research and evaluation methods*, 2nd edn. Sage: Newbury Park, CA.
- Roberts DL. (1990) Incidence of non-melanoma skin cancer in West Glamorgan, South Wales. *British Journal of Dermatology* 122:399-403.
- Robinson JK, Rigel DS, Amonette RA. (1997) Trends in sun exposure knowledge, attitudes, and behaviors: 1986 to 1996. *Journal of American Academy of Dermatology* 37:179-86.
- Rosso S, Zanetti R, Martinez C, Tormo MJ, Schraub S, Sancho-Garnier H, Franceschi S, Gafà L, Perea E, Navarro C, Laurent R, Schrameck C, Talamini R, Tumino R, Wechsler J. (1996) The multicenter south European study "Helios" II: different sun exposure patterns in the aetiology of basal cell and squamous cell carcinomas of the skin. *British Journal of Cancer* 73:1447-54.
- Sandelowski M. (1995) Sample size in qualitative research. *Research Nursing Health* 18(2):179-83.
- Schofield PE, Freeman JL, Dixon HG, Borland R, Hill DJ. (2001) Trends in sun protection behaviour among Australian young adults. *Australia and New Zealand Journal of Public Health* 25:62-5.
- Scott J, Fears TR, Fraumeni JF Jr. (1981) *Incidence of non-melanoma skin cancer in the United States*. Washington, DC: US Dept. of Health and Human Services. Publication NIH 82-2433.
- Staples M, Elwood M, Burton R, Williams J, Marks R, Giles G. (2006) Non-melanoma skin cancer in Australia: 2002 national survey and trends since 1985. *Medical Journal of Australia* 184(1):6-10.
- Staples M, Marks R, Giles G. (1998) Trends in the incidence of non-melanoma skin cancer (NMSC) treated in Australia 1985-1995: Are primary prevention programs starting to have an effect? *International Journal of Cancer* 78:144-8.
- Svenson O. (1984) Time perception and long term risk. *Canadian Journal of Operational Research and Information Processing* 22:196-202.
- Woolley T, Buettner PG, Lowe J. (2003) Sunburn in Australian men with a history of NMSC. *American Journal of Health Behavior* 27(3):195-207.
- Woolley T, Buettner PG, Raasch B, Glasby M, Lowe J. (2008) Workplace sun protection policies and employees' sun-related skin damage. *American Journal of Health Behavior* 32(2):201-8.