



## COVER SHEET

---

**This is the author version of article published as:**

Janda, Monika and Youl, Philippa and Lowe, John B and Baade, Peter and Elwood, Mark and Ring, Ian and Aitken, Joanne (2006) What Motivates Men Age >50 Years to Participate in a Screening Program for Melanoma?. *Cancer* 107(4):pp. 815-823.

**Copyright 2006 Wiley Interscience**

**Accessed from <http://eprints.qut.edu.au>**

**What motivates men 50 years and over to participate in a screening program for melanoma?**

Monika Janda, PhD<sup>1,2</sup> Philippa H. Youl, MPh<sup>1</sup> John B. Lowe, DrPh<sup>3</sup> Peter D. Baade, PhD<sup>1</sup> Mark Elwood, MD<sup>4</sup> Ian T Ring, FAFPHM<sup>5</sup> Joanne F Aitken, PhD<sup>1,6</sup>

<sup>1</sup> Viertel Centre for Research in Cancer Control, Queensland Cancer Fund, Brisbane, Queensland, Australia.

<sup>2</sup> School of Public Health, Queensland University of Technology, Brisbane, Queensland, Australia.

<sup>3</sup> Department of Community and Behavioral Health, College of Public Health, University of Iowa, Iowa City, Iowa, USA

<sup>4</sup> National Cancer Control Initiative, Carlton, Victoria, Australia

<sup>5</sup> Centre for Health Services Development, University of Wollongong, New South Wales, Australia;

<sup>6</sup> School of Population Health, University Queensland, Brisbane, Queensland, Australia.

**Short Title:** Melanoma Screening

**Manuscript category:** Original Article

**Keywords:** melanoma, screening, early detection, skin cancer, middle aged and elderly men

**Acknowledgements:** This study was funded by Queensland Health and the Queensland Cancer Fund

Correspondence:

Monika Janda, PhD  
Viertel Centre for Research in Cancer Control  
Queensland Cancer Fund  
PO Box 201  
Spring Hill, QLD 4004  
Phone: ++61 7 3258 2318  
Fax: ++ 61 7 3258 2310  
e-mail: [MonikaJanda@qldcancer.com.au](mailto:MonikaJanda@qldcancer.com.au)

**Count: Pages: 19**  
**Tables: 2**

## **Abstract**

**Background.** The screening behaviour and screening outcomes of men  $\geq 50$  years was investigated within a randomized controlled trial of a community-based intervention of screening for melanoma, consisting of a community education program, an education program for medical practitioners and the provision of dedicated skin screening clinics.

**Methods.** Data from cross-sectional telephone surveys before (559 completed interviews); at the end (591 completed interview); and at 2 year after the intervention (445 completed interviews) were analysed. In addition, we analysed data from skin screening clinics within the intervention program (3,355 men  $\geq 50$  years participated).

**Results.** During the intervention period men  $\geq 50$  years increased both their screening behaviour and intention to screen. Those men  $\geq 50$  years who reported a past history of removal of a mole as well as other risk factors for skin cancer and positive attitudes towards screening were more likely to participate in skin screening across time. Men  $\geq 50$  years accounted for 20.5% of all skin screening clinic attendees, 31.3% of those referred for a suspicious lesion, 48.5% of melanomas, and 45% of all Keratinocyte Carcinomas diagnosed within the screening program, respectively.

**Conclusions.** The intervention program successfully motivated men  $\geq 50$  years to attend screening for skin cancer, resulting in the highest yield of skin cancer within this subgroup of the population. Messages addressing skin cancer risk factors and attitudes towards skin cancer and screening could be used to target a screening program for melanoma towards men  $\geq 50$  years.

**Condensed abstract:** Within a population based screening program for melanoma men  $\geq$  50 years significantly increased their participation in screening for melanoma and intention to screen. Within skin screening clinics provided within the intervention program, men  $\geq$  50 years contributed 48.5% of melanomas, and 45% of all Keratinocyte Carcinomas diagnosed.

Excluding Keratinocyte Carcinoma (KC)(basal and squamous cell carcinoma), melanoma is the fourth most common cancer in Australia, with 8,885 new cases diagnosed in Australia in 2001 (population approximately 19,400,000) <sup>1</sup>. In the US, where the incidence of melanoma is rising rapidly, 59,580 new cases of melanoma are expected for 2005 (population approximately 294,000,000) <sup>2</sup>. Men accounted for 56% of all new melanoma cases, and for 63% of all melanoma related deaths in both Australia and the US <sup>1-3</sup>. Melanoma incidence continues to rise over-proportionally in men over 50 <sup>4</sup>. The thickness of the lesion at diagnosis is one of the most important prognostic indicators for survival from melanoma <sup>5,6</sup> and diagnosis and treatment of melanomas while still thin is likely to improve survival from this disease <sup>7,8</sup>. Screening for melanoma has the potential to improve early diagnosis. Although there is at present no conclusive evidence that screening for melanoma will reduce morbidity and mortality from melanoma, the US Preventive Task Force (USPTF) describes screening as the most promising strategy especially for older people <sup>9</sup>. The American Cancer Society recommends a skin examination as a component of any routine cancer-related check-up <sup>10</sup>. Targeted screening towards those older than 50 years has been suggested as a possible way to increase its cost-effectiveness <sup>11,12</sup>. Previous studies found men  $\geq 50$  years more commonly present with thick and nodular melanomas compared to women and younger people, and should be targeted by early detection programs <sup>4,13-18</sup>. Despite this, within general practice, excisions are more commonly performed on patients younger than 50 years compared to patients  $\geq 50$  years <sup>19</sup>. Older men are also less likely to self-present with a lesion of concern at open access community screening programs <sup>20</sup>. However, despite representing only 25% of all screenees, men over 50 contribute 44% of those with a confirmed melanoma within such clinics <sup>21</sup>. Reduced ability to recognise a melanoma was reported for older compared to younger people, and older men frequently have

lesions in difficult to see areas such as the scalp and the back, and may therefore be additionally limited in their ability to notice any new or changing lesions themselves<sup>15</sup>.

The present investigation presents an important part of the first phase of a randomised controlled trial of a community based intervention of screening for melanoma<sup>22, 23</sup>.

Earlier we reported the results from the baseline survey of this trial. People  $\geq 50$  years were less likely to conduct a whole-body skin self-examination compared to younger people<sup>24</sup>, but there was no difference between men and women or between different age groups with regards to self-reported prevalence of a whole-body skin examination by a general practitioner (clinical skin examination) within the past 12 months<sup>25</sup>. Men were less likely to indicate an intention to conduct skin self-examination or to attend a doctor for a skin examination within the next 12 months than women suggesting that changing this behaviour in men could prove challenging. Although having had a previous clinical examination by a doctor was most strongly related to future screening intention, several attitudinal factors (perceived susceptibility, giving skin checks a high priority, previous history of NMSC) were also associated with intention to screen<sup>26</sup>.

After completion of the trial we investigated changes in skin screening behaviour over time in intervention and control communities. Overall, within the intervention communities, the prevalence of whole-body skin examinations increased from 11% at baseline to a maximum of 34.8% two years into the trial, while screening rates amongst control communities remained stable. Uptake was highest amongst the population  $\geq 50$  years<sup>27</sup>.

The present paper investigates predictors of skin screening participation of men  $\geq 50$  years within the 3-year community based screening program for melanoma. We also describe the clinical and histopathological outcomes of screening examinations in men  $\geq$

50 years who attended one of the dedicated skin screening clinics provided during the intervention period.

## **Materials and Methods**

The design, intervention and implementation of the intervention program has been described in detail elsewhere<sup>22,23</sup>. The aim of the trial was to determine the effectiveness of a community-based melanoma screening program in reducing melanoma mortality.

The intervention consisted of three interrelated components: community education about early detection of skin cancer, education for local doctors in early detection of skin cancer and dedicated skin screening clinics. The objective was to increase to 60% the proportion of the population over 30 years within intervention communities who had at least one whole-body skin examination within the three year intervention period. During the first phase, eighteen Queensland communities each with an adult ( $\geq 30$  years) population of  $\geq 2,000$  were enrolled, for a total adult population of 63,035. Nine intervention communities were randomly allocated to receive a three-year community-based melanoma screening program, with the remaining nine control communities receiving standard practice only. The target population for screening was defined as those 30 years and over as mortality from melanoma is rare under this age<sup>1</sup>. For the purpose of this analysis, only data from the nine intervention communities were used.

The respondents' self-reported skin screening behaviour, skin cancer risk factors and attitudes towards skin cancer and skin screening were monitored by cross-sectional telephone surveys at 3 time-points: baseline (4 weeks prior to the intervention program during 1998), 36-month follow-up (at the end of the intervention period during 2001) and 5 year follow-up (2 years after the end of the intervention period during 2003)<sup>27</sup>.

### *Telephone surveys*

Professional telephone interviewers used a Computer-Assisted Telephone Interview System (CATI) to reach random samples of community residents  $\geq 30$  years selected from a commercially available directory of telephone numbers (equal numbers of men and women were ascertained through a quota system). The response rate for the 1998 survey was 66.9% (3,110 completed interviews); 66.5% for the 2001 survey (5,048 completed interviews); and 65.1% in 2003 (3,514 completed interviews) (66.2% overall). Compared to the 1996 and 2001 Australian census, the sociodemographic characteristics of the survey respondents were similar with respect to sex, age, employment and marital status to the respective populations. For the purpose of this investigation only the data from men  $\geq 50$  years were utilized.

### *Skin screening clinics*

During the intervention period, local doctors (in primary care practises) screened patients within their day to day practices and some also organised screening clinics within their private practices. In addition, centrally organised skin screening clinics staffed by local doctors and additional doctors hired from outside the communities were held in intervention communities. Overall, within those dedicated clinics, primary care physicians conducted 16,383 whole-body skin examinations. The aims, procedures and outcomes of the skin screening clinics have been described in detail elsewhere<sup>27</sup>.

Members of intervention communities were alerted to the clinics through advertisements and articles in local newspapers, street banners, flyers and information brochures in doctors practices and other places of interest, and personal letters of invitation signed by a sports celebrity for men and a media celebrity for women. The letters contained information about the time and place of the clinics and a toll free telephone number for appointments. Care was taken to test the design of the letters directed at men for their

suitability for this target group. The value of these letters for motivating men to attend screening with or without the addition of a glossy brochure was tested within a nested randomised trial at the beginning of the intervention period. There was no additional effect over and above the letter for the brochures and therefore the brochure was not used during subsequent invitations directed at men <sup>28</sup>.

Clinics were held in workplaces, community venues and local hospitals and participants completed a questionnaire before their examination which included demographic characteristics, history of skin screening and skin cancer risk factors. Participants signed consent forms for the whole-body examination and to allow access to relevant medical information resulting from the skin examination. Overall, 2,302 (14.1%) clinic attendees were referred back to their own doctor for investigation of 4,129 suspicious lesions. The location and provisional diagnosis of the suspicious lesion discovered during the examination was noted by the skin clinic doctor on the referral form which was given to the patient. A copy was also retained by the research team. Of those referred, 1,822 (79.2%) filled their referral after a maximum of two telephone and written reminders. For these patients, their doctor recorded how the lesion was managed and the date of management. If a lesion was excised or biopsied, histopathology reports were obtained.

#### Measures

A detailed description of the telephone survey development and psychometric testing can be found elsewhere <sup>25,26</sup>. The following variables were measured during the telephone interviews and used for the present analysis:

- 1) Sociodemographic factors – sex and age;
- 2) Skin cancer risk factors – history of spot or mole removal; personal and family history of KC or melanoma;

- 3) Attitudes and intentions towards skin screening – intention to have a clinical skin examination within the next 12 months; intention to examine the own skin in the next 12 months; perceived susceptibility to develop skin cancer; concern about skin cancer; current concern about a specific spot or mole;
- 4) Past skin screening behaviour - skin screening by whole-body skin examination by a doctor during the past 12 months.

### **Data analyses**

Changes in reported screening behaviour, attitudes and intentions towards skin cancer screening based on the telephone surveys were assessed using logistic regression models. Separate models were used for each outcome. A three-level categorical variable representing the survey period was the dependent variable, and baseline prevalence was taken as the reference point. The change in attitudes and behaviours over time was expressed as adjusted Odds Ratios (OR) and Confidence Intervals (CI). The significance of the overall change was assessed by the Wald chi-square statistic from the logistic model. To adjust for the cluster design of the study (with communities being the cluster unit), the logistic regression models were carried out using the statistical package SUDAAN<sup>29</sup>, which allows for the increase in variation associated with this type of study design.

We also fitted multivariate random effect models (using the glimmix macro in SAS (SAS Institute Inc., Cary, North Carolina 27513) to assess the influence of doctor recommendations or instructions to self-examine the skin, skin cancer risk factors and attitudes on skin screening participation throughout the trial period. Separate models were used for each factor, and included two way interaction terms between time and the specific factor.

## Ethics

The Behavioural and Social Sciences Ethical Review Committee of the University of Queensland approved this study.

## Results

### *Telephone survey results*

Within intervention communities, men  $\geq 50$  years were nearly four times more likely to report a clinical whole-body skin examination in the past 12 months at the end of the intervention (32.8%) compared to baseline (10.6%), and still more than twice as likely two years after completion of the intervention (24.8%). Men over 50 were twice as likely to report conducting a whole-body skin self-examination within the past 12 months at the end of the intervention (27.5%) and at 2 years follow-up (28.0%) compared to baseline (15.8%). Additionally, men  $\geq 50$  years were significantly more likely to report an intention to conduct skin self-examination at the end of the intervention (85.0%) and at 2 year follow-up (81.2%) compared to baseline (60.8%) (Table 1).

At the end of the intervention period (22.5%) and 2 year follow-up (24.2%) we found no increase in the proportion of men  $\geq 50$  years who indicated their doctor suggested they conduct a skin self-examination compared to baseline (23.4%). Somewhat more men indicated at later time-points (15.7% and 14.2% at end of intervention and 2 year follow-up, respectively) that they received instructions by their doctor how to conduct a skin self-examination compared to baseline (9.6%), however, this did not reach significance as indicated by the CI's (Table 1). Similarly, the proportion of men who perceived themselves at high risk of skin cancer, reported a current concern about a spot or mole, were very concerned about skin cancer, or expressed the view that skin checks are a priority remained stable throughout the intervention period. Men  $\geq 50$  years reported a

significant reduction in confidence that they could find a suspicious spot or mole at the end of the intervention (79.4%) and at two years follow-up (72.5%) compared to baseline (85.9%). There was no significant change in participants' attitude towards contacting a doctor if they detected something suspicious on their skin, or confidence in their doctor's ability to diagnose skin cancer throughout the observation period. There was a slight decrease in the number of men over 50 reporting that they ever had a spot or mole removed in the past (baseline = 67.4%; end of intervention = 65.9%; 2 year follow-up = 64.7%), or reporting a history of melanoma or KC compared to baseline (Table 1). The random effects models to explain the influence of skin cancer risk factors and attitudinal factors on participation in skin screening across all three time points revealed a significant interaction effect for the models 'time' x 'doctor taught how to perform a skin self-examination' ( $F(2; 1394) = 6.52; p \leq 0.001$ ), 'time' x 'very likely to develop skin cancer' ( $F(2; 31565) = 9.77; p \leq 0.001$ ) and 'time' x 'confident that I could find a suspicious spot' ( $F(2; 1565) = 3.13; p = 0.04$ ) (Table 2). Generally the immediate effect of the intervention was to reduce the effect of these variables on the outcome measure. For example at baseline, nearly twice as many men who thought they were very likely to develop skin cancer reported to have recently received a whole-body skin examination (14%) compared to those who thought they were unlikely (8%). Following the intervention, the difference in reported whole-body skin examinations was reduced (34% to 32%). This reduction in these subgroup differences did not persist long term (ie. 2 years after the intervention), particularly for 'doctor taught skin examination' and a perception of increased personal risk of skin cancer. All other interactions were not significant indicating that men reporting these skin cancer risk factors or positive attitudes towards skin screening were consistently more likely to also report a whole-body skin examination within the past 12 months across all three timepoints (Table 2).

*Skin screening clinic outcomes for men  $\geq$  50 years*

Men  $\geq$  50 years comprised 22% of the population within intervention communities, 20.5% of all those who attended the skin screening clinics provided as one component of the intervention program, however, this same group comprised 31.3% of those referred for a suspicious lesion. Of those men  $\geq$  50 years referred (n=720), 81.5% attended a doctor for their referral. Of all 1,343 lesions excised or biopsied, 31.3% were on men  $\geq$  50 years, and, of lesions assumed to be melanoma, 32.7% were on men  $\geq$  50 years. Of the histologically confirmed melanomas, 48.5% were found within this same group. Of all BCC's and SCC's diagnosed within the screening program, 46.3% and 44.3% were found on men  $\geq$  50 years, respectively.

The overall yield of melanoma in the screening program was 33/16,383 (2.0 per 1,000 screenings), with a yield of 16/3,355 (4.8 per 1,000 screenings) in men  $\geq$  50 years compared with 17/13028 amongst all other participants (1.3 per 1,000 screenings). Of the 16 melanomas detected in men  $\geq$  50 years, 50% were in-situ and 50% less than 1mm thick. The most common location of melanomas in men older than 50 years was on the back (69%). Of men  $\geq$  50 years who were diagnosed with melanoma during the screening program, all reported a past history of having a spot or mole removed, and 11 (68.8%) men were currently concerned about a spot or mole.

## **Discussion**

These results indicate that within a community based randomised screening program, men  $\geq 50$  years can be motivated to participate in screening for melanoma and that with screening examinations, melanomas are more commonly detected in men  $\geq 50$  years than other screening participants. Despite the fact that men at baseline indicated less intention to screen for melanoma compared to women<sup>26</sup>, the community intervention program was successful in inducing behaviour change in men  $\geq 50$  years by increasing their rate of whole-body clinical skin examinations by four-fold, and the rate of skin self-examinations by two-fold. Also, their screening behaviour during the two years following the intervention declined more slowly compared to screening participants overall<sup>27</sup>.

The community based intervention program of melanoma screening employed within this randomized trial was not specifically targeted at men  $\geq 50$  years. However, particular care was taken to ensure it was also suitable to a male audience<sup>23</sup>. All materials were written at primary school reading levels, and earlier we reported that residents of all educational levels were equally likely to attend the screening clinics<sup>30</sup>. Skin screening clinics were advertised in local newspapers and all residents were sent letters of invitation which were thoroughly pilot tested<sup>28</sup>. Screening services were located in workplaces, hospitals and community centres to make them easily accessible for men. In addition, the educational package for medical practitioners included information on the disproportional risk of thick melanomas in men  $\geq 50$  years. All of these components may have contributed to the successful behavioural change observed amongst men  $\geq 50$  years within the present study.

Across all time periods those men who reported risk factors such as the removal of a spot or mole in the past or current concern about a spot or mole of were consistently more likely to participate in screening compared to men  $\geq 50$  years without such a history, and

all men diagnosed with melanoma reported the removal of a spot or mole in the past. These results are similar to findings from the American Academy of Dermatology (AAD) National Skin Screening Program, resulting in the recommendation to focus screening towards men with a changing mole to further increase the yield of melanoma within the screened population <sup>21</sup>. These results also support the notion that the natural increase in removal of benign lesions and KCs through a screening program for melanoma may positively influence screening participation during subsequent rounds by increasing awareness of the importance of skin checks <sup>31</sup>. On the other hand, future screening programs will need to target those men  $\geq 50$  years who never had a spot or mole removed and who are unconcerned about a mole or spot to raise their attendance rates.

The association of confidence to self-detect a spot and screening behaviour under the influence of the intervention program was somewhat different from the other attitudinal factors. Men who reported less confidence in their own ability to self-detect a spot or mole were more likely to report a skin examination at baseline and at the end of the intervention program, but fell below men with such confidence after the intervention ceased. Overall we observed that men's confidence to self-detect a spot or mole of concern decreased significantly over time. This suggests addressing men's confidence and self-detection skills could be important within skin screening promotion, possibly through increasing skin self-examination recommendations and instructions by general practitioners. Within the present screening program, we did not observe a significant increase in doctors recommending such skin self-examination behaviour, leaving quite a large leeway for improvement. In an innovative approach, which may be transferable to a population setting, high risk patients were provided with images of their body surface and instructions to systematically examine the skin of the whole body <sup>32</sup>. This

intervention increased the median frequency of self-examination from twice yearly to six times yearly. More than 50% of participants used the images provided to assist their self-examination<sup>32</sup>, thus potentially increasing their confidence that they could detect any notable change.

Men  $\geq$  50 years contributed 30% of the referred patients, and also 30% of the patients who received a biopsy or excision for a suspicious lesion. In addition, nearly 50% of the melanoma cases were detected on men  $\geq$  50 years. These figures are very similar to those reported by the AAD National Skin Screening program, where dermatologists screened more than 600,000 individuals over the past 15 years<sup>20</sup>. Within this program, men  $\geq$  50 years comprised 25% of all screening participants, but 44% of all confirmed melanoma cases. The yield per 1,000 screenings was higher amongst men over 50 within the present screening program (4.8) compared to the AAD program (2.6), highlighting the importance of screening efforts for men  $\geq$  50 years within Australian.

Within this community screening program men over 50 also had the highest yield of KC's and seborrhoeic keratoses. While the detection of KC's is not the primary aim of the program, removal of a KC or even a benign lesion could increase the willingness of men over 50 to undergo further screening for melanoma through changes in perceived susceptibility<sup>33</sup>. The time spent with the medical practitioner while undergoing an excision or biopsy may also provide an opportunity for health education in a teachable moment<sup>24</sup>.

The main health promotion messages of the community based intervention program encouraged attendance at a skin screening clinic for a whole-body screen by a doctor, but also encouraged participants to examine their own skin and present to a doctor with any suspicious lesion. In a case control study of melanoma in Connecticut skin awareness was associated with a favourable prognosis besides other, well known predictive factors

of melanoma outcome such as Breslow thickness and mitotic index<sup>34</sup>. It has been suggested that men should be encouraged to note any change in size of a lesion and that this should trigger action even in the absence of other symptoms<sup>16</sup>. However in the present study, similar to previous observations, the majority of melanomas in these older men were located on the back – a difficult to see area<sup>15</sup>. These findings also point towards the limits of part-body examinations and self-examinations if these are not conducted thoroughly, using a mirror or utilising the help of a second person to locate lesions on difficult to see areas<sup>8</sup>.

This randomised trial employed a nested cross sectional design to monitor uptake of screening. The advantage of using such design is that the results are not affected by cohort movements (in-migration and out-migration). However, this design does not allow statistical modelling of changes in behaviour and intentions to the same extent as a nested cohort design with longitudinal measurement<sup>35</sup>. Although the yield of melanoma cases detected within the screening program was higher than reported from open skin screening days in the US or elsewhere<sup>36</sup>, the number of melanomas detected is still small, and therefore results need to be interpreted with caution. The generalizability of these results may be limited as the study communities were located in rural and regional areas of Queensland. Although the participants had similar sociodemographic characteristics compared to the Australian census, they may have differed in some characteristics from those not participating in the surveys .

Our results are the first to report on the screening behaviour and detection patterns amongst men  $\geq 50$  years within a population based screening program for melanoma. They provide evidence that the skin screening behaviour of this population subgroup is amenable to change through a community based intervention program. However, the ability to sustain high levels of screening activity will depend on the availability of

services. Future population based melanoma screening programs need to emphasize the importance of whole-body examinations both by patients themselves and their doctors. Our results also suggest that to sustain screening rates in men  $\geq 50$  years an understanding of their susceptibility to melanoma and their doctor's encouragement of early detection and screening behaviour will be important.

## REFERENCES

1. Australian Institute of Health and Welfare (AIHW) & Australasian Association of Cancer Registries (AACR), Cancer in Australia 2001. AIHW, Canberra, 2004.
2. Jemal A, Murray T, Ward E, et al. Cancer statistics, 2005. *CA Cancer J Clin.* 2005;55:10-30.
3. Geller AC, Miller DR, Annas GD, Demierre MF, Gilchrest BA, Koh HK. Melanoma incidence and mortality among US whites, 1969-1999. *JAMA.* 2002;288:1719-20.
4. Swetter SM, Geller AC, Kirkwood JM. Melanoma in the older person. *Oncology (Williston Park).* 2004;18:1187-96; discussion 96-7.
5. Balch CM, Soong SJ, Atkins MB, et al. An evidence-based staging system for cutaneous melanoma. *CA Cancer J Clin.* 2004;54:131-49; quiz 82-4.
6. Balch CM, Buzaid AC, Soong SJ, et al. New TNM melanoma staging system: linking biology and natural history to clinical outcomes. *Semin Surg Oncol.* 2003;21:43-52.
7. Manson JE, Rexrode KM, Garland FC, Garland CF, Weinstock MA. The case for a comprehensive national campaign to prevent melanoma and associated mortality. *Epidemiology.* 2000;11:728-34.
8. Weinstock MA. Early detection of melanoma. *JAMA.* 2000;284:886-9.
9. United States Preventive Services Task Force. Screening for skin cancer: recommendations and rationale. *Am J Prev Med.* 2001;20:44-6.
10. American Cancer Society. Can Melanoma Be Found Early? Available from URL: [http://www.cancer.org/docroot/CRI/content/CRI\\_2\\_4\\_3X\\_Can\\_melanoma\\_be\\_found\\_early\\_50.asp?sitearea=](http://www.cancer.org/docroot/CRI/content/CRI_2_4_3X_Can_melanoma_be_found_early_50.asp?sitearea=); [accessed Feb 27, 2006].
11. Burton RC, Howe C, Adamson L, et al. General practitioner screening for melanoma: sensitivity, specificity, and effect of training. *J Med Screen.* 1998;5:156-61.
12. Girgis A, Clarke P, Burton RC, Sanson-Fisher RW. Screening for melanoma by primary health care physicians: a cost-effectiveness analysis. *J Med Screen.* 1996;3:47-53.
13. McHenry PM, Hole DJ, MacKie RM. Melanoma in people aged 65 and over in Scotland, 1979-89. *BMJ.* 1992;304:746-9.
14. Hersey P, Sillar RW, Howe CG, et al. Factors related to the presentation of patients with thick primary melanomas. *Med J Aust.* 1991;154:583-7.
15. Hanrahan PF, Hersey P, D'Este CA. Factors involved in presentation of older people with thick melanoma. *Med J Aust.* 1998;169:410-4.
16. Bergenmar M, Ringborg U, Mansson Brahme E, Brandberg Y. Nodular histogenetic type -- the most significant factor for thick melanoma: implications for prevention. *Melanoma Res.* 1998;8:403-11.
17. Chamberlain AJ, Fritschi L, Giles GG, Dowling JP, Kelly JW. Nodular type and older age as the most significant associations of thick melanoma in Victoria, Australia. *Arch Dermatol.* 2002;138:609-14.
18. Demierre MF. Thin melanomas and regression, thick melanomas and older men: prognostic implications and perspectives on secondary prevention. *Arch Dermatol.* 2002;138:678-82.
19. English DR, Del Mar C, Burton RC. Factors influencing the number needed to excise: excision rates of pigmented lesions by general practitioners. *Med J Aust.* 2004;180:16-9.
20. Geller AC, Zhang Z, Sober AJ, et al. The first 15 years of the American Academy of Dermatology skin cancer screening programs: 1985-1999. *J Am Acad Dermatol.* 2003;48:34-41.
21. Geller AC, Sober AJ, Zhang Z, et al. Strategies for improving melanoma education and screening for men age  $\geq$  50 years: findings from the American Academy of Dermatological National Skin Cancer Screening Program. *Cancer.* 2002;95:1554-61.

22. Aitken JF, Elwood JM, Lowe JB, Firman DW, Balanda KP, Ring IT. A randomised trial of population screening for melanoma. *J Med Screen*. 2002;9:33-7.
23. Lowe JB, Ball J, Lynch BM, et al. Acceptability and feasibility of a community-based screening programme for melanoma in Australia. *Health Promot Int*. 2004;19:437-44.
24. Aitken JF, Janda M, Lowe JB, et al. Prevalence of Whole-Body Skin Self-Examination in a Population at High Risk for Skin Cancer (Australia). *Cancer Causes Control*. 2004;15:453-63.
25. Janda M, Elwood M, Ring IT, et al. Prevalence of skin screening by general practitioners in regional Queensland. *Med J Aust*. 2004;180:10-5.
26. Janda M, Youl PH, Lowe JB, Elwood M, Ring IT, Aitken JF. Attitudes and intentions in relation to skin checks for early signs of skin cancer. *Prev Med*. 2004;39:11-8.
27. Aitken JF, Youl PH, Janda M, Lowe JB, Ring IT, Elwood M. Increase in skin cancer screening during a community-based randomized intervention trial. *Int J Cancer*. 2006;118:1010-6.
28. Youl PH, Janda M, Lowe JB, Aitken JF. Does the type of promotional material influence men's attendance at skin screening clinics? *Health Promot J Austr*. 2005;16:229-32.
29. Shah BV, Barnwell BG, Bieler GS. SUDAAN user's manual. 1996.
30. Youl PH, Janda M, Elwood M, Lowe JB, Ring IT, Aitken JF. Who attends skin cancer clinics within a randomized melanoma screening program? *Cancer Detect Prev*. 2006; 30:44-51.
31. Aitken JF, Janda M, Elwood M, Youl PH, Ring IT, Lowe JB. Clinical outcomes from skin screening clinics within a community-based melanoma screening program. *J Am Acad Dermatol*. 2006;54:105-14.
32. Weinstock MA, Nguyen FQ, Martin RA. Enhancing skin self-examination with imaging: evaluation of a mole-mapping program. *J Cutan Med Surg*. 2004;8:1-5.
33. Ford JS, Ostroff JS, Hay JL, et al. Participation in annual skin cancer screening among women seeking routine mammography. *Prev Med*. 2004;38:704-12.
34. Berwick M, Armstrong BK, Ben-Porat L, et al. Sun exposure and mortality from melanoma. *J Natl Cancer Inst*. 2005;97:195-9.
35. Murray DM. Design and analysis of group-randomized trials. Volume 27, New York: Oxford University Press, 1998.
36. Helfand M, Mahon SM, Eden KB, Frame PS, Orleans CT. Screening for skin cancer. *Am J Prev Med*. 2001;20:47-58.

Table 1: Changes in screening behaviour, attitudes and intentions towards skin cancer from baseline to the end of the intervention and 2 years after the intervention amongst men 50 (Intervention communities only)\*

	Odds Ratio (95% CI) <sup>a</sup>			Wald F; p value
	Baseline Survey <sup>c</sup> (n = 559)	Survey - End of intervention <sup>c</sup> (n = 591)	Survey - 2 year follow-up <sup>c</sup> (n = 445)	
Had a clinical whole-body skin examination in the past 12 months	1.00	4.12 (2.62-6.47)	2.78 (1.73-4.47)	19.6; <0.001
Has performed whole-body skin self-examination within the past 12 months	1.00	2.01 (1.29-3.14)	2.06 (1.31-3.26)	5.30; 0.005
Intend to have a clinical skin examination within the next 12 months	1.00	1.13 (0.74-1.72)	1.03 (0.67-1.58)	0.33; 0.72
Intend to check my own skin in the next 12 months	1.00	2.14 (1.30-3.53)	1.62 (0.98-2.69)	4.74; <0.001
Doctor suggested to perform skin self-examination within the past 12 months	1.00	0.95 (0.52-1.72)	1.04 (0.57-1.91)	0.17; 0.85
Doctor taught how to perform skin self-examination within the past 12 months	1.00	1.74 (0.98-3.08)	1.54 (0.86-2.78)	1.81; 0.16
Very likely to develop skin cancer	1.00	0.60 (0.39-0.92)	0.67 (0.43-1.04)	2.69; 0.07
Current concern about a spot or mole	1.00	0.98 (0.59-1.63)	0.70 (0.41-1.20)	2.10; 0.12
Very concerned about skin cancer	1.00	0.78 (0.50-1.23)	0.73 (0.45-1.16)	0.89; 0.41
Regular skin checks are a priority	1.00	0.84 (0.53-1.33)	0.74 (0.46-1.20)	0.89; 0.41
Confident that I could find a suspicious spot or mole	1.00	0.63 (0.38-1.06)	0.43 (0.25-0.73)	6.08; 0.002
I would contact the doctor immediately if I found something suspicious	1.00	1.43 (0.86-2.39)	1.42 (0.83-2.41)	1.00; 0.37
Confident that doctor can diagnose skin cancer	1.00	0.96 (0.55-1.66)	1.01 (0.57-1.77)	0.04; 0.95
Ever had a spot or mole removed	1.00	0.94 (0.60-1.46)	0.89 (0.56-1.40)	0.16; 0.85
History of melanoma	1.00	1.07 (0.54-2.12)	1.46 (0.72-2.93)	0.99; 0.37
History of KC <sup>b</sup>	1.00	1.30 (0.74-2.30)	1.49 (0.83-2.67)	1.00; 0.37

<sup>a</sup> Odds Ratio (95% confidence intervals) calculated by logistic regression models using SUDAAN adjusted for cluster sampling using the baseline survey as the reference category.

<sup>b</sup> Keratinocyte Carcinoma (KC) (basal and squamous cell carcinoma).

<sup>c</sup> Cross sectional survey at each time point

Table 2: Influence of attitudes, skin cancer risk factors and doctors recommendation of skin self-examination on whole-body skin examinations

		% (n) reporting a whole-body skin examination within the past 12 months			F-Value (interaction); p-value
		Baseline Survey <sup>b</sup> (n = 559)	Survey End of intervention <sup>b</sup> (n = 591)	Survey 2 year follow-up <sup>b</sup> (n = 445)	
Doctor suggested to perform skin self-examination within the past 12 months	Y	31.2 (36)	58.0 (68)	53.4 (49)	1.97, 0.14
	N	6.3 (39)	23.7 (96)	13.7 (41)	
Doctor taught how to perform skin self-examination within the past 12 months	Y	66.1 (24)	66.3 (51)	60.9 (35)	6.52, 0.001
	N	5.19 (51)	24.8 (113)	16.6 (56)	
Very likely to develop skin cancer	Y	14.1 (33)	34.1 (61)	41.7 (61)	9.77, <0.001
	N	8.1 (44)	32.0 (135)	16.7 (48)	
Current concern about a spot or mole	Y	13.4 (20)	28.3 (35)	31.2 (22)	2.07, 0.13
	N	9.9 (57)	33.7 (161)	23.6 (87)	
Very concerned about skin cancer	Y	15.7 (38)	28.3 (35)	31.2 (22)	1.98, 0.14
	N	9.9 (57)	33.7 (161)	23.6 (87)	
Regular skin checks are a priority	Y	14.9 (68)	40.2 (136)	31.2 (73)	0.89, 0.41
	N	3.9 (9)	22.7 (59)	17.4 (36)	
Confident that I could find a suspicious spot or mole	Y	9.8 (65)	31.3 (147)	26.6 (84)	3.13, 0.04
	N	15.6 (12)	37.7 (49)	19.9 (25)	
I would contact the doctor immediately if I found something suspicious	Y	13.3 (74)	35.9 (180)	26.8 (84)	1.58, 0.21
	N	1.11 (3)	16.1 (16)	14.7 (11)	
Confident that doctor can diagnose skin cancer	Y	11.5 (70)	33.5 (165)	25.6 (95)	0.53, 0.59
	N	6.2 (7)	28.4 (31)	20.5 (14)	
Ever had a spot or mole removed	Y	10.5 (61)	37.7 (145)	28.5 (86)	0.57, 0.55
	N	10.9 (16)	24.2 (51)	17.9 (23)	
History of melanoma	Y	20.3 (9)	48.6 (20)	41.2 (16)	0.31, 0.73
	N	10.0 (68)	31.5 (176)	23.2 (93)	
History of KC <sup>a</sup>	Y	19.8 (12)	44.3 (49)	39.5 (37)	0.57, 0.57
	N	7.6 (33)	30.1 (147)	21.0 (72)	

Abbreviations: Y = Yes; N = No

<sup>a</sup> KC = Keratinocyte Carcinoma (basal and squamous cell carcinoma)

<sup>b</sup> Cross sectional surveys at each time point