

Preventing Skin Cancer: Interventions in Outdoor Occupational Settings

Summary Evidence Tables for Updated Search Period (June 2000 - April 2013)

Author, Year Design; Execution; Location;	Population characteristics:	Intervention Characteristics:	Outcome measures:	Results: Effect Estimate (CI/p-value)
<p>Andersen et al., 2008</p> <p>Group RCT</p> <p>Fair</p> <p>US - 8 states and 1 Canadian province</p>	<p>Ski resort employees (31% of the eligible worked indoor) and visitors</p> <p><u>Occupational Setting:</u> Recreational (Ski resorts)</p> <p><u>Demographics: (Entire sample at baseline)</u></p> <p><u>Age:</u> Mean =34; 18-29: 48%</p> <p><u>Gender:</u> 64% M; 36% F</p> <p><u>Race/Ethnicity:</u> 96% White; 4% Other</p> <p><u>Education:</u> High school or less: 12%; Some education beyond high school: 38%; College graduate: 49%</p> <p><u>Socioeconomic Status:</u> NR</p>	<p>Go Sun Smart Program</p> <p><u>Intervention:</u> Education + Environment (for a subset)</p> <p><u>Components:</u> Educational: This worksite sun safety program included written, electronic, visual, and interpersonal channels of communication, with employees as the primary audience. Six week training program; Website (information).</p> <p>Environmental: Lift operators-were provided sunscreen and wide-brimmed hats</p> <p><u>Incentive:</u> NR</p>	<p><u>Implementation Period:</u> January to April 2002</p> <p><u>Follow-up:</u> Pretest: Early fall 2001 (March-April); Immediate Posttest: March to April 2002 (Buller 2005); Long-term Posttest: September 2002 - October 2002 (Andersen 2008)</p> <p><u>Outcomes:</u> Sun protective behaviors: (five-point scale where 1=always; 5=never) for using sunscreen, sunscreen lip balm;</p>	<p>Results: Effect estimates reported as mean difference and odds Ratio compared with workers in the control group: Mean score= five-point scale where 1=always; 5=never (N=1463)</p> <p>Sunscreen: -0.16; adjusted OR: 1.43, (95% CI = 1.20–1.71), p<0.05^{4,5,8,9}</p> <p>Lip balm: -0.09; OR: 1.13, (95% CI = 0.90–1.42), p>0.05⁴</p> <p>Clothing: -0.13; OR: 1.10, (95% CI = 0.93–1.30), p>0.05^{2,3,6}</p> <p>Hat: -0.01; OR: 1.01, (95% CI = 0.86–1.18), p>0.05^{1,2,3,4,7}</p> <p>Sunglasses/goggles: -0.06; unadjusted OR: 1.26, (95% CI = 1.08–1.48), p<0.05</p> <p>Have sunscreen, sunglasses, and a hat with you at all times: -0.05; OR: 1.10, (95% CI = 0.95–1.29), p>0.05^{1,2,8,9}</p> <p>Limit time in the sun: -0.03; OR: 1.17, (95% CI = 0.98–1.39), p>0.05^{4,6,8}</p>

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	<u>Employment type:</u> Winter only 79%	<u>Control:</u> Ski resorts/ employees at 13 resorts	wearing protective clothing, hats, and sunglasses/goggles; having: sunscreen, sunglasses, and a hat at all times while at work; limiting time in the sun; staying in the shade, and averaged sun protection scale; Sunburns (Y/N) during the summer 2002.	Stay in the shade: 0.07; OR: 0.94, (95% CI = 0.80–1.11), $p > 0.5$ ^{1,4,6,8} Averaged sun protection scale: -0.088, SE=0.044; $p = 0.04$ ^{1,4,6,8,9} <i>Estimates adjusted for 1) working outdoors in summer, 2) working outdoors in winter, 3) hours worked per week at resort, 4) gender, 5) race, 6) age, 7) education, 8) skin sun sensitivity, 9) skin cancer diagnosis</i> Sunburn: baseline=53%; -3 pct. pts.; (95% CI=-6.6-0.6) OR: 0.78, (95% CI. = 0.64–0.95), $p < .05$ ^{6,7,8}
Glanz, et al., 2002 Group RCT Good US (HI and MA)	<u>Target population:</u> Lifeguards and visitors at participating pools <u>Occupational Setting:</u> Recreational (Pools) <u>Demographics</u> <u>Age:</u> Mean = 21 +/- 0.76 <u>Gender:</u> 31.9% M; 68.1% F	Pool Cool <u>Intervention:</u> Education + Environment <u>Components:</u> Educational: Sites in the sun protection arm (15 pools) received staff training; plus a series of eight sun-safety lessons; a “big book” to make lessons more interactive; on-site interactive activities; and incentives to reinforce the	<u>Implementation Period:</u> Summer 1999 <u>Follow-up:</u> Outcomes were measured at the beginning, middle, and end of summer 1999 <u>Outcomes:</u> Directly observed use of hats and shirts among	Results: <u>Change in Lifeguards’ Shirt Use:</u> Baseline: Control (n=78): 100% Intervention (n=142): 93.3% Follow-up (3 months): Control (n=78): 83.3% Intervention (n=116): 100% Effect estimate=23.4 pct. pts. (95% CI=15.1, 31.7) <u>Change in Lifeguards’ Hat Use:</u> Baseline: Control (n=78): 63.6% Intervention (n=142): 71.4%

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	<p><u>Race/Ethnicity:</u> 58.9% White</p> <p><u>Education:</u> High school or less: 50.4%</p> <p><u>Socioeconomic Status:</u> NR</p> <p>SES: NR</p>	<p>sun-safety messages</p> <p>Environmental: Refillable pump sunscreen container and a portable shade structure or umbrellas (of their choosing).</p> <p><u>Incentives:</u> NR</p> <p><u>Control:</u> Sites in the injury prevention (IP) arm (13 pools) received a parallel program that included lessons and activities on bicycle and rollerblading safety, fire safety, traffic and walking safety, poisoning and choking prevention, and playground, safety.</p>	<p>lifeguards (reported here)</p> <p>Visitor related outcomes not reported in this summary</p>	<p>Follow-up (3 months): Control (n=78): 66.7% Intervention (n=116): 78.6% Effect estimate=4.1 (95% CI= -8.7, 16.9)</p>
Hall et al., 2008 Group RCT Fair US (GA, NV, KS)	<p><u>Target population:</u> Lifeguards and visitors at participating pools</p> <p><u>Occupational Setting:</u> Recreational (Pools)</p> <p><u>Demographics: (Total)</u> <u>Age:</u> Mean= 17.02 +/- 5.32;</p>	<p>Pool Cool Plus</p> <p><u>Intervention:</u> Education +Environment</p> <p><u>Pool Cool Plus Arm Components:</u> Educational: Training and educational material; pool cool plus implemented a peer-driven motivational approach including</p>	<p><u>Implementation Period:</u> June to August 2007</p> <p><u>Follow-up:</u> Pretest: Beginning of summer Posttest: End of summer 2007</p> <p><u>Outcomes:</u></p>	<p>Results: <u>Change in Sun Protection Score at Work (Mean):</u></p> <p>Baseline: (n=260): 2.27 (+/- 0.48) 3 months: (n=195): 2.41(+/- 0.55) Effect estimate= 0.14 p>0.05</p> <p><u>Change in Sunburns %</u> Baseline: (n=260): 79.9% Follow-up: 3 months: (n=195): 72.8% Effect estimate=7.1% (95% CI= -15.1, 0.8)</p>

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	<p><u>Gender:</u> M=42.1% F=57.9%</p> <p><u>Race/Ethnicity:</u> White 88.5%</p> <p><u>Education:</u> Less than high school: 53.9%; High school: 22.3%; Some college: 23.8%;</p> <p><u>Socioeconomic Status:</u> NR</p>	<p>personalizing lifeguards' skin cancer risk, encouragement to form a sun-safety planning team with support from Pool Cool staff, Pool Cool pages on networking sites, awards for the best work.</p> <p>Environmental: Sunscreen, free shade structure, and options to request up to \$200.00 worth of additional sun-safety support.</p> <p><u>Incentives:</u> Items such as pens, lanyards at baseline and a \$10.00 gift certificate for completing post survey</p> <p><u>Control /Standard Pool Cool Arm:</u> Each pool received a Pool Cool Tool-kit containing educational materials, incentive items, and a gallon pump container of sunscreen.</p>	<p>Sun protection habits=means score for: (sunscreen + shirt+ hat+ seeking shade + sunglasses) on a 4 point scale; 1=never; 4=always</p> <p>Sunburns(# of times got a sunburn past summer and this summer) 0 to ≥5 times;</p>	<p><u>Pool Cool Plus vs. Standard Pool Cool</u></p> <p>Pool Cool Plus group showed a statistically significant decrease in sunburns relative to the standard Pool Cool intervention</p> <p>A MANCOVA assessing change over the summer in sunburn by treatment group and by skin cancer risk group showed a statistically significant reduction in sunburn in the "Plus" group only, $F(1, 87) = 16.97, p < .001$.</p> <p>No statistically significant between-group differences on other outcomes (e.g., sun protection at work)</p>

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<p>Hiemstra et al., 2012</p> <p>Group RCT</p> <p>Fair</p> <p>32 geographic locations in multiple states</p>	<p><u>Target population:</u> Lifeguards and visitors at participating pools</p> <p><u>Occupational Setting:</u> Recreational (Pools)</p> <p><u>Demographics:</u></p> <p><u>Age:</u> Mean = 18.6 (+/- 4.7)</p> <p><u>Gender:</u> 40.4% M; 59.6% F,</p> <p><u>Race/Ethnicity:</u> 84.3% white</p> <p><u>Education:</u> Less than high school = 43.6%; High school = 17.5%; Some college = 34.4%</p> <p><u>Socioeconomic Status:</u> NR</p>	<p>Pool Cool Enhanced</p> <p><u>Intervention:</u> Education + Environment</p> <p><u>Enhanced Pools Components:</u> Educational: Tool kit, training, signage to reinforce the sun safety messages, Field coordinator training and support, opportunity to accumulate incentive points towards recognition levels (bronze silver, gold frequent applier awards)</p> <p>Environmental: Sunscreen. Additional sun safety resource items at no cost or at substantial discount</p> <p><u>Incentives:</u> NR</p> <p><u>Control: Basic Pools:</u> Toolkit, training session, educational strategies, signage to reinforce the message, sunscreen tip poster + sunscreen</p>	<p><u>Implementation Period:</u> Summer 2005</p> <p><u>Follow-up:</u> Pretest: Beginning of summer Posttest: End of summer 2005</p> <p><u>Outcomes:</u> Sun protection habits Mean: Four-point scale; 1=never; 4=always Wearing long-sleeved shirt, sunglasses, hat, sunscreen, and staying in shade</p> <p>Sun exposure Average sun exposure during peak hours (10AM – 4PM; on weekdays and weekends) algorithm provided</p> <p>Sunburns(# of times sunburn past summer and this</p>	<p>Effect Estimate (CI/p-value)</p> <p><u>Results:</u> <u>Change in Sun Protection Score (mean):</u> Baseline: (n=3014): 2.49(-/+0.56) 3 months: (n=3014): 2.61(-/+0.57) Effect estimate= 0.12 ; p<0.05</p> <p><u>Change in Sun Exposure Score (Mean):</u> Baseline: (n=3014): 4.37 (-/+1.31) 3 months: (n=3014): 4.56 (-/+1.26) Effect estimate= 0.19 ; p<0.05</p> <p><u>Change in Sunburn:</u> Baseline: (n=3014): 80.5% 3 months: (n=3014): 75.3% Effect estimate= -5.2% (95% CI= -7.3, -3.1)</p>

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			summer 0 to ≥5 times	
Mayer, et al., 2007 Group RCT Good US-Southern CA (70 postal stations)	<p><u>Target Population:</u> US postal workers (mail carriers)</p> <p><u>Occupational Setting:</u> US Postal Stations</p> <p><u>Demographics:</u></p> <p><u>Age:</u> Mean = 43 (+/- 8.6);</p> <p><u>Gender:</u> 69.9% M; 30.1% F</p> <p><u>Race/Ethnicity:</u> 51.3% White; 19.3% Latino, 23% UK; 12.4% Asian, 8.3% African-American; 4.3% Pacific-Islander; 0.6% AI;</p> <p><u>Ethnicity:</u> 77% Non-Hispanic; <u>Education:</u> 71.7% had completed some college</p>	<p>SUNWISE</p> <p><u>Intervention:</u> Education + Environment</p> <p><u>Components:</u> Educational: The 2-year sun safety intervention included reminders, 6 brief educational sessions, monthly “ask the skin doctor” poster in break-room, and visual cues to sun-safety Environmental: Provision of sunscreen and wide-brimmed hat</p> <p><u>Incentives:</u> NR</p> <p><u>Control:</u> During 2001-2003, 35 control postal stations received evaluation material only</p>	<p><u>Implementation Period:</u> 2001-2003</p> <p><u>Follow-up:</u> 3 months, 12 months, 24 months</p> <p><u>Outcomes of Interest:</u></p> <p>Self-reported occupational use of always using Sunscreen and wide-brim hats when delivering mail in the past 5 days</p> <p>Reduction in tanning measured by colorimeter</p>	<p>Results:</p> <p><u>Change in Sunscreen Use (always wore sunscreen when delivering mail in the past five days):</u></p> <p>Baseline: Control (n=1404): 23.5%; Intervention (n=1255): 26.9%</p> <p>FU1: (12 Months):</p> <p>Control (n=1285): 28.1%; Intervention (n=1144): 41.6%</p> <p>Effect estimate=10.1 (95% CI=6.3, 13.9)</p> <p>FU2: (24 Months): Control (n=1196): 26.3%; Intervention (n=994): 39.2%</p> <p>Effect estimate=9.5 (95% CI=5.6, 13.4)</p> <p><u>Change in Hat Use(always wore hat when delivering mail in the past five days):</u></p> <p>Baseline: Control (n=1405): 21.0%; Intervention (n=1257): 27.3%</p> <p>FU1: (12 Months):</p>

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	<p><u>Socioeconomic Status:</u> NR</p> <p><u>Skin type:</u> 23% sun sensitivity based on Fitzpatrick skin type I or II</p> <p><u>History of skin cancer:</u> 5.1%</p> <p><u>Family history of skin cancer</u> 17.7%</p>			<p>Control (n=1286): 24.0%; Intervention (n=1145): 41.4%</p> <p>Effect estimate=11.1 (95% CI=7.4, 14.8)</p> <p>FU2: (24 Months):</p> <p>Control (n=1196): 22.3%; Intervention (n=994): 40.0%</p> <p><u>Effect estimate</u>=11.4 (95% CI=7.8, 15.0)</p> <p><u>UV Exposure (tanning level):</u> Baseline (N=2543)=16.47;</p> <p>12 Mos (N=2395) +0.05, p=NR 24 Mos (N= 2138) - 0.09; p<0.05</p>
<p>Mayer et al., 2009</p> <p>Group RCT</p> <p>Fair</p> <p>US-Southern CA (70 postal stations)</p>	<p><u>Target Population:</u> US postal workers (mail carriers)</p> <p><u>Occupational Setting:</u> US Postal Stations</p> <p><u>Demographics:</u> (Entire population; same as in Mayer 2007)</p> <p><u>Age:</u> Mean = 43 (+/- 8.6)</p> <p><u>Gender:</u> 69.9% M; 30.1% F</p>	<p>SUNWISE</p> <p><u>Intervention:</u> Education + Environment</p> <p><u>Components:</u> Educational: Three brief educational sessions</p> <p>Environmental: Provision of sunscreen and wide-brimmed hat</p> <p><u>Incentive:</u> NR</p>	<p><u>Implementation Period:</u> 2003-2004</p> <p><u>Follow-up:</u> 12 months</p> <p><u>Outcomes of Interest:</u></p> <p>Self-reported occupational use of always using sunscreen and wide-brim hats</p>	<p>Results:</p> <p><u>Change in Sunscreen Use (always wore sunscreen when delivering mail in the past five days):</u></p> <p>Baseline: (n=1196): 26.3</p> <p>12 months: (n=1130): 34.3</p> <p>Effect estimate=8.0 (95% CI=4.3, 11.7)</p> <p><u>Change in Hat Use(always wore hat when delivering mail in the past five days):</u></p> <p>Baseline: (n=1196): 22.3</p>

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Stock et al., 2009 Group RCT Fair Iowa	<p><u>Target Population:</u> Highway Workers</p> <p><u>Occupational Setting:</u> Iowa Department of Transportation field offices</p> <p><u>Demographics (Entire population):</u></p> <p><u>Age:</u> Mean= 46.5 (+/- 9.3)</p>	<p><u>Intervention:</u> Education</p> <p><u>Components:</u> UV photo and a 12-min educational video on UV risk (focusing on either skin cancer or photo aging) Participants assigned to 1 of 4 intervention arms or to a control group: 1.Photo-aging video</p>	<p><u>Implementation Period:</u> June-August, year not reported</p> <p><u>Follow-up Period:</u> 2 months, 12 months</p> <p><u>Outcomes:</u> Sun protection behavior: Mean</p>	<p>Results:</p> <p><u>Change in composite sun protective behavior scores:</u> (N=148)</p> <table border="1"> <thead> <tr> <th>Study Arms</th> <th>BL</th> <th>FU</th> <th>Diff</th> <th>Effect</th> <th>P-value</th> </tr> </thead> <tbody> <tr> <td>1-Aging video</td> <td>1.04</td> <td>0.93</td> <td>- 0.11</td> <td>0.05</td> <td>> 0.05</td> </tr> <tr> <td>2- UV photo +</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Study Arms	BL	FU	Diff	Effect	P-value	1-Aging video	1.04	0.93	- 0.11	0.05	> 0.05	2- UV photo +					
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	Range 24-64 <u>Gender:</u> M=100% <u>Race/Ethnicity:</u> 97% White <u>Education:</u> NR <u>Socioeconomic Status:</u> NR <u>Sun exposure Years (Mean):</u> 27 years outdoor jobs, 14.3 (+/-8.9) years at the Department of Transportation	2.UV photo + photo-aging video 3.Skin cancer video 4.UV photo + skin cancer video <u>Incentive:</u> \$75 if participated before or after work <u>Control:</u> No informational video or UV photo intervention for control group	(index) Use of sunscreen, hat, long-sleeved shirt when outdoors at work; use of sunscreen (body/face) in general; use of sunscreen on your own time + 3 skin color assessments for tanning level	<table border="0"> <tr> <td>Aging video</td> <td>0.93</td> <td>1.13</td> <td>0.20</td> <td>0.36</td> <td>< 0.05</td> </tr> <tr> <td>3-Cancer video</td> <td>0.99</td> <td>1.08</td> <td>0.09</td> <td>0.25</td> <td>< 0.05</td> </tr> <tr> <td>4-UV photo+</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Cancer video</td> <td>0.93</td> <td>1.06</td> <td>0.13</td> <td>0.29</td> <td>< 0.05</td> </tr> <tr> <td>Control</td> <td>0.94</td> <td>0.78</td> <td>- 0.16</td> <td></td> <td></td> </tr> </table>	Aging video	0.93	1.13	0.20	0.36	< 0.05	3-Cancer video	0.99	1.08	0.09	0.25	< 0.05	4-UV photo+						Cancer video	0.93	1.06	0.13	0.29	< 0.05	Control	0.94	0.78	- 0.16		
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Woolley et al., 2008 Other Study Design with Concurrent comparison Fair Townsville, North Queensland Australia	<u>Target Population:</u> <u>Occupational Setting:</u> Main Roads Department Workers <u>Demographics:</u> (Intervention) <u>Age:</u> Mean = 42 (+/-10) <u>Gender:</u> 89% M; 11% F <u>Race/Ethnicity:</u> NR	<u>Intervention:</u> Policy + Education <u>Components:</u> Mandatory policy Employees are required to wear long-sleeved shirts, wide-brimmed hats, and sunscreen while outdoor. Supervisors observed outdoor working employees for compliance on a regular basis. Non-compliance resulted in escalating disciplinary measures, including verbal	<u>Implementation period:</u> 1993-2003 and ongoing <u>Follow-up Period:</u> 10 years since the policy; March to May 2003 <u>Outcomes:</u> Self-reported sun protective behaviors asked what participants wore at work and on off days	<u>Results: Difference in Sun protective Behaviors at Work:</u> <u>Shirt Use:</u> Intervention: 81%; Control:29%; Effect: 52.0; (95% CI=27.4, 76.6) <u>Hat Use:</u> Intervention: 69%; Control:62%; Effect: 7.0%;(95% CI=-20.3, 34.3) <u>Sunscreen:</u> Intervention: 45%; Control:38%; Effect: 7.0%;(95% CI=-21.2, 35.2)																														

Preventing Skin Cancer: Interventions in Outdoor Occupational Settings – Evidence Tables

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	<p><u>Education:</u> NR</p> <p><u>Socioeconomic Status:</u> NR</p> <p><u>Skin type I or II:</u> 69%</p> <p><u>Family history of skin cancer:</u> 39%</p> <p><u>Mean years spent working outdoors in the tropics:</u> 20 (+/-13)</p> <p><u>Mean years lived in the tropics:</u> 36 (+/-14)</p>	<p>warnings, written warnings, retraining, and potential dismissal.</p> <p><u>Education:</u> Yearly education session on skin cancer</p> <p><u>Incentives:</u> NR</p> <p><u>Controls:</u> Responsible for their own sun protection. Queensland Build outdoor workers (n=21)</p>	<p>Lab measured sun damage (tan) measured using reflectance spectrophotometer</p> <p>Lab measured solar keratosis</p> <p>Self-reported history of number of medically excised skin cancers</p>	<p><u>Difference in Sun protective Behaviors off Work:</u></p> <p><u>Shirt Use:</u> Intervention: 19%; Control: 32%; Effect: -13.0; (95% CI=-38.0, 12.0)</p> <p><u>Hat Use:</u> Intervention: 54%; Control: 53%; Effect: 1.0%; (95% CI=-27.7, 29.7)</p> <p><u>Sunscreen:</u> Intervention: 27%; Control: 26%; Effect: 1.0%; (95% CI=-24.4, 26.4)</p> <p><u>Severe Sunburns at Work (mean):</u> Intervention: 0.1 (+/- 0.3); Control: 0.3 (+/- 0.4); Effect: -0.2; p-value>0.05</p> <p><u>Total Sunburns at Work (mean):</u> Intervention: 0.7 (+/- 1.0) ; Control: 1.4 (+/- 1.6); Effect: -0.7; p-value>0.05</p> <p><u>Total Sunburns off Work (mean):</u> Intervention: 0.3 (+/- 0.5); Control: 0.6 (+/- 0.7); Effect: -0.3; p-value>0.05</p> <p><u>Difference in UV Exposure:</u></p> <p>Mean tanning level on right forearm: Intervention: 20.5 (+/-7.8); Control: 25.4 (+/- 5.1); Effect: -4.9;</p>

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				<p>p-value<0.05</p> <p>Mean tanning level on right hand: Intervention: 20.2 (+/- 6.7); Control: 25.1 (+/- 4.4); Effect: -4.9; p-value<0.05</p> <p><u>Difference in Solar Keratosis:</u></p> <p>Mean number of solar keratosis on right forearm: Intervention: 0.7 (+/- 1.6); Control: 8.1(+/- 11.4); Effect: - 7.4; p-value<0.05</p> <p>Mean number of solar keratosis on right hand: Intervention; 0.3 +/- (0.7) Control: 4.0 (+/-5.9) ; Effect: - 3.7; p-value<0.05</p> <p><u>Difference in Previously Diagnosed and Excised Skin Cancers:</u></p> <p>Mean number of previous medically diagnosed skin cancers: : Intervention; 0.5 (+/- 1.2); Control: 3.5 (+/- 5.2) ; Effect: - 3.0; p-value<0.05</p>