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# The role of health education versus safety regulations in generating skin cancer preventive behavior among outdoor workers in Israel: an exploratory photosurvey

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## SUMMARY

*The present photosurvey corroborated with our 1995–1997 evaluation study of a multifaceted skin cancer control program among outdoor workers of Mekorot—Israel National Water Company (Shani* et al.*, 1998, Final Research Report presented to the Committee for Research and Prevention in Occupational Safety and Health). While the survey's primary purpose was to investigate the impact of health education versus sun-protection regulations (issued when the project ended) on workers' skin cancer preventive behavior (SCPB), it also experimented with 'objective' tools of data collection. Visiting working sites and mother-base, 118 workers were approached. Of these, 51 former program-involved workers ('education' group) and 50 former non-participants (technical barriers), and newly recruited ones ('regulation' group) who filled out a one-page questionnaire, had their photographs taken and were measured (spectrophotometer) for melanin presence, were included in the present study. Findings indicated that participants in the 'regulation' group had a significantly lower mean years of seniority and a higher number of workers in semi-skilled occupations. Both groups were identical in age, ethnic origin and reported skin type. Consistent and significant between-group differences were observed in the SCPB and melanin presence mean scores, suggesting better SCPB habits among the 'education' group employees in comparison to their counterparts. The multiple regression analysis indicated that former program-involved participants and older workers were significantly more likely than others to comply with desired SCPB practices. Combined, our previous and present findings suggest that the educational approach was indispensable for generating and sustaining long-term skin cancer control practices and was preferable to the use of regulations, per se. Though no final conclusions could be drawn regarding the validity of the spectrophotometer- and camera-related procedures, and both are limited with regard to uncovering the motivational factors of behavioral outcomes, it should be recognized that the camera is a low-cost and easily available tool for capturing 'reality' while overcoming management's claims on workers' time. Results are also discussed in terms of practical implications.*

*Key words*: health education; outdoor workers; safety regulations; skin cancer preventive behavior

## INTRODUCTION

The health-damaging effects of excessive and cumulative exposure to solar radiation, during leisure time and work, have been manifested in the worldwide steep increase of melanoma and non-melanoma skin cancers (basal and squamous cell carcinoma), as well as skin neoplasias (solar

keratoses) and photoaging, which may herald increased skin cancer risk and ocular damage (Mullen *et al*., 1996; Naylor and Farmer, 1997). Israel has one of the highest incidence rates of skin cancer in the world (Israel Cancer Association, 1991). Over 600 new cases of malignant melanoma and 7500 new cases of BCC are registered annually (Israel Cancer Registry, 1998), indicating an increase of 100% for MM in the past 10–15 years. Rates were found to be higher among Israeli-born Jews and Jews who immigrated to Israel from Europe and America, and relatively lower among Jews of Asia/Africa origin. Agricultural populations (kibbutzim members) and outdoor workers have also been identified to be at high risk (Anaise *et al*., 1978; Azizi *et al*., 1990; Rosenberg *et al*., 1991; Gutman *et al*., 1992). Although an inherited light complexion and a poor tanning ability increase one's susceptibility to the disease, its onset and prognosis are, to a great extent, behaviorally determined and could thus be individually controlled (Marks, 1995; Everett and Colditz, 1997). Limiting exposure to sunlight between 10 am and 3 pm, using protective clothing, hats, sunglasses and sunscreens on exposed body areas are considered significant measures in lowering the risk of developing the disease. It is also estimated that 90% of the cases are curable if detected and treated at an early stage (Rhodes, 1995; Brandt, 1996). However, while public campaigns have had positive effects on people's awareness and skin cancer-related knowledge, a great number of studies indicate that getting at-risk populations to practice preventive measures remains a thorny problem (Arthey and Clark, 1995). The soci-cultural imperatives of fair skin populations to acquire a tan for the sake of beauty, relaxation and even health (Broadstock *et al*., 1992; Keesling and Friedman, 1995; Lupton and Gaffney, 1996), and the inherent job-related imperatives of outdoor workers (Girgis *et al*., 1994; Morris and Elwood, 1996) are but some of the adoption-related barriers worldwide. The need to promote the use of sun-protection measures and early detection skills is particularly acute among outdoor employees, almost half of which have been identified in a national survey conducted in Israel at increased risk for skin cancer due to occupational sun exposure (Azizi *et al*., 1990). Moreover, given the nature of their occupation, they may be exposed to up to eight times the dose of ultra-violet radiation compared to indoor workers (Stepanski and Mayer, 1998), yet they cannot practice sun avoidance when radiation is high and their work routines might be resistant to change (Mullen *et al*., 1996). Furthermore, most outdoor workers are blue-collar males and are thus in general less likely than women and white-collar males to engage in preventive and health-promoting activities (Pion *et al*., 1994; Sorensen *et al*., 1998). Their increased risk notwithstanding, there is a dearth of information on the development of worker-focused interventions. Also rare are longitudinal studies that measure feasibility, illuminate the process of change, and identify effective health-promoting strategies in this complex field setting (Morris and Elwood, 1996). Thus, in 1995, a two-phase multifaceted intervention (at 12-month interval) and a 26-month follow-up study were administered to a convenience sample of permanent outdoor employees (100% males) of the Israel National Water Company—Mekorot (Shani *et al*., 1998). The pattern of our quantitative findings, derived from three self-report questionnaires, supported the efficacy of the 'first-phase' intervention, comprising an educational slide-based session and a clinical skin and eye examination. Data also supported the incremental beneficial effect of structural changes, in the form of free access to sun-protection gear, as one component of the 'second phase' intervention comprising, in addition, a repeated educational session and skill-acquisition exercises (Shani *et al*., 2000). The multivariate analyses revealed that perceived self-efficacy (Bandura, 1986) was the most consistent and most powerful predictor of skin cancer control habits. It is thus possible that cumulative interventions coupled with efficacy-building strategies (Stajkovic and Luthans, 1998) and structural changes could enable and reinforce behavioral changes. However, qualitative data gathered from trained safety officers, via 6-monthly feedback meetings, revealed the officers' impression that the educational, as well as the structural measures had a short-term and somewhat limited effect. It was suggested that the barriers to action were rooted in the interplay between the obstinate nature of behavioral patterns, the dictate of norms and the gear-related constraints, expressed in comments such as 'There is a guy called Moti who always comes to work with a long-sleeved shirt, but he won't be caught dead wearing a hat', and '... it [sunscreen lotion] smells too good, what am I going to tell my wife ...' Finally, the officers advocated the use of 'authentic life stories'

(e.g. the experience of skin cancer among peers) in order to raise awareness, and reiterated the need for safety regulations as the best means of enhancing and sustaining health-related actions. Partly as a result of our efforts, regulations concerning free supply and obligatory use of sun-protection gear were passed by the Israeli Ministry of Labor and Social Affairs in September 1997. To date, the Mekorot management has complied with the law, but it has been reluctant to carry out our recommendation to conduct educational sessions for newly recruited workers, let alone repeated skill training sessions for all (personal communication from Mekorot southern region chief safety supervisor, 1999). This unique feature, and the fact that during the months of June–August most permanent workers are replaced by temporary ones, provided us with the opportunity to capture behavioral responsiveness to regulations, per se, without education, and to test the role of health education in generating long-term health behavior habits. To accomplish these goals, we approached, yet again, the participants of the 1995 Mekorot longitudinal study, as well as a group of previously non-participants, due to technical barriers, and newly recruited ones. To gather data on skin cancer preventive behavior (SCPB), workers, at the various working sites, filled out a one-page questionnaire, were measured for melanin presence and were then photographed. The decision to use the camera as a research tool was formed within the theories and field experience of the participatory action research—PAR [reported in detail by (Wang *et al*., 1996) and (Wang *et al*., 1998)] and the safety officers' suggestion for 'authentic life stories'. According to Wang's evidence, using the camera 'to document reality' could be a powerful means to enable people to express their needs, to increase critical consciousness about community issues, to build capacity for social change and to exert influence on policy-makers. However, unlike the PAR method, where participants themselves documented the reality of their everyday lives, the present study put the camera in the hands of the researcher and its 'direct' use was restricted for data collection only. Indirectly and not empirically tested, we hoped that the camera-related procedures could be used as a tool to enhance awareness and place the issue of skin cancer control, once again, on the agenda of both management and workers.

## METHODS

### Study population and data collection modes

The sample comprised outdoor workers from the three former intervention-involved units (Shani *et al*., 1998), located in the southern region of the Israel Water Company—Mekorot. Only those who were present at the various working sites and at the central mother-base on a particular date determined by the working schedule of Mekorot's chief safety supervisor were included. Table 1 presents the dates, hours, locations and number of outdoors interviewed.

At the site, workers were first asked to read and sign an informed consent. Next, questionnaires were distributed and individual full-body photographs were taken. However, due to inaccurate handling of the camera, most of the photographs did not include shoes. If the photographs were taken between 7 and 9 am at the central home-base before leaving to the dispersed working sites, the chief supervisor saw to it that workers fetched their 'personal' hats and sunglasses from their working vans. In an effort to support the above procedures and due to a special loan, a narrow-band reflectance spectrophotometer [for details see (Thibodeau and D'Ambrosio, 1997)] was used to measure individual melanin presence, as an indicator of facultative UV-inducible skin pigmentation (Mahler *et al*., 1997). Five anatomical sites were measured: inner upper arm (considered to be representative of baseline constitutive pigmentation level); lower right arm; cheek below the zygomatic bone; upper vermilion; and lower vermilion. All measurements were duplicated and each was obtained in 5 s. It should be noted that the researcher in charge of data collection was a medical student whose mother tongue was Russian and whose second language was English. She was therefore assisted, for the above procedures, by the supervisor and an Israeli student.

**Table 1:** Sample recruitment by dates, hours and locations

| Date | Hours | Location | *n* |
|---|---|---|---|
| 15 June 1999 | 10 am–5.30 pm | Arava[a] | 19 |
| 21 June 1999 | 7 am–3 pm | Ashkelon[b] | 21 |
| 22 June 1999 | 6.30 am–12 pm | Ashkelon | 30 |
| 23 June 1999 | 7 am–4 pm | Beer-Sheva[c] | 32 |
| 27 June 1999 | 7 am–10 am | Beer-Sheva | 16 |

[a]Southern Unit; [b]Northern Unit; [c]Central Unit.

### Measurement

The independent (questionnaire-based) variables included: date, hour, working site, age, seniority, present occupation [categorized for further statistical analysis according to levels of sun exposure into: low–medium exposure (e.g. administrators; team supervisor); high (e.g. constructors and maintenance workers)]; birthplace and parents origin (categorized for further analysis according to SC risk into: 1 = Africa/Asia; 2 = Europe/America; 3 = Israel); skin type (categorized for further analysis according to SC risk into: 1 = dark; 2 = medium brown; 3 = white); participation in the intervention procedures (0 = no, 1 = yes). The dependent (questionnaire-based) behavioral variables included: use of sunscreen today (0 = no, 1 = yes); use of sunscreen in general (1 = rarely, 2 = often, 3 = always); visit to a doctor for skin exam during past year (0 = no, 1 = yes); and frequency of self skin exam (1 = never–rarely, 2 = often). The dependent (photograph-based) behavioral variables included: hat, sunglasses and a collared shirt (0 = no, 1 = yes), sleeves (no sleeves = 0, short sleeves = 1, long sleeves = 2), pants (short = 1, long = 2). The behavioral outcome measure—SCPB—was constructed by summing up the scores of seven behavior-related items, thus creating a range of potential scores for each individual from 3 to 12. It should be noted that the question on sunscreen use today was excluded due to the fact that over 50% of the workers were interviewed during the early morning hours at the mother-base and some complained that it was too early to apply sunscreen. Also excluded was the item on visiting a doctor for a skin exam, as turning to a clinical skin exam is not recommended for either frequent or constant use. Melanin presence variables were computed by calculating the mean values of three anatomical sites: inner upper arm; lower arm; and cheek.

### Statistical analysis

Data analyses were conducted using the SPSS for Windows version 6.1. The comparison on the background characteristics of the 'education' group (participants in former intervention procedures) versus 'regulation' group (non-participants) was conducted using the chi-square tests for categorical variables and non-paired *t*-tests (two-tailed) for the continuous ones. The *t*-test statistical procedures were also used to identify between-group differences on the SCPB measure, and on the three melanin presence items. Finally, to determine the unique contribution of each of the independent background variables to the prediction of the dependent outcome measure of SCPB, a stepwise regression analysis, using dummy variables for categorical items, was performed on the overall sample.

## RESULTS

Of the 118 workers interviewed, one refused to be photographed, 15 photographs were damaged and one missed the program-participation item. The statistical analyses were thus conducted on a sample of $n = 101$, of which 51 reported taking part in the former skin cancer control program. Table 2 displays between-group comparisons on background characteristics.

As could be expected, the 'regulations' group, in comparison to the 'education' group, had a significantly lower mean years of seniority and a significantly higher number of workers in semi-skilled occupations demanding higher levels of sun exposure. Both groups were similar on age

**Table 2:** Between-group comparison on background characteristics

| | 'Education' group $n = 51$ | 'Regulation' group $n = 50$ | $p$ |
|---|---|---|---|
| Mean age (year) | 42.98 | 42.62 | NS |
| SD | 8.43 | 9.90 | |
| Mean seniority (year) | 15.55 | 7.32 | 0.001[a] |
| SD | 8.78 | 7.01 | |
| Occupational exposure | | | |
| Low–medium | 25 | 12 | 0.006[b] |
| High | 26 | 37 | |
| Birthplace | | | |
| East | 12 | 20 | NS |
| West | 14 | 13 | |
| Israel | 25 | 16 | |
| Origin (father) | | | |
| East | 31 | 34 | NS |
| West | 18 | 14 | |
| Israel | 2 | 2 | |
| Origin (mother) | | | |
| East | 32 | 34 | NS |
| West | 17 | 14 | |
| Israel | 2 | 2 | |
| Skin type | | | |
| Dark | 18 | 17 | NS |
| Brown | 10 | 8 | |
| White | 20 | 23 | |

[a] *t*-test; [b] $\chi^2$-test.

**Table 3:** Between-group comparison on the SCPB and melanin presence scores

| | 'Education' group $n = 51$ | 'Regulation' group $n = 50$ | $p$ |
|---|---|---|---|
| Mean SCPB (index) | 9.47 | 8.66 | 0.001 |
| SD | 1.55 | 1.45 | |
| Mean MP (upper arm) | 39.24 | 40.79 | 0.047 |
| SD | 3.77 | 3.96 | |
| Mean MP (lower arm) | 53.10 | 56.95 | 0.018 |
| SD | 7.46 | 8.55 | |
| Mean MP (cheek) | 48.61 | 52.75 | 0.004 |
| SD | 7.14 | 7.11 | |

SCPB, skin cancer preventive behavior; MP, melanin presence.

means, birthplace (overall higher number of Israeli-born employees), father and mother origin (overall a higher number of workers of Asia/Africa origin), and skin color (overall a higher number of workers with a light skin color). Between-group differences on the SCPB and the melanin presence scores are presented in Table 3.

A significant between-group difference was found on the SCPB measure, indicating that the 'education' group scored higher (better protected) than the 'regulation' group. The significant between-group differences on the melanin presence mean scores of the three anatomical sites supported the above findings, indicating that workers in the 'education' group had lower melanin presence means (implying better protection) than their counterparts. Controlling for demographics and the reported skin type, the results of the multivariate analysis performed on the SCPB measure revealed that participation in the educational procedures and age were the only significant predictors, accounting for 7% ($\beta = 0.263$, $p = 0.01$) and an additional 4% ($\beta = 0.198$, $p = 0.046$) of the variance explained, respectively.

## DISCUSSION

The present photosurvey corroborated with our 1995 multifaceted and long-term skin cancer control project among outdoor workers of Mekorot—the Israel National Water Company (Shani *et al*., 1998). Targeting two groups of program-involved workers versus former non-participants and newly recruited ones, the photosurvey sought to investigate the role of sun-protection regulations, comprising free access to safety gear and issued when project ended, versus educational measures on workers' SCPB patterns. Regardless of outcomes, we also attempted to expand on the scope of evaluation methodologies by using the camera, in addition to a short self-report questionnaire, to 'document reality', and a spectrophotometer to assist in supporting the results of both. A consistent and significant pattern of between-group differences was demonstrated, indicating more positive SCPB practices among the 'education' group versus the 'regulation' only group. These findings are in line with theoretical arguments (Tones and Tilford, 1994), with the empirical data of others (O'Toole, 1999) and with our previous findings (Shani *et al*., 1998; Shani *et al*., 2000) with regard to the role of educational measures in generating positive changes in skin cancer control habits. Because data for the present outcome measure of SCPB were differently gathered (mostly by the camera) and differently computed than the SCPB-index in the 1995 Mekorot project, it is unclear whether safety regulations had an incremental contribution to these behavior patterns. However, though caution in interpreting our results is warranted due to the study's methodological limitations of sample size, measurements' tools, lack of data regarding participants' education level and its cross-sectional nature, it seems that the regulations, per se, were less likely than the educational measures to achieve desired health-promoting aims. Another important finding, derived from the multivariate analysis, was the significant explanatory contribution of age, above and beyond program participation. Consistent with the findings of Carmel *et al*. (Carmel *et al*., 1994; Carmel *et al*., 1996) and others (Arthey and Clark, 1995), it was evident that the higher the age the better the SCPB practices. It is possible that similar to younger male students in Australia (Lupton and Gaffney, 1996), younger outdoor employees in Israel are unwilling to be concerned with health and photoaging and they are less eager to comply with 'unmasculine' protective measures such as sunscreen lotions. Clearly, from a practical point of view, efforts should be invested in recruiting the co-operation of pharmaceutical industries, as well as the fashion industries, to manufacture products (e.g. sunscreens) which could appeal to the prevailing masculine stereotypes. Finally, though a considerable body of knowledge now supports the view that individual and group empowerment is conducive to health and well being

(Rissel, 1994), one source of which is creating photographic images of daily life (Wang, 1999), our research design does not allow any conclusions regarding the impact of the data-collection techniques on awareness raising, empowerment and action. Further research is thus warranted to determine if 'a picture is worth a thousand words' in this context and other life settings. Yet, based on our short experience, the photosurvey was a low-cost and easily available method for capturing outcomes and overcoming management's claims on workers' time. However, its validity might be limited because unannounced observations are not possible. It also excludes any account of demographic and psycho-social factors which explore and explain behavioral outcomes. To penetrate beneath the photographic images, the triangulation of qualitative and quantitative methods should be pursued. Likewise, the validity of the spectrophotometer-related data, though 'objective' and easily gathered, needs further investigation. At the level of intervention strategies, it is rather 'common sense' knowledge that an ecological perspective (Green *et al*., 1996) and the synergy of the education, engineering (structural) and enforcement approaches for addressing public health problems should be adopted.

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