

# Sun protection habits and behaviors of a group of outdoor workers and students from the agricultural and construction sectors in north-Italy

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**KEY WORDS:** Ultraviolet rays; occupational exposure; risk reduction behavior; construction industry; farmers; students

**PAROLE CHIAVE:** radiazione ultravioletta; esposizione occupazionale; prevenzione dei rischi; edilizia; agricoltura; scuola

## SUMMARY

**Background:** *Despite the relevant frequency of ultraviolet induced adverse health effects in workers, solar ultraviolet radiation (UVR) exposure is an occupational risk not adequately minimized in Italy.* **Objective:** *To assess the characteristics and prevalence of sun exposure habits and behaviors in a group of students and outdoor workers (OW) from the agricultural and construction sectors of a north-Italian region.* **Methods:** *Based on a previously developed standardized questionnaire, we collected full information on individual sun exposure habits at work and during leisure activities.* **Results:** *In 2018, 380 high school students and OW from the agricultural and construction sectors participated in a sun-safety campaign. More than a third (39.0%) of OW reported never using sunglasses, 52.8% never applied sunscreens at work, and a quarter never wear a UV protective hat. Considering leisure-time, students reported more frequent sunburns compared to OW: 25.0% vs. 13.8%; half (51.6%) of students and a third (36.4%) of OW reported never wearing a UV protective hat. A third (30.1%) of students and 37.2% of OW never or only seldom applied sunscreens on holidays.* **Discussion:** *The majority of OW in our study reported poor protective solar exposure habits. Young students of the construction and agricultural sectors indicated even worse sun-protective behaviors, both during apprenticeship and leisure activities. Our study highlights the low health literacy related to solar UVR in OW and apprentices. Further educational initiatives are required in Italy to improve the adoption of protective behaviors during outdoor activities.*

## RIASSUNTO

«**Titolo italiano:** *Abitudini di esposizione e comportamenti protettivi individuali rispetto al rischio da esposizione a radiazione solare in un gruppo di lavoratori outdoor e studenti del settore agricolo ed edile del Nord-Italia*».

**Background:** *L'esposizione a radiazione solare ultravioletta (RSUV) è un rischio occupazionale la cui prevenzione*

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non è adeguatamente implementata in Italia, nonostante la rilevanza degli effetti avversi per la salute attesi nei lavoratori. **Obiettivi:** Valutare caratteristiche e frequenza delle abitudini di esposizione a RSUV e dei comportamenti UV-protettivi individuali in un gruppo di lavoratori outdoor e di studenti del settore agricolo ed edile di una regione del nord-Italia. **Metodi:** Utilizzando un questionario precedentemente sviluppato, sono state raccolte informazioni complete sulle abitudini individuali di esposizione a RSUV sul lavoro e nel tempo libero. **Risultati:** Nel corso del 2018 è stata condotta una campagna di prevenzione sul rischio da esposizione a RSUV, che ha coinvolto 380 studenti e lavoratori outdoor dei settori agricolo ed edile. Sul lavoro, il 39% dei lavoratori riferisce di non utilizzare mai occhiali da sole, il 52.8% di non applicare mai creme solari, e  $\frac{1}{4}$  dei lavoratori non indossa mai un cappello UV-protettivo. Durante il tempo libero, gli studenti riferiscono ustioni solari più frequentemente rispetto ai lavoratori outdoor: 25 vs 13.8%; il 51.6% degli studenti e il 36.4% dei lavoratori non utilizzano mai un cappello UV-protettivo. Il 30.1% degli studenti ed il 37.2% dei lavoratori non applicano mai, o solo raramente, creme solari in vacanza. **Discussione:** Nonostante l'elevata esposizione a RSUV e l'aumentato rischio di effetti avversi UV correlati riportati in letteratura, i lavoratori all'aperto oggetto del presente studio hanno riportato abitudini UV-protettive completamente inadeguate. I giovani studenti agricoli ed edili hanno indicato comportamenti UV-protettivi peggiori dei lavoratori, sia durante il tirocinio che nel tempo libero. Lo studio indica quindi che ulteriori urgenti iniziative di prevenzione debbano essere implementate in Italia per un più corretto riconoscimento del rischio occupazionale da esposizione a RSUV, al fine di migliorare l'adozione dei comportamenti individuali UV-protettivi durante le attività all'aperto.

## INTRODUCTION

Solar radiation is a carcinogen group 1 IARC, mainly for its ultraviolet (UV) component (8). It is also associated with the development of both melanoma and non-melanoma skin cancers (NMSC), and ocular cancers such as squamous cell carcinoma of the cornea and conjunctiva and the uveal melanoma (8, 29). Cumulative exposure to solar UV radiation (UVR) is also related to other chronic skin and eye diseases such as photo-aging, actinic keratosis, pterygium, cataract, and possibly macular degeneration (29). Acute effects are also possible to both the eye and the skin, mainly via photochemical mechanisms (e.g. snow blindness, sunburns) (9, 29). UV exposure is also thought to be a significant immunosuppressive agent, and this may play a role in the occurrence of other diseases, not only of the eye and of the skin (29). It has been proven that outdoor workers (OW), mainly employed in sectors such as agriculture, construction, and fishery, are at high risk for the occurrence of UV-related adverse effects (16). According to the data of the Carcinogen Exposure (CAREX) system, solar radiation exposure is one of the main carcinogenic exposure for OW in many countries, and millions of workers are exposed to this occupational risk factor almost every day during their working life (10). Despite the

adverse health effects, the large number of exposed workers and the high individual UV exposure levels reported in many studies, usually above the available occupational limits (3-4, 7, 9, 13, 16-17, 19-20, 26, 30), it is surprising that many countries have not enforced adequate preventive strategies to manage this occupational risk, and UV related occupational diseases are under-recognized or not recognized at all (5, 27).

For these above given reasons a specific preventive intervention was enforced in a North-Italian region in the year 2018, including specific training courses for the prevention of solar UVR related occupational risks in the agricultural and construction sector. As UV-induced adverse effects are related to a photochemical mechanism, the diseases may appear even several years after the first exposure, when it is too late to implement adequate prevention. Furthermore, the adverse effects of cumulative long-term UV exposure, typically associated with outdoor work activities and demonstrated as a relevant risk factor in particular for NMSC, can be additional with the UV exposure derived from recreational activities (19). Leisure UV exposure contributes to the cumulative UV dose received by the skin, but it can be also a specific risk factor, as there is evidence to suggest that intense intermittent UV exposures and repeated sunburns when young are associated with

malignant melanoma (2). Accordingly, it is highly important to involve young workers and students in sun-safety campaigns at work (25, 28). It should be noted also that there is growing evidence that occupational sun-safety education is effective in increasing outdoor workers' sun-protection habits (22); nevertheless, there is still a scarcity of projects that have systematically focused on outdoor workers (11). For wider groups, including the general public, multicomponent community-wide interventions have been shown to be effective in increasing sun-screen use, while other interventions such as mass media campaigns appears to be less effective (23). For outdoor workers, it seems that specific training and preventive campaigns with interpersonal contacts, also with the support of innovative technologies, increase the impact of sun-protective initiatives (1, 11, 22).

The aim of the present study was to provide an evaluation of the characteristics and frequency of sun exposure habits and behaviors in a group of high school students and OW from the agricultural and construction sector of a north-Italian region.

## METHODS

### Study design and setting

In 2018, a specific sun-protection campaign and workers' training activity was organized for the agriculture and construction sectors of a North-Italian province, with the support of the Italian Authority for Workers' compensation (INAIL). We performed a cross-sectional evaluation of sun-protective habits and behaviors in a group of farmers, construction workers, and high school students before the beginning of a training on solar UV risk and its prevention. The study is part of a public occupational health and safety preventive campaign and it was conducted in accordance with all national regulations and with the principles of the Declaration of Helsinki.

### Participants, study size, bias

Study participants were recruited from groups of outdoor workers, including farmers and construc-

tion workers and students from the professional high schools of the agricultural and construction sectors. For the recruitment of the sample, during the first year of the project (December 2016-December 2017) we organized several meetings with the main labor union representatives and with the employer/employees associations of the Agricultural sector of the Italian province of Modena (API-MA, C.I.A, CIIMLA, COLDIRETTI, Confagricoltura, Confcooperative, Confindustria Modena, COPAGRI, EPACA, Legacoopestense), while for the Construction sector we contacted the "Scuola Edile" of the province of Modena, a joint association in charge for professional training and other preventive activities recognized by the Italian law on safety and health at work (legislative decree n° 81 of the year 2008) and representing both employers and employees of the building sector. We asked these associations to recruit a maximum of 200 voluntary workers and 198 workers agreed to participate in our sun-protection campaign. Periodic occupational safety and health (OSH) training is mandatory for workers in Italy, so that, even if the participation was on a voluntary basis and it is possible that persons not interested in the topic did not participate, the need of an update of the training activities (offered for free) may have reduced the impact of possible selection bias. In order to recruit the students, we contacted the directors of all the high schools operating in the agricultural and construction sectors of the Province of Modena: one Institute – Spallanzani - with three schools for the Agricultural sector, three Institutes – Baggi, Guarini and Calvi - for the Construction sector. Only one Institute (Calvi) refused to participate in the project. We asked the high schools to recruit all the students attending the fifth (last) year of the school, and this may have prevented possible selection bias, and to organize training groups of approximately 30 students per six different trainings, for a total of 182 students.

Complete information regarding the study project was given to the participants of the training courses, and subjects were informed that the collection of information on individual sun exposure habits was on a voluntary basis, and that they were free to withdraw from the study at any time. All par-

ticipants provided verbal consent and none refused to participate or withdrew during the study.

### Variables and data sources

All study participants completed a self-administered questionnaire that had been adapted and simplified from a previously described one (14-15). The questionnaire was designed to investigate individual solar UVR exposure habits during both work and leisure activities. The survey was completed by each group of participants before the beginning of the sun-protection training, prior to the participants receiving any specific information on harmfulness of solar UVR. Fourteen separate groups of participants completed the questionnaire: four groups of farmers, four groups of construction workers, three groups of students of the agricultural sector and three groups of students of the construction sector. Subjects were asked to answer the questionnaire considering only the period of the year between March and October, when UV exposure is higher. Briefly, the tool

included two specific sections for occupational and non-occupational UV exposure, and investigated the characteristics of the outdoor activities and the main UV protections adopted with 22 items, summarized in Table 1. For all the items investigating the typical outdoor activity, the answers were based on a 5 point Likert scale, ranging from 0, “never”, to 5 “always”.

### Statistical analysis

Data were analyzed using the software SPSS version 25 for Windows: statistical analysis performed included *Student's t-test* and *Pearson's Chi-square test*.

### RESULTS

We collected a total of 354 questionnaires from 380 participants in our sun-protection campaign (response rate= 93.2%), for the evaluation of individual solar UVR exposure habits and behaviors. Table 2 presents the main socio-demographic characteristics of the participants.

**Table 1** - Summary of the solar ultraviolet radiation exposure evaluation questionnaire

Occupational exposure	Leisure exposure (for vacations + additional information in case of relevant outdoor sports or hobbies)
Job description / job task	Type and place of the activity (geographic area, latitude, altitude)
Job place (geographic area, latitude, altitude)	
Time spent outdoor (with reporting also of an estimate of the mean number of hours spent outdoor per day, between 9 am - 5 pm, and between 11 am - 3 pm)	
Frequency of lunch breaks outside during work	Frequency of sunburns
Working postures adopted	
Frequency of work in shades	Use of sun-tanning lotions
Frequency of activities close to reflecting surfaces	
Use of hat / cap (indications on the type)	
Use of sunglasses (indications on the type of lens and certified UV filters)	
Use of spectacles and/or contact lenses	
Use of protective clothes (indications on the type of textiles, and whether the clothes include long sleeves and pants)	
Use of sunscreen protections (indication of the SPF applied)	

**Table 2** - Main characteristics of the subjects investigated for their solar ultraviolet radiation exposure habits and behaviors

	Number of subjects	Males %	Females %	Mean age in years (SD)
Agricultural workers	59	71.2	28.8	49.1 (16.3)
Construction workers	131	92.6	7.4	45.5 (12.5)
Outdoor workers (agricultural + construction workers)	190	85.6	14.4	47.1 (17.1)
Students of the agricultural sector	69	81.5	18.5	19.8 (0.8)
Students of the construction sector	95	83.5	16.5	20.0 (0.8)
All the students (agricultural + construction sector)	164	82.7	17.3	19.9 (0.8)

Considering OW, 89.0% of agricultural workers reported *always* or *often* work outdoor, 32.8% of them *never* used sunglasses, and 44.8% *never* applied sunscreens at work, while 77.6% *always* or *often* wore a hat during their outdoor job (Table 3). A significantly greater proportion (77.7%) of construction workers reported *always* or *often* working outdoors compared to agricultural workers

( $p < 0.001$ ). Construction workers (40.2%) were also more likely to report *sometimes* or *often* having lunch outdoors compared to agricultural workers (16.1%;  $p < 0.001$ ). Nearly half (42.0%) of construction workers *never* wore sunglasses at work, 56.7% *never* applied sunscreens, and 33.9% *never* wore a protective hat at work: for this latter protective habit there was a significant difference when compared to agricul-

**Table 3** - Results of the questionnaire administration for the assessment of exposure to solar ultraviolet radiation at work in the group of agricultural (A, n=59) and construction workers (C, n=131). The valid percentages of responders are reported in the cells for each item, in case of significant statistical difference at the Pearson's chi-square test the p value is reported in the last column

	Never		Seldom		Sometimes		Often		Always		P
	A	C	A	C	A	C	A	C	A	C	
Working outdoor	1.8	0	1.8	5.0	7.1	17.4	39.3	57.9	50.0	19.8	<b>&lt;0.001</b>
Having lunch outdoor	51.8	39.3	32.1	17.0	14.3	27.4	1.8	12.8	0	3.4	<b>0.005</b>
Working postures											
Standing: looking down	6.7	10.3	11.1	8.0	57.8	39.1	24.4	40.2	0	2.3	0.19
Standing: looking straight ahead	3.6	13.7	3.6	5.9	21.4	17.6	60.7	52.0	10.7	10.8	0.30
Standing: looking up	4.3	9.8	17.4	25.6	52.1	39.0	23.9	24.4	2.2	1.2	0.50
Bent over	7.7	13.5	46.2	10.8	46.2	51.4	0	24.3	0	0	<b>0.02</b>
Sitting: looking down	27.0	19.3	24.3	16.9	29.7	27.7	18.9	26.5	0	9.6	0.23
Sitting: looking straight ahead	18.0	20.0	8.0	16.2	30.0	15.0	38.0	33.8	6.0	15.0	0.12
Sitting: looking up	35.1	21.9	27.0	27.4	21.6	32.9	13.5	13.7	2.7	4.1	0.45
Working in shades	12.3	9.6	36.8	17.5	33.3	55.3	17.5	13.2	0	4.4	<b>0.008</b>
Working close to reflecting surfaces	34.5	9.5	41.4	19.8	13.8	44.8	10.3	15.5	0	10.3	<b>&lt;0.001</b>
Wearing a hat	6.9	33.9	6.9	12.4	8.6	18.2	25.9	14.9	51.7	20.7	<b>&lt;0.001</b>
Wearing sunglasses	32.8	42.0	17.2	15.1	19.0	16.0	13.8	13.4	17.2	13.4	0.82
Wearing glasses/ contact lenses	81.5	76.5	1.9	6.1	0	4.3	1.9	1.7	14.8	11.3	0.96
Wearing UV protective clothes	12.5	15.5	21.4	20.7	23.2	30.2	26.8	21.6	16.1	12.0	0.77
Using sunscreens	44.8	56.7	20.7	20.8	13.8	15.0	10.3	4.2	10.3	3.3	0.14

tural workers ( $p<0.001$ ) (Table 3). Another significant difference between construction and agricultural workers was observed for the habits of working in shade and close to reflecting surfaces, as 27.1% of construction workers *never* or *seldom* worked in shade versus 49.1% of the farmers ( $p=0.008$ ). On the contrary, 75.9% of agricultural workers *never* or *seldom* worked close to reflecting surfaces, while this percentage was significantly lower in the building sector (29.3%;  $p<0.001$ ). Finally, a significant difference was found with regard to the working postures adopted, as 24.3% of construction workers reported working *often* in a bent over position, while no agricultural workers reported working in this posture *often* ( $p=0.02$ ) (Table 3).

Sun exposure habits at work were also collected for 93 of the 164 students (56.7% response rate), as they were involved in seasonal outdoor jobs, e.g. as lifeguards or fruits pickers during summer, or in

apprenticeships organized by their scholastic institutes. The majority (60.0%) of the students reported *always* or *often* working outside during their outdoor job experiences, compared to 81.4% of the OW (agricultural and construction workers,  $p<0.001$ ). Overall, 45.1% of students *never* used sunglasses and 59.3% *never* applied sunscreens. A significantly greater proportion (45.1%) of students *never* wore a hat at work compared to 25.1% of OW ( $p<0.001$ ). Moreover, 55% of the students reported *never* or *seldom* wearing UV protective clothes at work, compared to 35.4% of OW ( $p=0.007$ ) (Table 4).

Considering sun exposure habits during leisure activities, in the Table 5 we report the answers given by the groups of OW and students to the questions investigating sun exposure during summer vacations. Sun exposure habits during holidays were collected for only 150 of the 190 OW (78.9%), as 40 participants declared no summer vacations in places

**Table 4** - Results of the questionnaire administration for the assessment of exposure to solar ultraviolet radiation at work in the group of outdoor workers (OW, n=190) and students (S, n=93). The valid percentages of responders are reported in the cells for each item, in case of significant statistical difference at the Pearson's chi-square test the p value is reported in the last column

	Never		Seldom		Sometimes		Often		Always		P
	OW	S	OW	S	OW	S	OW	S	OW	S	
Working outdoor	0.6	5.6	4.0	12.2	14.1	22.2	52.0	34.4	29.4	25.6	<0.001
Having lunch outdoor	43.4	28.0	22.0	36.6	23.1	25.8	9.2	5.4	2.3	4.3	0.03
Working postures											
Standing: looking down	9.1	12.0	9.1	19.6	45.5	33.7	34.8	32.6	1.5	2.2	0.14
Standing: looking straight ahead	10.1	6.5	5.1	5.4	19.0	37.6	55.1	33.3	10.8	17.2	0.002
Standing: looking up	7.8	25.3	22.7	36.3	43.8	22.0	24.2	13.2	1.6	3.3	<0.001
Bent over	12.0	23.3	20.0	17.1	50.0	31.7	18.0	25.4	0	2.5	0.25
Sitting: looking down	21.7	18.0	19.2	23.6	28.3	30.3	24.2	27.0	6.7	1.1	0.32
Sitting: looking straight ahead	19.2	10.2	13.1	13.6	20.8	31.8	35.4	33.0	11.5	11.4	0.25
Sitting: looking up	26.1	35.6	27.2	35.6	28.9	22.2	13.9	4.4	3.9	2.2	0.11
Working in shades	10.7	8.9	24.0	22.2	47.6	50.0	14.8	17.8	2.9	1.1	0.84
Working close to reflecting surfaces	17.8	23.6	27.0	31.5	34.5	36.0	13.8	7.9	6.9	1.1	0.13
Wearing a hat	25.1	45.1	10.6	20.9	15.1	8.8	18.4	13.2	30.7	12.1	<0.001
Wearing sunglasses	39.0	45.1	15.8	24.2	16.9	17.6	13.6	6.6	14.7	6.6	0.07
Wearing glasses/ contact lenses	78.1	78.9	4.7	4.4	3.0	2.2	1.8	3.3	12.4	11.1	0.93
Wearing UV protective clothes	14.5	23.1	20.9	31.9	27.9	24.2	23.3	18.7	13.4	2.2	0.007
Using sunscreens	52.8	59.3	20.8	24.2	14.6	7.7	6.2	7.7	5.6	1.1	0.17

other than their hometown. No significant difference was observed regarding the time spent outside during vacations, as 84.8% of the students and 76.2% of the OW reported *always* or *often* spending their days outside during holidays. Students reported more frequent sunburns when compared to OW: 20.1% vs. 10.9% *often* and 5.0% vs. 2.9% *always* experiencing sunburns ( $p=0.02$ ). area third (33.3%) of students reported *always* being close to reflecting surfaces during their vacations compared to 17.2% of OW ( $p=0.01$ ). Regarding the use of individual protection, 51.6% of students *never* wore a UV protective hat during holidays, compared to 36.4% of OW ( $p\leq 0.001$ ). Similarly, nearly a quarter (22.5%) of students reported *never* using sunglasses and 46.9% reported *never* wearing UV protective clothes, compared to 10.0% and the 29.3% of the OW ( $p=0.02$  and  $p=0.009$  respectively for sunglasses and clothes). No significant differences were observed with regard to the habit of using sunscreens as 30.1% of students and 37.2% of OW reported *never* or *seldom* applying sunscreen (Table 5).

The characteristics of the sun exposure habits of the students and of the OW during leisure activities as outdoor sports and/or hobbies are not reported here, but are available as supplementary material on request.

## DISCUSSION

Our study, in agreement with other similar studies recently performed (6, 12, 18, 21-22, 24), indicates poor protective habits and behaviors of OW with respect to a relevant occupational risk, which is solar UVR exposure, responsible for a significant impact on workers' health. An interesting point is the comparison between work and leisure time sun protective habits and behaviors of OW and students of the agricultural and construction sectors in north-Italy. Our data are consistent with findings in the extant scientific literature that show a relevant under-estimation of the risk related to UV exposure, both artificial and natural, in young people as they may ignore that the effects of UV rays can be cumulative, inducing UV-related diseases at an older age, after years of exposure (25,28). Previous research has also reported that UV exposure at young age, and in particular intermittent intense exposure and repeated sunburns – that according to our results are extremely frequent in the students' group, as more than 1/4 of the students reported *often* or *always* sunburns during their holidays -, are associated with a higher risk of developing malignant melanoma in adulthood (2). In general, our results show that the sun exposure habits of the students are even worse

**Table 5** - Results of the questionnaire administration for the assessment of exposure to solar ultraviolet radiation during holidays in the group of outdoor workers (OW, n=150) and students (S, n=164). The valid percentages of responders are reported in the cells for each item, in case of significant statistical difference at the Pearson's chi-square test the p value is reported in the last column

	Never		Seldom		Sometimes		Often		Always		P
	OW	S	OW	S	OW	S	OW	S	OW	S	
Time outdoor	2.9	1.3	5.0	3.2	15.8	10.8	53.2	50.0	23.0	34.8	0.15
Frequency of sunburns	26.1	13.2	30.4	31.4	29.7	30.2	10.9	20.1	2.9	5.0	<b>0.02</b>
Use of sun tanning lotions	55.1	56.0	8.8	11.9	11.6	13.8	15.0	9.4	9.5	8.8	0.56
Time close to reflecting surfaces	4.5	1.3	8.2	3.9	27.6	19.9	41.8	41.6	17.2	33.3	<b>0.01</b>
Wearing a hat	36.4	51.6	14.3	18.9	16.4	18.9	15.7	7.5	17.1	3.1	<b>&lt;0.001</b>
Wearing sunglasses	10.0	22.5	7.3	9.4	15.3	16.9	36.7	31.9	30.7	18.8	<b>0.02</b>
Wearing glasses/contact lenses	61.2	70.7	10.8	1.3	8.6	5.1	6.5	7.0	12.9	15.9	<b>0.006</b>
Wearing UV protective clothes	29.3	46.9	29.3	24.4	20.0	18.8	15.3	6.9	6.0	3.1	<b>0.009</b>
Using sunscreens	23.0	12.5	14.2	17.6	18.2	19.5	21.6	23.9	23.0	26.5	0.26

than the OW, both during working and vacation time, with particular regard to the use of UV protective hats and clothes. Our data further denotes the importance of including students and young workers in sun-safety trainings and other interventions for the prevention of solar exposure risk.

Preventive interventions should be urgently implemented for Italian OW and students, as currently there is a lack of attention to the problem of UV-related diseases, and specifically skin cancers (5, 27). In particular, considering “Non-Melanoma Skin Cancers” (NMSC, which are for the vast majority BCC and SCC) as UV-induced occupational diseases, a high fraction of these frequently occurring tumors (thousands of cases per year in Italy) is expected to be work-related, but the official notifications to the Italian workers’ compensation authority (INAIL) are only ~25 per year, suggesting a large under-estimation of the burden of occupational skin cancer (5).

In Italy, as in other European countries, sun-safety preventive interventions for OW are currently lacking, and OW are not provided with sufficient information on solar UVR risks or with adequate personal protection (5, 12, 27). Specifically, workers exposed to solar UVR should be provided with clothing with adequate UV protective factors (UPF), sunscreens with a SPF of at least 15-30 to be applied and re-applied during the working shift, protective glasses with UV filtering lenses, and hats or helmets designed to protect the head, the nape and the face from UV rays (9, 12, 22). This is currently a relevant issue in the construction sector, where the protective helmet is inappropriate for the scope of providing the workers with adequate UV protection. In our study we found a significant difference regarding the habit of wearing a UV protective hat between agricultural and construction workers, as farmers were more likely to use large brimmed hats to cover themselves, while in the construction sector it is uncommon to find helmets equipped with brims or designed with special shapes to prevent excessive UV exposure (22).

Our study has some limitations, as it is a cross sectional survey, based on the collection of subjectively reported sun protective habits and behaviors. The questionnaire used, even if not validated yet, was previously successfully applied with its longer

version in the same territory in clinical settings, with good compliance showed by the participants, and it included the main environmental and personal factors internationally recognized as the ones influencing individual UV exposure (14-15). The questionnaire adopted was quite detailed, but some important information (e.g. on photo-type, included in the full version) were not collected with the simplified version applied in the present study, aimed to investigate sun-protective habits. Nevertheless, it should be noted that the vast majority of the workers and students investigated could be considered with sun sensitive photo-types, and could be classified mainly as Fitzpatrick 3 (estimated: 60-70% of the sample), then as 2 (estimated: 15-25% of the sample and finally as 4 (estimated: 10-15% of the sample) (9).

## CONCLUSIONS

Despite their high exposure levels and the increased risk of developing UV-related adverse effects reported in the scientific literature, most outdoor workers and students of the agricultural and construction sector in north-Italy did not report adequate sun protective habits and behaviors according to our data, both during their working and leisure time. Our study suggests that further effective preventive initiatives for a better recognition of solar UVR-related occupational risk should be implemented in Italy to improve the adoption of protective behaviors during outdoor activities, both in students and outdoor workers.

NO POTENTIAL CONFLICT OF INTEREST RELEVANT TO THIS ARTICLE WAS REPORTED BY THE AUTHORS

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