



WHITE PAPER

Improved Protection of Outdoor Workers from Solar Ultraviolet Radiation

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Executive summary

Non-melanoma skin cancer (NMSC) is by far the most common cancer diagnosed in fair-skinned people. Ninety percent of NMSC is attributable to excessive exposure to ultraviolet radiation (UVR). Outdoor workers are exposed to an UVR dose of at least 2 to 3 times higher than indoor workers. So far, the risk of UVR exposure is vastly neglected and the evident future challenges presented in the following pages are contrasted with the current situation regarding legal recognition, patient care and compensation. While prevention is crucial to reduce cancer risks for outdoor workers, it is as much of relevance to better protect outdoor workers through legally binding rules and regulations, including at EU level.

Therefore, targeted actions are needed to make workplaces safer for the approximately 15 million outdoor workers in the EU, and millions more abroad. This includes the harmonisation of cancer registries, sun-safe awareness-raising activities, further in-depth research to establish the extent and impact of exposure to UVR during working hours, the implementation of regular health surveillance and dermatological screening, as well as education and early care for high risk workers.

The objective of the White Paper is to draw attention to the threat of UVR to outdoor workers around the globe, as well as to outline regulatory gaps and suggest methods to improve the protection of outdoor workers through better regulations and targeted preventative measures.

It is addressed to all key stakeholders involved in the protection of workers' health, such as policy makers, doctors and other health professionals, employers, workers, social security and patient advocacy groups. Specific actions are outlined in five recommendations (see Appendix 1) based on the Call to Action [\[add hyperlink\]](#) launched at the Multi-Stakeholder Summit on Occupational Skin Cancer, held on 26 April 2019 in Paris at the occasion of the yearly European Association of Dermato Oncology (EADO) Congress. The European Academy of Dermatology and Venereology (EADV), EADO, the Association of European Cancer Leagues (ECL), the International League of Dermatological Societies (ILDS), the European Dermatology Forum (EDF), the International Commission on Occupational Health (ICOH), the European Cancer Patient Coalition (ECPC), the Federation of Building and Woodworkers (EFBWW) and the European Federation of Food, Agriculture and Tourism Trade Unions (EFFAT) urge key stakeholders to take the following actions to address the unmet needs of NMSC patients:

1. Strengthen legislation to protect outdoor workers and build accessibility for regular screenings and earlier treatments;
2. Increase cooperation to ensure standardised registration of NMSC;
3. Develop tools to monitor solar UVR exposure at work;
4. Improve the reporting of occupational NMSC (including actinic keratosis);
5. Enhance collaboration between patient advocacy groups, doctors and other health professionals as well as employers to address the unmet needs of outdoor workers with NMSC, a disease which results in persisting suffering from highly chronic tumours.

Introduction

Non-melanoma skin cancer (NMSC) is by far the world's most diagnosed cancer¹. Solar ultraviolet radiation (UVR) is the main cause of NMSC in fair-skinned individuals (1). An earlier systematic review and meta-analysis found that the risk among outdoor workers was raised for SCC and actinic keratosis (= intraepidermal SCC) by 77%, and for BCC by 43% respectively, compared with the general population (2,3). While UVR is classified as Group 1 carcinogen alongside substances such as plutonium and asbestos by the International Agency for Research on Cancer (IARC) (4,5), it is rarely highlighted as a major risk factor compared to other work-related carcinogens (e.g. solvents, toxic dust). With a workforce of over 14.5 million in the EU occupied for at least 75% of their working lives outdoors (e.g. in construction, farming, seafaring, and public services), attention to the invisible risk of UVR exposure to develop occupational skin cancer has been vastly neglected. In a recent large case-control study in 8 European countries it is estimated that the risk of developing for SCC and BCC triples with five or more years of outdoor work (6). Correspondingly, in 2018, in another population-based case control study occupational UVR exposure threshold doses could be calculated for both SCC and BCC, above which the risks for these cancers double (7,8). Thus, within the framework of the UN Sustainable Development Goals (SDG) 2015 - 2030 the World Health Organization (WHO) and the International Labour Organization (ILO) are giving this topic a high priority, and are currently developing a joint methodology to assess the global disease burden of work-related skin cancer by solar UVR (8).

NMSC is on the rise worldwide, and if not detected and prevented at an early stage, NMSC leads to a life-long chronicity with abundant newly forming lesions, entailing an ongoing need for treatment (9). Often the disease remains "invisible" as there is a long latency period between exposure and the (chronic) illness, and thus over 80% of cases occur in people aged 60 and above (10). As life expectancies increase, so will incidences of NMSC, presenting an increasing burden on healthcare systems globally. However, it is one of the few curable, easily detectable and preventable types of cancer.

Only what can be measured can be improved

It is frequently argued that insufficient data exists to clearly differentiate between recreational and work UVR exposure to prove which is the root cause of the disease. This has resulted in a lack of knowledge about the disease, and has also allegedly made it difficult to establish regulations for outdoor workers. Yet, there is a growing body of research linking exposure to UVR in outdoor workers to the rapidly increasing incidence of NMSC. Exposure assessments (e.g. by means of personal dosimeters) of outdoor workers in different countries and regions reveal unexpectedly high exposures to UVR, as compared with the general population. This exposure regularly vastly exceeds the recommended work exposure limits of 1.3 Standard Erythemal Doses (SED; 1 SED = 100 Jm⁻² of erythemally weighted UV irradiance) for eight hours working outdoors (11). Overall, yearly occupational UVR exposure in outdoor workers is 3-5 times the yearly average indoor workers' exposure.

¹NMSC encompasses basal cell carcinoma (BCC), squamous cell carcinoma (SCC) and actinic keratosis (AK); more correctly, these tumour entities are being referred to as "keratinocytic carcinomata". However, for the purpose of this paper the term NMSC will be applied.

In the early 2000s, high daily solar UVR exposure of 9.9 SED in construction workers was measured in Australia (12). High SED values of over 5 SED/day for construction and road workers were confirmed for New Zealand (13) and Spain, with a median UV exposure of 6.11 SED per day (14). In the US, lifeguards are also exposed to high risk with a range between 1.7 SED to 6.2 SED per day (15). Nearly 6 x the recommended limit, namely 6.1 SED, were also measured as a mean exposure value in a Canadian study carried out in 2016 in 3 provinces with over 400 workers from power utilities and municipalities (16). In 2012, a French study came to a similar conclusion: certain outdoor occupations, such as gardeners, receive high SED doses (17). Similar results were obtained in Denmark in 2003 where the median estimated yearly UVR was measured as 224 SED for gardeners (18). In 2017, another Danish study, carried out with 457 Danish workers to measure UVR exposure at work and at leisure, revealed that roofers are exceedingly exposed to UVR with a semi-annual exposure of 361.8 SED (19).

Most recently, a 3-year dosimetric measurement project carried out in Germany between 2014-2017 with >1,000 outdoor workers from 97 different occupations showed that exposures of **up to 5 SED/day** are common. For instance, for dock workers, yearly exposure has been measured at 222 SED, while masons/bricklayers face an average exposure of 435 SED per year, and roofers and quarry workers over 580 SED (20). To put this into perspective, 1 SED is sufficient to cause sunburn in fair skinned individuals of Fitzpatrick skin type 1.

Importantly, the German study found that the amount of UV radiation varies significantly, even within the same profession. As a result, contrary to what one would think, arable farming is not among the highest exposure professions in the agricultural sector. New evidence on sun exposure also shows that, among postal service mail carriers, a distinction must be made between those who cover their route on foot (who are likely to seek the shade next to the buildings), and those who cover their route by bike (who are more often directly exposed to the sun when biking) (20).

The above data shows that most outdoor workers receive UV erythemal radiation exposure in excess of occupational guidelines. There is no other occupational carcinogen (WHO/IARC group 1) where it is legally accepted for exposed workers to exceed the daily threshold-levels regularly by five times or more.

The objective dosimetric measurements have helped to get a more precise understanding of the at-risk populations amongst outdoor workers: it is not the (industrial) sector as such, but the occupation and tasks linked to the specific occupation within the industrial sector, which is the defining factor in determining the amount of UVR exposure faced at work. As a consequence, in Germany, the introduction of a mathematical model called “Wittlich algorithm” to assess individual occupational lifetime UVR exposure has been derived from the obtained dosimetric data and is now being used by the German statutory social accident insurance to improve prevention measures, health care services and compensation for affected workers (21). In Germany, with 8,558 notified cases in 2017, work-related skin cancer is already the third most frequently reported and the second most frequently acknowledged occupational disease, and by far the most frequent occupational cancer.

In order to obtain improved and objective disease data at global level, an important milestone has been the 11th revision of the WHO International Classification of Diseases (ICD), released

on 18 June 2018: NMSC, incl. actinic keratosis can now be coded for as occupational, and BCC and SCC are now separate entities (22). This was not possible under the previous ICD and is a relevant step to reveal the true epidemiological magnitude of work-related skin cancer.

Given the pressing nature of the growing numbers of NMSC cases linked to occupational UVR exposure, the WHO and ILO are currently assessing - within the UN Sustainable Development Goals 2030 framework - the global disease burden of NMSC. Both UN agencies have classified it amongst the 10 most relevant occupational risk factors and health outcomes that have never been included in previous global estimation strategies but are very likely to account for a considerable disease burden (8). For the first time, the two UN specialized agencies for health and labour will produce joint estimates on the impact of work on health. This will help leverage the case of work-related skin cancer at a global level.

The disease burden of NMSC

The economic impact of work-related UVR induced skin cancer is quite burdensome. It increasingly places governments and healthcare systems under significant economic pressure. The annual direct healthcare costs in Europe are estimated to range from EUR 341 to EUR 853 million per year (23). For Canada, the direct and indirect costs of occupational NMSC cases are CA\$ 28.9 million, while compensation claims for occupational skin cancer in Australia between 2000 and 2012 amounted to AU\$ 63 million demonstrating an upward trend (24,25). In the US, the average annual costs for NMSC treatment between 2007 and 2011 amounted to US\$ 4.8 billion (26).

NMSC patients also inevitably endure a considerable reduction in quality-of-life due to the chronicity of this highly recalcitrant disease. Given that NMSC patients often undergo repeatedly surgery, and given that the disease occurs on highly visible areas (such as on the head, ears, neck and hands) patients may suffer significant consequences for their appearance, self-esteem, and well-being. The intangible costs for NMSC are therefore estimated to be even higher than original estimates, namely EUR 1,040 to EUR 2,040 million per year in Europe and CA \$ 5.7 million in Canada (23,24).

This expenditure could be largely avoided if targeted prevention measures were put in place. Primary prevention, early detection, treatment and regular follow-up (NMSC and melanoma) are shown to be beneficial from a health economic perspective (27-30). The potential for the economic benefits of skin cancer prevention are great and include not only a reduction of costs, but also increased quality-of-life, functional ability and health (27).

In this context, health surveillance and skin cancer screening are important tools to detect any adverse changes to the skin at an early stage. This includes not only regular skin inspections by a responsible person (health professional), but it also means informing the worker about the risks - and about when and where to seek assistance if a skin lesion is suspected. However, studies have indicated that outdoor workers with higher UVR exposure are indeed less likely to have received a skin examination than the average (indoor) worker. For instance, several studies from the US revealed that farmers had never had skin examinations and that they did not know how to conduct skin self-examinations (31,32). The same situation was found amongst fishermen in Brazil, who regularly face over 12 hours of UVR exposure every day (33).

In Germany, the decision to introduce skin cancer screening was based on the results of a population-based skin cancer screening project (SCREEN - Skin Cancer Research to provide Evidence for Effectiveness of Screening in Northern Germany) conducted as a pilot study in Schleswig-Holstein. The savings potential of introducing widespread skin cancer screening in Germany was calculated at over EUR 575 million annually (23,25). In the SCREEN pilot study, it is claimed that the inspection of the complete body by the GP or dermatologist resulted in earlier diagnosis of melanoma, BCC and SCC in prognostically more favourable stages (27,29).

However, cancer screening of the general population as described above has been debated in the scientific community; screening of high-risk populations like outdoor workers, however, is not controversial but a stringent postulate by physicians throughout the world.

Legislation covering occupational NMSC

To date, not many countries cover compensation for occupational skin cancer (NMSC) *inter alia* due to the fact that the relationship between the disease and the occupation is still not being made, despite growing evidence. However, in Australia, legislation for NMSC as an occupational disease comes from state legislation. In Canada it is organized by provinces and territories. In Europe, only seven countries recognize UVR-inflicted occupational skin cancer as an occupational disease (34).

Yet, even in these countries, patients with work-related NMSC mostly do not benefit from recognition because, despite disposing of the legal grounds for notifying and treating cases, under-reporting is massive: the responsible physician or dermatologist simply does not notify, as the correlation between the disease and the occupation is not yet routinely made.

In Denmark, only 36 cases have been recognized since its inclusion in the list of occupational diseases in 2000 (35). In Italy, where NMSC is on the occupational diseases list, the situation is no different: on average only 34 cases were reported annually between 2002 and 2017 (36); a similarly dramatic underreporting applies to other countries (34).

The picture changed in Germany in 2015, when some forms of NMSC (SCC, multiple AK) were officially included in the list of occupational diseases. Within the first 12 months of official recognition, more than 7,700 occupational NMSC cases were notified. In 2017, the number of notifications amounted to 8,558. Notifications are expected to continue increasing in the years to come. However, it is worth noting that a financial incentive has been instituted which encourages physicians to report - which undoubtedly has been instrumental to the high numbers of notifications. Also, patients with acknowledged occupational skin cancer are provided with priority medical care and, in severe cases, substantial compensation.

Regarding the situation of population-based cancer registries, NMSC is not reported in the majority of cases, and can therefore only be measured in an inconsistent manner. When recorded, only primary tumours are registered, while consecutive tumours are not. This is a relevant problem because the risk of acquiring further NMSC after the first lesion has been diagnosed, is about 30% in the first year after diagnosis in the average population; and in outdoor workers it is expected to be even higher due to the substantial actinic damage that so many of them suffer from.

To standardise comparisons of incidence trends between regions, the European Network of Cancer Registries and the International Agency for Research on Cancer recommend reporting only the first BCC or SCC per person (37,38). This leads to incomplete data - another reason why NMSC is often not included in the analyses of comparative cancer data. Some additional barriers to recording NMSC cases include the high costs associated with the labour-intensive aspect of the registration process, the lack of an efficient electronic system, the often-limited sharing of data (even more so in view of the current EU data protection regulation) and the low usage of notification forms in a given country. Furthermore, the practice of skin cancer registration varies between countries, which adds to the fact that the crisis remains in the shadow (38,39).

As a result, outdoor workers still lack legislative protection to ensure adequate prevention measures, diagnosis and effective treatments for this occupational disease. Interestingly, numerous elimination and control protocols to protect workers from exposure to the WHO group 1 carcinogens have been put in place over the years, regulations have been adopted and amended to better protect workers' health, but not for UVR. Multi-purpose reporting forms for occupational skin cancer cases, which can also be used to inform respective authorities in countries where this is not yet a recognized occupational disease, have recently been published open access (40).

Over twenty-five years ago, the European Union adopted its first global directive for improving the workplace prevention of work-related cancer. And since 2015, the European Commission has been reviewing all EU existing legislation on health and safety at work. Still, the damage to workers' health caused by UVR continues to be underestimated throughout the EU. While EU-OSHA states that UVR is one of the most common sources of carcinogenic exposure in the EU member states, the EU occupational safety and health directives have so far failed to protect outdoor workers from skin cancer - as the continuous exposure of workers to UVR is excluded. For instance, the 2006 EU Directive on Optical Radiation (2006/25/EC), which defines limit values for workers' exposure to artificial optical radiation to eyes and skin, does not cover exposure to natural optical radiation (sunlight). This could however be amended accordingly. Also, the European Commission has proposed to amend Directive 2004/37/EC by expanding its scope and by including and/or revising occupational exposure limit values for a number of occupational mutagens and carcinogens. Unfortunately, UVR - as one of the most frequent occupational carcinogen - is also not included, although the initiative is proceeding in steps and a third proposal is currently being negotiated in EU trilogue deliberations.

As welcome as safer workplace legislation is, there remain missed opportunities to increase cancer protection and prevention for the approximately 15 million outdoor workers in the EU who are put at extremely high risk due to UVR. Indeed, risks with postponed effects should not lead to postponed prevention. Actions to increase protection against work-related skin cancer have clearly stagnated.

In November 2017, the European Parliament, the Council and the Commission committed themselves to abiding by the European Pillar of Social Rights, which features 20 key principles aimed at delivering new and more effective rights for citizens. Principle 10 is particularly noteworthy, as it states that "a) Workers have the right to a high level of protection of their health and safety at work. b) Workers have the right to a working environment adapted to their professional needs and which enables them to prolong their participation in the labour

market“ (41). This principle should set the groundwork for introducing targeted measures to better protect outdoor workers exposed to high levels of UVR.

It is now time to adapt policies and legislation to new scientific evidence. Prevention of UVR exposure for outdoor workers should therefore be part of the European agenda. It is cheap and simple, but action is needed. If several EU and non-EU countries have overcome the complex issue of exposure and causation, what is stopping others from following suit and recognising NMSC as an occupational disease?

Interestingly, at international level, article 1.2.5 of the 2010 ILO List of Occupational Diseases, which represents the latest worldwide consensus on diseases caused by work, includes UVR induced NMSC as an occupational disease (42).

As a result, this White Paper provides recommendations for policy-makers, doctors and other health professionals, employers, workers and patient advocacy groups on five fields of action to address the unmet needs of NMSC patients.

Recommendation 1: Policy makers should improve the legislative framework to protect outdoor workers more effectively and build accessibility for regular screenings and thus earlier treatments. In the European Union, NMSC should be officially recognized as an occupational disease within the next legislative period.

The European Commission should update the 2003 Schedule of Occupational Diseases to reflect the fact that non-melanoma skin cancer caused by solar UV radiation is directly linked to occupation. This means including the disease in Annex I, Part 5 of the legislation.

The European Commission should work with the European Parliament and Council to update Directive 2006/25/EC on artificial optical radiation to include solar UV radiation, with specific obligations on health surveillance of outdoor workers, and thus provide accessibility to early treatment or intervention.

The WHO should continue efforts to define and reinforce work place exposure limits to UVR, which should then be used by member countries to develop and implement national legislation.

The ILO should further update its 2010 List of Occupational Diseases and include even more explicit reference to solar UV induced non-melanoma skin cancers.

Member states of the European Union should recognize NMSC as occupational diseases and cater for the needs of outdoor workers in terms of compensation and targeted prevention measures. To that end, national policy instruments need to be adopted or amended accordingly.

Recommendation 2: Doctors, other health professionals and policy makers should work together to ensure standardised EU-wide registration of NMSC.

Registration of NMSC including of subsequent tumours in national cancer registries should become compulsory in order to get a better understanding of the epidemic. Also, the professional activity of the patient should be recorded. This will in turn help develop targeted preventive measures and detect peaks in incidence in risk professions. An improved registration of NMSC will increase efficiency of screening programs, particularly in high risk sectors.

National, European and international dermatological societies should press for national initiatives to include NMSC in population-based cancer registries.

Collecting and analysing cancer registries' data at European level could furthermore ensure effective diagnoses and harmonised quality of care for affected workers across the EU.

Incentives need to be created to encourage registration of NMSC cases in population-based cancer registries and in occupational disease registries of compensation schemes.

Recommendation 3: Employers should use tools to monitor exposure levels to UVR in the workplace. They shall also implement cost-effective techniques for sun-safe behaviour and ensure regular skin cancer screenings for outdoor workers.

Authorities and national insurance systems, together with employers, should conceive and implement a global measurement programme to evaluate exposure to UVR among outdoor workers during their working hours in comparison with their leisure time. This data should be collected in an international database on factual UVR exposure in outdoor workplaces to enable comparability.

UVR exposure should be minimised at the workplace with a variety of technical, organisational and personal strategies. This includes the use of awnings, planning of work schedules to reduce work during high midday sun, optimal use of personal protective measures (clothing, broad-brimmed hats with neck protection, sunglasses), and the use of high SPF sunscreens on uncovered skin surfaces.

Employers' and workers' organisations in professions at particular risk of exposure to UVR should be encouraged to include in social partner agreements workplace health surveillance and regular skin cancer screening of risk populations. The latter will in particular help the (affected) worker to benefit from early treatment, and can be considered as beneficial from a health economic perspective.

Public and private funding should be used to develop simple but effective tools (e.g. apps, UV-dosimeter cards, UV-index, information platforms through social media) to inform/remind outdoor workers how to protect themselves from the sun, and thus drive change to sun-smart protection behaviour.

The efficacy of personal protective equipment strongly depends on workers' compliance, a reason why outdoor workers should be advised of their increased risk and be taught how to self-examine their skin on a regular basis to ensure earlier detection. This will enhance health literacy of the workers.

Recommendation 4: Doctors and other health professionals should improve reporting of occupational NMSC (including actinic keratosis).

Primary care physicians have to be provided with the necessary diagnostic skills and incentives to identify, notify and refer cases of occupational skin cancer to dermatologists. The training on how to recognise and respond to these diseases should form part of the revalidation criteria for general practitioners.

Occupational physicians, on the other hand, need to be trained on how to recognise, notify and refer occupationally induced non-melanoma skin cancer, incl. actinic keratosis to dermatologists. They should also receive comprehensive training on the prevention of

solar UVR induced occupational diseases in order to advise effectively employers at workplace visits.

All physicians should be provided with the tools (e.g. standardized notification forms (40) and simple exposure assessment algorithms (21)) and incentives to report cases of occupational skin diseases.

It is also important to breach gaps between specializations and highlight the need for improved interdisciplinary collaboration, including exchange of data, to improve patient care.

Recommendation 5: Patient advocacy groups, doctors and other health professionals as well as employers should collaborate to promote skin cancer prevention and sun-safe working practices and to address the unmet needs of retired outdoor workers with persisting NMSC.

Evidence suggests that social media campaigns and awareness raising activities targeting workers in risk sectors (e.g. agriculture, construction, fishery, forestry, athletes, swimming pool attendants, kindergarten teachers etc.) can effectively improve knowledge and attitudes about sun protective behaviours. This also applies to low-income countries. Outdoor workers of the future, i.e. children and young population, are an important target group in this context and need to be addressed to foster an early sun safety culture. The information offered to the outdoor workers and young population should be based on good practice examples and research findings.

In this context, community-based educational organizations can bring an added value to penetrate small businesses and self-employed and should be included in the development of activities.

WHO together with ILO should promote good practices in national policies to protect outdoor workers from the dangers of the sun. To that end, a databank on good practice examples of sun safety campaigns and information should be established and put at disposal.

National broadcasters and private media groups should be encouraged to provide air-time for public service announcements on sun safety for outdoor workers.

A multi-stakeholder dialogue should be enhanced to emphasise the need for preventative measures (e.g. sun-shielding, protective clothing, evidence-based sunscreens) to be put in place for outdoor workers, and to educate workers and employers in the importance of applying these measures. The costs for adequate prevention are negligible compared to the costs of inactivity towards the worldwide skin cancer epidemic, let alone what can be saved in terms of life-long human suffering.

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Global Call to Action to End the Non-Melanoma Skin Cancer Epidemic in Outdoor Workers

April 26th, 2019

The nine co-hosting organizations of the Multi-Stakeholders Summit on Occupational Skin Cancer² in cooperation with patient advocacy groups, workers unions, social security representatives, dermatologists and oncologists call for the implementation of a systematic approach to **addressing the Non-Melanoma Skin Cancer Epidemic** in view of the following:

Non-melanoma skin cancer (NMSC)³ is by far the most frequently diagnosed cancer around the globe⁴. It is also one of the most common occupational diseases in Europe and its prevalence continues to increase⁵. For instance, in Germany, it is the second most frequently acknowledged occupational disease. In most countries, it is also the most common occupational cancer. Despite this, victims remain overlooked while prevention efforts, screening and improved access to care are neglected.

A lack of reporting and accurate data on the disease burden has allowed this crisis to remain in the shadows. Outdoor workers in construction and agriculture, recreation and public services may be exposed to solar UV radiation (UVR) for more than 75% of their working lives. UVR is classified by WHO as a group 1 carcinogen. WHO threshold levels are exceeded by five times in many outdoor professions. It is estimated that the risk of developing skin cancer increases significantly – up to more than 100% - with five or more years of outdoor work. If not detected and prevented at an early stage, NMSC leads to a life-long chronicity with abundant newly forming lesions.

The economic costs of NMSC continue to increase, placing governments and healthcare systems under significant economic pressure and affecting the livelihoods of millions of workers around the world.

Despite this alarming reality, outdoor workers lack legislative protection to ensure adequate prevention measures, diagnosis and effective treatments for this occupational disease globally. For that reason, WHO and ILO are currently assessing the global disease burden of occupational skin cancer within the UN Sustainable Development Goals 2030 framework⁶.

² The European Academy of Dermatology and Venereology (EADV), the European Association of Dermato-Oncology (EADO), the Association of European Cancer Leagues (ECL), the International league of Dermatological Societies (ILDS), the European Dermatology Forum (EDF), the International Commission on Occupational Health (ICOH), the European Cancer Patient Coalition (ECPC), the Federation of Building and Woodworkers (EFBWW) and the European Federation of Food, Agriculture and Tourism Trade Unions (EFFAT).

³ NMSC refers to a group of mostly skin-coloured cancers that slowly develop in the upper layers of the skin; the main clinical entities are basal cell carcinoma and squamous cell carcinoma/actinic keratosis. These tumors are also referred to as keratinocytic carcinomata.

⁴ Didona D, Paolino G, Bottoni U, Cantisani C. Non Melanoma Skin Cancer Pathogenesis Overview. *Biomedicines* 2018;6(1):6. doi: 10.3390/biomedicines6010006.

⁵ John SM, Trakatelli M, Gehring R, Finlay K, Fionda C, Wittlich M, Augustin M, Hilpert G, Barroso Dias JM, Ulrich C, Pellacani G. CONSENSUS REPORT: Recognizing non-melanoma skin cancer, including actinic keratosis, as an occupational disease - A Call to Action. *J Eur Acad Dermatol Venereol* 2016;30(Suppl 3):38-45. doi:10.1111/jdv.13608.

⁶ Paulo SM, Adam B, Akagwu C, Akparibo I, Al-Rifaia HR, Bazrafshan S, Gobba FM, Green AC, Ivanov I, Kezic S, Leppink N, Loney T, Modenese A, Pega F, Peters CE, Prüss-Üstün AM, Tenkate T, Ujita Y, John SM. WHO/ILO work-related burden of disease and injury: Protocol for systematic reviews of occupational exposure to solar ultraviolet radiation and of the effect of occupational exposure to solar ultraviolet radiation on melanoma and non-melanoma skin cancer. *Environ Int* 2019 May;126:804-815. doi.org/10.1016/j.envint.2018.09.039.

We urge policy makers, doctors and other health professionals, employers, workers and patient advocacy groups to take five actions to address the unmet needs of NMSC patients:

1. **Policy makers** should improve the legislative framework to protect outdoor workers more effectively, and build accessibility for regular screenings and earlier, better treatments. In the European Union, NMSC should be officially recognized as an occupational disease within the next legislative period.
2. **Doctors, other health professionals and policy makers** should work together to ensure standardised EU-wide registration of NMSC.
3. **Employers** should use tools to quantify exposure levels to UVR in the workplace. They shall also implement cost-effective techniques for sun-safe behaviour and ensure regular skin cancer screenings for outdoor workers.
4. **Doctors and other health professionals** should improve reporting of occupational NMSC (including actinic keratosis).
5. **Patient advocacy groups, doctors and other health professionals, and employers** should collaborate to promote skin cancer prevention and sun-safe working practices, and to address the unmet needs of retired outdoor workers with persisting NMSC.