

The  
**Health Policy**  
Partnership

## **Non-melanoma skin cancer:**

protecting outdoor workers from  
occupational disease



Discussion paper

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# Executive summary

It is now well recognised that exposure to solar ultraviolet radiation (sUVR) is associated with non-melanoma skin cancer (NMSC).<sup>1</sup> The most common types of NMSC are basal cell carcinoma and squamous cell carcinoma, which are collectively also known as keratinocyte carcinomas.<sup>1 2</sup>

More than 36 million workers across the European Union are in a profession that puts them at risk of developing NMSC.<sup>3</sup> Despite convincing evidence that outdoor workers represent a vulnerable group of people who are exposed to high levels of sUVR, few European countries have officially recognised NMSC as an occupational disease.<sup>3</sup> This leaves many outdoor workers inadequately protected from sUVR and unable to mitigate this risk.

Climate change is set to exacerbate the negative impacts of sUVR on outdoor workers,<sup>4</sup> with potential ripple effects on health systems and economies. This requires a proactive response from policymakers to prioritise occupational NMSC, with appropriate health and employment policies implemented at the national and European levels.

Multi-stakeholder solidarity – including policymakers and decision-makers, clinicians and other healthcare providers, employers and employees – is required to drive policy action that can reduce health inequalities and prevent both avoidable costs and harm for individuals and societies. This discussion paper joins many voices that have been advocating for change in this area. We hope it will contribute to this important agenda and help raise the political profile of occupational NMSC in Europe.

# What is the burden of non-melanoma skin cancer in people working outdoors?

**Non-melanoma skin cancer (NMSC) is the most frequently diagnosed cancer globally, and its prevalence is rising.** Approximately 7.7 million people around the world are diagnosed with NMSC every year – more than any other cancer.<sup>5</sup> There are two main types of NMSC: basal cell carcinoma (BCC) and squamous cell carcinoma (SCC), which together are also known as keratinocyte carcinomas.<sup>2,6</sup> NMSC is typically diagnosed in older people, with more than 80% of cases in people over the age of 60.<sup>7</sup> Over the past decades, its incidence has been increasing in many countries,<sup>8</sup> recently among people under 40.<sup>9</sup> As global populations age, the incidence of NMSC may rise by almost 58% by 2040.<sup>10</sup>

**Exposure to solar ultraviolet radiation (sUVR) is the most common risk factor for developing NMSC.** Ultraviolet radiation is a type of energy, either from the sun or artificially produced, that damages DNA in skin cells, leading to premature ageing and skin cancer.<sup>11</sup> Different types of sUVR exposure can lead to different types of NMSC: cumulative exposure is associated with SCC while intermittent exposure is associated with BCC.<sup>1</sup> Other factors also increase a person's risk of NMSC. Men are twice as likely as women to develop NMSC, and it is significantly more common in people with fair skin, light hair colour and light-coloured eyes.<sup>7,12</sup> Furthermore, incidence of NMSC increases with duration of exposure to sUVR.<sup>8</sup>

**The risk of developing NMSC is considerably higher among people who work outdoors, but the condition is rarely recognised as an occupational disease in health or employment policies.** There is a clear link between occupational exposure to sUVR and NMSC (*Box 1*).<sup>7,13,14</sup> Despite this, most European Union (EU) countries do not recognise NMSC as an occupational disease, and people in certain jobs are placed at a high risk of developing NMSC and other skin cancers (*Box 2*).<sup>15</sup>

### **Box 1. NMSC, sUVR and employment: key facts and figures**

- sUVR is the most common occupational carcinogen in the EU.<sup>16</sup>
- Skin diseases, such as NMSC, are the most common occupational disorders.<sup>17</sup>
- Across the EU, 36.1 million people have jobs that place them at greater risk of developing NMSC.<sup>3</sup>
- Compared with indoor workers, outdoor workers are exposed to dangerous sUVR levels three to five times higher.<sup>18</sup>
- Working outdoors for just five years can increase the risk of developing NMSC threefold;<sup>19</sup> outdoor work increases the risk of SCC by up to 77% and BCC by up to 43%.<sup>7 13</sup>

### **Box 2. Types of profession at higher risk of sUVR exposure**

There does not seem to be a consensus on the number of hours that define an 'outdoor worker' across the EU. However, there are many types of outdoor work that place people at a heightened risk of sUVR exposure. These include jobs in the construction, agricultural, fishing and horticultural industries, and recreation or seasonal jobs such as lifeguarding and the ski industry.<sup>18</sup> There are also other professionals who may be required to be outside occasionally and have some level of heightened risk, such as teachers, police officers, military staff and delivery drivers.<sup>18</sup>

**The impact of NMSC is considerable, placing individuals, employers, governments and health systems under significant strain.** NMSC can recur and become a chronic disease,<sup>15</sup> with people requiring repeated surgeries on the head, neck and hands. This may lead to visible scarring,<sup>20</sup> with an impact on self-esteem, mental health and quality of life.<sup>21 22</sup> While surgery and other therapies can cure many cases of NMSC, if it is detected late and at a very advanced stage, it can be fatal.<sup>23</sup> High morbidity and associated treatment costs mean NMSC can place an economic burden on health systems.<sup>24</sup> NMSC itself is associated with significant productivity losses, with many people or their carers being temporarily unable to work or having to retire earlier than planned.<sup>25</sup> In Europe, occupational skin diseases, which include NMSC, are associated with a loss of productivity costing over €5 billion every year.<sup>26</sup>

**This discussion paper explores what is needed to ensure greater recognition of NMSC as an occupational disease in Europe.** It considers what good policy and practice could look like, and what is needed to ensure high-risk outdoor workers are protected, diagnosed and adequately supported. It discusses existing challenges to greater political recognition of this issue as well as the emerging challenge posed by the warming climate, which means more people than ever before may find themselves at an increased risk of NMSC and other types of skin cancer. We hope this paper galvanises health and employment policymakers to better support all people with, or at risk of, NMSC.



# Policy and practice for occupational non-melanoma skin cancer

## Policy progress to date

**Recognition of the need to protect outdoor workers from occupational NMSC has increased over the past decade, but this is still not enough.** Despite many European and global efforts to raise awareness of this issue and change policy (*Figure 1*), the way in which occupational NMSC is addressed across the continent is hugely variable. Many policies are still required at the national level to increase awareness and promote early screening and detection of NMSC in outdoor workers. Furthermore, there is no common or consistent EU-wide approach to financial compensation and employer responsibility for people with occupational skin cancer.<sup>27</sup> Climate change is amplifying the problem, with a rise of 2°C in global temperatures predicted to increase skin cancer incidence by 11% globally by 2050.<sup>28</sup> It is essential that climate change no longer be omitted from this conversation.



**Figure 1. Key policy developments and milestones around NMSC as an occupational disease**

Year	Activity
2013	Initiation of Development and Implementation of European Standards on Prevention of Occupational Skin Diseases (StanDerm), an EU-funded project from the European Cooperation in Science and Technology (COST) Action. <sup>29</sup>
2016	Call to action developed by Ulrich <i>et al.</i> encouraging the European community to adopt a multidisciplinary approach to NMSC awareness-raising, screening, management, aftercare and risk reduction in all Member States. <sup>27</sup>
2017	COST Action StanDerm launches evidence-based common European standards for occupational skin cancers. <sup>29</sup>
2019	Global call to action launched by nine leading international groups, including the European Academy of Dermatology and Venereology, European Association of Dermato-Oncology and Association of European Cancer Leagues. <sup>30</sup> The call included the need to officially recognise UV-induced NMSC as an occupational disease and ensure outdoor workers are more effectively protected from the sUVR and have access to regular screening. <sup>30</sup>
2020	International Labour Organization includes NMSC in its <i>List of Occupational Diseases</i> . <sup>31</sup>
2021	Europe's Beating Cancer Plan launched, acknowledging the importance of reducing exposure to environmental hazards, including sUVR, in the workplace. <sup>32</sup>
2022	<i>International Classification of Diseases</i> (ICD-11) revised with new coding options to help provide differentiation between different causes of NMSC. <sup>33</sup>

## What could good policy and practice look like, and what are the current challenges?

**There are five key elements of optimal management and support for people with NMSC:**

- Comprehensive and supportive health and employment policies
- Public health strategies and multidisciplinary approaches that drive NMSC prevention
- Early detection and diagnosis
- Accessible, coordinated and innovative approaches to treatment
- Ongoing follow-up and support.

### **Comprehensive and supportive health and employment policies**

**All workers should be adequately protected from risks in the workplace.** The 2017 European Pillar of Social Rights was established in part to ensure people have their health and safety protected at work, and have their work environment adapted to prolong healthy employment.<sup>34</sup> In the context of NMSC, this means employers should monitor and protect outdoor workers exposed to sUVR.<sup>21 35</sup>



**There are major discrepancies in how NMSC is addressed across Europe.** EU frameworks need to be adequately implemented at a national level to protect workers through access to regular screening, diagnosis and treatment.<sup>21</sup> However, few countries have developed comprehensive programmes for occupational skin cancer prevention, screening and aftercare.<sup>27</sup> A pioneer in this area is Germany, which was the first country to officially include some forms of NMSC in its list of occupational diseases (*Box 3*). Other countries are following the example set by Germany, but the extent of protections varies between countries (*Box 4*). Regulations and policies in relation to NMSC are needed to better support both employees and employers, with common legislation to promote equal working conditions and protections for all workers.<sup>29</sup> Any new frameworks must also be adaptable to potential new health risks, such as rising temperatures and increased exposure to sUVR, that outdoor workers may be subjected to in the future.

### **Box 3. Occupational NMSC in Germany: paving the way**

In 2015, SCC was added to the Ordinance on Occupational Diseases (also called Bamberg Recommendations, BKV).<sup>36</sup> The BKV legislation outlines how to assess whether there is a link between NMSC and a person's occupation, and provides thresholds for financial compensation.<sup>36 37</sup> It has coincided with the establishment of comprehensive occupational disease surveillance systems and the Occupational Health Prevention (OHP) programme.<sup>3 38</sup> The OHP focuses on supporting all employees who work outdoors for more than one hour per day between 11:00 and 16:00 for over 50 days between April and September.<sup>3</sup> Employers are also required to ensure access to personal protective equipment and sunscreen and to conduct sUVR-exposure training for their employees.<sup>27</sup> The legislation currently includes only SCC,<sup>3</sup> while BCC is still not officially recognised as an occupational disease, so people living with BCC may not be able to access such support.

#### **Box 4. What legislation exists in Europe to protect outdoor workers from skin cancer?**

- Only Denmark, France and Germany have established programmes for work-related skin cancers.<sup>27 39</sup>
- Seven countries in Europe – the Czech Republic, Denmark, France, Germany, Italy, Portugal and Romania – recognise SCC as potentially work-related.<sup>27 39</sup>
- BCC has yet to be recognised legally as work-induced, despite being acknowledged as potentially work-related in Denmark, France, Germany, Italy, Portugal and Romania.<sup>27 39</sup>

### **Public health strategies and multidisciplinary approaches that drive NMSC prevention**

#### **There are many effective interventions to prevent NMSC in the workplace.**

Occupational NMSC is largely preventable through programmes and policies that adapt infrastructure, encourage personal protection, and increase education and access to experts (*Figure 2*).<sup>29 40-43</sup> Employers, healthcare professionals (including general practitioners and occupational physicians), patient advocacy groups and outdoor workers themselves all play an important role in assessing risk for NMSC and implementing preventive measures.<sup>18 19 35 44 45</sup> Such programmes, which can improve both quality of life and ability to work,<sup>46</sup> may facilitate earlier diagnosis of NMSC.<sup>16</sup> Many of these programmes have been shown to be cost-effective and even cost-saving (*Box 5*).<sup>47</sup>

**Despite the many benefits of preventive programmes, implementation can be challenging.** A holistic approach inclusive of physical protections and awareness raising is required. Employers may not be willing to invest in prevention programmes without government intervention, and the majority of EU Member States do not have effective employee sun-protection strategies in place.<sup>27</sup> Evidence suggests that where employers are involved in NMSC prevention, employees tend to have better protection practices, with improved use of sunscreen, sunglasses and hats, as well as a lower prevalence of sunburn.<sup>48</sup>

**Figure 2. Challenges to the implementation of prevention strategies**

Category	Prevention strategy	Challenges to implementation
<p><b>Infrastructure and organisational changes</b></p>	<p>Physical protections, including placing a roof over outdoor working areas, installation of sun panels or shades, sUVR-absorbing windows for vehicles and shaded areas for breaks<sup>18,29</sup></p> <p>Adaptation of working patterns to avoid sUVR exposure between 11:00 and 15:00<sup>18</sup></p>	<p>These changes place practical and financial demands on employers, who may not be in a position to make the investment</p>
<p><b>Personal protection</b></p>	<p>Protective clothing, including long-sleeved shirts, trousers and broad-brimmed hats<sup>18</sup></p> <p>Sunscreen applied every two hours to all uncovered areas<sup>18</sup></p>	<p>Wearing some kinds of protective clothing can elevate body temperature, leading to discomfort and physical exhaustion<sup>40,49</sup></p> <p>Sunscreen may not always be applied in the appropriate amount or at the right frequency<sup>18</sup></p> <p>Employers may not always be willing or able to provide protections such as sunscreen<sup>50</sup></p>
<p><b>Educational programmes</b></p>	<p>Regular information on sUVR exposure provided to employees and people in vocational training<sup>29</sup></p> <p>Individual support to encourage improved personal protection behaviours<sup>29</sup></p>	<p>Information related to the correct forms of protection is not always available<sup>51</sup></p> <p>Some outdoor workers may underestimate their risk of skin cancer and not use adequate sun protection<sup>52</sup></p>
<p><b>Access to experts</b></p>	<p>Relevant healthcare professionals accessible for screening and to facilitate diagnosis, particularly for groups at high risk of NMSC and other occupational skin diseases<sup>29</sup></p>	<p>Access to health services, diagnosis and treatment provided by experts remains a challenge in many countries due to the number of available dermatologists, for example<sup>53</sup></p>

### **Box 5. Economic evaluations of skin cancer screening and prevention programmes**

There are various examples of effective screening and prevention programmes for skin cancer, including NMSC:

- In Germany, a 12-month population-based skin cancer screening project called SCREEN led to cost savings of over €575 million per year.<sup>46</sup>
- In the US, a national school-based sun safety education programme called SunWise saved \$2 to \$4 in medical costs and productivity losses for every \$1 spent.<sup>54</sup>
- Two Australian studies demonstrated that primary prevention in the general population was highly cost-effective, with a high return on investment: for every dollar spent on skin cancer prevention, the return was around three to four times greater.<sup>55 56</sup>
- Eleven economic evaluations across multiple EU and non-EU countries have demonstrated that screening and prevention programmes – including promotion of regular sunscreen use, school-based initiatives and mass educational campaigns – were either cost-effective or cost-saving.<sup>47</sup>

## Early detection and diagnosis

### **While clinical guidelines clearly highlight how to diagnose NMSC, delays to diagnosis are common.**

Correct diagnosis of NMSC depends on an accurate patient history, clinical examination, skin biopsy and dermatopathology.<sup>29</sup> Various European and national consensus-based guidelines and standards exist to guide NMSC diagnosis.<sup>29 57-59</sup> There is generally a requirement that general practitioners, occupational physicians, dermatologists, employers, workers and their safety representatives all be involved in risk assessment and initiatives to prevent NMSC.<sup>29 44 45</sup> Delays to diagnosis can occur, however.<sup>60 61</sup> They may be caused by limited resources for screening programmes, a lack of general practitioners trained in dermatology, late presentation to primary care or inappropriate referral to specialists that contradicts national guidelines.<sup>61 62</sup> One option to prevent inappropriate referral involves training community healthcare professionals to assess risk and make referrals; *Case study 1* presents a trial of using pharmacists to improve early assessment of NMSC across Spain. Once NMSC has been diagnosed, it can be difficult to establish a causal link with sUVR exposure in the workplace.<sup>63</sup> Employers should develop strategies to monitor sUVR in their employees.<sup>15</sup>

#### **Case study 1. Involving community pharmacists in skin cancer triage process**

One Spanish study has found that trained pharmacists could triage people with a high risk of developing NMSC, referring them to general practitioners if total body skin examination is required.<sup>61</sup> This strategy may be considered in multidisciplinary approaches to skin cancer screening, broadening the number of people screened, increasing early detection, optimising use of resources and ultimately enhancing cost-effectiveness.<sup>61</sup>



## Accessible, coordinated and innovative approaches to treatment

**NMSC is treatable if diagnosed early, and guidelines clearly outline treatment options.** Many guidelines exist for the management of different types of NMSC, at the national and international level.<sup>29 57 59 64 65</sup> There exists a variety of different therapies for early-stage NMSC, including surgical removal, cryotherapy, localised chemotherapy or radiation, and immune-system modulators.<sup>66 67</sup> When diagnosed early, five-year survival is over 95% for both SCC and BCC.<sup>68 69</sup> However, NMSC can sometimes return and become a lifelong chronic disease that requires ongoing treatment.<sup>21</sup>

**When NMSC progresses to more advanced or metastatic forms, treatment options become limited.** Treatment typically involves extensive surgery, radiotherapy or aggressive chemotherapy and immunotherapy.<sup>57 66 70</sup> Inequalities in access to such types of treatment are common, and there are still many therapeutic unmet needs for people with advanced and metastatic NMSC.<sup>71</sup> In some European countries, for example, targeted therapies are only available in certain specialised centres.<sup>72</sup> This is a contributing factor to poor prognosis at the most advanced stage,<sup>71</sup> when five-year survival is approximately 40%.<sup>68 69</sup>

**Multidisciplinary care is vital for people living with NMSC.** The burden of NMSC is increasing considerably due to its rising incidence, population ageing and complexity of cases; this requires a multidisciplinary approach, referral networks and partnerships for NMSC care.<sup>73 74</sup> Management of NMSC – particularly its more advanced forms – often necessitates the expertise of multiple specialists, requiring interdisciplinary management and aftercare.<sup>27 73</sup> Such care includes involvement from dermatologists, general and plastic surgeons, oncologists and specialist nurses.<sup>62</sup> Care provided through multidisciplinary teams allows people with NMSC to access a wide range of expertise and treatment options.<sup>62</sup> To ensure the most benefit, there is a need to facilitate communication and collaboration between specialists and professionals in the skin cancer care team.

**Delivering multidisciplinary care is still a challenge in some countries.** While the UK has yet to recognise NMSC as an occupational disease, it has implemented a multidisciplinary approach to its management: it is recommended people with NMSC are cared for by either local or regional skin cancer multidisciplinary teams,<sup>75</sup> but access remains challenging with only one dermatologist per 100,000 people.<sup>53</sup> In Spain, there are also noted challenges in equitable access to specialists, with an average of only 2.9 dermatologists per 100,000 people. This is considerably lower than in Germany or Greece where 6.5 and 11.4 dermatologists are available per 100,000 people, respectively.<sup>53</sup> *Case study 2* outlines one approach to the issue of access to specialists.

## Case study 2. Ensuring equitable access to care in Spain and the UK through teledermatology



The efficiency of skin cancer management can be improved through teledermatology – dermatology practised remotely – addressing issues in access to specialists and reducing unnecessary hospital visits.<sup>76</sup> This approach is increasingly being used.

More than 25% of dermatology centres in Spain offer teledermatology, allowing people with skin cancer to receive rapid emergency care, access educational information and communicate with physicians.<sup>77</sup> The waiting time for an urgent teledermatology consultation is approximately 48–72 hours, considerably lower than the waiting time seen in other countries.<sup>53</sup>

The UK has a waiting time of up to two weeks for an urgent face-to-face appointment,<sup>53</sup> but the technology for remote consultations is widely used and accepted by both healthcare professionals and patients.<sup>62</sup>

It is hoped that continued and more consistent uptake of digital health technologies could reduce unnecessary referrals, waiting times and costs of care, as well as automating some of the decision-making related to NMSC.<sup>62</sup>

## Ongoing follow-up and support

**Continuous follow-up is highly recommended for people with NMSC, as the disease can be recurrent.** Approximately 30–50% of people living with SCC develop another tumour within five years of diagnosis.<sup>57</sup> It is therefore recommended that people be closely monitored by their healthcare team and taught how to conduct regular skin examinations themselves, so that any tumour recurrence can be identified and treated quickly.<sup>57</sup>

**Ensuring appropriate support is available to people with NMSC can help address potential long-term consequences of the disease and its treatment.** In the UK, guidance notes that psychological support and high-quality information should be available as part of best-practice care.<sup>78</sup> However, comprehensive and ongoing clinical monitoring and support can be challenging to access. In Spain, for example, people with NMSC are managed and followed up differently between small and large cities, and there is no routine follow-up pathway.<sup>53</sup> This means that people may receive very different care depending on where they live.

**The hidden costs of occupational NMSC should mean people diagnosed with it are entitled to financial compensation, in line with other occupational diseases or injuries.** In many European countries, treatment and impairment related to occupational diseases and injuries are covered through a mixture of national healthcare and private insurance, with prevention and rehabilitation often included.<sup>79</sup> People diagnosed with NMSC caused by occupational exposure to sUVR should receive such benefits and compensation. Where NMSC is classified as an occupational disease, compensation and support is available (*Case study 3*). While a few countries have established ways to differentiate between occupation- and leisure-related exposure to sUVR, demonstrating a clear link between NMSC and occupational exposure forms the basis for compensation in Germany (*Case study 4*). However, this is not the case in all countries (*Box 6*).

### **Case study 3. Criteria for compensation of occupational NMSC in Germany**

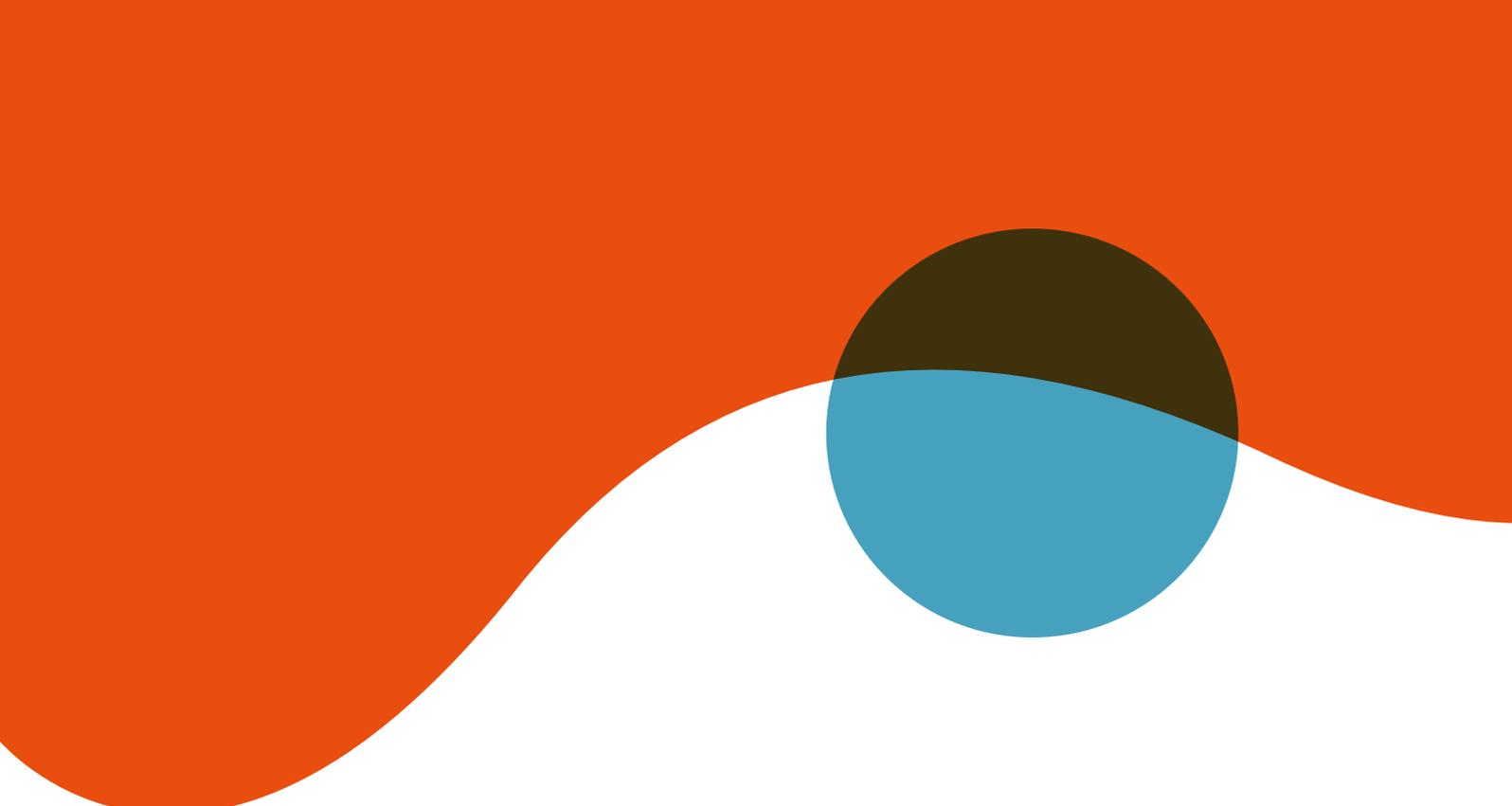
In Germany, workers are covered by mandatory comprehensive accident insurance.<sup>17</sup> Should a person with occupational skin cancer such as NMSC have their earning capacity reduced by 20% or more for longer than 26 weeks, they are entitled to receive benefits.<sup>80</sup> People facing severe illness are entitled to substantial compensation.<sup>81</sup> German insurers are also obliged to cover treatment, ensure preventive measures are in place against potential recurrences and provide educational materials and training for at-risk workers.<sup>27 80 81</sup>



### **Case study 4. Linking a diagnosis of NMSC with occupational exposure to sUVR**

The German Society of Occupational and Environmental Dermatology and the German Statutory Accident Insurance set criteria for the recognition of occupational NMSC.<sup>80</sup> To be able to determine the occupational nature of NMSC, a retrospective assessment of occupational and recreational sUVR exposure is required.<sup>36</sup> If more than 40% of the sUVR to which the tumour site was exposed was occupational rather than recreational, the person must be compensated.<sup>36 80</sup>





### **Box 6. Context-specific evidence, political recognition and compensation**

In the UK, if people become ill or develop a work-related disability, they may make a claim under the Industrial Injuries Disablement Benefit.<sup>82 83</sup> However, as NMSC is not included in the list of eligible diseases,<sup>84</sup> outdoor workers are left insufficiently protected and supported. People with NMSC who served in the UK armed forces and who were likely to have been exposed to high levels of sUVR, such as in East Asia, are able to claim compensation through a separate scheme though.<sup>85</sup>

Similarly, it has been recognised that mountain and ski guides across Austria, Germany and Switzerland – a high-risk group with particular needs for prevention and support – remain inadequately protected.<sup>86</sup> Owing to their infrequent visits to dermatologists, data on the skin health of these workers are still very limited, preventing the generation of evidence-based recommendations to protect mountain and ski guides in the Alps.<sup>86</sup>

# Establishing occupational non-melanoma skin cancer on the European agenda: existing and emerging challenges

## Data on occupational non-melanoma skin cancer

**Poor recognition of NMSC has led to inadequate data collection.** There are very few registries that provide reliable information on NMSC,<sup>24</sup> and the true burden of the disease is likely to be significantly higher than currently estimated.<sup>87</sup> Data collection for NMSC is challenging as information is rarely digitised and data-sharing capabilities remain limited.<sup>81</sup> A more realistic estimation of NMSC cases may be found where treatment claims data are collected.<sup>87</sup> In Germany, data collection greatly improved after NMSC was recognised as an occupational disease (*Case study 5*).

### Case study 5. The value of improving data collection on occupational NMSC: lessons from Germany

Since Germany formally recognised NMSC as an occupational disease in 2015, the incidence of occupational diseases has increased considerably. In 2015–16, approximately 8,000 cases of occupational NMSC were reported.<sup>81</sup> Between 2015 and 2019, a total of approximately 44,000 cases of occupational diseases were reported, with 60% officially recognised as being occupation-related.<sup>3</sup> While this is a significant increase in incidence when compared with data collected in previous years, the true number of occupational skin cancers is still estimated to be much higher than the number of registered cases.<sup>17</sup>

NMSC incidence data post-2015 are higher in Germany than in southern European countries.<sup>3</sup> As these countries are expected to have higher levels of sUVR, this suggests significant underreporting of NMSC cases.<sup>3</sup>





**The lack of occupation-related NMSC data has major real-life consequences.**

It is important to collect data on occupation in population-based cancer registries to fully understand risks of NMSC and develop appropriate prevention policies and interventions.<sup>88</sup> While there are approximately 20 population-based cancer registries across the continent that have included NMSC in their data sets,<sup>88</sup> the majority do not collect information on the person's occupation.<sup>89</sup> Without a better understanding of NMSC and its risks, prevention efforts may remain isolated and underprioritised.<sup>26 87</sup> This leaves a large number of people affected by NMSC without access to adequate care and support.<sup>29</sup>

**While NMSC is an emerging workforce challenge, gaps in the research limit our ability to fully understand occupational NMSC.** Most studies that involve NMSC and sun safety have been conducted in countries with a significant amount of sUVR exposure, such as Australia and the US,<sup>63</sup> and the pattern of disease is likely to be different in European countries.<sup>75</sup> Furthermore, it is very difficult to differentiate occupational exposure from recreational exposure.<sup>63</sup> If the true burden of occupational NMSC were uncovered, it is likely that new legislation and protections for outdoor workers would become compelling.

**Improvements in data collection would facilitate greater recognition of NMSC as an occupational disease.** There is still no common approach or framework for NMSC data collection and reporting of occupational NMSC across Europe.<sup>15</sup> Improved data collection will support better management of occupational NMSC and development of new targets for safety and health at work.<sup>90</sup>

## Protecting all outdoor workers

**Informal and unregistered outdoor workers are exposed to high levels of sUVR, but they are unlikely to receive employment protections.** Informal workers represent a group that is at a particularly high risk of developing NMSC. One study found that 32% of workers in the agricultural sector and 9% of workers in the construction sector do not have any formal employment contracts.<sup>91</sup> Without such contracts, workers are generally not eligible for compensation or employment support should they develop occupational NMSC, and may be less likely to receive basic protections from their employers.<sup>92</sup> While this population may be hard to reach via traditional routes, it should be taken into consideration by decision-makers.

**Differentiating between occupational and recreational sUVR exposure remains challenging, hindering the implementation of policies that protect outdoor workers.** Whether skin cancer can be determined to be occupational is often difficult to confirm, owing to the possibility of exposure from recreational activities.<sup>24</sup> However, there may be ways to overcome this. Personal UV dosimeters could be a way to calculate total exposure and differentiate the exposure received while at work,<sup>93</sup> providing evidence and allowing preventive initiatives to be put in place.

## A warming world

**Climate change contributes to the ever-growing burden of skin cancers, including NMSC.** There is compelling evidence that climate change is likely to play an even greater role in the incidence of skin cancer in the future.<sup>94</sup> Owing to a reduction in ozone levels, people around the world are being exposed to more sUVR and face an increasing risk of NMSC and other types of skin cancer.<sup>95 96</sup> Furthermore, the cancerous effect of sUVR is estimated to increase by 5% for every 1°C that the temperature rises; as global temperatures increase, there will be more people at risk of NMSC in the future.<sup>94</sup> Climate change is also putting people who live in traditionally cooler climates, including in Europe, at a higher risk than ever before.<sup>95</sup> Outdoor workers and people with limited access to healthcare services will continue to be disproportionately impacted by the climate crisis, exacerbating health inequalities related to skin cancer.<sup>95</sup> This will accelerate the need for mitigation strategies that attenuate the negative impacts of climate change on people and the environment.



## Looking ahead

Various initiatives have been started to highlight the political issue of NMSC as an occupational disease across Europe. Five key actions could help to advance this at the national and European levels:

- Officially recognise sUVR-induced NMSC as an occupational disease through facilitation of NMSC data reporting and collection
- Recognise that the changing climate will require new and adapted protections against sUVR
- Promote early detection and diagnosis of occupational NMSC
- Ensure treatment of NMSC is multidisciplinary, accessible, coordinated and innovative
- Provide continuous follow-up and support to prevent NMSC recurrence and improve quality of life.

**Now is the time to take a new look at the existing and emerging challenges around occupational NMSC.** Coordinated action is needed to amplify and support existing efforts in sun protection, but new approaches are also required to protect all outdoor workers in light of a changing climate and changing risk profiles. Such action needs to be taken at both national and European levels to ensure that all workers are adequately protected, regardless of where they live.

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