Dear Norwegian Radiation and Nuclear Safety Authority,

I wish to comment on and critically appraise the consultation document on stricter regulation of sunbeds released on April 30th, 2025.

The well-appreciated overall aim of this amendment is to improve public health. The hypothesis is that when reducing solarium use by stricter regulations of solariums, this would translate into improved health and survival in the Norwegian population. The currently available scientific evidence is not in line with this hypothesis, as I outline below. Therefore, the consultation document should not be implemented.

If solarium use would be of significant harm to human health, then solarium users versus non-users should have a reduced life expectancy, as smokers versus non-smokers have a reduced life expectancy. I use the comparison with smoking as the authors of the consultation document used the analogy to smoking multiple times throughout the whole document. Data from the UK biobank study in 18,177 solarium users versus 376,909 solarium non-users showed a significantly reduced (!!) all-cause mortality in solarium users versus non-users by 15% (hazard ratio (HR) 0.85; 95% CI: 0.79 to 0.91) in fully adjusted models considering various potential confounding factors (Stevenson AC, et al. Health Place. 2024 Sep; 89: 103328. doi: 10.1016/j.healthplace.2024.103328). In the same study, solarium users versus non-users yielded a significant reduction in cardiovascular, cancer, and non-cancer/non-cardiovascular mortality by 23%, 14%, and 12%, respectively. Contrary to observational studies on smoking, that finally led to restrictions on smoking due to adverse outcomes in smokers versus non-smokers, the observational study results from the UK biobank on solarium use suggest an overall health benefit, and not a harm, for solarium use. This strongly argues against the hypothesis that reducing the use of solariums may improve public health and survival in the general population. It should be acknowledged that the UK biobank data suggesting a survival advantage for solarium users are just observational, and are thus no definite proof of causality, but restrictions for smoking were also only based on observational data. In evidence-based medicine, we usually refer to the highest level of evidence, and for the potential effect of solarium use on mortality, data from the UK biobank (i.e., large well designed observational studies) are the highest level of evidence on this topic and must thus be considered.

It is of great concern that in the consultation document, the justification for the restriction of solarium use is exclusively based on the carcinogenic effect of solarium use regarding skin cancer. This argumentation is insufficient to justify the restriction of solarium use due to several reasons. Firstly, scientific literature indicates that there are both positive and negative effects of solarium use or UV radiation (see e.g., Riedmann U, et al. Photochem Photobiol Sci. 2025 Jun;24(6):867-893. doi: 10.1007/s43630-025-00743-6. or Slominski RM, et al. Nat Rev Endocrinol. 2025 Apr 22. doi: 10.1038/s41574-025-01107-x), so that the conclusion on the overall health effect of solarium use should be based on overall health outcomes (e.g., total mortality) and not on certain health outcomes such as skin cancer, while neglecting other diseases. Note that physical activity may cause injuries and is therefore potentially lethal, while the overall health benefits of physical activity outweigh the adverse effects, so that there is a wide recommendation for regular physical activity . Secondly, the above-mentioned UK biobank study did not show a significant association of solarium use versus non-use with melanoma incidence or melanoma mortality (Stevenson AC, et al. Health Place. 2024 Sep; 89: 103328. doi: 10.1016/j.healthplace.2024.103328). Therefore, it is not established in the scientific literature that solarium use causes malignant melanoma deaths, which is

also reflected by debates on this issue in scientific articles (see e.g., Reicharth J, et al. Anticancer Res. 2020 Jan;40(1):501-509. doi: 10.21873/anticanres.13978). In this context, it must also be stressed that various scientific publications documented significant overdiagnosis of malignant melanoma with rising incidence rates but little or no changes in mortality from malignant melanoma (Bjørch MF, Gram EG, Brodersen JB.BMJ Evid Based Med. 2024 Jan 19;29(1):17-28. doi: 10.1136/bmjebm-2023-112341.PMID: 37793786; Adamson AS, Naik G, Jones MA, Bell KJ.BMJ Evid Based Med. 2024 May 22;29(3):156-161. doi: 10.1136/bmjebm-2023-112460; Adamson AS, Welch H, Welch HG.JAMA Intern Med. 2022 Oct 3;182(11):1181-9. doi: 10.1001/jamainternmed.2022.4342). Therefore, the rise in skin cancer incidence is significantly driven by overdiagnosis and it is unclear whether, and if so, to what extent, there is a true increase in skin cancer incidence over time (Adamson AS, Welch H, Welch HG.JAMA Intern Med. 2022 Oct 3;182(11):1181-9. doi: 10.1001/jamainternmed.2022.4342). Importantly, if solarium use would cause malignant melanomas that in turn increase cancer mortality in the general population, solarium users must have a higher cancer mortality as compared to non-users, if the net effect of solarium use would be detrimental as stated in the consultation document. By contrast, the opposite has been shown in the UK biobank study, and many other investigations showed that more versus less UV radiation is associated with an overall reduced total and cancer mortality (Riedmann U, et al. Photochem Photobiol Sci. 2025 Jun;24(6):867-893. doi: 10.1007/s43630-025-00743-6). Note that the main issue is not whether solarium use increases melanoma skin cancer incidence but whether the overall health effects of solarium use (including potential effects regarding skin cancer incidence) are detrimental or not (or even beneficial). Thirdly, skin cancer encompasses several types of skin cancer that have significant differences in terms of morbidity and mortality. Therefore, mixing all these different entities (e.g., malignant melanoma, squamous cell carcinoma and basal cell carcinoma) is not appropriate. For example, while malignant melanoma patients have a significantly increased risk of mortality (when compared to individuals without malignant melanomas) and contribute to most skin cancer deaths, one study from Denmark showed that patients with basal cell carcinoma (BCC) have even a reduced risk of mortality compared to age- and gender-matched controls from the general population, hypothetically reflecting that more lifetime UV exposure (as indicated by the occurrence of BCC) may increase longevity (Jensen AO, et al. Acta Derm Venereol. 2010 Jul;90(4):362-7. doi: 10.2340/00015555-0899).

It is noted in the document that solariums are unsuitable as a source of vitamin D and that the increased risks of skin cancer are far greater and better documented than the health benefits of vitamin D. This is not in line with the available evidence (as outlined above) and I also wish to emphasize that solarium users do have significantly higher (i.e., better) vitamin D status than non-users (see e.g. (Stevenson AC, et al. Health Place. 2024 Sep; 89: 103328. doi: 10.1016/j.healthplace.2024.103328). This improved vitamin D status in solarium users versus non-users may well be beneficial to major health outcomes as supported by acknowledged health benefits of vitamin D supplementation according to the Endocrine Society (see e.g., the Endocrine Society Guideline on vitamin D: Demay MB, et al. J Clin Endocrinol Metab. 2024 Jul 12;109(8):1907-1947. doi: 10.1210/clinem/dgae290). In addition, it must be emphasized that UV radiation has many non-vitamin D dependent potentially beneficial effects for human health as summarized in some well published papers (see e.g., Slominski RM, et al. Proc Natl Acad Sci U S A. 2024 Apr 2;121(14):e2308374121. doi: 10.1073/pnas.2308374121). The overall beneficial effect of UV emitting devices is also underscored by the fact that patients with vitiligo, a disease that is usually treated by UV emitting devices (i.e., phototherapy), have reduced all-cause mortality and cancer mortality

compared to matched controls (Ju HJ, et al. J Invest Dermatol. 2024 Jan;144(1):125-132.e3. doi: 10.1016/j.jid.2023.07.007).

Apart from the above-mentioned data on solarium use and mortality (Stevenson AC, et al. Health Place. 2024 Sep; 89: 103328. doi: 10.1016/j.healthplace.2024.103328), there is also compelling evidence that more UV exposure by the sun is associated with lower (and not higher) mortality, suggesting that the benefits of UV exposure outweigh the adverse effects as reflected by mortality outcomes (see e.g. Lindqvist PG. Anticancer Res. 2018 Feb;38(2):1173-1178. doi: 10.21873/anticanres.12337 and Stevenson AC, et al. Health Place. 2024 Sep; 89: 103328. doi: 10.1016/j.healthplace.2024.103328). Using the example of smoking as in the consultation document, an observational study from Sweden concluded that avoidance of sun exposure is a risk factor of similar magnitude as smoking in terms of mortality (Lindqvist PG. Anticancer Res. 2018 Feb;38(2):1173-1178. doi: 10.21873/anticanres.12337). Interestingly, even COVID-19 mortality was reduced in regions with more versus less solar UV A radiation (Cherrie M, et al. Br J Dermatol. 2021 Aug;185(2):363-370. doi: 10.1111/bjd.20093).

Finally, if the overall health benefits of solarium use outweigh potential adverse effects, any measures to reduce solarium use would be harmful (and not beneficial) to public health. This is in line with several studies and scientists suggesting to modify recommendations regarding UV exposure (Riedmann U, et al. Photochem Photobiol Sci. 2025 Jun;24(6):867-893. doi: 10.1007/s43630-025-00743-6). Any initiatives to reduce solarium use by regulations should be based on studies that assess hard clinical endpoints (such as e.g., total mortality or other major disease outcomes such as cardiovascular mortality) and not only skin cancer incidence, while neglecting data that total cancer mortality is reduced in solarium users versus non-users (Stevenson AC, et al. Health Place. 2024 Sep; 89: 103328. doi: 10.1016/j.healthplace.2024.103328; Riedmann U, et al. Photochem Photobiol Sci. 2025 Jun;24(6):867-893. doi: 10.1007/s43630-025-00743-6). In conclusion, there are harms and benefits of solarium use and UV exposure in general, but current evidence suggests that the overall beneficial health effects outweigh the adverse effects of solarium use (Stevenson AC, et al. Health Place. 2024 Sep; 89: 103328. doi: 10.1016/j.healthplace.2024.103328; Riedmann U, et al. Photochem Photobiol Sci. 2025 Jun;24(6):867-893. doi: 10.1007/s43630-025-00743-6). Therefore, reducing solarium use would likewise translate into worse public health outcomes and may lead to more deaths and significant burden to the healthcare system.

Yours sincerely,

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