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MEDICAL SCIENCES

# Addressing the health benefits and risks, involving vitamin D or skin cancer, of increased sun exposure

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## Abstract

Solar radiation is the main cause of skin cancers. However, it also is a main source of vitamin D for humans. Because the optimal status of vitamin D protects against internal cancers and a number of other diseases, a controversy exists: Will increased sun exposure lead to net health benefits or risks? We calculated the relative yield of vitamin D photosynthesis as a function of latitude with a radiative transfer model and cylinder geometry for the human skin surface. The annual yield of vitamin D is 3.4 and 4.8 times larger below the equator than in

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the U.K. and Scandinavia, respectively. In populations with similar skin types, there are clear latitude gradients of all major forms of skin cancer, indicating a north–south gradient in real sun exposure. Surprisingly, the incidence rates of major internal cancers also increase from north to south. However, the survival prognosis also improves significantly from north to south. Reasons for these findings are discussed in view of the role of vitamin D. In Norway, melanoma rates increased by a factor of 6 from 1960 to 1990, while the prognosis improved in the same period. After 1990, melanoma rates have remained constant or even decreased in age groups <50 years, whereas the prognosis has not improved further. These data, together with those for internal cancers and the beneficial effects of an optimal vitamin D status, indicate that increased sun exposure may lead to improved cancer prognosis and, possibly, give more positive than adverse health effects.

body mass index | cutaneous malignant melanoma | squamous cell carcinoma | ultraviolet radiation

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## Footnotes

Author contributions: J.M. designed research; A.C.P. and A.D. performed research; J.M., A.C.P., and A.D. analyzed data; and J.M. and R.B.S. wrote the paper.

The authors declare no conflict of interest.

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