

WHO-Facts Sheet

1. Health Consequences of Excessive Solar UV Radiation
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1. HEALTH CONSEQUENCES OF EXCESSIVE SOLAR UV RADIATION

New WHO report shows breakdown of disease caused by UV radiation

Ultraviolet radiation from the sun causes a considerable global disease burden, including specific cancers, a new World Health Organization (WHO) report finds. Much of the UV-related illness and death can be avoided through a series of simple prevention measures.

The report, *Global Burden of Disease of Solar Ultraviolet Radiation* estimates that up to 60,000 deaths a year worldwide are caused by too much exposure to ultraviolet radiation (UVR). Of those 60,000 deaths, an estimated 48,000 are caused by malignant melanomas, and 12,000 by skin carcinomas.

In total, more than 1.5 million DALYS ("disability-adjusted life years") - a measure of the loss of full functioning due to disease and death are lost every year due to excessive UVR exposure. The most serious consequence of excess UVR is malignant melanoma, which has high cure rates only if detected early. Up to 90% of the global burden of disease from melanoma and other skin cancers are estimated to be due to UVR exposure.

The new WHO report is the first-ever systematic examination of the global health burden due to UVR. It investigates nine adverse health outcomes from excess UVR exposure. The main three, which cause the greatest burden of disease from UVR, are cutaneous malignant melanomas, and non-melanoma skin cancers developing in different cell layers of the skin (squamous cell carcinomas and basal cell carcinomas). In addition, UVR causes sunburn, skin photoageing, cortical cataracts (eye lens opacities), pterygium (a fleshy growth on the surface of the eye), reactivation of

herpes of the lip (cold sores) and the rare squamous cell carcinomas of the eye.

"This global assessment of the health risks of UV radiation provides a good basis for public health action. We all need some sun, but too much sun can be dangerous - and even deadly. Fortunately, diseases from UV such as malignant melanomas, other skin cancers and cataracts are almost entirely preventable through simple protective measures," said Dr Maria Neira, Director for Public Health and the Environment at WHO.

The report notes that UVR does have beneficial effects, mainly in the production of vitamin D following skin exposure to the UVB (shorter wavelength) component of UVR. Adequate vitamin D prevents the development of bone diseases such as rickets, osteomalacia and osteoporosis. Moreover, the possible beneficial effects on some cancers and immune disorders are under investigation.

WHO notes, in most cases minimal casual exposure to UVR should be sufficient to maintain vitamin D levels at a range that avoids these health problems. The dangers are much greater from over-exposure to the sun's radiation.

A few easy-to-implement sun safety measures could prevent much of the cancer and other death and disease burden due to UV radiation, WHO says:

- Limit time in the midday sun
- Use shade wisely: seek shade when UV rays are most intense
- Wear protective clothing including hats and sunglasses
- Use a broad-spectrum sunscreen of sun protection factor 15+
- Avoid sunlamps and tanning parlours; for youth under the age of 18, WHO recommends that they do not use them at all

- Know the UV index: when the UV Index predicts radiation levels of 3 (moderate) or above
- sun safety practices should be taken
- Protect children from the sun

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2. GLOBAL DISEASE BURDEN FROM SOLAR ULTRAVIOLETRADIATION

Introduction

Everyone is exposed to ultraviolet radiation (UVR) from the sun. Small amounts of UV radiation are beneficial to health, and play an essential role in the production of vitamin D. However, overexposure to UV radiation is associated with a variety of health problems, most notably skin cancer and eye cataracts. WHO has recently assessed the global disease burden that can be attributed to solar UV radiation. This information provides an important basis for national and international UV public health and health protection programmes to assist people to avoid inappropriate sun exposure.

UV Radiation

UVR reaching the earth's surface is largely composed of long-wavelength UVA with a small amount of the shorter wavelength UVB. Most UVB and the very short wavelength UVC is filtered out by the atmosphere. UV radiation levels are influenced by:

- Sun elevation: the higher the sun in the sky, the higher the UVR level, with an increase in UVB relative to UVA. Thus UVR levels vary with time of day and time of year.
- Latitude: the closer to equatorial regions, the higher the UVR levels.
- Cloud cover: UVR levels are highest under cloudless skies. However, even with cloud cover, UVR levels can be high due to scattering within the atmosphere.
- Altitude: at higher altitudes, the atmosphere is thinner and the air mass is decreased; less UVR is absorbed.
- Ozone: ozone present in the atmosphere absorbs some of the UVR that would otherwise reach the earth's surface. Ozone depletion leads to increased UVB levels with little impact on UVA levels.
- Ground reflection: grass, soil and water reflect less than 10% of UVR; fresh snow reflects as much as 80%; dry beach sand about 15% and sea foam about 25%.

UVR can neither be seen nor felt. Therefore, UVR measurements are necessary to determine precisely the extent of ground level (ambient) UVR. UVR measurements such as the global solar UV index (see www.who.int/uv) add up all the solar UVR, taking account of its ability to cause skin damage. If measurements are not available, an approximation of ambient UVR levels can be based on geographic latitude.

For individuals, the UVR exposure additionally depends on factors such as behaviour and use of sun protectants, e.g., clothing, hats, sunscreen and sunglasses, during outdoor (including occupational) activities. A person's skin type is also important. Fair skinned people suffer from sunburn much more readily than dark-skinned people.

Health consequences of excessive UVR exposure

Using evidence systematically collected from the scientific literature, WHO has identified nine adverse health outcomes that are clearly caused by UVR exposure. An assessment of the global disease burden, comprising both mortality and morbidity, was completed for these health outcomes. The nine diseases assessed were:

- *Cutaneous malignant melanoma (CMM)*: Melanoma of the skin is a malignant cancer of great severity. Although treatment is improving, melanoma still carries a significant risk of death. Between 50% and 90% of the burden of disease from melanoma estimated in the WHO report is due to UVR exposure.
- *Squamous cell carcinoma of the skin (SCC)*: This is another type of malignant skin cancer which generally progresses less rapidly than melanoma and is less likely to cause death or ongoing disability. Of the total SCC disease burden, 50-70% is attributable to UVR exposure.
- *Basal cell carcinoma of the skin (BCC)*: This skin cancer appears predominantly in older people and grows slowly by local spread. The incidence and mortality of BCC were estimated to be 50-90% attributable to UVR exposure.
- *Squamous cell carcinoma of the cornea or conjunctiva (SCCC)*: This is a rare tumour of the surface of the eye. Some 50-70% of the disease burden due to SCCC is attributable to UVR exposure.

The following conditions are also the consequence of excess UVR, but there is considerable uncertainty about the overall burden of disease estimates, since few data are available on incidence and/or UV-attributable fraction:

- *Photoageing*: Chronic sun damage is associated with the development of skin conditions called solar keratoses. On rare occasions, these are pre-malignant conditions. The burden of

disease due to solar keratoses is 100% attributable to UVR exposure.

- *Sunburn*: Sunburns may be severe and blistering, and the resulting disease burden is 100% attributable to UVR exposure.
- *Cortical cataract*: Cataract is an eye disease where the lens becomes increasingly opaque, resulting in impaired vision and eventual blindness. Long term sun exposure to the eye increases the risk of developing a specific cataract type called cortical cataract. Five percent of all cataract-related disease burden is directly attributable to UVR exposure.
- *Pterygium*: This is a wing-shaped fleshy growth on the surface of the eye. 40-70% of the disease burden is attributable to UVR exposure.
- *Reactivation of herpes of the lip (RHL)*: Excessive UVR exposure causes immunosuppression and reactivation of the herpes simplex virus ("cold sores"). 25-50% of the disease burden is attributable to UV exposure.

Estimates of global UV disease burden

WHO uses disability adjusted life years (DALYs) to measure the health detriment associated with a particular health outcome. DALYs combine the life years lost due to premature mortality associated with the disease and the number of years lost due to disability. Thus, one DALY is equivalent to one lost year of life in full health.

The following table summarizes the DALYs and mortality attributable to excessive UVR exposure for the nine diseases listed above and calculated for the year 2000. The upper and lower estimates indicate the variation that depends on actual assumptions and values used in the calculations. Globally, around 1.5 million DALYs (0.1% of the total global burden of disease) are lost every year due to excessive UVR exposure. The estimates concerning sunburn and reactivation of the Herpes Simplex virus (cold sores) are regarded as particularly uncertain. Therefore, summary DALY estimates are also presented excluding these health problems (Table 1).

In terms of mortality, only the three skin cancers contribute to deaths that can be attributable to excessive UVR exposure. Between 41,000 and 71,000 deaths, with a best estimate of around 60,000 were attributed to excessive UVR exposure in 2000.

Regional differences

The main health effects contributing to the UVR-related disease burden differ by region:

In the WHO European region, with a predominantly fair-skinned population, melanoma is by far the largest cause of UVR-attributable

Table 1: DALYs (000) Deaths Estimates

| Disease | Upper Estimate | Lower estimate | Upper estimate | Lower estimate |
|-------------------|----------------|----------------|----------------|----------------|
| CMM | 621 | 345 | 58645 | 32581 |
| SCC of skin | 83 | 59 | 9474 | 6767 |
| BCC of skin | 52 | 29 | 2921 | 1623 |
| Solar keratoses | 8 | 8 | 0 | 0 |
| Sunburn | 294 | 294 | 0 | 0 |
| Cortical cataract | 529 | 529 | 0 | 0 |
| Pterygium | 35 | 20 | 0 | 0 |
| SCCC | 2 | 1 | 0 | 0 |
| RHL | 68 | 34 | 0 | 0 |
| Total | 1692 | 1319 | 71 039 | 40970 |
| Total* | 1330 | 991 | 71 039 | 40970 |

* (excluding sunburn and RHL)

disease burden. Similar results are found in some countries of the WHO Western Pacific region, notably Australia, Brunei, Japan, New Zealand and Singapore. In most of the Americas, melanoma represents the greatest UVR-attributable disease burden, but sunburn also contributes significantly.

In the WHO African Region, the main burden of disease attributable to UVR is cataract. Even though cutaneous malignant melanoma is uncommon in deeply pigmented populations, it accounts for the second greatest burden of disease in this region.

Cataract also causes the greatest UVR-associated disease burden in some countries of the WHO American region such as Bolivia, Ecuador, Guatemala, Haiti, Nicaragua, and Peru and in the Eastern Mediterranean Region notably in Egypt, Saudi Arabia, Iran and Iraq. Similarly, in WHO South East Asia Region, in countries like Indonesia, Thailand, India, and Bangladesh, cataract is the most important cause of disease. In several Western Pacific countries including China, Malaysia and the Philippines, sunburn and cataract are the leading UV-related ill health effects, followed by melanoma.

Beneficial effects of UVR exposure

UVR exposure has beneficial effects, mainly in the production of vitamin D. Adequate vitamin D prevents the development of bone diseases such as rickets, osteomalacia and osteoporosis. Possible beneficial effects on some cancers and immune disorders are under intense scientific investigation. Populations living at low latitudes (who have not evolved a diet high in vitamin D) and deeply pigmented populations particularly rely on UVR to produce adequate Vitamin D levels.

For the purpose of a theoretical assessment of

the effect of lack of UV, WHO has conducted model calculations. If zero exposure to UV leading to widespread and profound Vitamin D deficiency were assumed, more than 3.3 million DALYS would be lost annually from diseases related to Vitamin D deficiency. Importantly, this is not the current situation. Although research suggests that many people may have lower vitamin D levels than might be optimal, these are not in the range that causes the above-mentioned bone diseases. Indeed, rickets and osteomalacia are uncommon diseases. In most circumstances, minimal casual exposure to UVR is sufficient to maintain vitamin D at a level that avoids these health problems.

Over-exposure to UVR, rather than under-exposure, therefore remains the primary public health concern. The detailed and appropriate sun exposure advice to avoid diseases of excessive UVR exposure and of vitamin D deficiency is best framed by local health authorities, taking into account the skin type of local populations and ambient UVR of the region.

Prevention of UVR overexposure - WHO recommendations

- **Limit time in the midday sun:** The sun's UV rays are the strongest between 10 am and 2 pm (= 2 hours each side of the solar noon). To the extent possible, limit exposure to the sun during these hours.

- **Use shade wisely:** Seeking shade when UV rays are the most intense is recommended, however, shade structures such as trees, umbrellas or canopies do not offer complete sun protection. The shadow rule: "Watch your shadow - Short shadow, seek shade!" serves as a simple aide-memoire.

- **Wear protective clothing:** A hat with a wide brim offers good sun protection for eyes, ears, face, and the back of your neck. Sunglasses, with adequate side protection that provide 99 to 100 percent UV-A and UV-B protection will greatly reduce eye damage from sun exposure. Tightly woven, loose fitting clothes will provide additional protection from the sun.

- **Use sunscreen:** Liberal application of a broad-spectrum sunscreen of SPF 15+ and re-application every two hours, or after working, swimming, playing or exercising outdoors, can help protect the skin from UVR. The application of sunscreens exposure should not be used to prolong sun exposure but rather to protect the skin when exposure is unavoidable.

- **Avoid sunlamps and tanning parlours:** Sunbeds damage the skin and unprotected eyes and are best avoided entirely. WHO recommends

that youth under the age of 18 do not use them at all.

- **Know the UV index:** The UV index is a measure of UV radiation (see www.who.int/uv). The higher the UV index, the higher the risk of skin and eye damage. Use the UV index to plan sun-safe outdoor activities. When the UV Index predicts radiation levels of 3 (moderate) or above, sun safety practices should be taken.

- **Protect children:** Children are generally more susceptible to environmental hazards than adults. During outdoor activities, they should be protected from high UV exposure as above, and babies should always remain in the shade. The promotion of sun protection in schools is particularly important to make children aware of the risks of overexposure and how to avoid it. WHO has developed special programmes to address this issue. For more information see www.who.int/UV.

Prevention of vitamin D deficiency

The risks of vitamin D deficiency due to under-exposure to UVR have been much publicized recently. Considerable research is currently underway to better understand these risks and appropriate levels of sun exposure. Populations who have very low sun exposure, such as institutionalized individuals (e.g., prisoners), deeply pigmented persons living in low UVR settings (e.g., at high latitude) or those who, for religious or cultural reasons cover their entire body surface when they are outdoors, should, in consultation with their doctor, consider a vitamin D nutritional supplement. For the large majority of people worldwide, prevention of overexposure to UVR (using the above advice) remains the main health concern.

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3. LAUNCH OF GLOBAL EARLYWARNING SYSTEM FOR ANIMAL DISEASES TRANSMISSIBLE TO HUMANS

A global early warning system for animal diseases transmissible to humans (zoonoses) was formally launched in July 2006 by the UN Food and Agriculture Organization (FAO), the World Organization for Animal Health (OIE) and the World Health Organization (WHO).

The Global Early Warning and Response System (GLEWS) is the first joint early warning and response system conceived with the aim of predicting and responding to animal diseases including zoonoses worldwide. This system

builds on the added value of combining and coordinating the tracking, verification and alert mechanisms of OIE, FAO and WHO.

“From an animal health point of view, controlling contagious animal diseases in their early stages is easier and less expensive for the international community. In cases of zoonoses this system will enable control measures that can also benefit public health ,” explained Dr Bernard Vallat, Director General of the OIE.

As demonstrated throughout much of the globe, weaknesses of early detection and rapid response for animal diseases, and the inability to control major diseases at their source, have contributed to the spread across borders of diseases of animal origin such as bovine spongiform encephalitis (BSE), Severe Acute Respiratory Syndrome (SARS) and avian influenza.

“In such a context, the main expected outputs of GLEWS are better prediction and prevention of animal disease threats, through sharing of information, epidemiological analysis and joint field missions to assess and control outbreaks in animals and humans. That will lead to the development of improved coordinated response to emergencies worldwide,” said Dr. Samuel Jutzi of FAO’s Agriculture, Biosecurity, Nutrition and Consumer Protection Department.

“History shows us that the earlier we can detect a zoonosis, the early we can take action to reduce the threats to people. Today, the spread of avian flu reinforces the fact that the animal and human health sectors must work closely together, and that early detection and coordination is critical. This new network is an important step forward,” explained Mrs Susanne Weber-Mosdorf, WHO Assistant Director-General, for Sustainable Development and Healthy Environments.

The information gathered through the tracking and verification channels of each organization will be shared using the GLEWS web-based electronic platform and jointly analyzed to decide whether to issue common early warning messages. These alert messages will describe the possible implications of disease spread among animals at national, regional and international level and its potential public health impact. If there is a clear indication that a joint on-site assessment or intervention is required, the response mechanisms of the three organizations will be activated together.

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