A marked increase in the incidence of skin cancers has been observed in fair-skinned populations worldwide since the early 1970s. This is strongly associated with personal habits in relation to sun exposure and the ultraviolet (UV) component, and the societal view that a tan is desirable and healthy.

The Global Solar UV Index (UVI) described in this document was developed in an international effort by WHO in collaboration with WMO, UNDP, UNICEF and IOM, and is a simple measure of the UV radiation level at the Earth's surface. It serves as an important vehicle to raise public awareness and to alert people about the need to adopt protective measures when exposed to UV radiation. Intersun, WHO's Global UV Project, aims to reduce the burden of disease resulting from exposure to UV radiation by assessing health risks and developing guidelines and recommendations.

The Global Solar UV Index (UVI) serves as a simple and effective tool to raise public awareness and to alert people about the need to adopt protective measures when exposed to UV radiation.

A joint recommendation of:
World Health Organization
World Meteorological Organization
United Nations Environment Programme
International Commission on Non-Ionizing Radiation Protection
A Practical Guide

International Commission on Non-Ionizing Radiation Protection

UNEP

United Nations Environment Programme

World Meteorological Organization

World Health Organization

A joint recommendation of:

UV INDEX

SOLAR GLOBAL

WHO/SDE/OEH/02.2
Everyone is exposed to UV radiation from the sun and many artificial sources used in industry, commerce and recreation.

Emissions from the sun include light, heat and UV radiation. The UV region covers the wavelength range 100–400 nm and is divided into three bands: UVA (315–400 nm), UVB (280–315 nm) and UVC (100–280 nm).

Therefore, the UV radiation reaching the Earth's surface is largely composed of UVA with a small UVB component. This radiation is less affected by the atmosphere than UVC and approximately 90% of UVB radiation are absorbed by ozone, water vapour, oxygen and carbon dioxide. UVA radiation is more affected by the atmosphere.

Introduction

A marked increase in the incidence of skin cancers worldwide has been observed since the early 1970s. This is strongly associated with increased exposure to UV radiation and can be linked to personal habits in relation to sun exposure and its ultraviolet component. Educational programmes are urgently needed to raise awareness of the damaging effects of UV radiation, and to encourage changes in lifestyle that will arrest the trend towards more and more skin cancers.
Small amounts of UV radiation are beneficial for people and essential in the production of vitamin D. UV radiation is also used to treat several diseases, including rickets, psoriasis, and eczema. This takes place under medical supervision, and the benefits of treatment versus the risks of UV radiation exposure are a matter of clinical judgement.

Prolonged human exposure to solar UV radiation may result in acute and chronic health effects on the skin, eye, and immune system. Sunburn and tanning are the best-known acute effects of excessive UV radiation exposure; in the long term, UV radiation-induced degenerative changes in cells, tissues, and organs can contribute to mortality rates and cause skin cancer. While the effects of UV exposure increase with latitude, people living at higher latitudes are more protected from UV exposure due to the curvature of the Earth.

UV radiation levels are influenced by several factors, including:

- **Sun elevation**: The higher the sun in the sky, the higher the UV radiation level. Thus UV radiation levels vary with time of day and time of year. Outside the tropics, the highest levels occur when the sun is at its maximum elevation, at around midday (solar noon) during the summer months.
- **Latitude**: The closer to equatorial regions, the higher the UV radiation levels.
- **Cloud cover**: UV radiation levels are highest under cloudless skies but can be high even with cloud cover due to scattering. Cloud cover can reduce UV by 50% or more.
- **Ground reflection**: UV radiation is reflected or scattered to varying extents by different surfaces, e.g., fresh snow can reflect as much as 80% of UV radiation, dry beach sand about 15%, and sea foam about 25%.
- **Ozone**: Ozone absorbs some of the UV radiation, but its levels vary over the year and can be affected by pollution.
- **Altitude**: At higher altitudes, a thinner atmosphere absorbs less UV radiation. With every 1000 metres increase in altitude, UV radiation levels increase by 10% to 12%.
- **Ground level**: UV radiation is reduced by about 2% for every 300 metres increase in altitude.
- **Shade**: Shade can provide significant protection from UV radiation. UV exposure can be reduced by 50% or more when seeking shade.

Sun protection programs are needed to raise awareness of the health hazards of UV radiation, and to achieve changes in lifestyle that will arrest the trend towards more skin cancers. Effective education programs can strengthen national economies by reducing the financial burden to health care systems caused by skin cancer and cataracts. Billions are spent worldwide to treat these diseases, which could have been prevented or delayed if people had been educated about the dangers of UV exposure.

UV radiation levels vary throughout the day and year, and people’s behaviour in the sun is considered a major cause for the rise in skin cancer rates in recent decades. An increase in popular outdoor activities and changed sunbathing habits often result in excessive exposure to UV radiation. Many people consider intensive sunbathing to be normal; unfortunately, even children, adolescents, and their parents perceive a suntan as a symbol of attractiveness and good health. Sun protection programmes are urgently needed to raise awareness of the dangers of excessive sun exposure and to encourage safe and healthy behaviour in the sun.
WHAT IS THE IMPORTANCE OF A HARMONIZED UVI?
Many countries use the UVI to promote sun protection. Surveys suggest that a large percentage of the public is aware of the existence of the UVI but does not understand its meaning or usefulness. These problems are related to the lack of standardized messages associated with the UVI. The UVI is clearly defined as an educational tool, and its use must be based on effective communication with the public and the media. Uniformity of UVI presentation, and uniformity of sun protection messages associated with different UVI values, will facilitate the delivery of a simple and relevant message, and will help to familiarize people with this important concept.

WHAT IS THE GLOBAL SOLAR UV INDEX?
The Global Solar UV Index (UVI) describes the level of solar UV radiation at the Earth’s surface. The values of the index range from zero upward – the higher the index value, the greater the potential for damage to the skin and eye, and the less time it takes for harm to occur.

WHY DO WE NEED THE UVI?
A marked increase in the incidence of skin cancer in fair-skinned populations worldwide is strongly associated with excessive UV radiation exposure from the sun; it may also be associated with the use of artificial UV radiation sources such as sunbeds. Current evidence indicates that personal habits in relation to sun exposure constitute the most important individual risk factor for UV radiation damage. The UVI is an important vehicle to raise public awareness of the risks of excessive exposure to UV radiation, and to alert people about the need to adopt protective measures. Encouraging people to reduce their sun exposure can decrease harmful health effects and significantly reduce health care costs.

HOW SHOULD THE UVI BE USED?
This educational tool should be used as an integral component of a programme to inform the public about UV radiation health risks and sun protection, and to change people’s attitudes and behaviour with respect to UV radiation exposure. The UVI should especially aim at vulnerable and highly-exposed groups within the population, e.g., children and tourists, and should inform people about the range of UV radiation-induced health effects including sunburn, skin cancer and skin ageing, and effects on the eye and immune system. Educational messages should emphasize that the risk of adverse health effects from UV radiation exposure is cumulative, and that exposure in everyday life may be as important as exposure during vacations in sunny climates.

HOW IS THE UVI PRESENTED?
UV radiation levels and therefore the values of the index vary throughout the day. In reporting the UVI, most emphasis is placed on the maximum UV radiation level on a given day. This occurs during the four-hour period around solar noon. Depending on geographical location and whether daylight saving time is applied, solar noon takes place between local noon and 2 p.m. The media usually present a forecast of the maximum UV radiation level for the following day.

WHERE IS THE UVI REPORTED?
In many countries the UVI is reported along with the weather forecast in newspapers, on TV and on the radio; however, this is usually done only during the summer months. Annex B lists a series of Internet links that provide the UVI for a range of countries and in many different languages.
Burn times have been used in many countries as this simple concept can be directly translated into action. However, people tend to interpret burn times to mean that there is a safe level of sun exposure. Hence, relating UVI values to “time to burn” or “safe tanning time” sends out the wrong message to the public. The UVI should not imply that extending exposures is acceptable. Although the priority goal of primary skin cancer prevention is to avoid sunburn, cumulative UV radiation exposure plays a major role in developing skin cancer and promotes damage to the eyes and immune system. Hence, relating UVI values to “time to burn” sends out the wrong message to the public. The UVI should not imply that extending exposures is acceptable. Although the priority goal of primary skin cancer prevention is to avoid sunburn, cumulative UV radiation exposure plays a major role in developing skin cancer and promotes damage to the eyes and immune system.

Table 2: Classification of skin types (adapted from Fitzpatrick and Bolognia, 1995)

<table>
<thead>
<tr>
<th>Skin Type Classification</th>
<th>Burns in the Sun</th>
<th>Tans After Having Been in the Sun</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Very seldom</td>
<td>Usually</td>
</tr>
<tr>
<td>II</td>
<td>Seldom</td>
<td>Sometimes</td>
</tr>
<tr>
<td>III</td>
<td>Sometimes</td>
<td>Usually</td>
</tr>
<tr>
<td>IV</td>
<td>Usually</td>
<td>Always</td>
</tr>
<tr>
<td>V</td>
<td>Always</td>
<td>Usually</td>
</tr>
</tbody>
</table>


Skin Type Classification

Table 1: UV radiation exposure categories

<table>
<thead>
<tr>
<th>Exposure Category</th>
<th>UVI Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOW</td>
<td>&lt; 2</td>
</tr>
<tr>
<td>MODERATE</td>
<td>3 to 5</td>
</tr>
<tr>
<td>HIGH</td>
<td>6 to 7</td>
</tr>
<tr>
<td>VERY HIGH</td>
<td>8 to 10</td>
</tr>
<tr>
<td>EXTREME</td>
<td>11+</td>
</tr>
</tbody>
</table>

Reporting UVI values

- The UVI should be presented as a single value rounded to the nearest whole number of values on both.
- The UVI should be presented as a single value on daily forecasts.
- The UVI should be presented as a single value on weekly forecasts.
- The UVI should be presented as a single value on monthly forecasts.
- The UVI should be presented as a single value on regional forecasts.
- The UVI should be presented as a single value on national forecasts.
- The UVI should be presented as a single value on global forecasts.

- The UVI should be presented as a single value on daily forecasts.
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- The UVI should be presented as a single value on national forecasts.
- The UVI should be presented as a single value on global forecasts.
A standard graphic presentation of the UVI helps to promote consistency in UVI reporting on news and weather bulletins, and serves to improve people's understanding of the UVI concept. Ready-made materials for UVI reporting facilitate successful media uptake, and more than one option is given to allow different media to cope with technical limitations.

THE BASIC SUN PROTECTION MESSAGES

- Limit exposure during midday hours.
- Seek shade outside a UV index of 8 and above.
- Avoid being outside during midday hours! Make sure you seek shade and avoid peak UV periods.
- Slip on a shirt, slip on sunscreen and slap on a hat!
- Avoid tanning beds.
- Protect babies and young children: this is particularly important.

Two different concepts of sun protection have been proposed: a binary response with a defined threshold UVI value beyond which sun protection is mandatory, or a graded response with increasing UVI values that would involve the successive use of different sun-protective measures. There is little scientific basis to support the latter: if sun protection is required, this should include all protective means, i.e. clothing, sunglasses, shade and sunscreen. Nevertheless, a graded approach is relevant in the sense that more sun protection is required as UVI values increase above the threshold. This is particularly important for very sensitive fair-skinned people, the risk of short-term and long-term UV radiation damage below a UVI of 3 is limited, and under normal circumstances no protective measures are needed. Above the threshold value of 3, protection is necessary, and this message should be reinforced at UVI values of 8 and above. The Basic Sun Protection Messages provide the foundation on which to build the Basic Sun Protection Messages that take into account all the risk of short-term and long-term UV radiation damage.

A standard graphic presentation of the UVI promotes consistency in UVI reporting on news and weather bulletins, and serves to improve people's understanding of the UVI concept. Ready-made materials for UVI reporting facilitate successful media uptake, and more than one option is given to allow different media to cope with technical limitations.
USING COLOUR TO INCREASE VARIABILITY

Sun Protection Messages

Specific colours should be used for presenting the solar UVI. These do not have a scientific basis but are a means of making the presentation of the UVI more appealing. This may be applied to increase variability. The colour coding facilitates variation between geographic areas of high and low UV radiation levels, and a basic colour is defined for each category. The colour within categories can be graded to allow for variation at the national level where values often remain within one category throughout the summer months (see Annex D).

Table 4: Presenting the UVI: International colour codes

<table>
<thead>
<tr>
<th>UVI Category</th>
<th>Colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Green</td>
</tr>
<tr>
<td>Moderate</td>
<td>Yellow</td>
</tr>
<tr>
<td>High</td>
<td>Orange</td>
</tr>
<tr>
<td>Very High</td>
<td>Red</td>
</tr>
<tr>
<td>Extreme</td>
<td>Purple</td>
</tr>
</tbody>
</table>

The basic scheme for UVI reporting and sun protection can be varied and expanded through the use of additional messages at the national or local level. Messages on suntanning, sun protection and people’s inability to perceive UV radiation underlie the basic message and can be used in all settings.

Targeted groups must include children and young people. Environment-based, activity-based or risk group-based messages can be geared specifically to local weather conditions, or the particular environmental or societal situation of a given country. Annex E lists examples of such additional sun protection messages adapted from Australia, Canada and France.

UV radiation during the winter months is not dangerous. Up to 80% of solar UV radiation can penetrate light cloud cover. Haze in the atmosphere can even increase UV radiation exposure. Reflection from water can enhance your UV radiation exposure, especially at high altitude. Pay particular attention in early spring when temperatures are low but the sun’s rays are unexpectedly strong.

UV radiation exposure and a history of sunburn during childhood and adolescence is an important risk factor for skin cancer, especially for potentially lethal malignant melanoma.

Some media will be able to integrate the recommended colour scheme. Television media generally use standardized maps and changing the colours may not be feasible due to technical limitations. Similarly, black and white print media will not be able to use the recommended colour scheme.

Additional Sunsmart Messages

Creating Variety

The colour coding facilitates variation for each category (Table 4). The specific colours should be red for presenting the UVI more appealing. This may be applied to increase variability. The colour coding facilitates variation between geographic areas of high and low UV radiation levels, and a basic colour is defined for each category. The colour within categories can be graded to allow for variation at the national level where values often remain within one category throughout the summer months (see Annex D).
**The Role of National Governments**

**Main Target Audiences and Sun Protection Settings**

A majority of a person's lifetime exposure to UV radiation occurs before age 18, and sun avoidance during childhood has a greater impact on health than avoiding sun exposure during adulthood. Therefore, children and adolescents should be the primary target for educational efforts to change behaviors and prevent skin and eye diseases caused by UV radiation. The sections below address key elements of effective education campaigns.

1. **Establish national statistics on UV radiation levels and sun protection.**
2. **Supply health care professionals, teachers and carers of children with educational material for distribution to the public.**
3. **Organize workshops for medical doctors and other health professionals.**
4. **Inform the community of drugs and cosmetics that sensitize the skin to the effects of UV radiation.**
5. **Enlist weather broadcasters, health reports and the media to provide the public with essential information, including UV index and weather reports.**
6. **Publicize the provision of information on the degree of UV radiation.**
7. **Facilitate the development of standards for sunscreens, clothing, sunbeds and sunglasses to ensure clear and safe guidelines for manufacturers and consumers.**
8. **Encourage and support the provision of shaded areas in schools, playgrounds and parks and in public places such as bus stops and swimming pools.**
9. **Establish education programs for outdoor workers.**
10. **Supply health care programs.**
11. **Recommend against the use of sunlamps and sunbeds for cosmetic purposes.**
12. **Support national programmes and international collaboration efforts on UV radiation effects and protective measures.**

**The Media should be encouraged to report on UV radiation-related public health concerns and to promote public health messages about the sun and sun protection. An effective media strategy can have an enormous impact on public awareness and behavior towards skin protection.**

**Ensuring Media Support**

As a large percentage of many people's lifetime exposure to UV radiation received during vacations, tourists represent an important audience for UV reporting and sun protection advice. Although members of the tourism industry have a direct and important role in disseminating UV radiation-related public health messages, they need to adopt UV protection measures that are tailored to the particular medium.

**Further partners in disseminating the information on UV radiation and the need to adopt UV protective measures. They can support local communities in implementing far-reaching educational strategies and providing additional support for the efforts of educational campaigns.**

**The Importance of Information**

It is important that public awareness about the health hazards of excessive UV radiation exposure be changed in a positive manner that makes people enjoy the sun safely but at the same time makes them aware of the need to avoid sunburn. The UV index is an effective approach to changing public awareness about the health hazards of excessive UV radiation exposure. It can be used to improve awareness and protection projects in the occurrence of sunburn and cumulative UV radiation levels and sun protection.

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Health Effects of UV Radiation

ANNEX A

Human exposure to solar radiation may result in acute and chronic health effects on the skin, eye and immune system. It is a popular misconception that only fair-skinned people need to be concerned about overexposure to the sun. Darker skin has more protective melanin pigment, and the incidence of skin cancer is lower in dark-skinned people. Nevertheless, skin cancers do occur with this group and unfortunately they are often detected at a later, more dangerous stage. The risk of UV radiation-related health effects on the eye and immune system is independent of skin type.


Non-Melanoma Skin Cancers

Non-melanoma skin cancers (NMSC) comprise basal cell carcinoma and squamous cell carcinoma. These are rarely lethal but surgical treatment is often painful and disfiguring. The temporal trends of NMSC incidence are difficult to determine, because reliable registration of these cancers has not been achieved. However, specific studies carried out in Australia, Canada and the United States indicate that between the 1960s and the 1980s the prevalence of NMSC increased by a factor of more than two. The risk of developing a skin cancer is higher in areas with higher UV exposure, and the incidence of skin cancer is higher in people who have fair skin and who overexpose their skin to the sun. People who live in areas with higher UV exposure are more likely to develop skin cancer than people who live in areas with lower UV exposure. The risk of developing skin cancer is higher in fair-skinned people and fair-skinned people who overexpose their skin to the sun.

The promotion of the UVI needs to be conducted in a positive and attractive way. The key words are “save”, “protect” and “help.”

The UVI CAN:

✓ save lives
✓ protect good health
✓ help preserve youthful complexion

EVALUATING THE EFFECTIVENESS OF A UVI CAMPAIGN

A sun awareness programme that uses the UVI as an educational tool aims to improve people’s knowledge, change attitudes and behaviour with respect to sun exposure and sun protection. A well-designed evaluation survey should assess:

• whether the campaign has changed people’s knowledge of the UVI and the UVI’s message;
• whether members of the general public understand the meaning of the UVI and the message it carries;
• whether the campaign has changed people’s knowledge, attitudes and behaviour with respect to sun exposure.

Useful Strategies Include:

• Encourage behaviour change through sign prompts and educational activities in community and recreation facilities and services. These could include programmes in schools and kindergartens, the distribution of brochures in public buildings, banks, shopping centres and health care centres, and sun protection fairs where health professionals participate in presentations and skin cancer screening.
• Promote creative activities on sun protection, e.g. fashion shows using UV-protective designs and fabrics, science projects, and competitions.
• Modify the physical environment and promote the consideration of shade in urban planning and in the modification of public places.

The role of local authorities and health agencies

ANNEX A

Health Effects of UV Radiation

Exposure

Skin

Sunburn, suntan and skin ageing

The best known acute effect of excessive UV radiation exposure is erythema, the familiar skin reddening termed sunburn. In addition, most people will tan from the UV radiation stimulation of melanin production, which occurs within a few days of exposure. A further, less obvious adaptive effect is the thickening of the outermost layers of the skin that attenuates UV radiation penetration to the deeper layers of the skin. Both changes are a sign of skin damage. Depending on their skin type, individuals vary greatly in their skin’s initial threshold for erythema and their ability to adapt to UV exposure. Chronic exposure to UV radiation also causes a number of degenerative changes in the skin, including wrinkling, freckling, lentigines and diffuse brown pigmentation. UV radiation accelerates skin ageing, and the gradual loss of the skin’s elasticity results in wrinkles and dry, coarse skin.

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A large number of atypical nevi (moles) is the strongest risk factor for MM in fair-skinned populations. The data remain preliminary, there is increasing evidence for a systematic immunosuppressive effect of both acute and low-dose UV radiation exposure. Animal experiments have demonstrated a lower threshold erythema and more prolonged skin reddening in melanoma patients than in controls. Consequently, beyond its role in the initiation and promotion of skin cancer, sun exposure may enhance the risk of MM.

The incidence of MM in white populations generally increases with decreasing latitude, with the highest recorded rates in Australia, where the annual rates are 10 and over 20 times the rates in Europe for women and men respectively.

NMSC is most frequent on parts of the body such as sun-exposed areas of the head, ears, face, neck and forearms. Experimental studies have demonstrated that UV radiation can modify the course and severity of NMSC and of solar keratoses, both of which are indicators of cumulative UV radiation exposure. Consequently, beyond its role in the initiation and promotion of skin cancer, sun exposure may enhance the risk of NMSC.

Several epidemiological studies support a protective association with history of sunburn, particularly sunburn in early years, and sun blisters.

EYE

Seemingly trivial effects of UV radiation include photokeratitis and photconjunctivitis. These inflammatory reactions are comparable to a sunburn of the very sensitive skin-like tissues of the eyeball and eyelids, and usually appear within a few hours of exposure. Both can be very painful, but are reversible and do not result in any long-term damage to the eye or vision. Extreme forms of photokeratitis are "arc-eye" and "snow blindness". Since many vaccine-preventable diseases are extremely infectious, any factor that results in delayed skin reaction is more likely to decrease the effectiveness of vaccines. Cataracts are the leading cause of blindness and are due to lens changes, which cloud the lens and eventually lead to blindness. Even though cataracts appear to different degrees in most individuals as they grow older, sun exposure, in particular exposure to UVB, appears to be a major risk factor for the development of cataract in the world. The incidence of cataract development generally increases with decreasing latitude with the highest occurrences in the developing world, high UV radiation levels prevail and sun exposure is more frequent.
Reporting the UV Index

Internet Links: Organizations

**ANNEX B**

**WORLD**
- World Ozone and Ultraviolet Radiation Data Centre
- Institute of Medical Physics and Biostatistics, University of Veterinary Medicine Vienna
  - [http://i115srv.vu-wien.ac.at/uv/uv_online_alt.htm#uvimaps](http://i115srv.vu-wien.ac.at/uv/uv_online_alt.htm#uvimaps)
- Scientific UV Data Management (SUVDAMA)
- Environmental Forecast and Information Service
- Regional Centre of Satellite Data
- National Meteorological Service
  - [http://www.meteofa.mil.ar/](http://www.meteofa.mil.ar/)
- Bureau of Meteorology
- Institute for Medical Physics, University of Innsbruck
  - [http://www.uibk.ac.at/projects/uv-index/aktuell/mon_kart_eng.html](http://www.uibk.ac.at/projects/uv-index/aktuell/mon_kart_eng.html)
- Meteorological Service of Canada
- Czech Hydrometeorological Institute
- Finnish Meteorological Institute
- Securité Solaire
  - [http://www.securite-solaire.org](http://www.securite-solaire.org)
- Federal Office for Radiation Protection
  - [http://www.bfs.de/uvi/index.htm](http://www.bfs.de/uvi/index.htm)
- German Weather Services
  - [http://www.uv-index.de/](http://www.uv-index.de/)
- Laboratory of Atmospheric Physics
- Hong Kong Observatory

- Martin: The ozone layer is progressively reduced. Consequently, human beings and the environment are exposed to higher UV radiation levels, and especially higher UVB levels that have the greatest impact on human health, animals, and ecosystems.

- Computational models predict that a 10% decrease in stratospheric ozone could cause an additional 300,000 non-melanoma and 4500 melanoma skin cancers and between 1.6 and 1.75 million more cases of cataracts worldwide every year.
The Global Solar UVI is formulated using the International Commission on Illumination (CIE) reference action spectrum for UV-induced erythema on the human skin (ISO 17166:1999/CIE S 007/E-1998). It is a measure of the UV radiation that is relevant to and defined for a horizontal surface. The UVI is a unitless quantity defined by the formula:

\[ I = \int_{250 \text{ nm}}^{400 \text{ nm}} E(\lambda) \cdot s_{er}(\lambda) \cdot d\lambda \]

where \( E(\lambda) \) is the solar spectral irradiance expressed in W·/(m²·nm) at wavelength \( \lambda \) and \( s_{er}(\lambda) \) is the erythema reference action spectrum, and \( k_{er} \) is a constant equal to 40 m²/W.

The determination of the UVI can be through measurements or model calculations. Two measurement approaches can be taken: the first is to use a spectroradiometer and to calculate the UVI using the above formula. The second is to use a broadband detector and the aerosol optical properties. A regression model is used to predict the total ozone and the aerosol optical properties. The model then requires the input of total ozone and the aerosol optical properties. The UVI is then derived with a radiaive transfer model that requires the input of total ozone and the aerosol optical properties. The second approach is to use a broadband detector and to calculate the UVI using the above formula. The second approach is to use a broadband detector and to calculate the UVI using the above formula.
SUN TANNING MESSAGES

- Tanning does not stop much UV radiation! Even when your skin is tanned, limit your exposure during midday hours, and continue to protect yourself.
- Sun exposure increases skin cancer risk.
- Damage to the eyes. Protect yourself.
- Do not UV OD. Sunburn is literally an indication that your skin has overdosed on UV radiation so Slip! Slop! Slap! and Save Your Skin.

SUN PROTECTION MESSAGES

- Wear sunglasses, a wide-brimmed hat and protective clothing, and frequently apply sunscreen of SPF 15+ to protect yourself.
- Sunscreen is not a means to prolong your stay in the sun but to reduce the health risk of your exposure.
- Taking certain medications as well as using perfumes and deodorants can sensitize your skin, causing serious burns in the sun. Ask your pharmacist for advice.
- Sun exposure increases skin cancer risk.
- Shade is one of the best defences against UV radiation. Try to find some shade during midday hours when the sun is at its highest.
- Sun damage is done by UV radiation, which is not seen or felt. So don't be fooled by mild temperatures or cloudy weather.
- When you fly into a new time zone, adjust your sleep cycle accordingly so that your body's internal clock can adapt to new conditions.

ACTIVITY-BASED MESSAGES

- Summer, holidays – not a nasty dose of sunburn for you. Go home with a great memory of your getaway and fresh snow can double the height of your adventure. Remember your sunscreen, your long-sleeved t-shirt and your wide-brimmed hat.
- Protect your skin while you're in the sun but to reduce the risk of skin cancer.
- Protect your skin with sun protection lotions that have broad-spectrum UV protection.
- Avoid sun exposure between 10 am and 4 pm. Use sunscreen with a SPF of 30 or higher.
- Wear sunglasses, a wide-brimmed hat and pack a hat, sunscreen and sunglasses.
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PERCEPTION OF UV RADIATION

- Cloudy weather doesn’t mean you can’t get burnt. It’s the UV radiation in the sun’s rays that burns you and causes skin cancer, and UV radiation can penetrate through clouds.
- UV protection so Slip! Slop! Slap! and Save.
- Don’t UV OD. Sunburn is literally an indication that your skin has overdosed on UV radiation.
- Continue to protect yourself.

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ENVIRONMENT-BASED MESSAGES

• Identify risky situations. If your shadow is short or if you are exposed for a long time – protect yourself!
• Watch out! A lot of UV radiation can pass through clouds.
• In the mountains, UV radiation levels increase by approximately 10% with every 1000 metres in altitude. Snow reflection can double the quantity of UV radiation you are exposed to.
• Fresh snow can double your UV radiation exposure. Extend your daily routines, such as gardening time, while wearing sunglasses and sunscreen. Wear sunscreen and long-sleeved clothing.

MESSAGES FOR CHILDREN AS A SPECIAL RISK GROUP

• Extended sun exposure during childhood increases the risk of skin cancer later in life and can cause serious damage to the eye.
• Children below the age of 6 must never stay in direct sun.
• The sun is getting stronger and children are exposed to its damaging rays during lunch and recess; encourage your children to use sun protection.
• Children below age 15 have sensitive skin and eyes – protect them and set a good example for them.

ENVIROMENT-BASED MESSAGES

• Wear extra lightweight clothing and sunscreen.
• Protect yourself – short of staying indoors, wear sunglasses and sunscreen.

SPECIAL RISK GROUP: CHILDREN

• Parents – protect your children from the sun. Teach them about avoiding sun exposure and the proper steps for sun protection.
• Most of our lifetime UV radiation exposure occurs before age 18; protect your children from the sun.
• Children below age 6 must never stay in direct sun.
• All children should wear sunglasses and sunscreen.