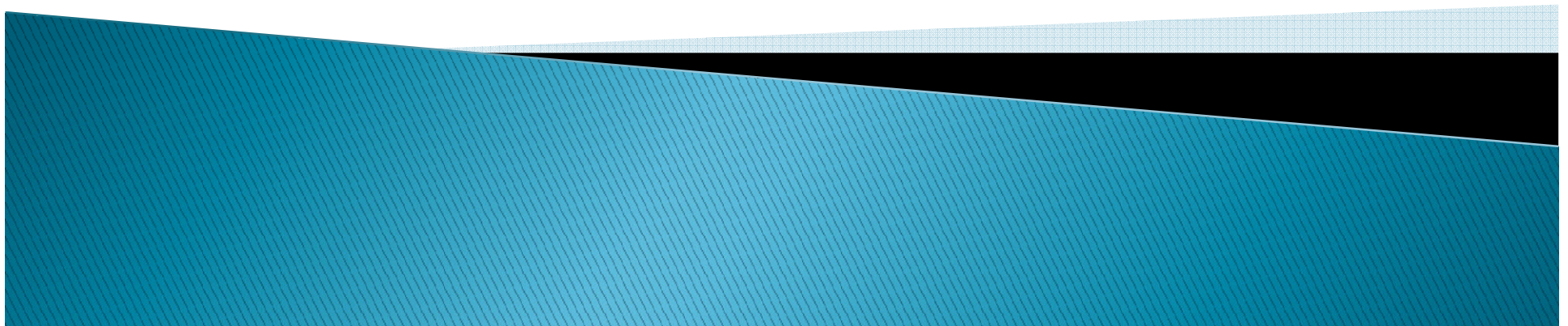
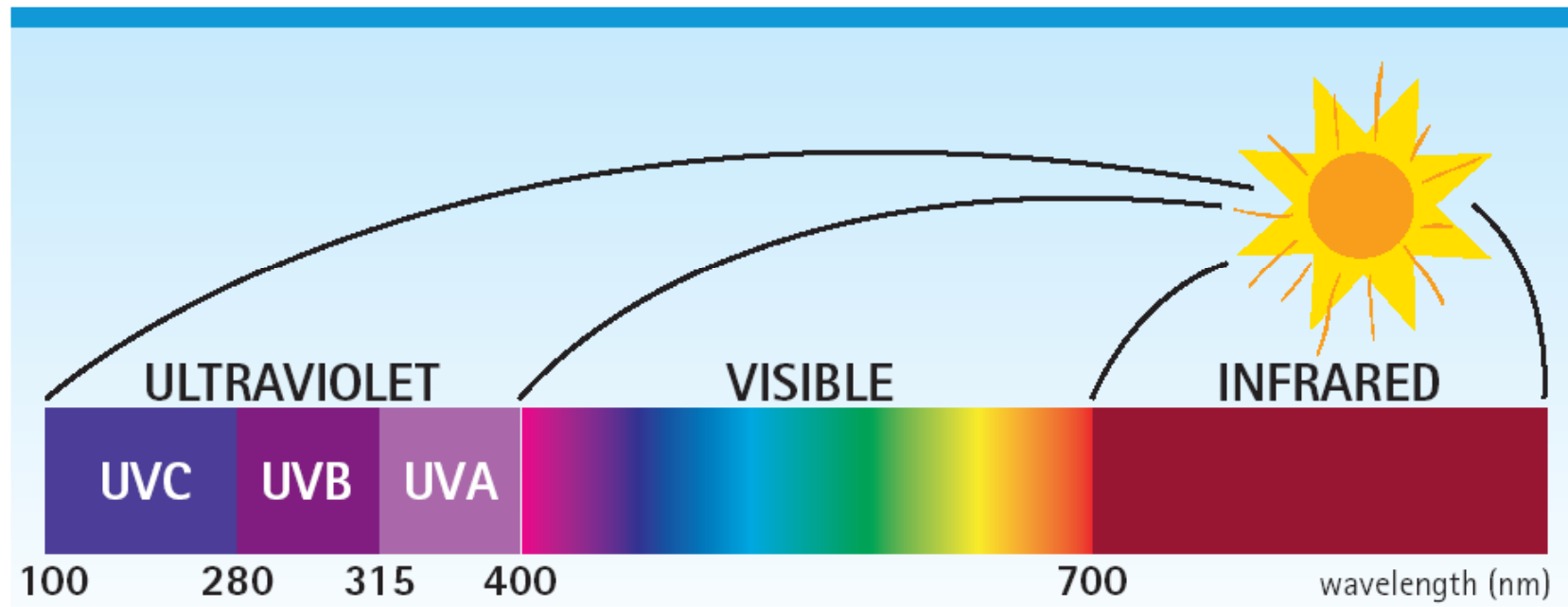


The effects of ultra violet radiation on the eyes

By Mark D Nagle

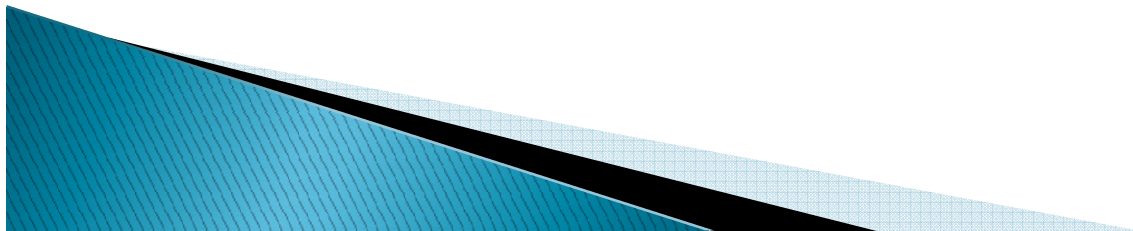


What is UV radiation?



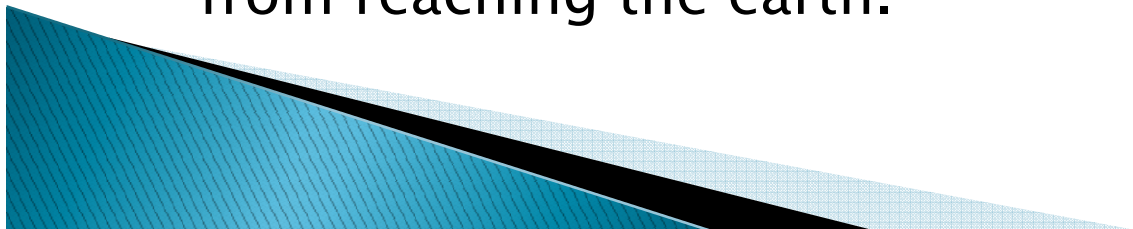
What is UV radiation?

- ▶ Ultraviolet(UV) rays are invisible forms of energy emitted by the sun and other sources.
- ▶ UV rays have much shorter wavelengths than visible light, existing just beyond the visible end of the spectrum.



Types of UV radiation

- ▶ UV-A (320–390nm)
Least toxic—causes tanning or browning of skin. The longer the wavelength, the deeper the radiation penetrates living tissue.
- ▶ UV-B (280–320nm)
Causes cataracts and skin cancer. Short wavelength UV radiation has the highest potential to damage organisms. UVB at 300nm is roughly 600 times more biologically effective at damaging ocular tissue than UVA at 325nm.
- ▶ UV-C (200–280nm)
Highly toxic to cells but are stopped by the ozone layer from reaching the earth.



Sources of UV radiation

Natural

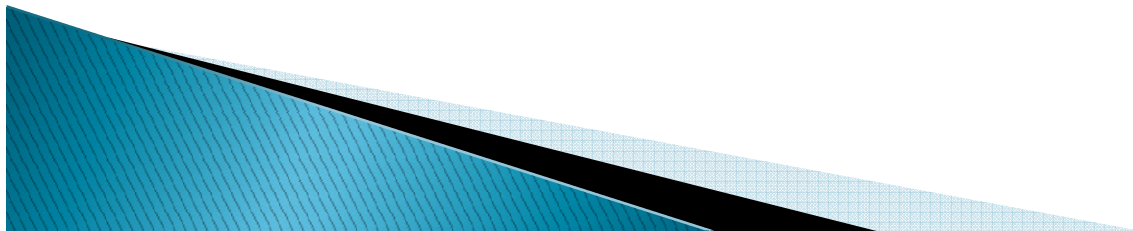
- Sun
- Sand and snow
- Water
- Clouds
- Reflections

Artificial

- High intensity filament lights
- Gaseous discharge tube
- Welding apparatus
- Germicidal lamps

UV radiation and the eye

- ▶ 95% of people associate UV with skin problems and 85% know of the risks of skin melanoma, however only 7% of people associate UV with eye problems.
- ▶ Excessive exposure to UV rays in your early childhood is particularly harmful to your eyes, possibly only showing up later in life.



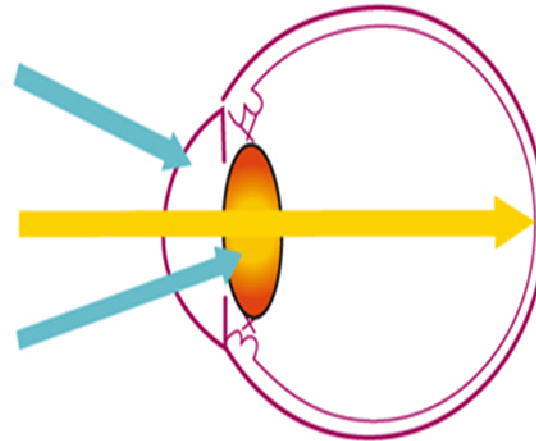
How can UV rays affect the eye?

- ▶ UVA and UVB penetrate into different parts of the eye:
- ▶ UVB is primarily absorbed by the cornea, and it is the cornea that absorbs most radiation.
- ▶ UVA is mostly absorbed by the crystalline lens but can penetrate deeper into the eye

UVB 280 nm - 315 nm

Visible 400 nm - 780 nm

UVA 315 nm - 400 nm



Effects of UV on the eyes

- ▶ UV exposure contributes to the development of many eye disorders, most are of a chronic nature, taking years to develop.
- ▶ Photokeratitis, is an acute response to UV radiation. It is temporary but painful burn on the surface of the eye (cornea)



Effects of UV on the eyes

- ▶ Pterygium, is an abnormal growth of fibro-vascular tissue from the corner of the eye. If severe , a pterygium can grow over the cornea, threatening vision loss and requires surgery to be removed.



Effects of UV on the eyes

- ▶ Cataract, is a cloudy or opaque area in the normally transparent crystalline lens of the eye. As the opacity thickens, it prevents light rays from passing through the lens and focusing on the retina.
- ▶ Symptoms include blurred vision, sensitivity to light and glare, increased nearsightedness, or distorted images.

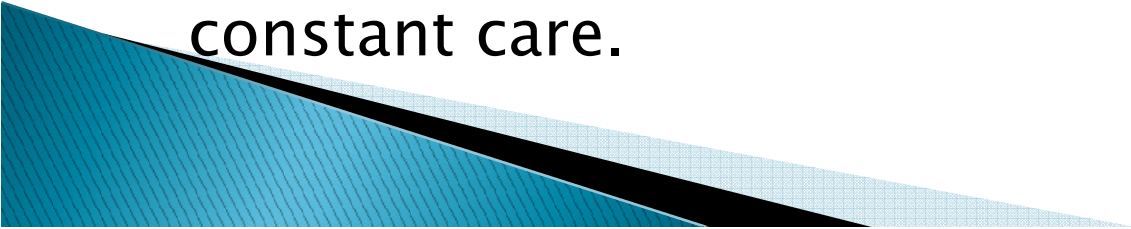


NORMAL VISION



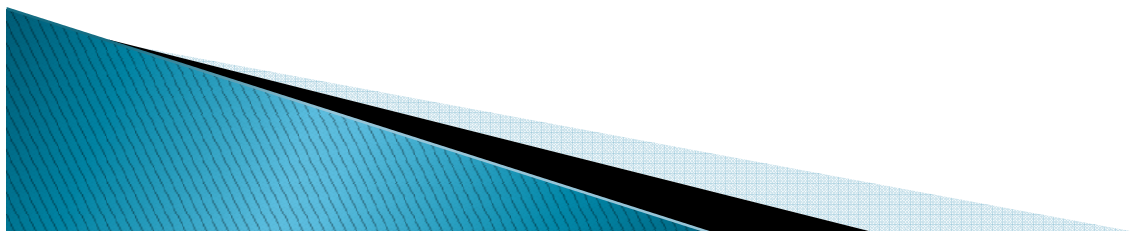
CATARACT VISION

Public health issues resulting from loss of vision/ blindness

- ▶ The WHO estimates that 12–15 million people become blind from cataracts annually, up to 20% maybe caused or enhanced by sun exposure.
 - ▶ Cataract is the leading cause of blindness in South Africa, responsible for about 50% of the prevalence of blindness, and identified as a national health priority.
 - ▶ The gradual deterioration in sight prevents patients from recognizing faces or finding their way in unfamiliar territory, eventually the patient requires constant care.
- 

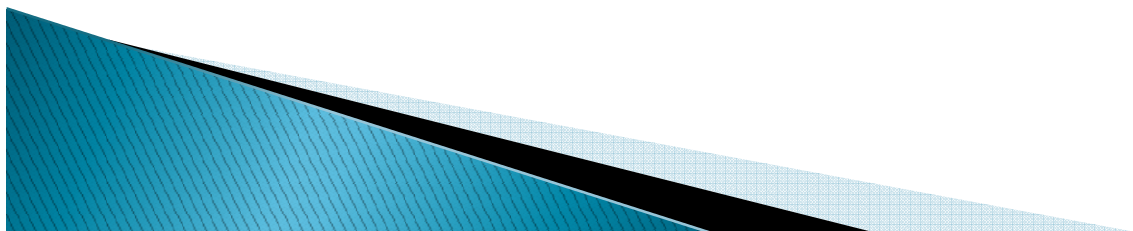
Public health issues resulting from loss of vision/blindness

- ▶ Unable to move about freely, the blind cannot access social services and health care, resulting in increasing poverty and ill health.
- ▶ Blindness leads not only to a loss of income and ill health for the individual, but also places an economic burden on the family and the community.



Public health issues resulting from loss of vision/blindness

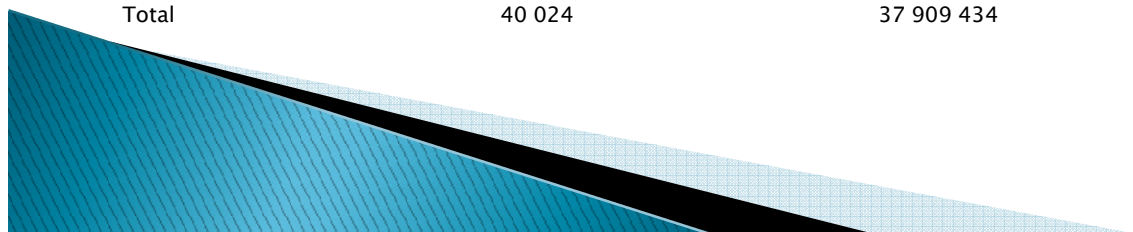
- ▶ There are costs involved in caring for the blind, both in time and lost wages.
- ▶ Younger children are often taken out of school to look after the elderly blind, thus depriving the child of education and perpetuating the cycle of poverty in the community.



Provisional Cataract surgery rates

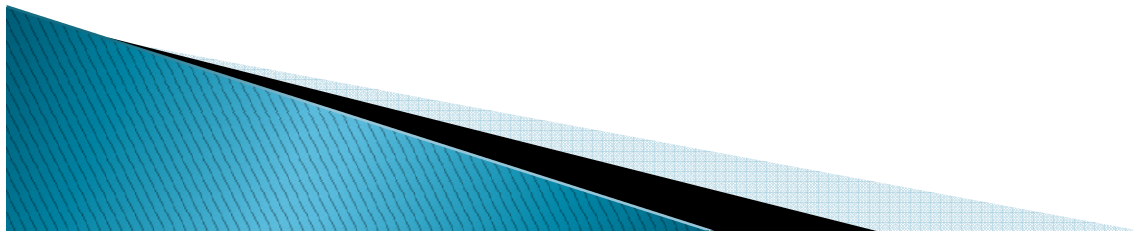
Table I. 2006 provincial CSRs and proportions of population living in urban areas

Province	Number of cataract surgeries done per year	Population dependent on public sector services	CSR	Proportion of population urbanized (%) ^{4,15}
Western Cape	5 463	3 900 189	1 401	90
Gauteng	9 917	7 832 182	1 266	97
Free State	2 773	2 369 474	1 170	76
Mpumalanga	2 764	2 381 674	1 161	82
Northern Cape	860	778 329	1 105	82
Limpopo	4 432	4 718 043	939	40
KwaZulu-Natal	7 266	7 786 511	933	46
Eastern Cape	4 556	5 647 073	807	38
North-West	1 993	2 495 959	798	42
Total	40 024	37 909 434	1 056	64



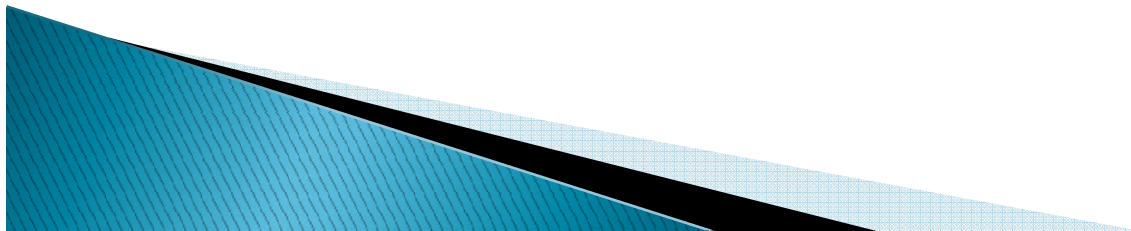
Cataract surgery rates

- ▶ In 2006, the human resources available for eyecare and cataract surgery in the indigent population of South Africa are far below the number recommended for the public sector (number available in South Africa followed by the recommended number in brackets)
- ▶ Ophthalmologists 70 and ophthalmic medical officers 55 (160); ophthalmic nurses 65 (380); optometrists 74 (152).



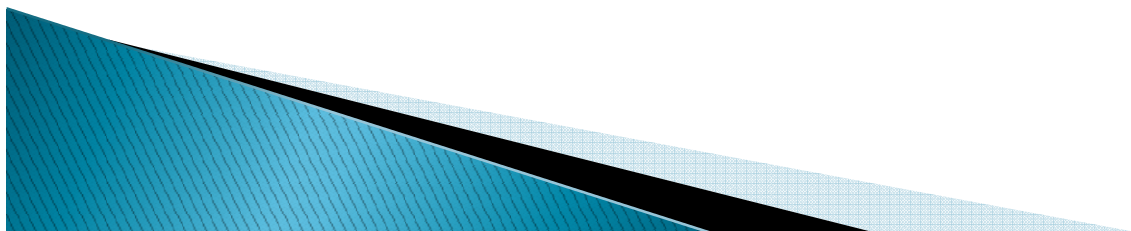
Cataract surgery rates

- ▶ The CSR should be at least 2000 per million population per year to eliminate cataract blindness.
- ▶ Urbanization seems to drive demand for surgery and push up the CSR. With ongoing urbanization, this demand for surgery will probably grow, and so will our waiting lists unless we increase our surgery capacity.



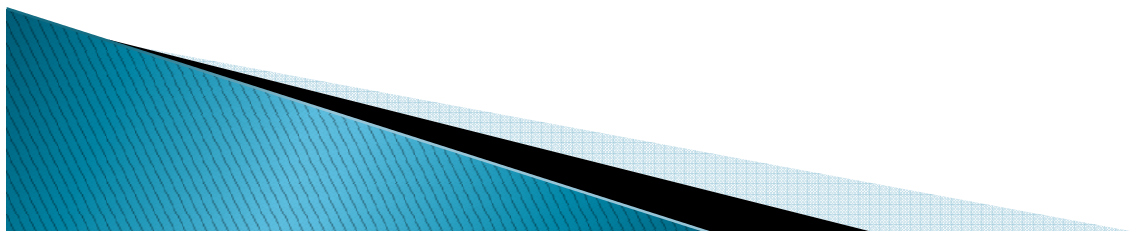
Retina

- ▶ The amount of UV radiation reaching the retina in the adult eye is very low, due to the filtering power of the crystalline lens.
- ▶ There have been recent associations between early age related macular degeneration and extended exposure to UV.



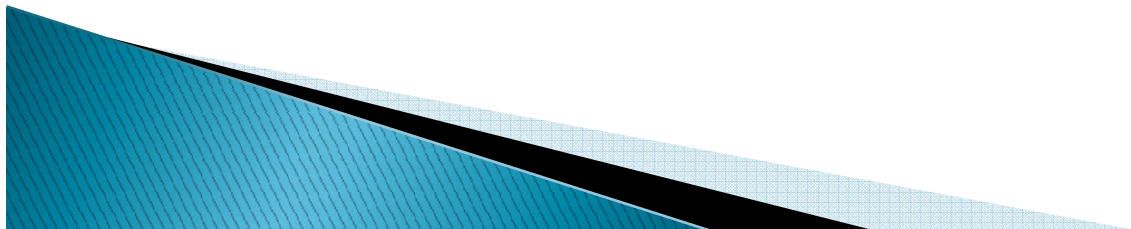
How to protect your eyes from UV

- ▶ Look for a label that lists the type and amount of protection to make sure that they are coated and block both UVA and UVB radiation.
- ▶ To prevent sunlight reaching through the sides of the sunglasses, use wrap around style glasses



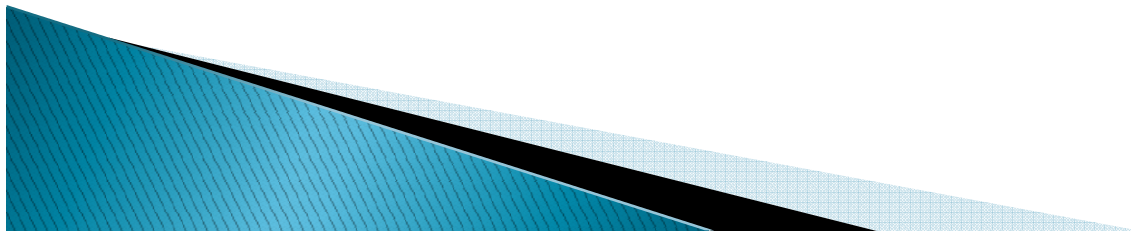
How to protect your eyes from UV

- ▶ Wear a wide brimmed hat, it keeps about 50 percent of UV radiation from reaching your eyes



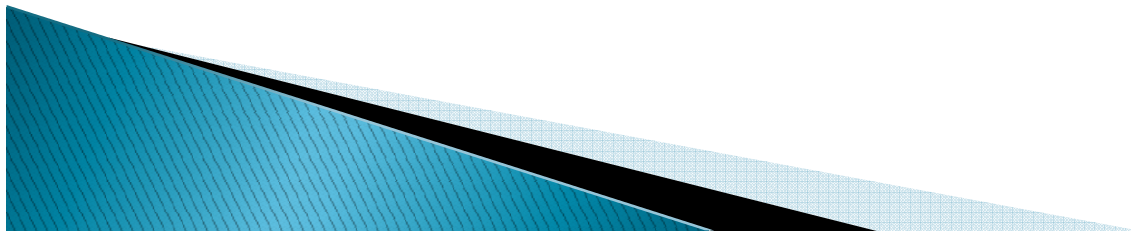
Interesting facts

- ▶ Some contact lenses have UV blocking filters embedded into the lens material.
- ▶ Sunglasses without certified UVA/UVB protection can cause more damage to the eyes than not wearing sunglasses at all. This is because the dark lenses cause the pupils of the eyes to dilate, letting in more UVA rays that will damage the retina and lens of the eyes.
- ▶ Even when we talk about 100% UV protection, light still enters from the sides of the sunglasses and can be reflected into the eye.



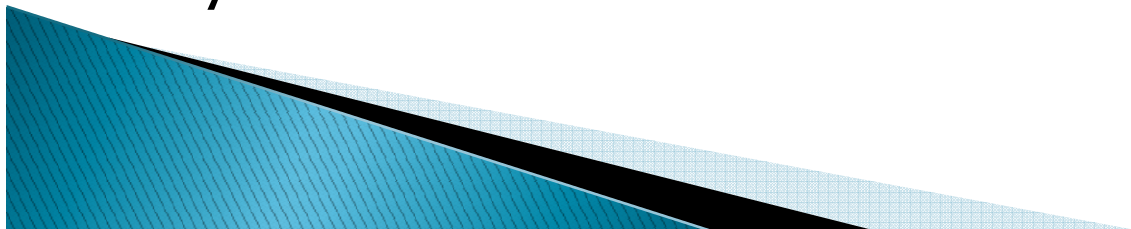
Interesting facts

- ▶ UV radiation from sources behind the wearer can reflect from the back lens surface toward the wearers eye.
- ▶ For this above mentioned fact, eyewear that incorporates a high wrap frame and high base curve lenses can prevent UV radiation from reaching the eye.



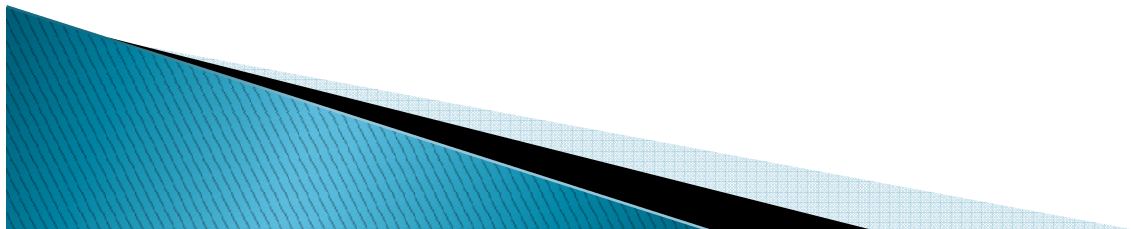
Interesting facts

- ▶ Some effects of UV are helpful– Vit D and the skin.
- ▶ UV is used in medical facilities to sterilize equipment.
- ▶ The effects of UV radiation are cumulative over a lifetime, young eyes are particularly vulnerable, due to larger pupils and clearer ocular media. The WHO states up to 80% of a person's lifetime exposure to UV radiation is reached before 18 years.



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Thank you for your time