



The recently launched Transitions Children's Cataract Calculator has been an exciting project, the result of collaboration between Transitions UK and Sightrisk, with endorsement by the Association of Optometrists.

The aim has been not simply to raise awareness of the risks faced by children from a young age, but to produce an individual risk prediction sound in both science and optometry. By this means, children and their parents can be made aware of the risks, and importantly, how to reduce them. In addition, although eye care professionals may be well aware of the risks to adults, the greater risks faced by children, particularly regarding UV light, can often be overlooked.

Cataract risk factors

The first thing that comes to mind as a cataract risk is increasing age. However, it is evident that some people develop cataract at a relatively early age, and others live all their lives untroubled. We live in an age where research is increasingly identifying individuals who have high or low risk of practically all human ailments, as a result of particular physiology or lifestyle. The unique strength of the Sightrisk mathematical model is that it combines all applicable risks, according to their relative significance, and generates a lifetime risk prediction.

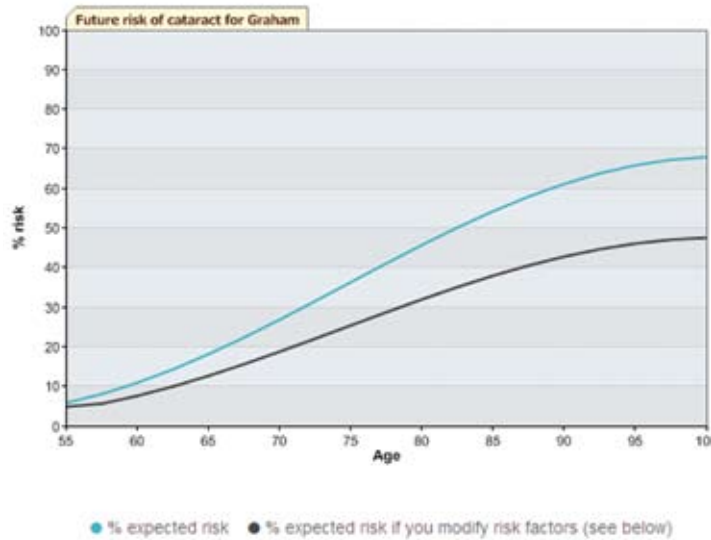
The following risk factors included in the children's cataract risk calculator are the ones which have been considered sufficiently validated at the present time. As and when other risk factors have been confirmed these too will be included in the mathematical model.

Age

The risk at ages from 55 to 100 is displayed as a line graph. When does an individual 'have' a cataract? For the purposes of the calculator, this has been defined as the point when it is visually consequential, and quality of life is affected, for example visual acuity reduced to outside the legal limit for driving, or significant problems with glare. These particular criteria are increasingly being used to establish a patient's qualification for cataract surgery, within a scoring system such as the recently launched Gloucestershire cataract direct referral pathway. The lower line represents how the risk can be reduced by taking

Transitions Children's Cataract Calculator

Graham O'Regan describes a novel way of predicting risks of cataract in children and how to reduce them



Example: At the age of 75 the subject will have an expected risk of 37 per cent

positive steps such as keeping weight at a healthy level, protecting the eyes from high energy (short wavelength) radiation etc.

The first entry in the calculator question list is current age. This information is used to modify the risks associated with body mass index (BMI) and unprotected exposure to light.

Gender

The risk of cataract is higher in females than in males, some studies suggesting increased risk of cortical cataract. A hormonal difference between males and females has been cited as a possible reason.

Family history

Family history risk is well established; however, research tends to concentrate on first degree relatives. As this information would be unavailable to a child (typically parents will be in their 20s or 30s when cataract is unlikely), a statistical calculation is made to predict risk from grandparents' history where available. A useful feature of the Sightrisk software is the ability to accumulate statistics from the online entries (anonymously) which will be used to further refine accuracy.

Skin colour

Much has been published regarding cataract and ethnicity; the major studies are in agreement with relative risk weightings.

Diet

This area is probably the most controversial with regard to cataract, but, increasingly, research indicates the significance of diet in the health of the eye – particularly AMD which is now incontestable, therefore diet has been included as a risk factor. The use of vitamin supplementation, for example vitamin C helping to reducing nuclear cataract, has not been included in the calculations at this stage.

BMI

This is calculated from input of height and weight. The advice regarding healthy BMI varies with age up to the age of around 20 years, and differs between girls and boys. Evidence suggests that many overweight teenagers go on to be overweight adults. To increase the sensitivity of the statistical analysis, the BMI risk factor is therefore variable.

Diabetes

Many publications and studies support the probability that diabetics are at



Clinical

higher risk of developing cataract, in particular posterior subcapsular cataract (PSC). In general, diabetic patients present for cataract surgery at an earlier age, this being related to the age of onset of the diabetes and how well it has been controlled.

Light

This is an area of increasing interest and research, and many studies are ongoing. Again because there is some variation in research results, the most robust have been considered and, we believe, a realistic weighting has been applied to the risk generated by unprotected exposure to light.

Ultraviolet radiation presents the major risk. UV is the area of the electromagnetic spectrum between X-Rays and visible light. Vacuum UV (40-190nm), Far UV (190-220nm) and UVC (220-290nm) are absorbed by the atmosphere, and therefore only encountered from man-made sources.

UVB (290-320nm), is the most biologically destructive form of UV radiation as it is not completely absorbed by the atmosphere and releases enough energy to cause photochemical damage to cellular DNA. There are well known concerns here regarding the increasing levels of UVB as a result of depletion of the ozone layer.

As a result of increased time outdoors, particularly in summer, children receive as much as three times the amount of UV exposure than adults. Other factors (although anecdotal) could be that children have a more upright posture than adults, who increasingly stoop with age, and facial bone structure which tends to less deep-set orbits, both of which would increase the light incident on the eyes. These factors

are consistent with studies which suggest that 80 per cent of radiation damage is likely before the age of 20 years.

The cornea is transparent to UVA (320-380nm) and largely blocks UVB; however, the younger the age, the more corneal transparency to both visible and UV radiation, including UVB, increasing the risk of cortical cataract (and a limited amount to the retina also, increasing AMD risk).

The mechanism of phototoxic damage differs between UVA and UVB; however, the end result is the same – loss of lenticular transparency. The Sighrisk mathematical model takes account of the current age and therefore generates a variable risk factor.

Steroids

The associated risk of steroid therapy is well-documented, the risk being of PSC cataract. A refinement here would be to produce a dosage-variable risk factor; however, current information is insufficient.

Rx

The increased risk to myopes is well established, and the appropriate risk weighting used.

Smoking

A lot of thought went into the risk from smoking. Although the risk from smoking is incontestable, this could not be selectable as a risk for young children, for evident reasons. For this reason the 'see what happens if you are exposed to smoke' approach has been used and has been well received. Obviously there is considerable variation in risk in later life depending on how much you smoke, if and when you give up etc. Also, as in many bodily conditions, smoking is

an inter-dependent risk with other factors. For example in osteoporosis, if you are a smoker and have a low BMI, the risk of bone fracture is considerably accentuated. However, for our purposes with cataract, a simple do/do not risk factor is generated. Smokers characteristically develop nuclear cataracts at an earlier age.

Of note, some significant risk factors are not included. Excessive alcohol consumption is not considered, as this is a children's risk calculator. However, with increasing evidence of underage drinking, this may need to be included in the future.

Cataract and latitude

Studies show an increase in prevalence of cataract with proximity to equatorial latitudes. One study in the US (Georgetown University, Washington) suggests a 3 per cent increase in cataract surgery per degree of latitude (southerly) in the US. The reasons for this being higher levels of UVA and UVB passing through the atmosphere where the incident light is less oblique (ie closer to the equator). However, other reasons have been cited, warmer climates leading to longer hours outdoors, also the angle (on the face) of sunlight appears to be a factor also. To balance this, another point increasingly mentioned is the depletion of the ozone layer across the poles, which would increase levels of UV radiation at higher latitudes.

With respect to the children's cataract calculator, as this version has been created for use in the UK, the variation in risk with latitude has not been included.

Interestingly, if you applied the results of the Washington study to the UK, with a latitude spread of from around 50 degrees in Cornwall to 60 degrees North in Shetland, you would expect a 30 per cent variation in cataract surgery across the UK. As far as the statistics are available, this doesn't appear to be true; in fact the number of people with cataract in Scotland may be greater. This could be attributed to diet and lifestyle factors, there being a very high rate of coronary heart disease in Scotland, which has many similar risk factors (eg smoking, poor diet, diabetes etc). ●

● **Graham O'Regan** is optometric director of Sighrisk (www.sighrisk.com). The Transitions/Sighrisk Children's Cataract Calculator is free to use and can be accessed via the Children's Corner within the Transitions website www.transitionsnet.co.uk



Children's Cataract Calculator

Download a shortcut button to your desktop. (Windows computers only)

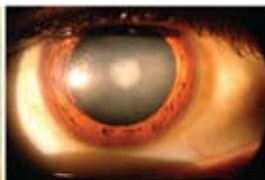
A cataract is a clouding of the lens in the eye, which affects vision. As we age, we are naturally exposed to harmful ultraviolet rays and the production of unstable molecules in the eye, known as free radicals, which cause cataracts to develop.



Normal vision



Cataract vision



Cataract