

Välkommen till Afa Försäkrings seminarium

Katarakt och arbetsmiljö

23
MAJ



Arbejdsrelateret katarakt

Et Arbete och Halsa dokument

Jens Peter Bonde, Stinna Skaaby

Arbejds- og miljømedicinsk afdeling

Bispebjerg-Frederiksberg Hospital

Københavns Universitet

Jakob Kondras Bjerager

Øjenafdelingen, Rigshospitalet, Glostrup, Denmark

AFA Forsikring frukostseminarium 23. maj 2025, Stockholm



Agenda

- Introduction (Stinna)
- What is cataract (Jakob)
- Occupations Exposures and Cataract (jp)
- Q&A Session (alle)





Cataract

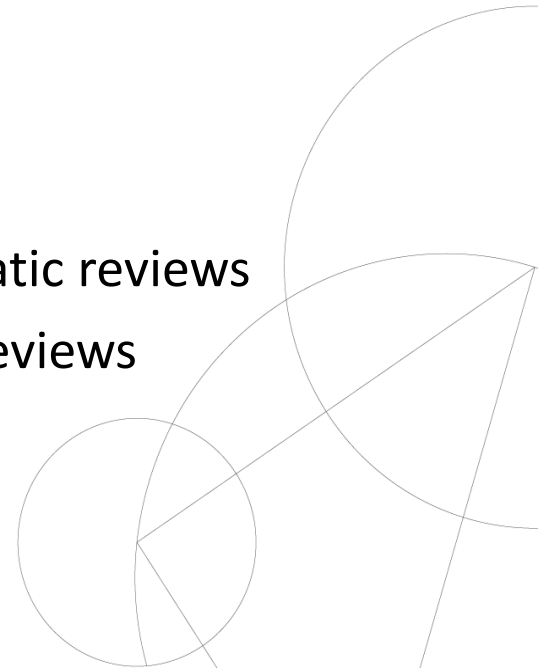
- Globally, the most common cause of blindness
- In Sweden, ~ 160,000 cataract surgeries in 2024
- **Few, if any cataract cases reported as work-related**

Methods

- Systematic literature review.
- Records screened: $n = 2,214$

Categories of evidence

1. Well-documented exposures with recent systematic reviews
2. Well-studied exposures lacking comprehensive reviews
3. Sparsely studied exposures



Occupational Exposures

- Radiation
 - Ionizing radiation
 - Ultraviolet radiation
 - Infrared radiation
 - Microwaves
- Chemicals
- Accidents
- Congenital cataract

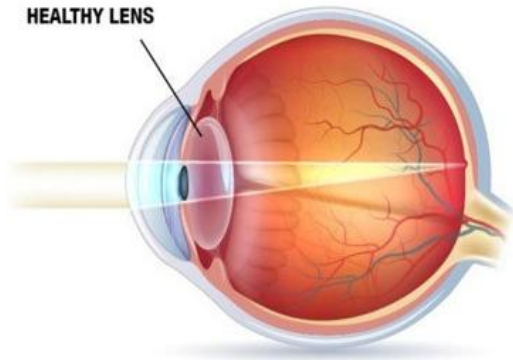


What is cataract



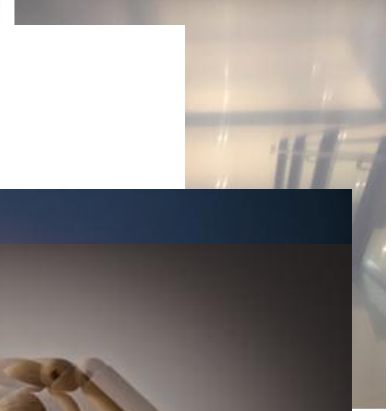
Cataract: What is it?

- eye disease caused by clouding of the lens



Cataract: Symptoms

- Reduced visual acuity
- Loss of contrast vision
- Color vision changes
- Glare
- Double vision
- Night blindness



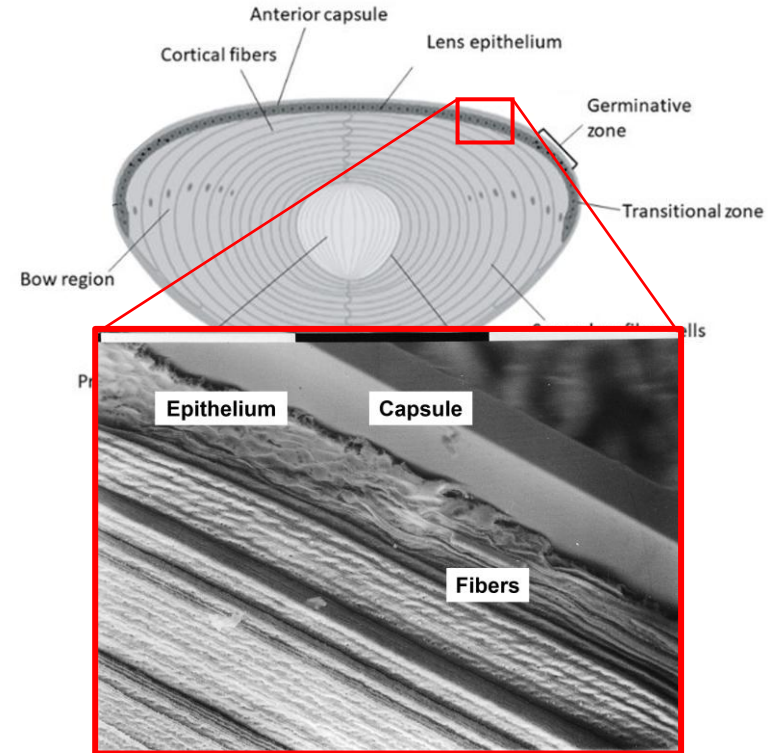
Cataract: Causes and risk factors

- **Acquired**

- Age-related
- Systemic disease: Diabetes (5x)
- Eye disease: Uveitis
- Medication: Corticosteroids
- Trauma (up to 65%)
- Smoking (1.5-3x)

- **Infantile**

- Genetic
- Malformations



Cataract: Diagnosis

Vision complaints



Visual acuity



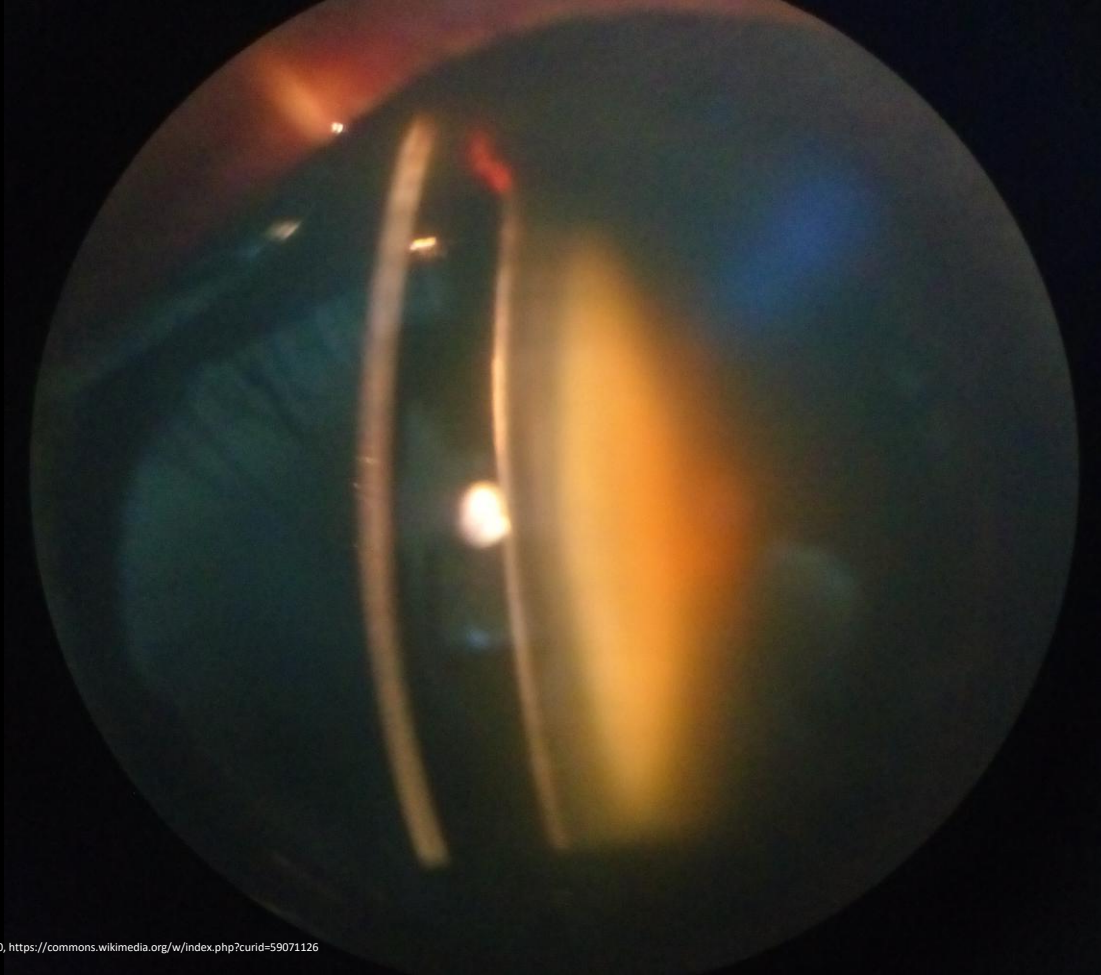
Pupil dilation



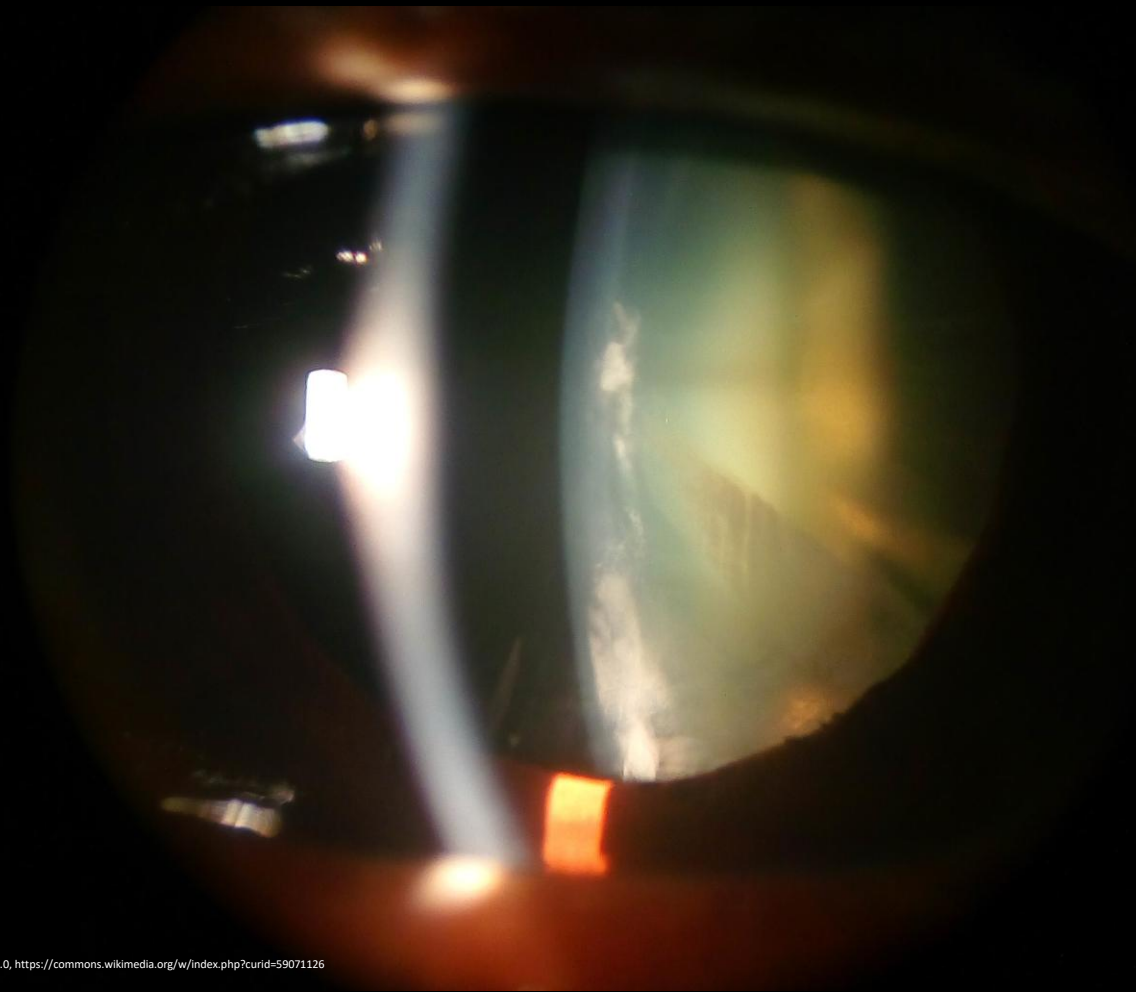
Slit lamp examination



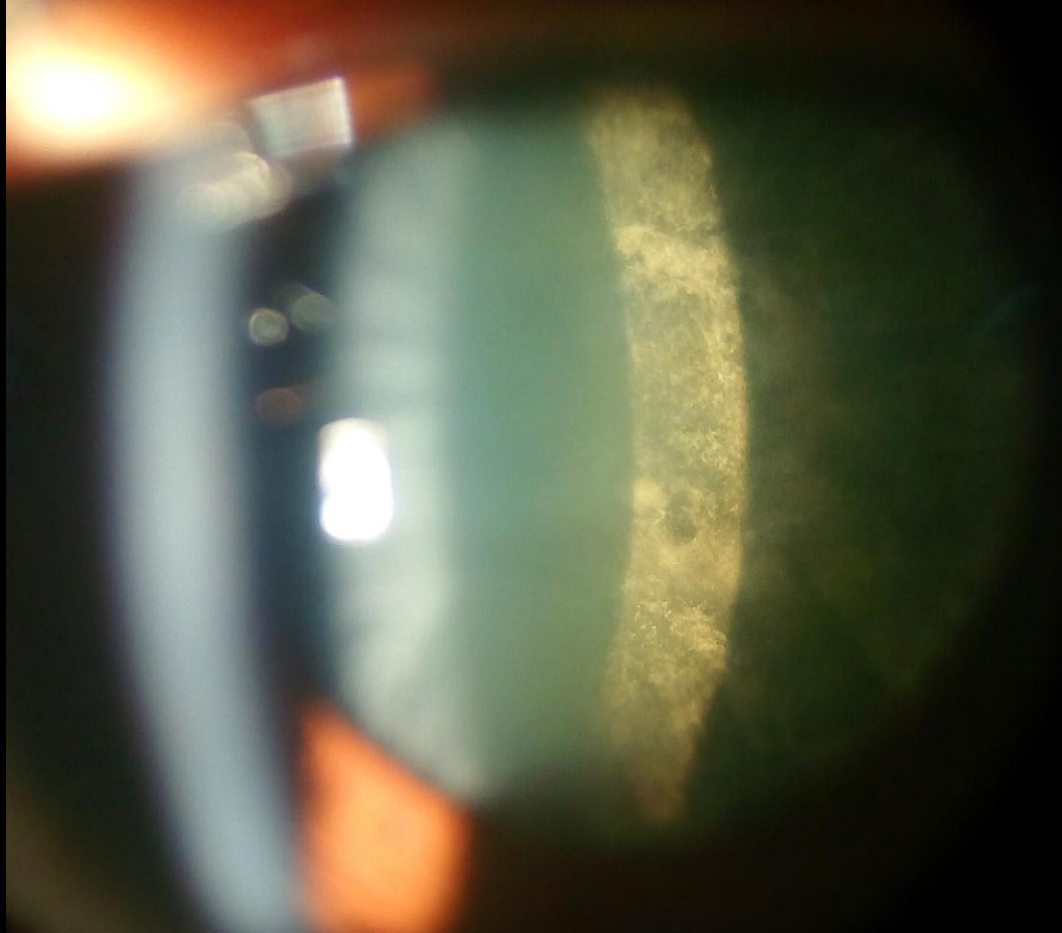
Most common cataracts: Age-related nuclear sclerosis



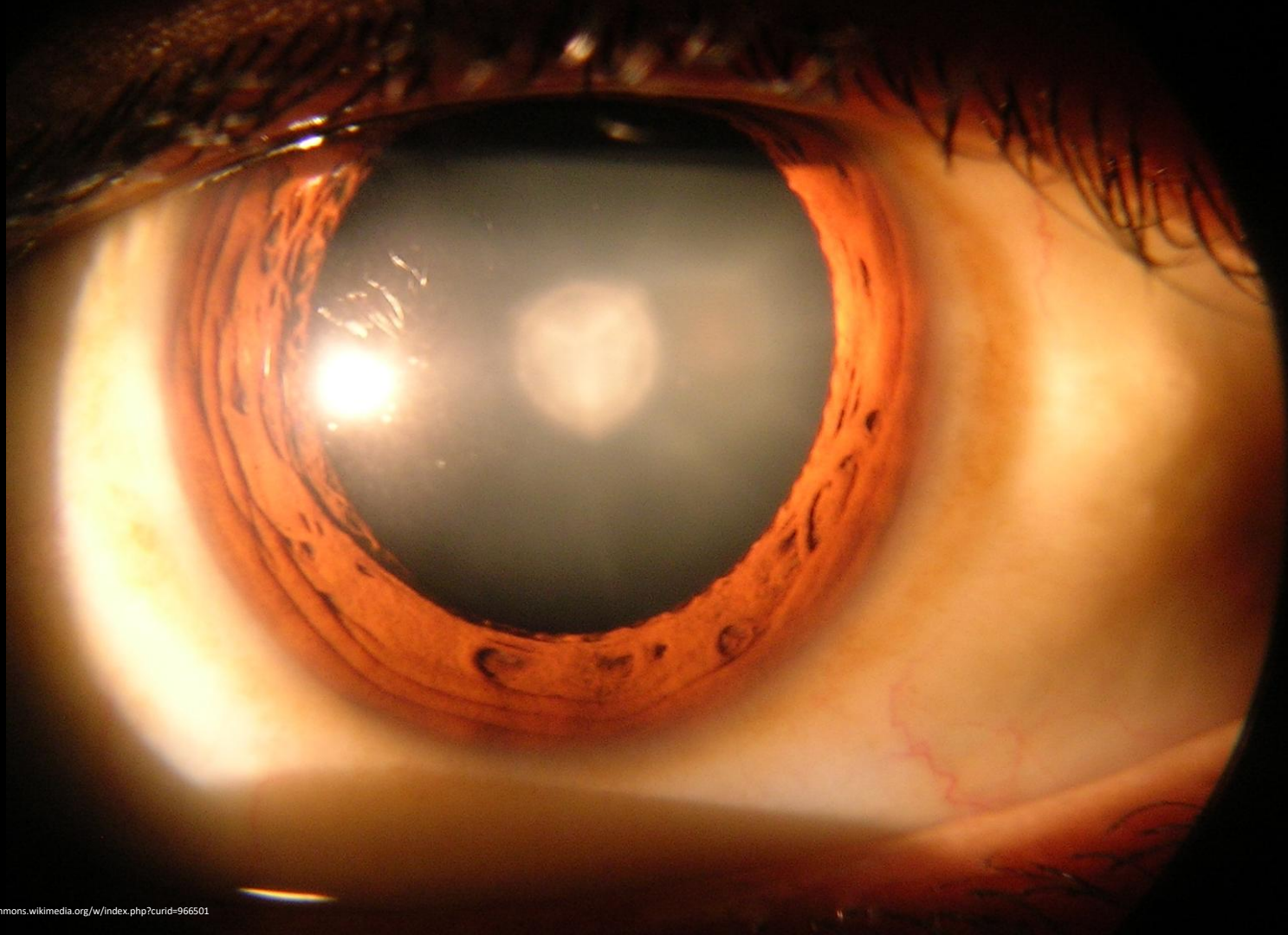
Most common cataracts: Cortical cataract



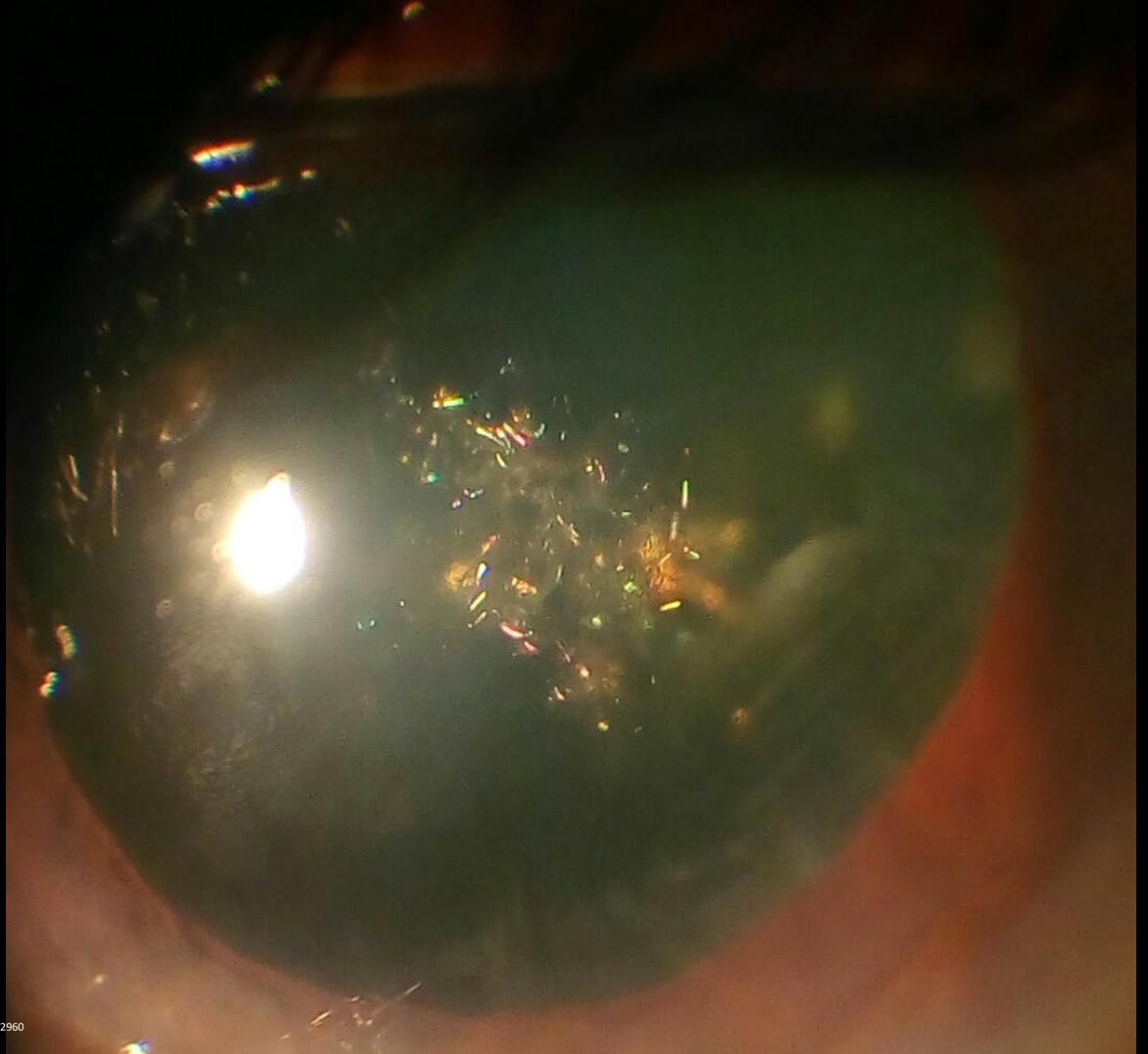
Most common cataracts: Posterior subcapsular cataract



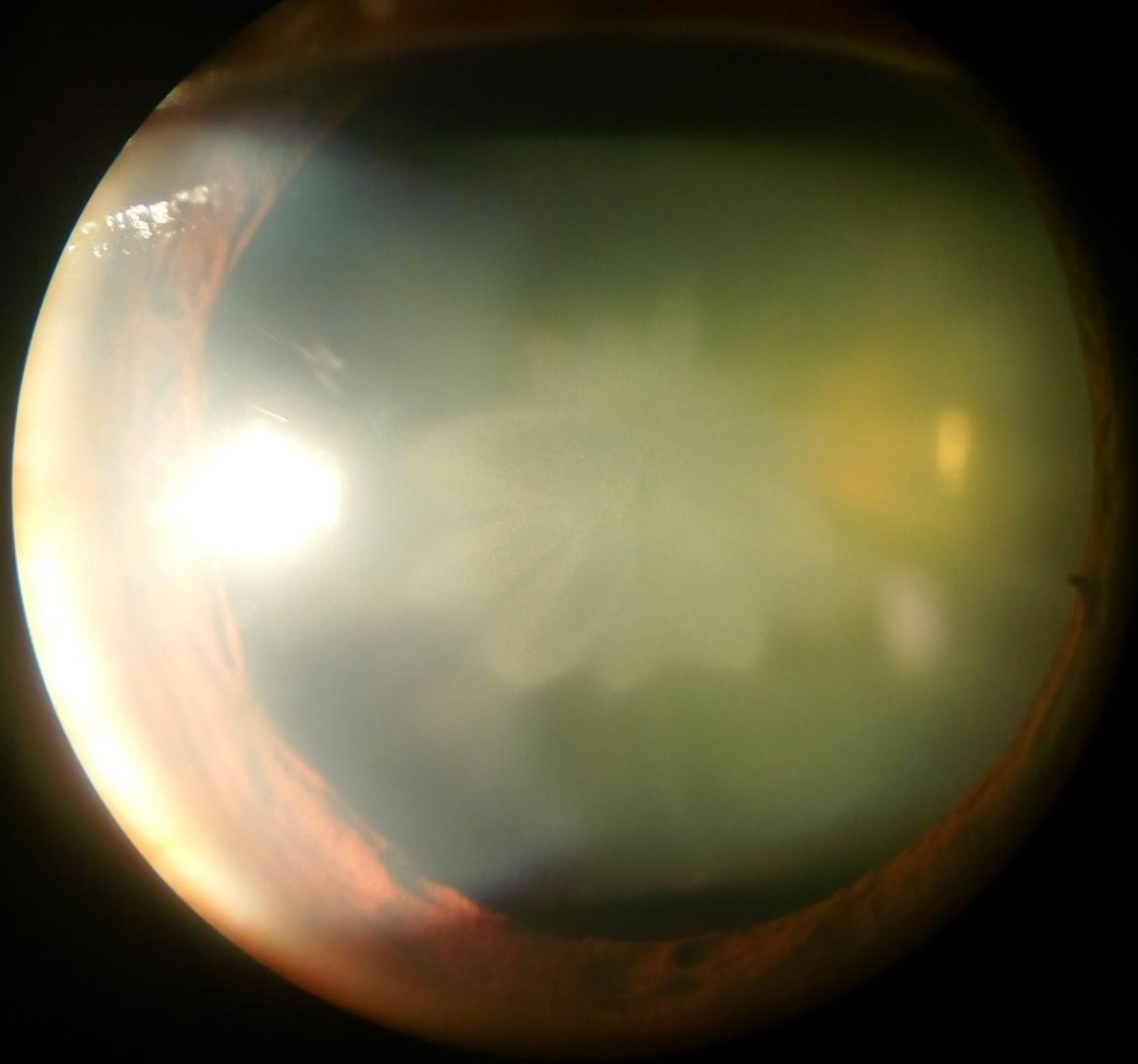
Polar cataract



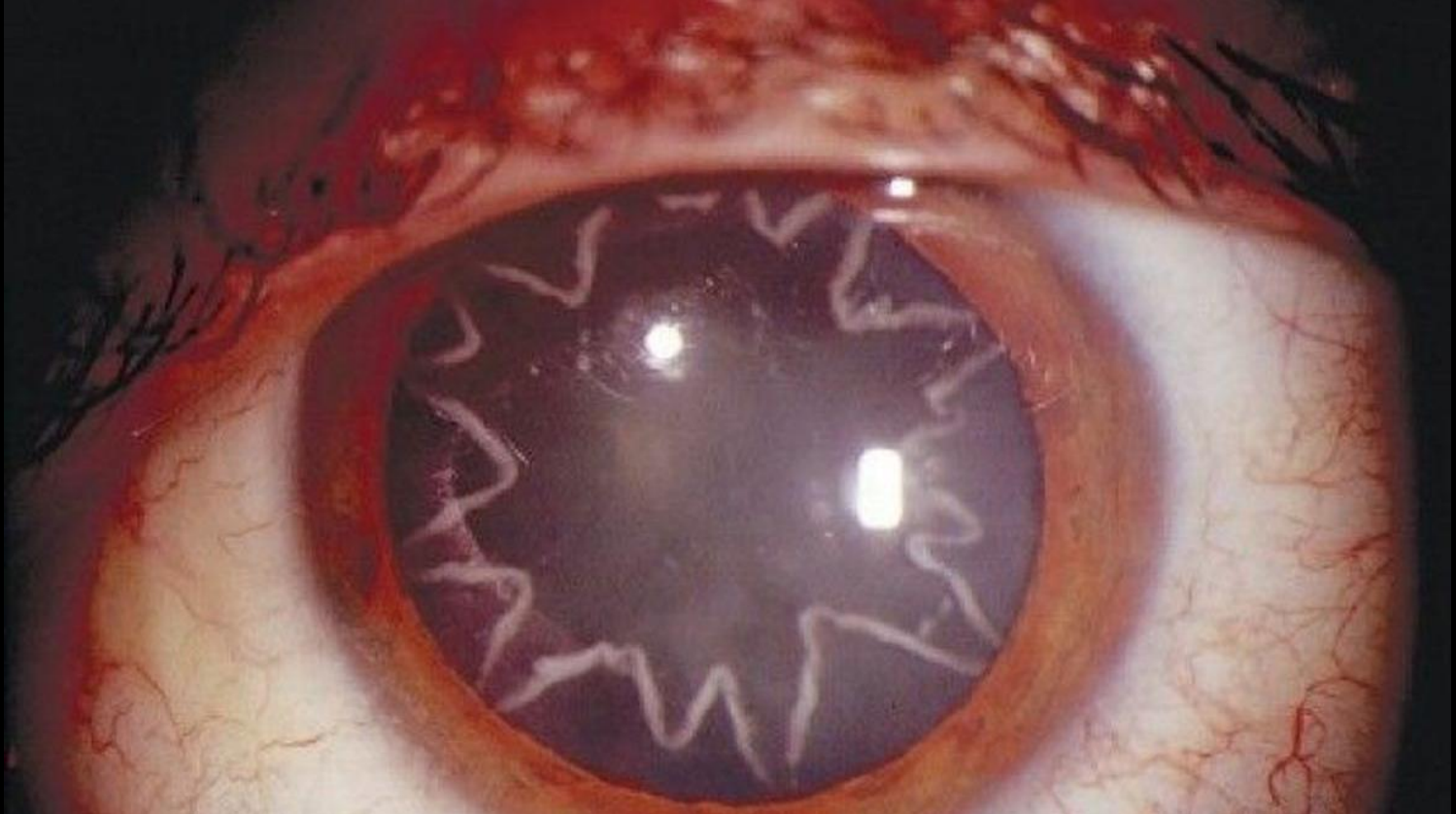
Christmas tree cataract



Traumatic cataract (blunt trauma)



Traumatic cataract (electric trauma)



**Chemical and others
(Trinitrotoluen
(TNT) cataract)**



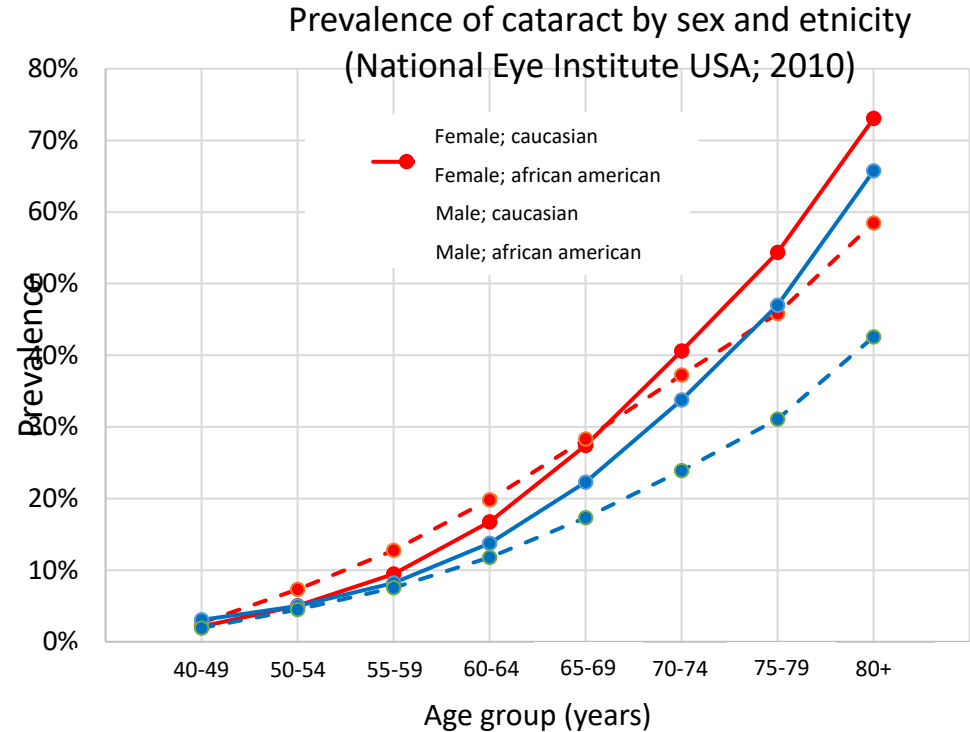
Cataract: Prevalence

- **75-84-year-olds**

- **Nuclear: 49-57%**

- **Cortical: 42-47%**

- **Post. subcapsular: 12-14%**



Cataract: Disease burden

- **75% of world blindness**
 - **Developing world: 90%**
 - **Scandinavia: 0.1%**
- **Country GDP**
- **Eye doctors**
 - **Ethiopia: 1 per million**
 - **Sweden: 1 per 13.150**

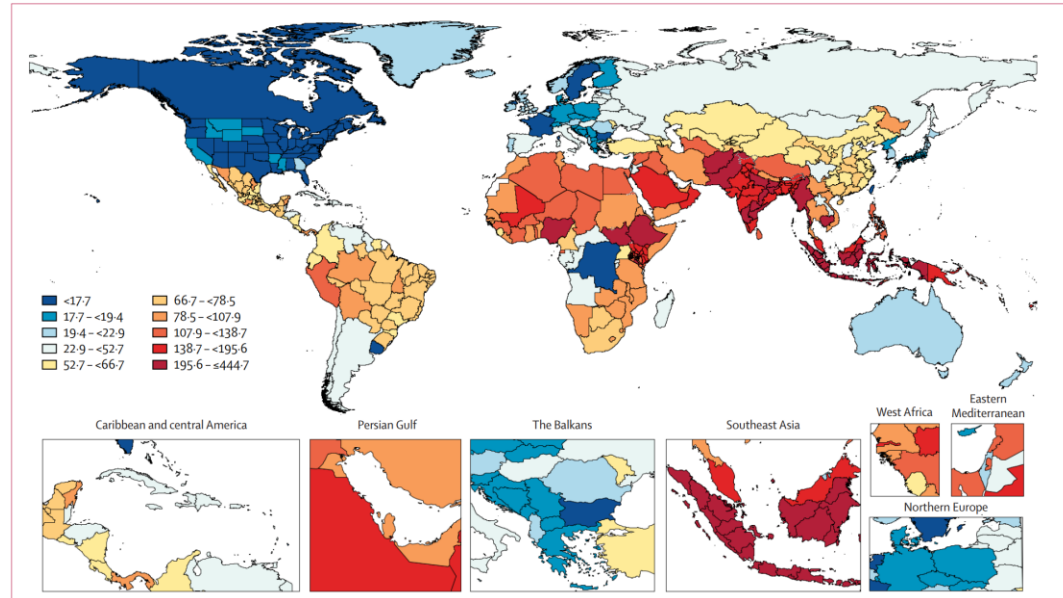
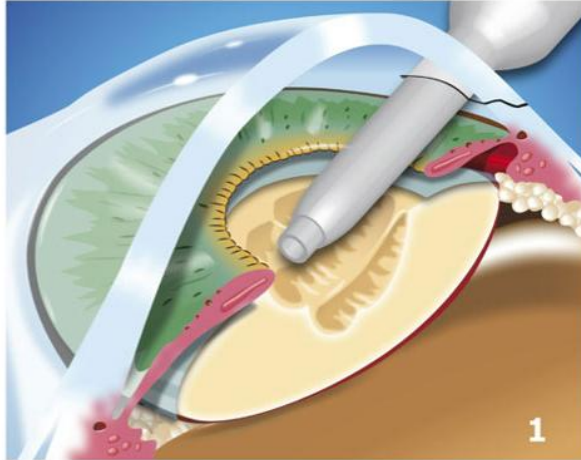
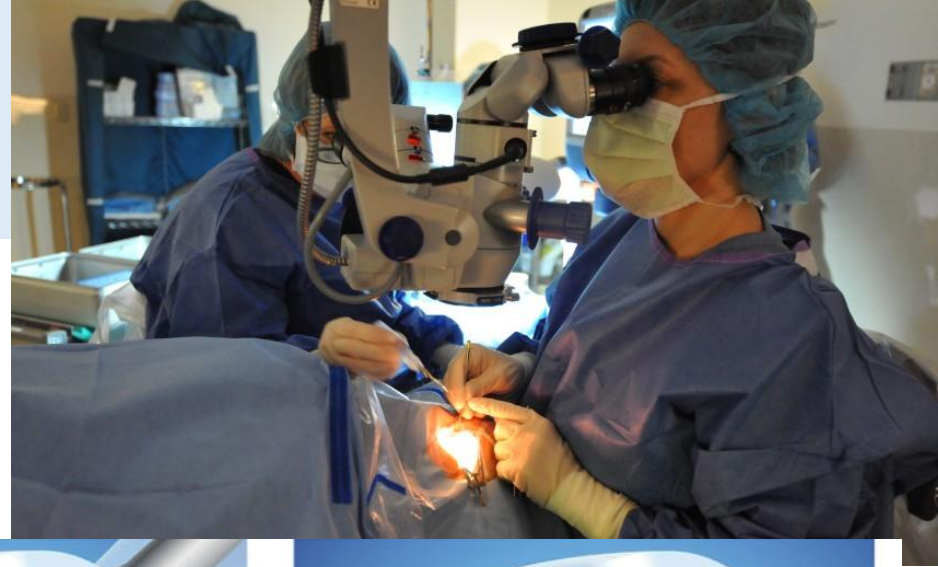


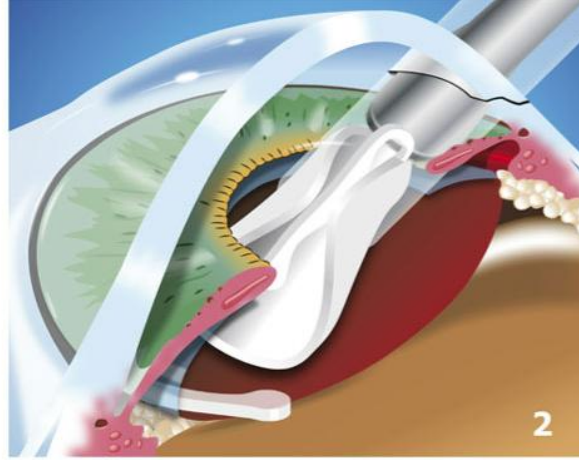
Figure 5: Age-standardised DALY rates (per 100 000) by location, both sexes combined, 2019
https://www.healthdata.org/sites/default/files/disease_and_injury/gbd_2019/topic_pdf/cause/671.pdf

Cataract: Treatment

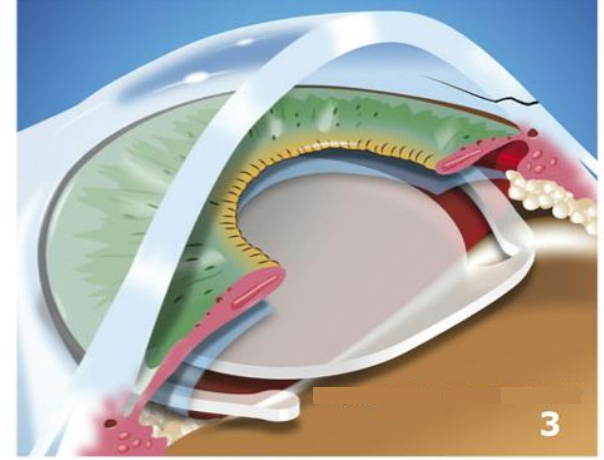
- Surgery only option
- Safe but with certain risks
 - Retinal detachment in younger myopes



The cloudy lens is removed (phacoemulsification).



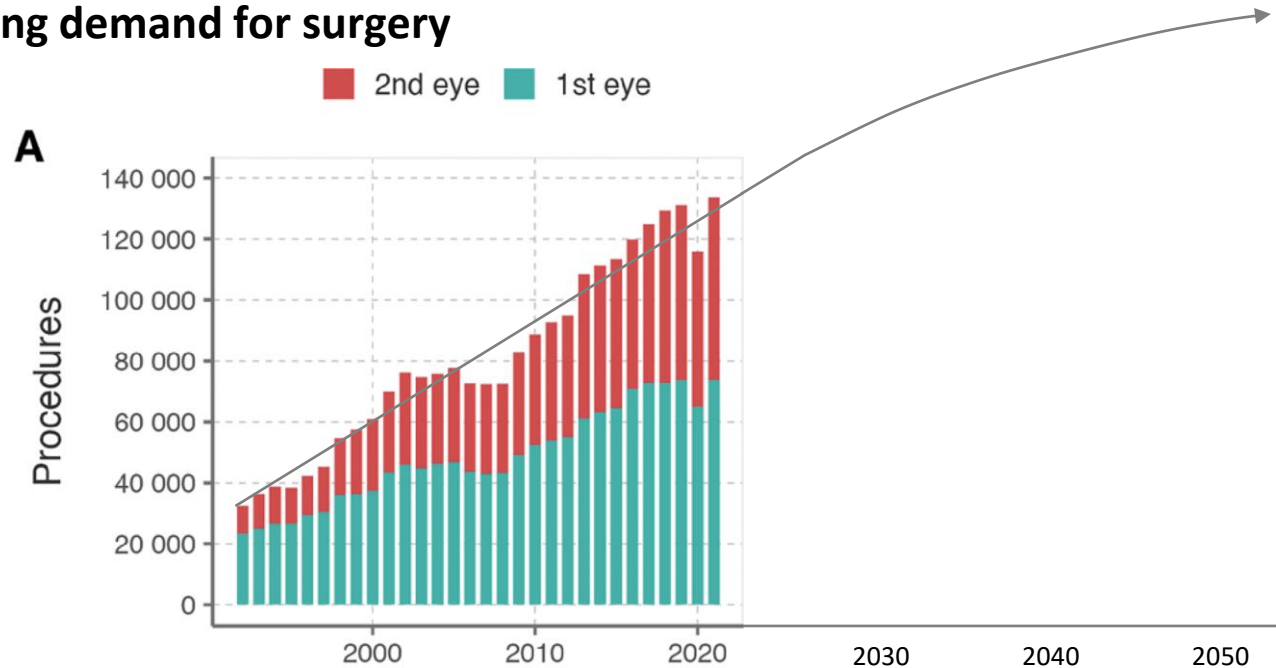
A clear artificial lens is implanted into the empty capsule of the lens.



Intraocular lens (IOL) in place.

Cataract: Disease burden

- Increasing demand for surgery



Bro, T. , Behndig, A. , Viberg, A. , Zetterberg, M. , Kugelberg, M. , Nilsson, I. , Thorburn, W. , Stenevi, U. & Lundström, M. (2023). Two point four million cataract surgeries: 30 years with the Swedish National Cataract Register, 1992-2021. *Journal of Cataract & Refractive Surgery*, 49(8), 879-884. doi: 10.1097/j.jcrs.0000000000001209.

Cataract: Key messages

- Causes **loss of daily functions** and quality of life
- Age-related but **risk factors such as trauma are important**
- **Surgery** is effective but
 - **availability** is increasingly challenged
 - carries **certain risks**, especially in younger eyes
- **Prevention** is key for easily modifiable risk factors



Occupational exposures and cataract



Content

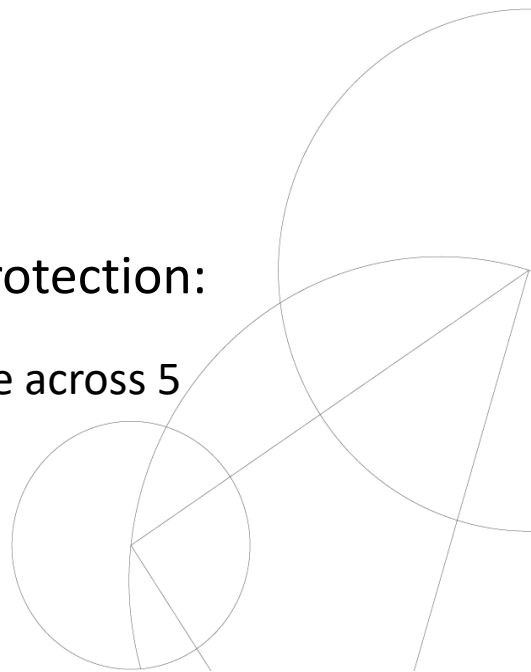
- Ionizing radiation
- Ultraviolet radiation
 - Solar radiation
 - Metal-welding
- Other exposures
- Implications



Ionizing radiation

- Established cause of cataract
- Linear dose-response relation
- Threshold?
- The International commission on Radiological protection:

TLV reduced from 150 mSV/y to 20 mSV/y as average across 5 years



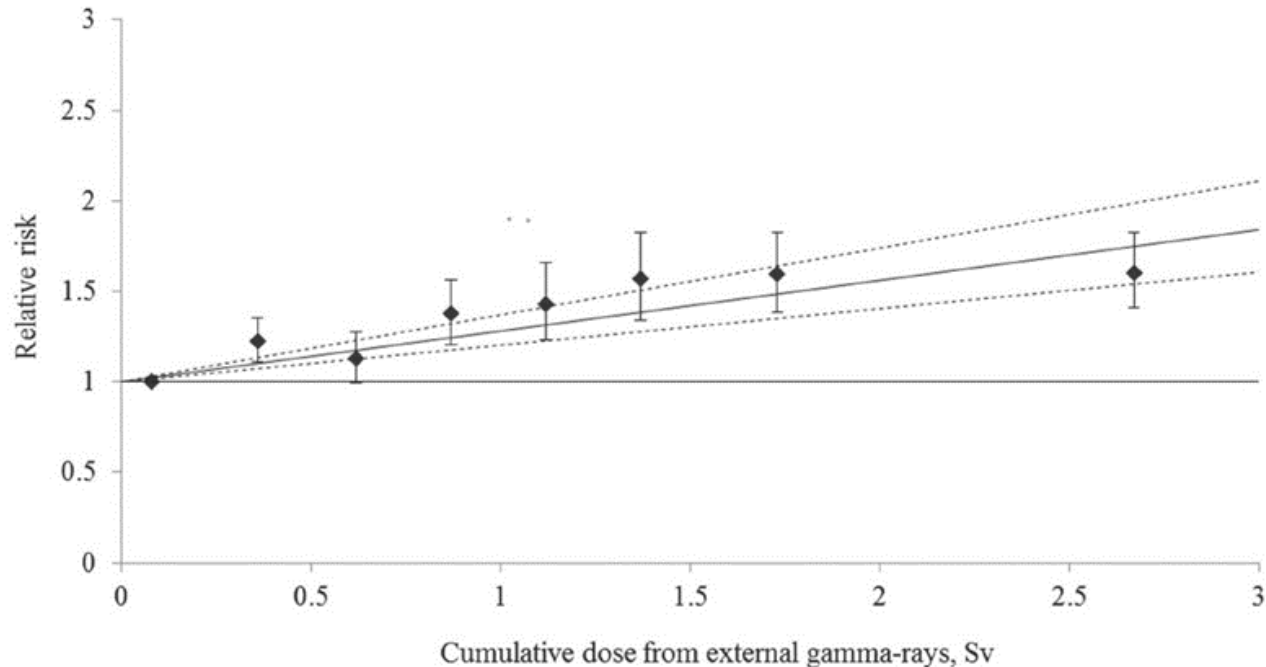
Background ionizing radiation in the Nordic countries, mSv/year

Kilde	Island	Danmark	Norge	Sverige	Finland
Radon-222	0.2	1.0	1.7	1.9	2.0
γ-stråling fra grundfjeld og jord	0.2	0.3	0.5	0.5	0.5
Kosmisk stråling	0.3	0.3	0.3	0.3	0.3
Andet	0.3	0.3	0.4	0.3	0.3
Total	1.0	1.9	2.9	3.0	3.1



US studies showing effects below TLV
apparently contradicted by Nordic
monitoring data

Risk of cataract among 22 377 workers nuclear industry workers in Ozyorsk, Russia 1948-1982 followed until 2008



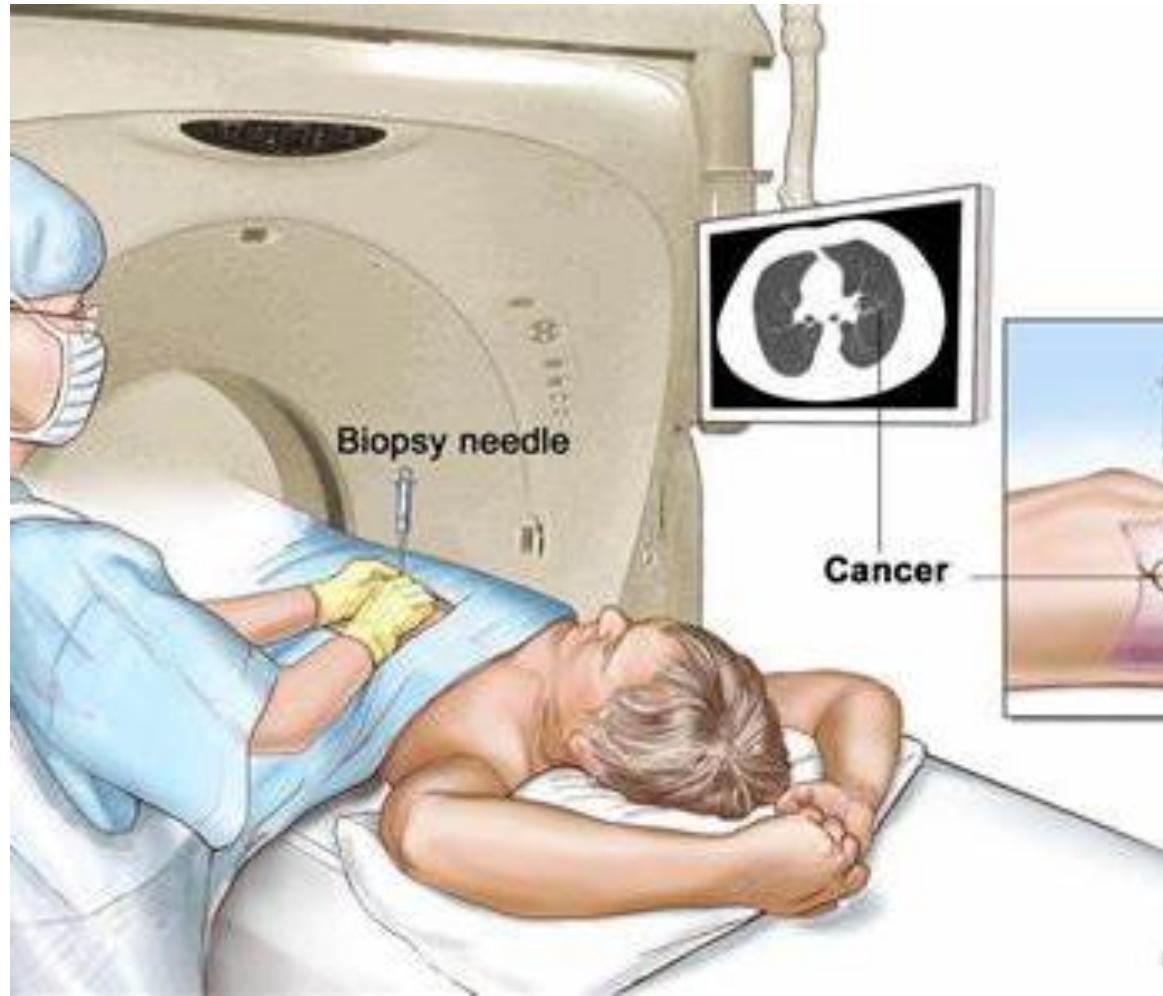
Fluoroscopy

(røntgen gennemlysning)

1. Rapidly increasing use in diagnostic and interventional procedures:

- a) radiology
- b) cardiology
- c) oncology
- d) urology
- e) other specialties

2. Increased risk in several newer studies



The most recent studies addressing risk of cataract among staff performing interventional fluoroscopy.

Reference	Land	Antal eksponerede og kontroller	Katarakt-type	Dosis	Kontrast	Risiko-estimate	95% CI
Velazquez-Kronen et al., 2019	USA	Spørgeskema	Selvrapporteret lægediagnosticeret katarakt	ND	FGIP Aldrig 0 - < 1000 1000 - < 3000 3000 - < 5000 ≥ 5000	RR 1,00 1,10 1,14 1,21 1,38	1,0-1,2 1,0-1,3 1,1-1,4 1,2-1,5
Rose et al., 2022er	Sydafrika	Spaltelampe, Verdenssundhedsorganisationens Simplified Cataracts Grading Score	Nuklear Kortikal Posterior subkapsulær	ND	Eksponerede vs referencer	OR 0,6 1,4 2,2	0,3-1,3 0,6-3,4 0,6-8,6

Other occupational exposures ionizing radiation

- Pilots and cabin crews: cosmic radiation

Yearly exposure 0,2-5 mSV

- **Research laboratories**
- **Industrial radiography**
- **Nuclear power facilities**
- **Nuclear industries**

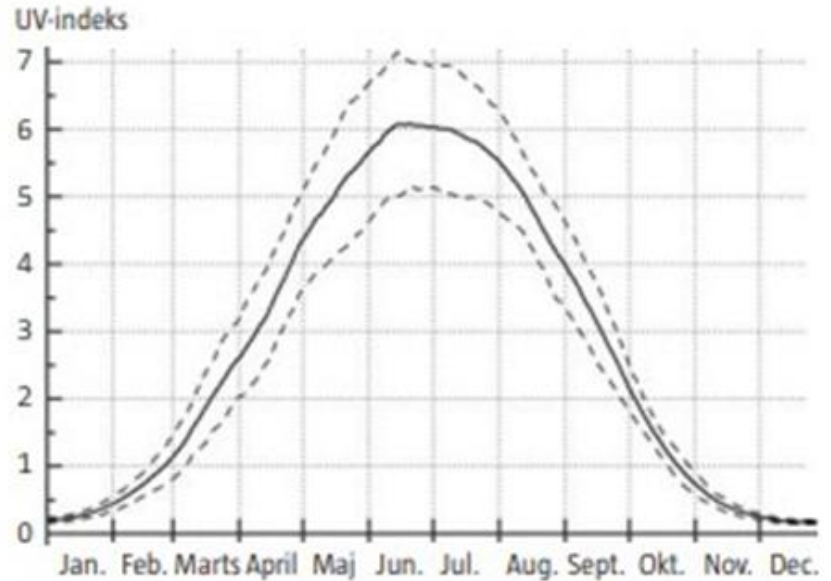
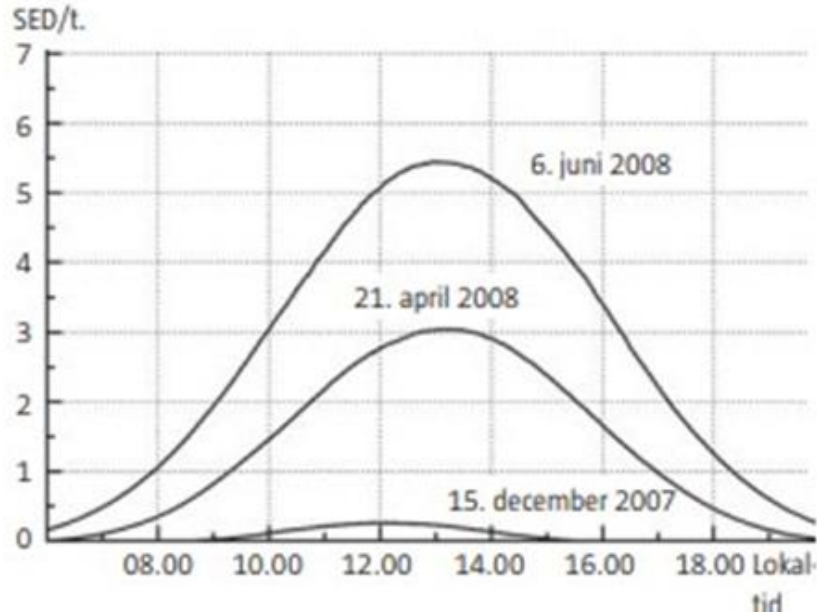


Solar UV radiation

Geografisk breddegrad	Døgn MED			Årlig MED
	Sommer	Forår/efterår	Vinter	
20° N	25	20	14	6000
30° N	15	12	5	4000
40° N	12	7	2	2500
50° N	10	3	0.4	1500

MED= minimal erythema dose: UV dose which induces erythema of the skin

Outdoor solar UV exposure across the day and across the year in Denmark



Solar exposure in outdoor workers during summer half year in DK:

(Grandahl K et al 2018)

Occupation	Average SED
Outdoor workers	215
Half indoor/outdoor	130
Indoor workers	55
Leisure time exposure	55-65

Strong experimental and epidemiological evidence linking solar radiation and (cortical) cataract

- Populations surveys report increasing risk with lower latitude on both northern and southern hemisphere
- The Chesapeake Bay Waterman study: double individual cumulative exposure in fishermen associate with OR cortical cataract 1.60 (95% CI 1.01-2.64)
- Findings corroborated in other population based studies

Fag med udendørs arbejde

Landmænd

Skovarbejdere og gartnere

Bygningsarbejdere

Fiskere- og sømænd

Livreddere

Asfaltarbejdere

Minearbejdere i åbne miner

Arbejdere med el- og vandforsyning

Udendørs sportsinstruktører

Udendørs sikkerhedsarbejde (fx patruljering)

Chauffører (lastbiler, offentlig transport mv)

Postbude

Udendørs læsning og losning

Gadesælgere

Lærere i vuggestuer og børnehaver

Studies explicitly addressing outdoor work

- 13 studies compare risk in outdoor workers with indoor workers:
 - 1)Chesapeake Bay Waterman study
 - 2)Beaver dam Eye study
 - 3)Other studies less informative and with conflicting results

Conclusion on occupational exposure to solar light

There is solid evidence that the cumulative UVB radiation dose from the sun increases the risk of cataracts throughout life and thus that outdoor work contributes to the risk, but there are only a few studies that shed light on its relative importance of exposure during outdoor work in relation to other exposure to sunlight.

Metal welding

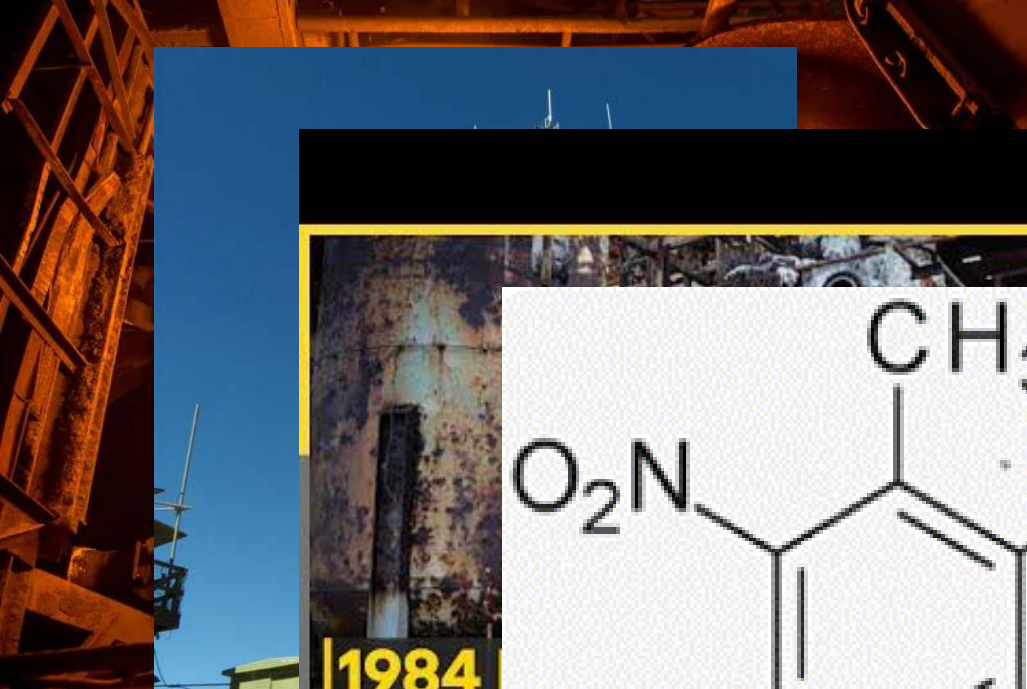


Studies addressing welding and risk of cataract

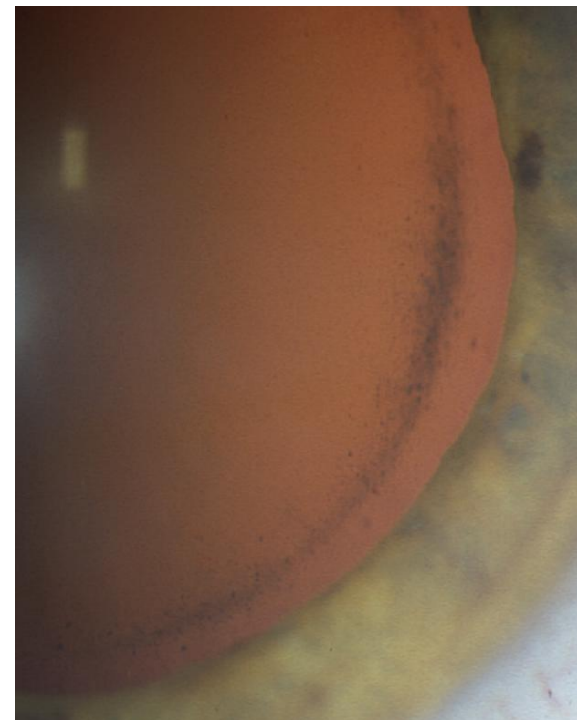
Studie	Land	Population	Katarakt undersøgelse / definition	Risiko estimat (95% CI)
Kohorte and case- control studier				
Slagor et al., 2016 (114)	Danmark	4.288 svejsere 512.151 kontrolpersoner	Hospitalsdiagnose/ alle typer katarakt	HR 1,08 (0,95 – 1,22)
Bochow et al., 2019 (117)	USA	168 cases 168 referencepersoner	Klinisk undersøgelse / Posterior subcapsular katarakt	OR 1,93 (0,89 – 4,61)
Tværsnitsstudier				
Emmett et al., 1981(115)	USA	77 svejsere 58 ikke-eksponerede	Spaltelampe biomikroskopi / Posterior subcapsular katarakt og anterior capsular lens opacity	OR 0,75 (0,05 – 12,3)
Davies et al., 2007 (116)	Nigeria	110 eksponerede 85 referencepersoner	Spaltelampeundersøgelse / ikke angivet	OR 5,57 (0,28 – 109)
Megbele et al., 2012 (104)	Nigeria	117 eksponerede 105 referencepersoner	Ophthalmoskopi / $\geq 5\%$ uklarhed af linseoverfladen	OR 3,49 (0,37 – 32,7)
Bhumika et al., 2014 (118)	Indien	276 eksponerede 276 referencepersoner	Klinisk undersøgelse / NA	OR 3,60 (2,27 – 5,70)
Alexander et al., 2016 (119)	Indien	150 eksponerede 150 referencepersoner	Klinisk undersøgelse / NA	OR 3,71 (1,33-10,3)
Kumari et al., 2016 (120)	Indien	37 eksponerede 100 referencepersoner	Ophthalmoscopy / $\geq 5\%$ uklarhed af linseoverfladen	OR 8,74 (0,88 – 86,8)
Praveena et al., 2022 (121)	Indien	90 eksponerede 90 referencepersoner	Spaltelampe biomikroskop / NA	OR 1,21 (0,51 – 2,87)

Conclusion metal welding

- Welding is associated with a substantial risk of UVB exposure
- Two large studies in DK and US do not provide clear evidence of increased risk of cataract but may be biased towards null
- Several small less informative studies of highly exposed workers in India and Nigeria report substantially increased risk but may be biased
- Strict precautions to protect the eye from direct and indirect bystander exposure is essential.



1984
GAS

Cc1cc([N+](=O)[O-])cc([N+](=O)[O-])c1[N+](=O)[O-]

Summing-up

- Occupation is a neglected risk factor for development of cataract
- Relevant exposures are in particular:
 - i. Ionising radiation, particularly fluoroscopy
 - ii. Solar UV radiation, outdoor work
 - iii. Welding
- In spite of solid knowledge, cataract is rarely considered for compensation



afa
FÖRSÄKRING