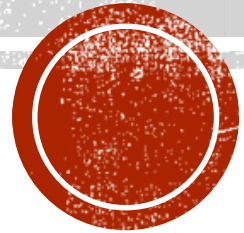
TIME TRENDS AND ASSOCIATIONS OF VISUAL OUTCOMES WITH RISK FACTORS IN EARLY CHILDHOOD: THE CHALLENGES OF HARMONISATION



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Life Course Epidemiology and Biostatistics

Population, Policy and Practice

UCL GOS Institute of child health

Background

Original Investigation

September 2016

Visual Function, Social Position, and Health and Life Chances

The UK Biobank Study

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Original article

Myopia Over the Lifecourse: Prevalence and Early Life Influences in the 1958 British Birth Cohort

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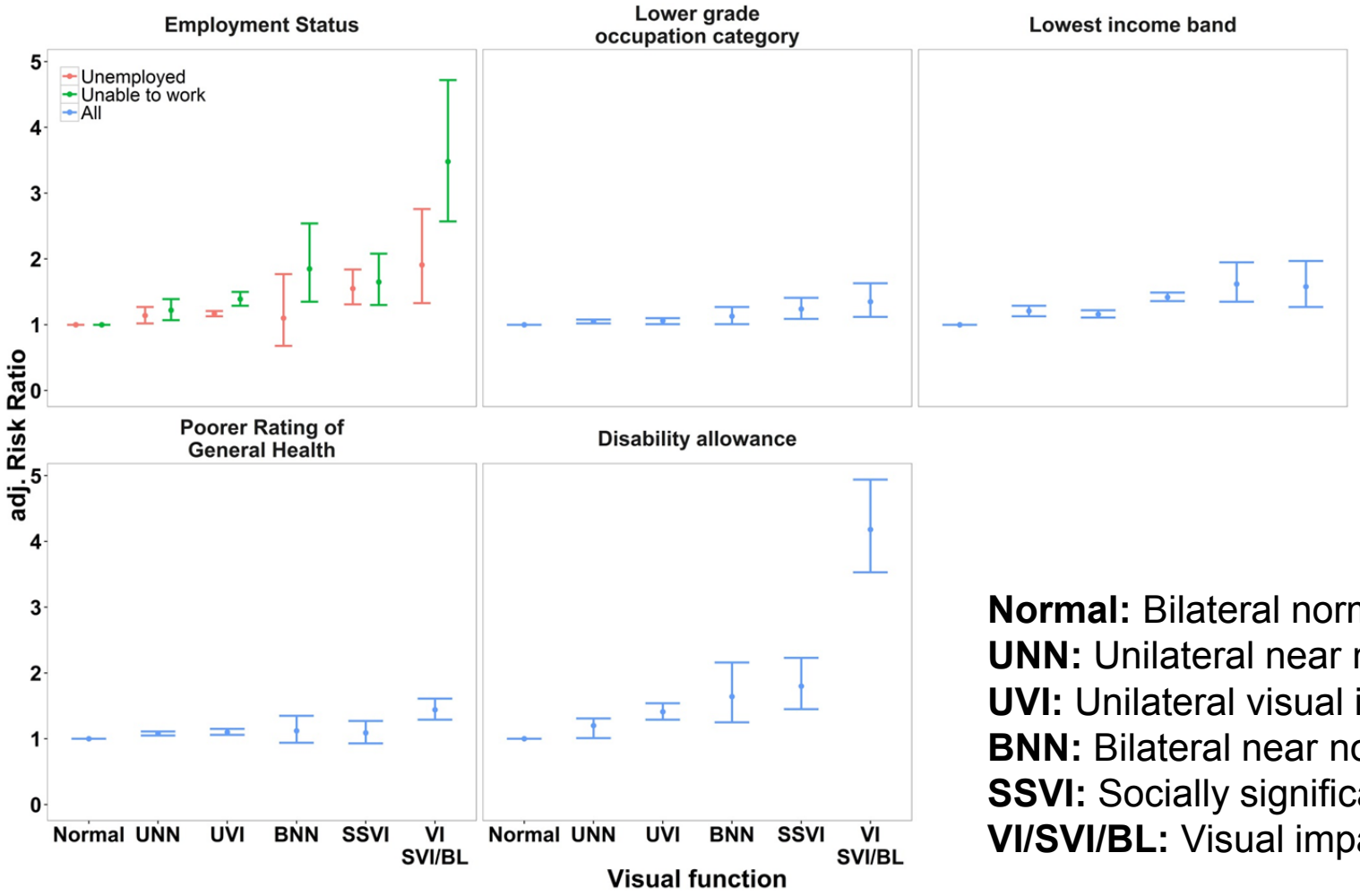
Background: Visual function



Normal: Bilateral normal vision
UNN: Unilateral near normal vision
UVI: Unilateral visual impairment
BNN: Bilateral near normal
SSVI: Socially significant visual impairment
VI/SVI/BL: Visual impairment/ Severe VI/ Blindness

Background: Refractive error (myopia)

- At least 1 in 3 working-age adults in the United Kingdom have clinically significant myopia
  - Most have an onset in *late adolescence*
    - Recent findings from studies in Asian populations suggest rapid increases in the prevalence of early-onset myopia
- Myopia risk, severity, and timing of onset are associated with key environmental influences on prenatal growth and health

Conclusions

- Impaired vision in adults is common, and even near-normal vision, potentially unrecognized without assessment, has a **tangible influence** on quality of life
- *key prenatal and childhood biological and social determinants* of general health may **influence** directly visual outcomes in adult life
  - Inequalities in visual health by social position mirror other health domains

- To understand the prenatal and early life biological, social, and lifestyle influences on visual outcomes and elucidate whether and how they **contribute** to the cause the application of life-course epidemiology in large unselected populations, studied longitudinally is a necessity

Research questions

- Visual function
  - Has the distribution of visual function in childhood ***changed over time***?
  - Is the pattern of association between visual function and social class in adults find its' **origins in childhood**?

- Myopia
  - Is there an increasing ***temporal trend*** in early-onset myopia in the UK?
  - Has the pattern of association between early life factors and early-onset myopia **changed over time**?

Unique opportunity

- UK cohort studies span 65+ years
- Maximise the value and impact of data collected all over these years

Involvement with CLOSER

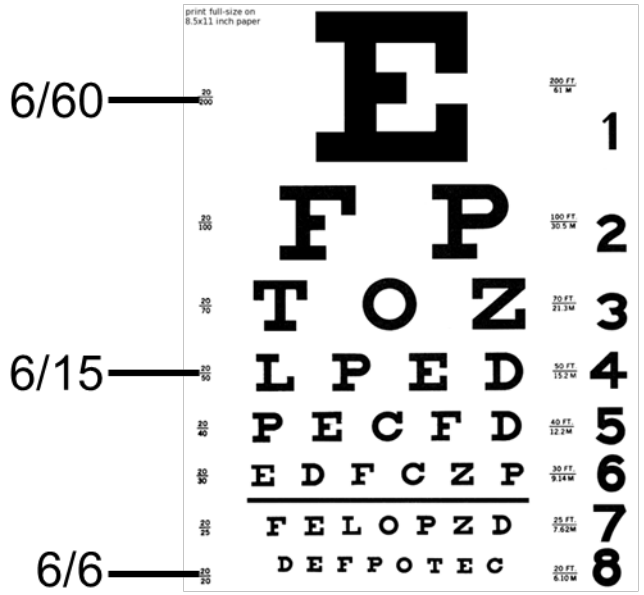
Aim:

To **harmonise** measures of vision across the UK cohort studies as the basis for life-course epidemiological investigation of visual function and refractive error

Measurements: Visual function

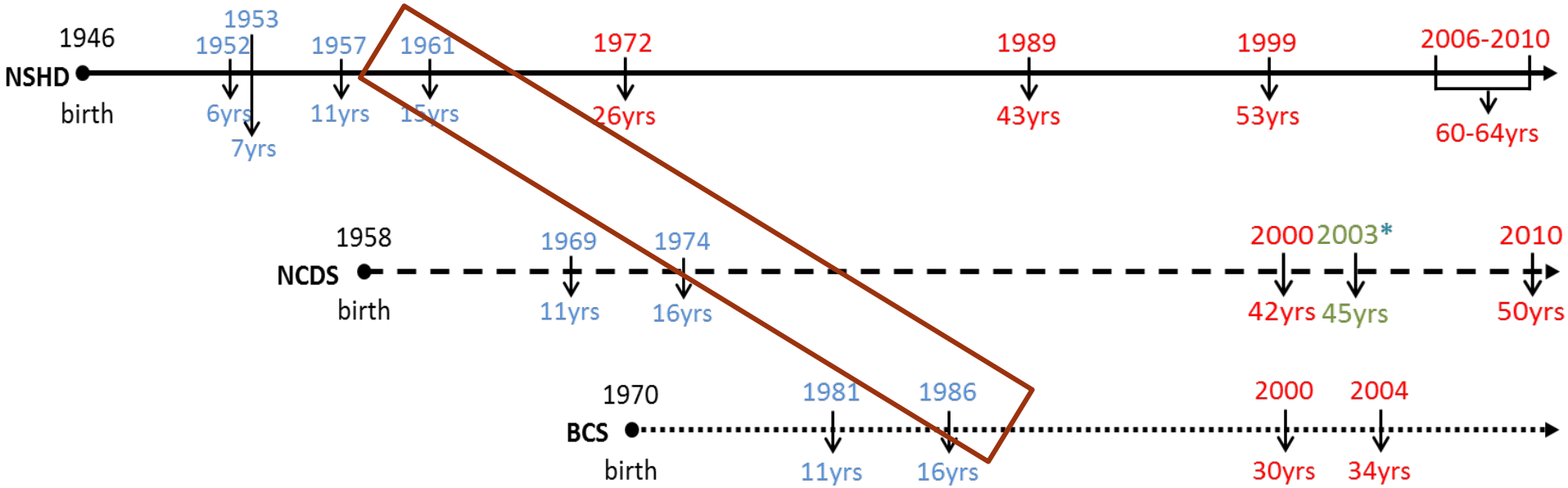
- Visual function is commonly measured through visual acuity (i.e. the clarity of vision)
  - Using the Snellen chart, and more recently the logMAR chart

Snellen chart



- Varied number of letters/shapes per row
- Spacing of letters varies
- Some letters easier to recognise
- Result ordinal, non-linear scale

Data used for visual function



Acuity measured with Snellen chart

Acuity measured with LogMAR chart

*Refractive error

Self report measurements on quality of vision

Harmonizing acuity measurements

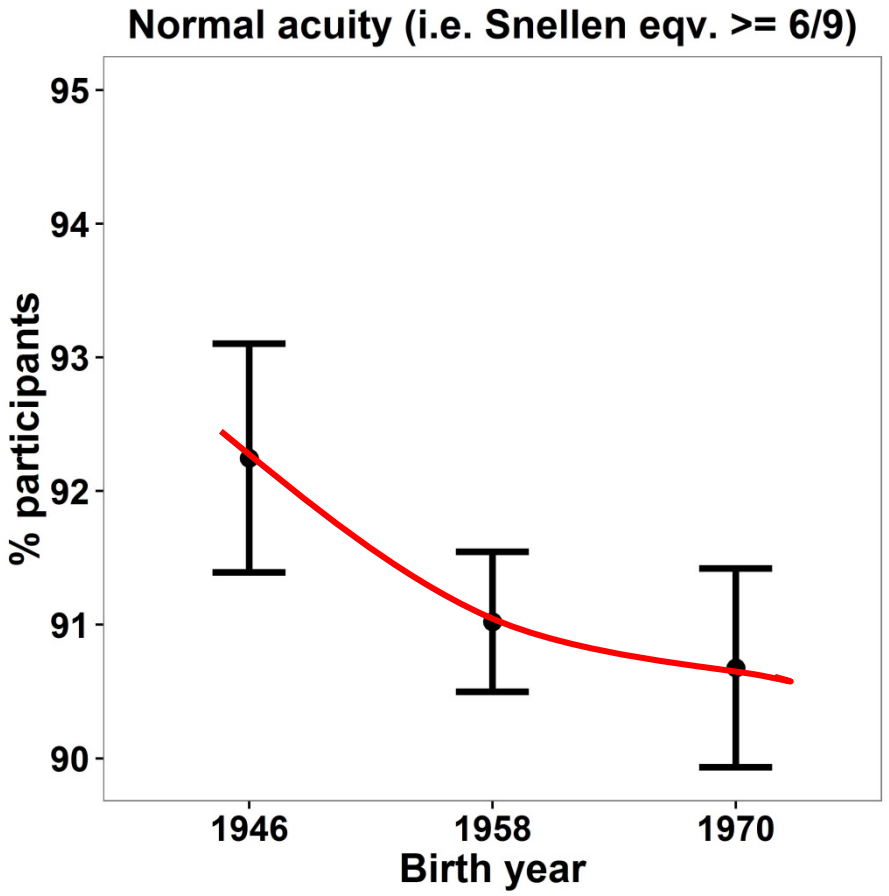
Acuity	Snellen chart	
	Birth year	
1946	1958	1970
6/4, 6/5, 6/6, 5/5	6-5 good vision	
	6-6	6
6/9	6-9	9
6/12	6-12	12
6/18	6-18	18
6/24	6-24	24
6/36	6-36	36
6/60 and over	6-60 poor vision	60
No sight	Near blind, blind	Worse than 60
Unknown	Unable to test	Unable to test
	NA	Not stated
		No questionnaire

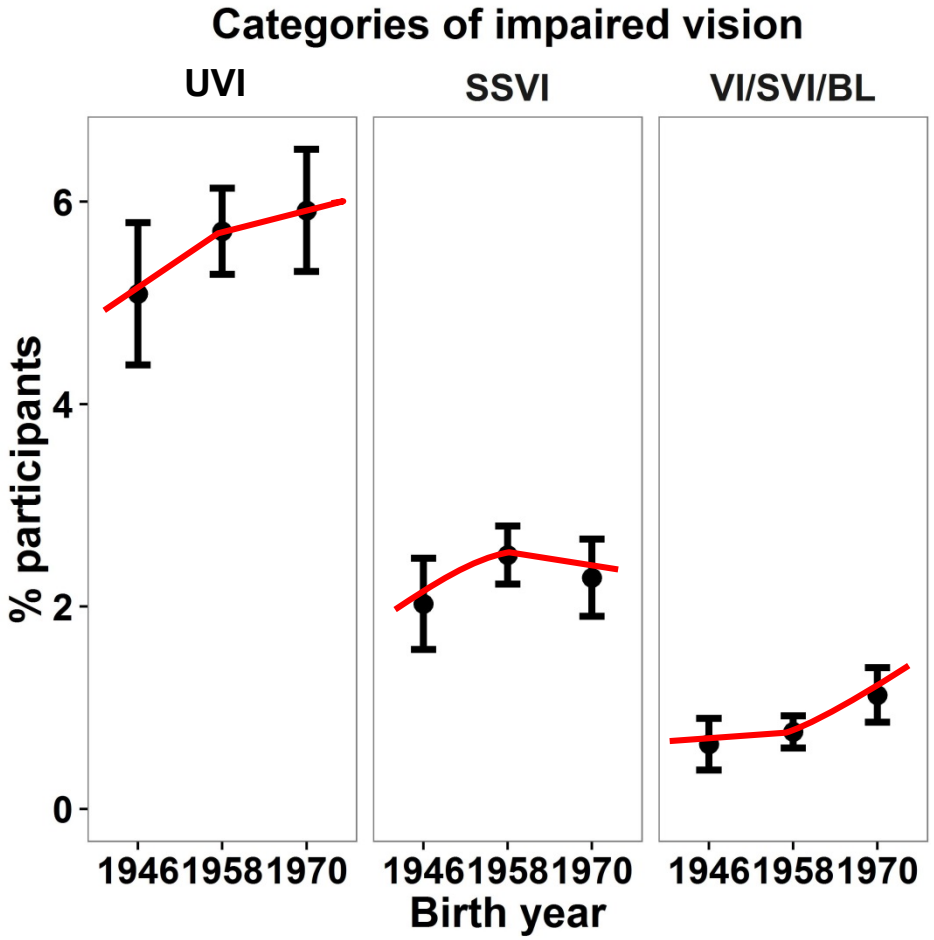
Harmonizing acuity measurements

WHO taxonomy, modified

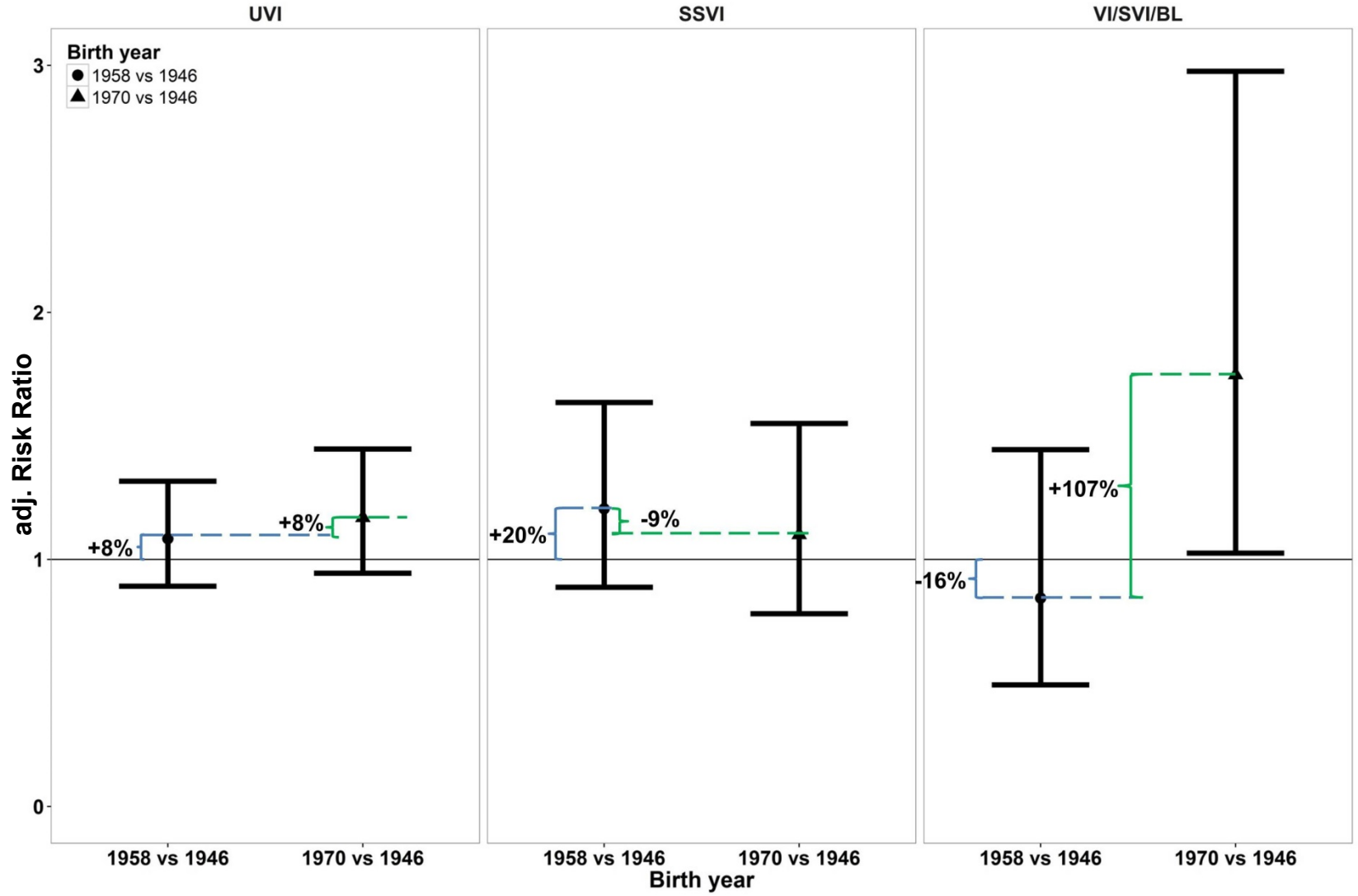
Left eye \ Right eye	6/6	6/9	6/12	6/18	6/24	6/36	6/60	> 6/60
6/6	Normal		Unilateral visual impairment (UVI)					
6/9								
6/12			Socially significant visual impairment (SSVI)					
6/18								
6/24					VI/SVI/BL			
6/36								
6/60								
> 6/60								

Trends in visual function over time





Cohort effect

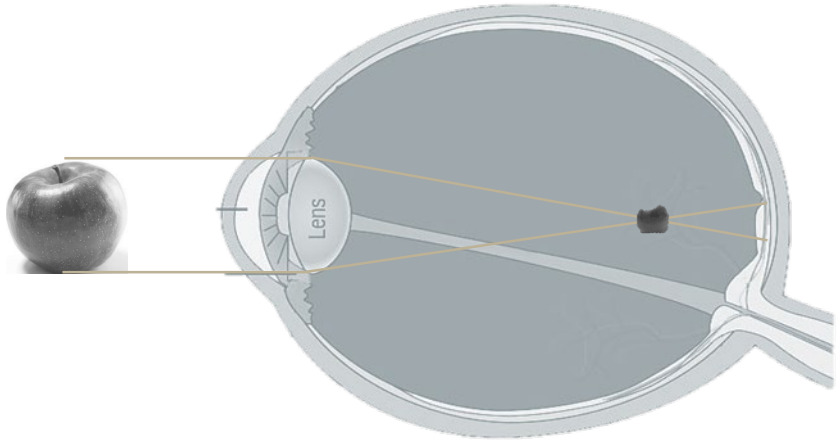


Social position and visual function

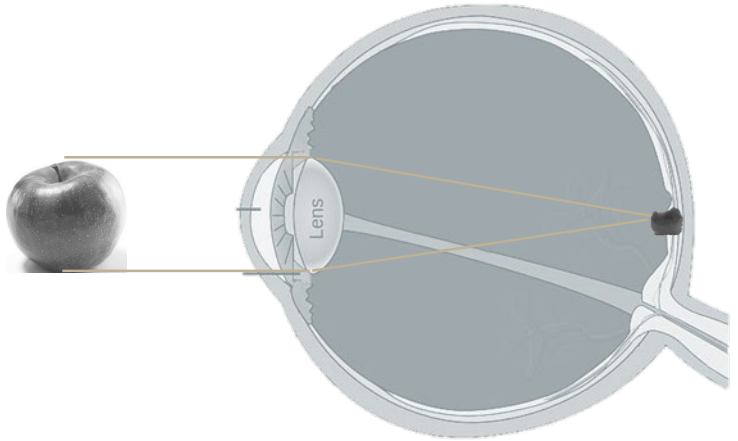
- Constant increase over time in the probability of having impaired vision, which
  - **Increases** as social class at birth (as evidenced through maternal educational level at birth) improves, and
  - **Attenuates** as social class at childhood (as evidenced through paternal social class) improves

Measurements: Myopia

Myopic eye



Normal (emmetropic) eye

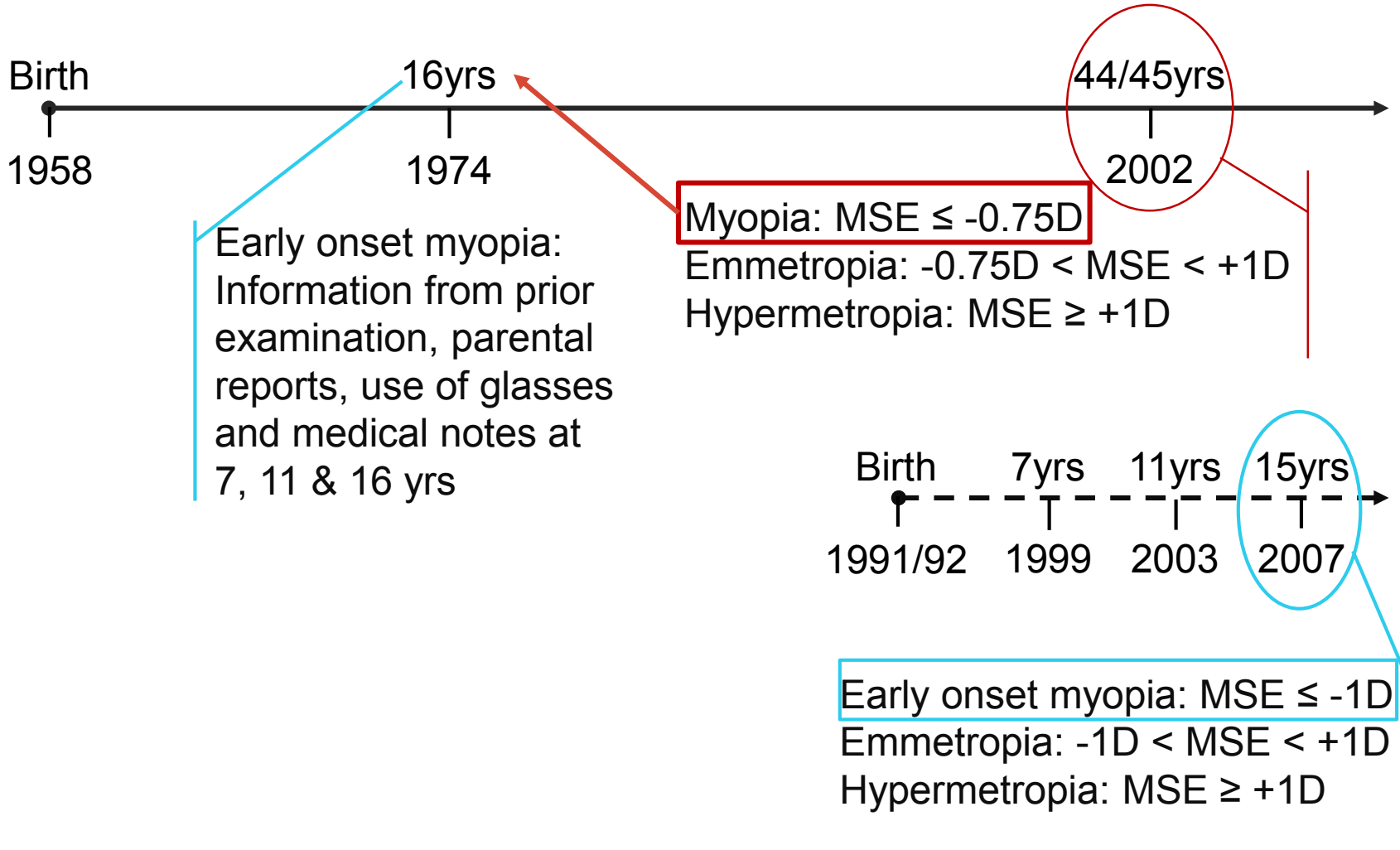


Myopia — Emmetropia — Hypermetropia

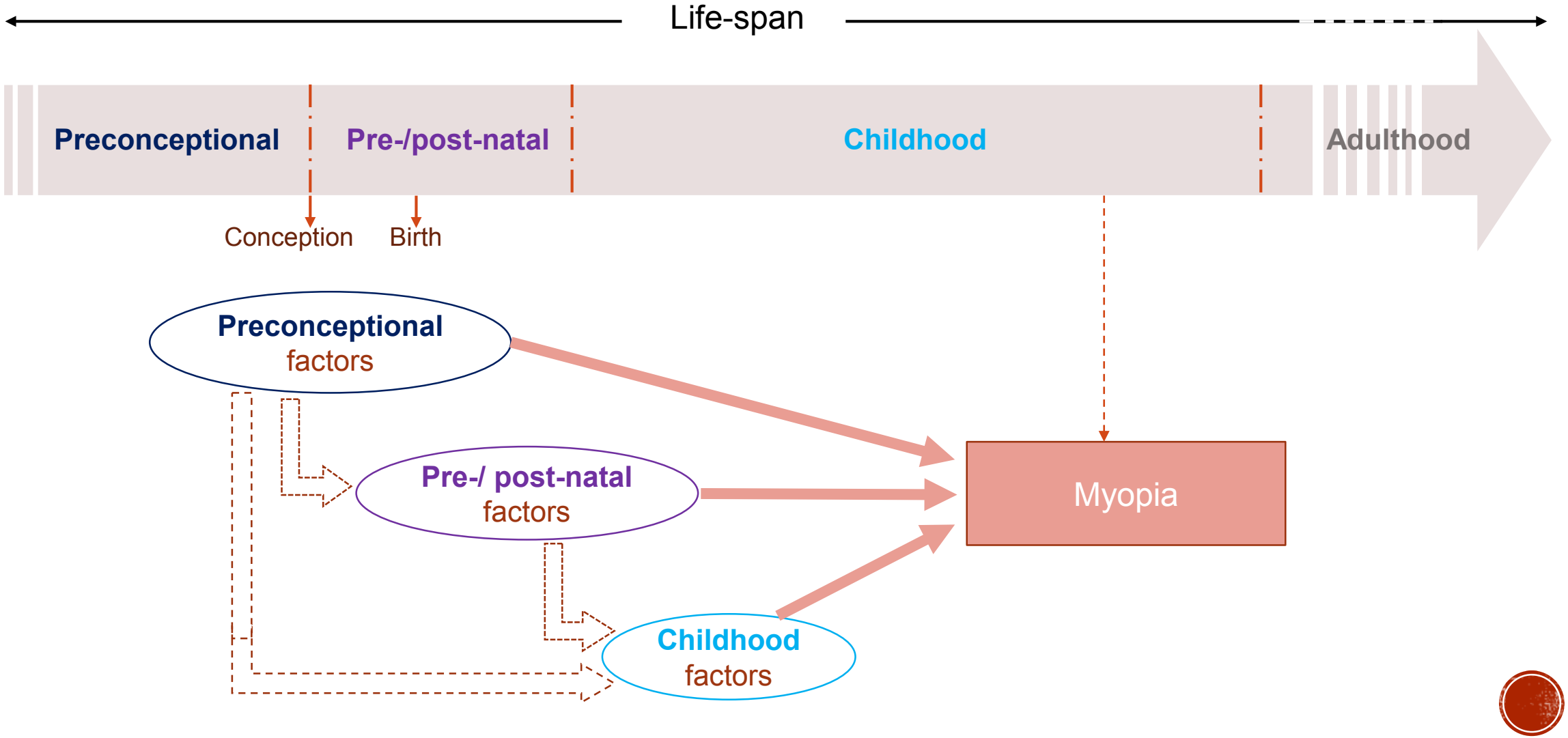
-10D -5D -1D 0D +1D +5D

Spherical Equivalent, Dioptres (D)

Data used for myopia



Methodology



Distribution of refractive errors

	1958 BC n=2487 n [% (95% CI)]	ALSPAC n=4384 n [% (95% CI)]
Refractive error category:		
Late/ potentially late onset myopia	979 [39 (37; 41)]	885 [20 (19; 21)]
Early onset myopia (by 16yrs)	235 [9 (8; 11)]	829 [19 (18; 20)]
Emmetropia	1053 [42 (40; 44)]	2496 [57 (56; 58)]
Hypermetropia	220 [9 (8; 10)]	174 [4 (3; 5)]

Results summary

- The size (& the direction in some cases) of the association between early life influences & early onset of myopia ***changed over time***

- Adjustment for factors from **subsequent life stages** had a different effect in the two cohorts, which resulted in
  - **changes** of the size of the difference between the two cohorts over the life-course

Conclusions: Visual function

- The contribution of socio-demographic status to that cohort effect may be the antecedents of the picture of childhood blindness that exists now

- Early life social position may also have **contributed** to the current known social patterning in visual function in older adults in the UK

Conclusions: Myopia

- Increase over the time span of these cohorts **in the risk of myopia onset** by the age of 15/16 years old

- We have shown a mediating effect through other pathways linking early life influences on growth and eye-specific environmental factors
  - **Different** effect between cohorts, indicating the change in the effect of the environmental factors over time

Benefits

- Investigate time trends in visual function and myopia
- Demonstrate that early life influences had different effect in these outcomes over time

target modifiable mechanisms and design appropriate interventions and policy strategies against avoidable visual disability

Challenges

- Lack of data documentation → difficulties to clarify queries
  - 1958-1970 cohorts site to describe the data → facilitate data exploration
  - 1946 not available an online dictionary → in touch with the admins

Challenges

- Differences in data collected
  - E.g. re visual acuity. In the 1946BC
    - a) Glasses supplied (GLA61): 0 “No”, 1 “Yes”
    - b) Glasses worn to-day (GLAW61): -99 “No glasses”, 0 “Yes” and 1 “No - although child has glasses”

	varName		Glasses worn on day of examination 1961 (GLAW61)					
		varLabel	Unknown -9999	Unknown -9899	No glasses -9799	Yes 0	No-although has glasses 1	Total
Glasses supplied to child 1961 (GLA61)	Unknown	-9999	1,506	0	0	0	0	1,506
	Unknown	-9899	0	216	11	12	2	241
	4 cases no label	-9799	0	0	4	0	0	4
	No	0	0	1	2,789	43	1	2,834
	Yes	1	0	11	4	344	418	777
	Total		1,506	228	2,808	399	421	5,362

Challenges

- Differences in data collected (other than the main harmonised outcome)
  - E.g. re other exposures used in the analysis: cognitive function in 1958 was assessed using the general ability test score, while in 1991-92 using the WISC-III
    - Reflect the same concept (i.e. general ability), but are not the same tests
    - Standardisation and use of percentiles to minimize the error due to the different nature of the variables used

Challenges

- Missing data
  - Data from previous waves can be used for imputing the missing information
    - Loss of detailed information
    - E.g. if missing refraction at 16yrs, but identified as myopic at 11yrs, then this child is myopic. The severity of myopia though cannot be evaluated

Any questions?

Thank you for your attention!!!