# Amblyopia risk factors in young Scottish children: proportions, association with deprivation, and implications for vision screening

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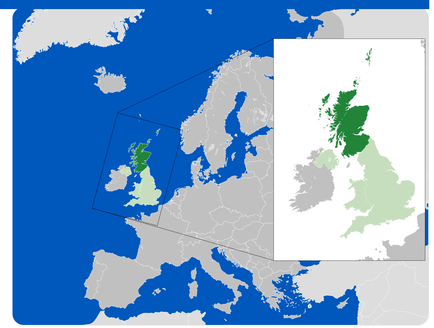
A0370

## Background and Purpose

Scotland's pre-school vision screening programme aims to detect and treat amblyopia early, reducing its prevalence, severity, and the risk of long-term visual impairment[1].

Data from this programme reveal increasing myopia[2]; however, it is unknown whether amblyopia risk factors (ARFs) are changing over time.



### AIMS

1. Calculate frequency of ARFs (2013-2022) in young Scottish children.
2. Evaluate associations between socioeconomic deprivation and outcomes of vision screening.

## Methods

National vision screening data from Scotland for five school years (2013–2016 and 2020–2022) were analysed. ARFs were determined using criteria based on AAPOS[3]:

- ❑ constant manifest strabismus;
- ❑ hyperopia > +4D (SER) in one or both eyes;
- ❑ astigmatism > 1.75DC in one or both eyes; and
- ❑ anisometropia with interocular difference for
  - hyperopia > 1.25D (SER),
  - astigmatism > 1.25 DC,
  - or mixed (one eye hyperopic, one myopic) >1.25D (SER).

Orthoptists screened ~85% of children aged 3.5–5.5 years (40,000–50,000 per annum). Cycloplegic refraction and cover test outcomes were used to determine the proportion of ARFs each year.

Linear regression models evaluated changes in ARF frequency (with Bonferroni corrections). Odds ratios were computed to analyse the likelihood of failing vision screening across socioeconomic deprivation quintiles, using the middle quintile as reference.

## Acknowledgements

Our thanks to screening leads and heads of orthoptic services in Scotland, Information Services Division (ISD) of National Services Scotland (NSS), Data & Digital Innovation Public Health Scotland, and Hoya for funding support. The project and presenter's attendance were funded by HOYA. Rakhee Shah is an employee of HOYA.

## Results

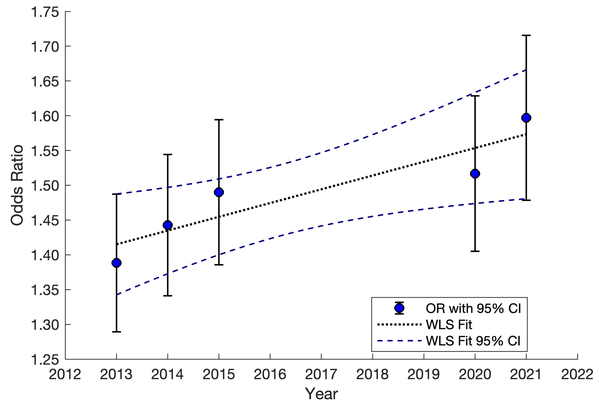
1

| | Proportion of Children (%) | | | | |
|---|---|---|---|---|---|
| | 2013-14 | 2014-15 | 2015-16 | 2020-21 | 2021-22 |
| **Any ARF (≥ 1 ARF)** | **4.41** | **5.04** | **5.13** | **4.62** | **5.15** |
| Constant manifest strabismus | 0.60 | 0.75 | 0.59 | 0.61 | 0.71 |
| Hyperopia >+4.00D (in one or both eyes, SER) | 1.71 | 2.04 | 2.23 | 1.72 | 1.81 |
| Astigmatism > 1.75DC (in one or both eyes) | 1.78 | 2.21 | 2.18 | 2.09 | 2.48 |
| Hyperopic anisometropia >1.25D (SER) | 1.35 | 1.34 | 1.47 | 1.40 | 1.37 |
| Astigmatic Anisometropia >1.25D | 0.60 | 0.66 | 0.61 | 0.58 | 0.65 |
| Mixed Anisometropia >1.25D (SER) | 0.08 | 0.07 | 0.08 | 0.10 | 0.10 |

2

| Quintile of deprivation | Odds Ratio for Failure on Vision Screening (95% Confidence Intervals) | | | | |
|---|---|---|---|---|---|
| | 2013-14 | 2014-15 | 2015-16 | 2020-21 | 2021-22 |
| **1 (Most deprived)** | **1.39** (1.29 - 1.49) | **1.44** (1.34 - 1.55) | **1.49** (1.39 - 1.60) | **1.52** (1.41 - 1.63) | **1.60** (1.48 - 1.72) |
| 2 | 1.13 (1.05 - 1.22) | 1.22 (1.14 - 1.32) | 1.20 (1.11 - 1.29) | 1.18 (1.09 - 1.27) | 1.19 (1.10 - 1.28) |
| 3 | 1.00 (0.93 - 1.08) | 1.00 (0.93 - 1.08) | 1.00 (0.93 - 1.08) | 1.00 (0.92 - 1.09) | 1.00 (0.92 - 1.09) |
| 4 | 0.90 (0.83 - 0.98) | 1.00 (0.93 - 1.08) | 0.84 (0.78 - 0.91) | 0.85 (0.78 - 0.92) | 0.88 (0.81 - 0.95) |
| **5 (Least deprived)** | **0.81** (0.75 - 0.87) | **0.81** (0.75 - 0.88) | **0.78** (0.72 - 0.84) | **0.80** (0.74 - 0.87) | **0.74** (0.68 - 0.80) |

**Change in Odds of Failure on Vision Screening for Most Deprived Quintile**




## Discussion

The proportion of young Scottish children with ARFs remained stable across the five years studied ranging from 4.41% to 5.15%, this stability contrasts with increasing myopia in this dataset,[2] indicating an ongoing need for vision screening to detect ARFs in addition to myopia.

However, **the study does reveal a consistent and significant socioeconomic gradient in vision screening failure rates.**

In 2021-22, children from the most deprived areas were substantially more likely to be referred from vision screening, with an odds ratio of 1.60 compared to a notably lower 0.74 in the least deprived quintile. This pattern generally held true across regional Health Boards, highlighting increasing health inequalities.

These findings reinforce the importance of maintaining universal vision screening programmes to ensure early detection and intervention—particularly for children in socioeconomically disadvantaged communities.

There was an increasing likelihood of failing screening for the most deprived quintile (weighted least squares regression $R^2 = 0.836$, $p = 0.03$)

## Conclusions

- ❖ In 2021-22, approximately 5.15% (95% CI: 4.92 - 5.38%) of Scottish children (3.5–5.5 years) had at least one ARF.
- ❖ The proportion of Scottish children with ARFs did not change after pandemic lockdowns.
- ❖ Children in the most deprived quintile were 1.6 times more likely to fail vision screening in 2021-22, highlighting the need for universal vision screening, especially in socioeconomically disadvantaged communities.

## References

1. `UK National Screening committee. Child Vision Screening Service specification. 2023. Child vision screening service specification – last updated 5 October 2023 https://www.gov.uk/government/publications/child-vision-screening-providing-screening/child-vision-screening-service-specification.
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