



Patrick, J A & Morgan, C LI
Human Data Sciences, Cardiff, Wales, UK

Background and Aims

- Esophoria/esotropia, an inward turning of one or both eyes caused by an imbalance in the ocular muscles, is a relatively common condition in children
- More recently it has been linked to digital eyestrain, a spectrum encompassing a range of ocular and visual symptoms resulting from exposure to the screens of digital devices [1,2]
- Children are exposed to greater screentime with age [3] and overall smartphone screentime in the UK is known to have increased [4]
- We investigated the age-specific incidence of esophoria between 2004-2019

Methods

- All analysis was performed by Livingstone; an analytical platform that uses real-world data to generate reproducible epidemiological evidence [5]
- Data was provided from the Clinical Practice Research Datalink (CPRD); a longitudinal, pseudonymised dataset from UK primary care that comprises two databases: CPRD GOLD and CPRD Aurum. Combined Aurum (12/23) and GOLD (01/24) datasets were used in this study
- Annual esophoria incidence rates per 10,000 patient years (p10k) were calculated between 2004-2019 (avoiding pandemic-induced changes in reporting)
- Four regression models were used to assess patterns in incidence: linear, exponential, linear spline (two straight lines connected at a 'knot'), and polynomial
- Model fits in all cases were calculated to optimise adjusted R2, which was the basis of comparison between fits
- This study received CPRD Research Data Governance approval (22_002078)

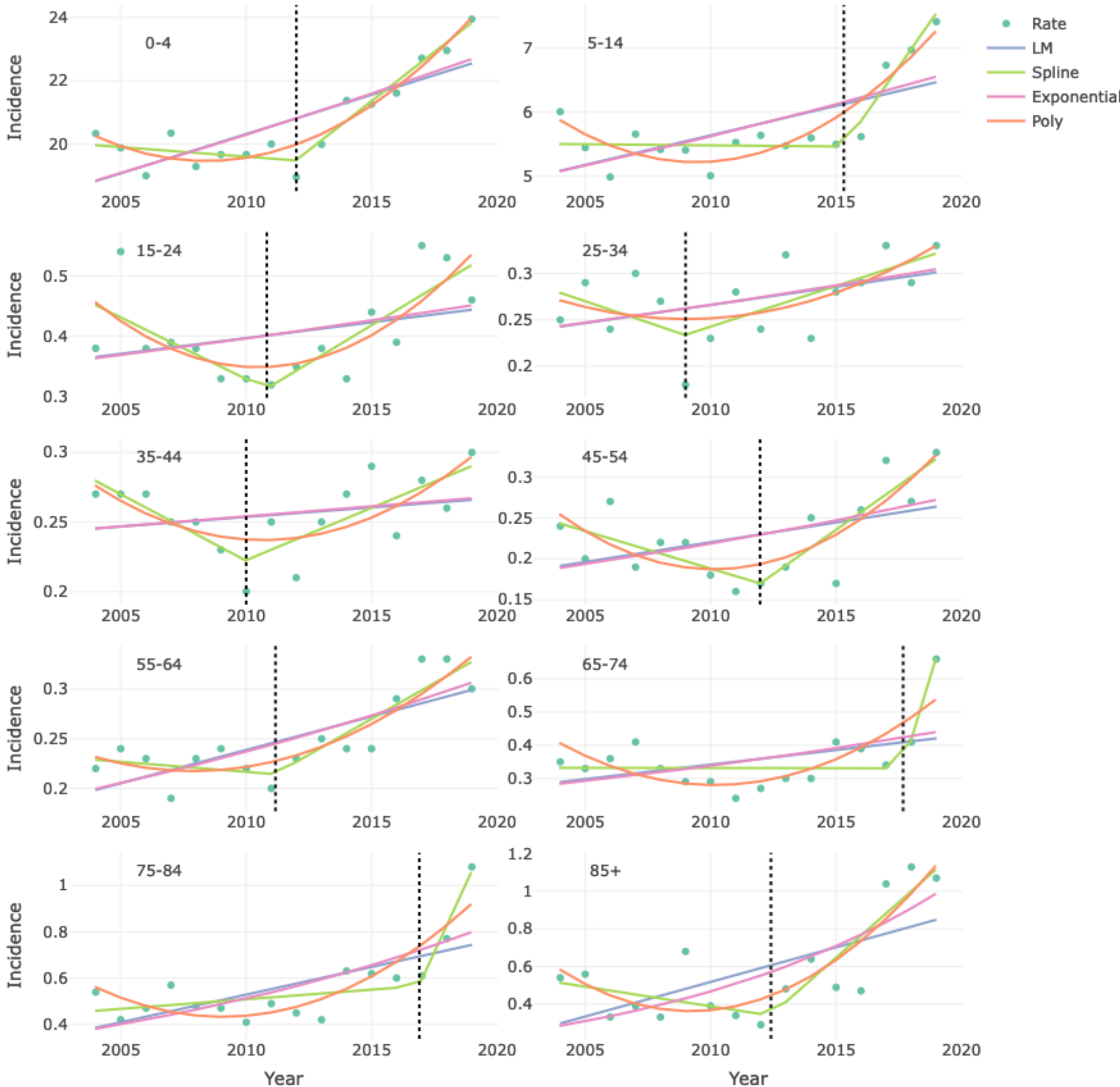


Figure 1. The incidence of esophoria per 10k population from 2004 to 2019 stratified by age group. Coloured lines indicate different model fits (see legend); vertical black dashed lines indicate spline knots.

References

[1] Kaur K, Gurnani B, Nayak S, Deori N, Kaur S, Jethani J, Singh D, Agarkar S, Hussaindeen JR, Sukhija J, Mishra D. Digital Eye Strain- A Comprehensive Review. Ophthalmol Ther. 2022 Oct;11(5):1655-1680
[2] H. S. Lee, S. W. Park, and H. Heo, "Acute acquired comitant esotropia related to excessive Smartphone use," BMC Ophthalmology, vol. 16, no. 1, pp. 1–7, Apr. 2016.
[3] M. E. Brushe, J. W. Lynch, E. Melhuish, S. Reilly, M. N. Mittinty, and S. A. Brinkman, "Objectively measured infant and toddler screen time: Findings from a prospective study," SSM - Population Health, vol. 22, p. 101395, Jun. 2023.
[4] "Children and Parents: Media Use and Attitudes Report," Ofcom. Accessed: Nov. 05, 2024. [Online]. Available: <https://www.ofcom.org.uk/siteassets/resources/documents/research-and-data/media-literacy-research/children/children-media-use-and-attitudes-2024/>
[5] B. R. Heywood et al., "Real-world evidence from the first online healthcare analytics platform-Livingstone. Validation of its descriptive epidemiology module," 2023.
[6] Greenberg AE, Mohny BG, Diehl NN, Burke JP. Incidence and types of childhood esotropia: a population-based study. Ophthalmology. 2007 Jan;114(1):170-4. doi: 10.1016/j.ophtha.2006.05.072. Epub 2006 Oct 27. PMID: 17070595.
[7] Madigan et al. (2022). Assessment of Changes in Child and Adolescent Screen Time During the COVID-19 Pandemic: A Systematic Review and Meta-analysis. JAMA Pediatr. 2022;176(12):1188-1198.

This study is based in part on data from the Clinical Practice Research Datalink obtained under licence from the UK Medicines and Healthcare products Regulatory Agency. The data is provided by patients and collected by the NHS as part of their care and support. HES data (Copyright © 2024), re-used with the permission of The Health & Social Care Information Centre. All rights reserved. All authors are employed by Human Data Sciences. Human Data Sciences funded this study and developed the Livingstone platform.

Results

- 52,634 esophoria/esotropia cases were selected
- Crude, annual incidence rates increased from 1.9 cases per p10k in 2004 to 2.4 in 2019; a 29.8% increase
- Stratified by age, the biggest rises in incidence were seen in 0-4 years (20.4 to 24.0 p10k) and 5-14 (6.0 to 7.4 p10k)
- Incidence rate was consistently best modelled by linear splines (avg aR2=0.65)
- Knot assessment showed a weak, non-significant relationship between age and year of inflection (R2=0.13; p=.30)

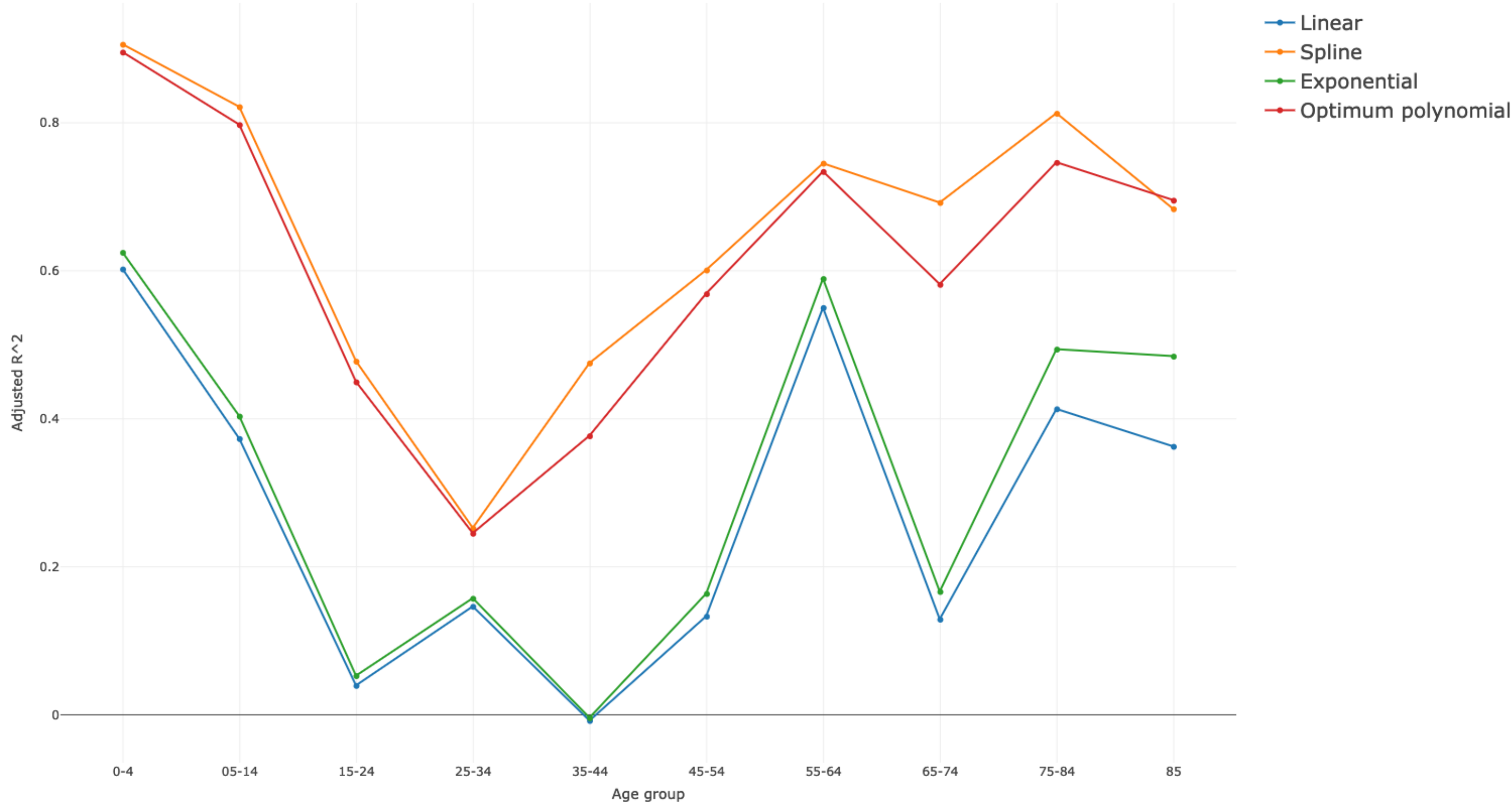


Figure 2. Comparison of Adjusted R^2 for each of the model fits by age group. Splines consistently best model the incidence trend data.

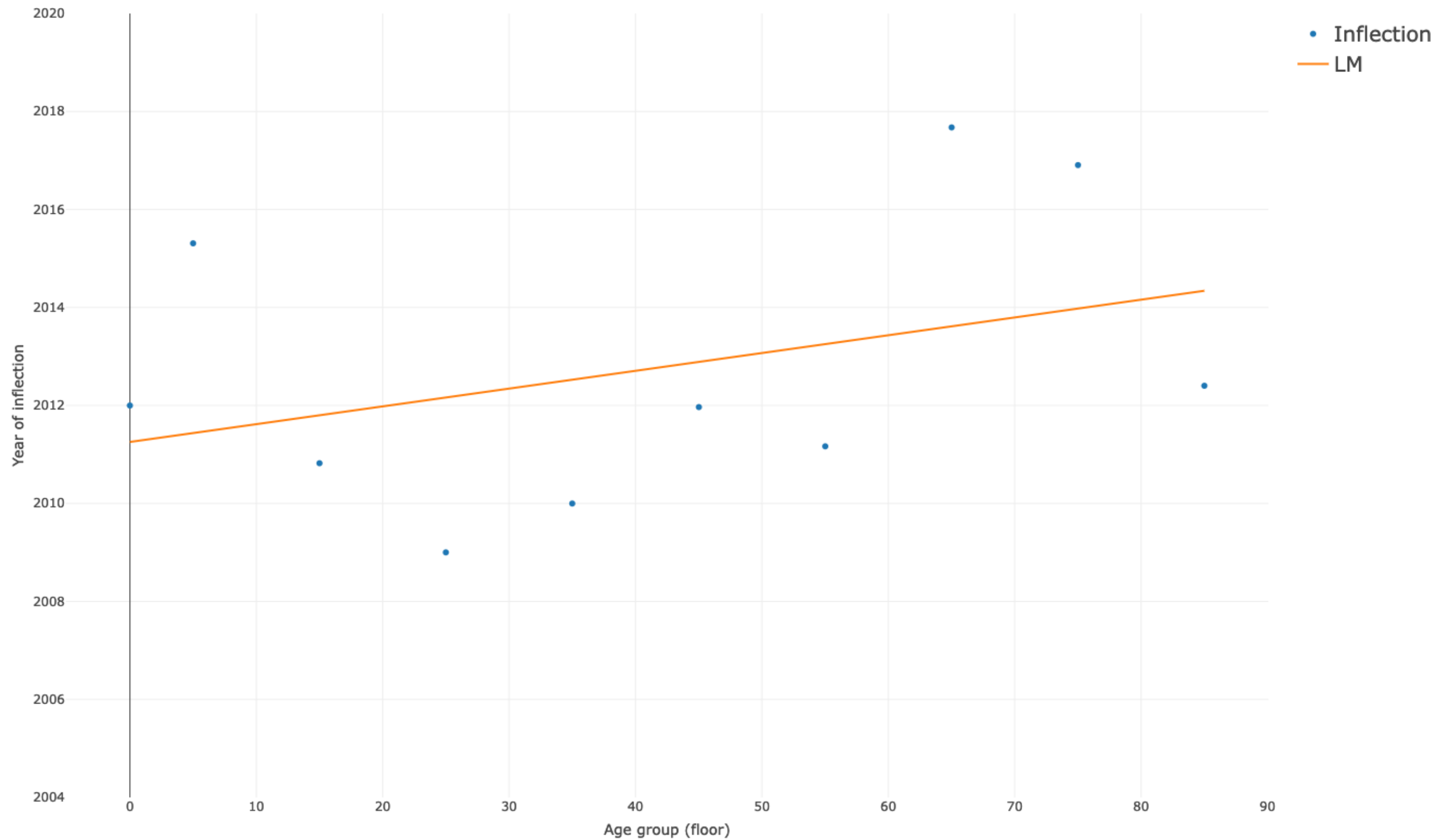


Figure 3. Analysis of the knot year (point of inflection) for each of the age groups. It shows a weak, non-significant increase in year of inflection with age.

Conclusion

- We observe a rise in annual incidence of esophoria during the study period
- Whilst screen time is known to have increased during this period, the observed increase could be due to improved diagnosis rates or increased capture in the electronic patient record
- The rates of childhood esophoria captured in routine primary care data was comparable to other studies [6]
- Methodologically, this study demonstrates potential value for spline and knot analyses to elucidate novel epidemiological patterns
- The results in the current study do not contain data after 2019 but it is known that there was a significant increase in screentime during and after the pandemic [7]



HUMAN
DATA SCIENCES

Livingstone

Contact: InstantRWE@humandatasciences.com