

Clinical and sociocultural influences on hearing aid use within the first years of life:
The RESONATE Project phase 1

Emilee Gosnell¹, Dr Merle Mahon², Dr Saima Rajasingam³, Professor Debi Vickers¹

¹SOUNDLab, Department of Clinical Neurosciences, University of Cambridge, Cambridge UK, ² Department of Language and Cognition, University College London, London, UK ³ School of Psychology, Sport and Sensory Science, Anglia Ruskin University, Cambridge UK

Introduction

Early and consistent hearing aid (HA) use (>10 hrs/day) is critical for optimal development in children with permanent childhood hearing loss (PCHL) [1,2]. Data from the US suggest hearing aid use is often suboptimal in the early years, with variation influenced by clinical factors and social determinants of health [3,4,5]. At present, little is known about HA use in young children within the UK.

The present study aims to examine patterns of hearing aid use in children aged 0–4 years living in the UK and to identify clinical and sociocultural factors associated with variation in device use.

Methods

- Seven NHS paediatric audiology services were approached to facilitate retrospective data collection of ~500 patient samples. Data for four sites were submitted as this poster went to press.
- Patients were included if they were fitted with one or two HAs for PCHL before the age of 24 months; had some level of datalogging records; had not completed NHS-opt out
- Descriptive statistics were derived from the data. Non-parametric tests and mixed-effects models were employed to explore relationships between variables.

Variables of Interest

- All available datalogging values up to their 4th birthday or date of data submission
- Date/age of fitting
- Sex
- PTA (500, 1k, 2, 4kHz to calculate mean)
- SII at fitting
- Lateral configuration
- Number of unattended appointments since fit
- Ethnicity
- Disability status
- Home language
- Index of Multiple Deprivation Decile (IMD)

References

1.

Wolff, R., Hommerich, J., Riemsma, R., Antes, G., Lango, S., & Kleijnen, J. (2010). Hearing screening in newborns: Systematic review of accuracy, effectiveness, and effects of interventions after screening. *Archives of Disease in Childhood*, 95(2), 130–135.

2.

Tomblin, J. B., Harrison, M., Ambrose, S. E., Walker, E. A., Oleson, J. J., & Moeller, M. P. (2015). Language Outcomes in Young Children with Mild to Severe Hearing Loss. *Ear and Hearing*, 36, 76S.

3.

Walker, E. A., McCreery, R. W., Sprattford, M., Oleson, J. J., Buren, J. V., Bentler, R., Roush, P., & Moeller, M. P. (2015). Trends and Predictors of Longitudinal Hearing Aid Use for Children who are Hard of Hearing. *Ear and Hearing*, 36(0 1), 38S.

4.

Marnane, V., & Ching, T. Y. (2015). Hearing aid and cochlear implant use in children with hearing loss at three years of age: Predictors of use and predictors of changes in use. *International Journal of Audiology*, 54(8), 544.

5.

Moeller, M. P., Hoover, B., Peterson, B., & Stelmachowicz, P. (2009). Consistency of Hearing Aid Use in Infants with Early-Identified Hearing Loss. *American Journal of Audiology*, 78(1), 14.

Distribution of Datalogging

- For early visualisation of the data, a "mean datalogging value" was calculated for each patient from the longitudinal data, weighted according each datalogging collection interval:

weighted mean = $\frac{\text{Sum}(\text{datalogging value} \times \text{days in interval})}{\text{total days across intervals}}$
- Distribution of mean datalogging values in figure 1 showed significant variation and a positive skew, suggesting a large prevalence of non-optimal hearing aid use in our cohort.

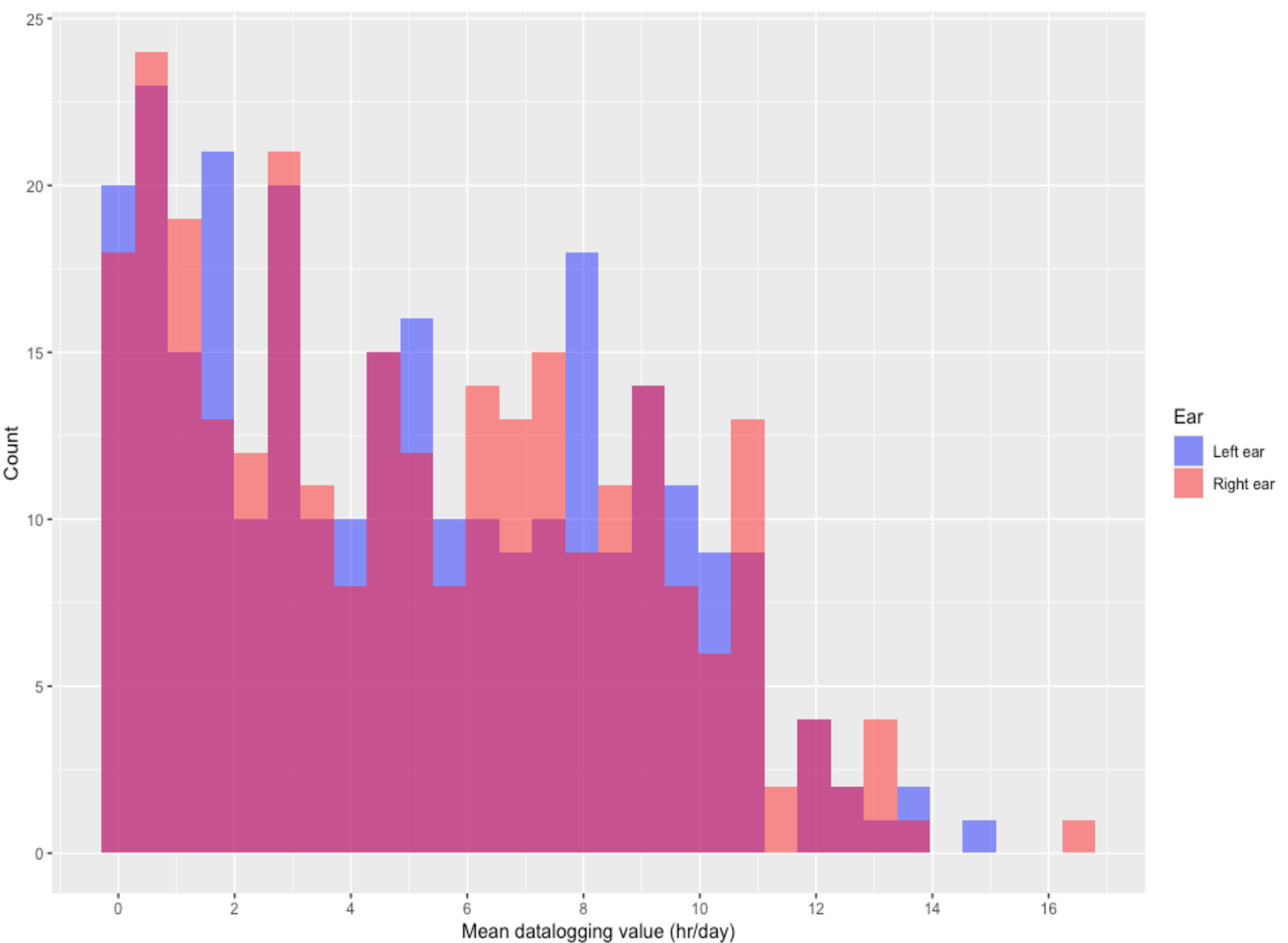


Figure 1 – Histogram of mean datalogging for right and left ears

Descriptive Statistics

Variable	Site A n= 72	Site B n= 79	Site C n= 67	Site D n= 74	Total n= 292
	Mean (SD), median (IQR) or n (%) *<0.01 **<0.001				
Weighted mean datalogging					
Right ear	6.4 (2.8-9.1)	4.6 (2.6-7.9)	5.4 (2.1-8.0)	2.7 (1-6.8)	4.7 (1.8-8.1)*
Left ear	5.4 (2.7-8.9)	4.4 (2.1-7.8)	5.4 (2.3-8.2)	2.7 (0.8-6.3)	4.6 (1.7-8.1)
Age of fitting (m)	2 (1-5)	2 (1-3)	3 (1-11)	3 (2-6)	2 (2-6)*
Sex					
Female	39 (54%)	40 (51%)	23 (34.3%)	39 (52.7%)	141 (48.3)
Mean PTA at fit					
Right ear	49.4 (18)	46.1 (17.9)	55.8 (21.2)	52.3 (17.5)	50.7 (18.9)*
Left ear	48.4 (16.9)	48 (17.8)	54 (21.6)	50.3 (16.7)	50.1 (18.3)
SII at fit (%)					
Right ear	76.5 (69-85)	78 (68-85)	73 (53-85)	78 (63-84)	76 (64-85)
Left ear	77.5 (72-86)	76 (66-86)	77 (55-85)	79 (65-84)	77 (65-85)
Configuration					
Bilateral	62 (86.1%)	67 (84.8%)	57 (85.1%)	66 (89.2%)	252 (86.3%)
Unilateral	10 (13.9%)	12 (15.2%)	10 (14.9%)	8 (10.8%)	40 (13.7%)
Unattended appointments since fit	0 (0-0)	0 (0-1)	1 (0-3)	0 (0-1)	0 (0-1)**
Ethnicity					
East Asian/British	1 (1.4%)	0	3 (4.5%)	0	4 (1.5%)*
SE Asian/British	2 (2.8%)	0	0	0	2 (0.7%)*
South Asian/British	11 (12.3%)	6 (9.5%)	16 (23.9%)	11 (15.1%)	44 (16%)
Black African & Caribbean/British	3 (4.2%)	11 (17.5%)	7 (10.4%)	3 (4.1%)	24 (8.7%)*
Mixed	5 (6.9%)	8 (12.7%)	8 (11.9%)	3 (4.1%)	24 (8.7%)*
Other	0	7 (11.1%)	3 (4.5%)	4 (5.5%)	14 (5.1%)*
White British	41 (56.9%)	22 (34.9%)	22 (32.8%)	35 (47.9%)	120 (43.6%)*
White Other	9 (12.5%)	9 (14.2%)	8 (11.9%)	17 (23.3%)	43 (15.6%)*
Disability					
No	46 (64.8%)	59 (74.7%)	45 (67.2%)	48 (64.9%)	198 (68%)*
Yes	25 (35.2%)	20 (25.3%)	22 (32.8%)	26 (35.1%)	93 (32%)*
Home language					
English	54 (75%)	56 (75.7%)	34 (51.5%)	43 (58.1%)	187 (65.4%)*
English & Native language	15 (20.8%)	3 (4.1%)	17 (25.8%)	22 (29.7%)	57 (19.9%)*
Native language	3 (4.9%)	15 (20.3%)	15 (22.7%)	9 (12.2%)	42 (14.7%)*
Index of Multiple Deprivation Decile					
Decile (1= high deprivation, 10=low)	5.4 (3.1)	4.8 (2.3)	5.6 (2.3)	3.3 (3.1)	4.8 (2.8)**

Variables Associated with HA Use

- A mixed-effects model was conducted to explore how clinical or sociocultural variables affect HA use across time. Child and site were treated as fixed-effects
- Categorical variables which have a significant association ($p < 0.5$) with HA use are home language, age at fitting and number of unattended appointments. There was a positive association with IMD and age of the child with datalogging values.

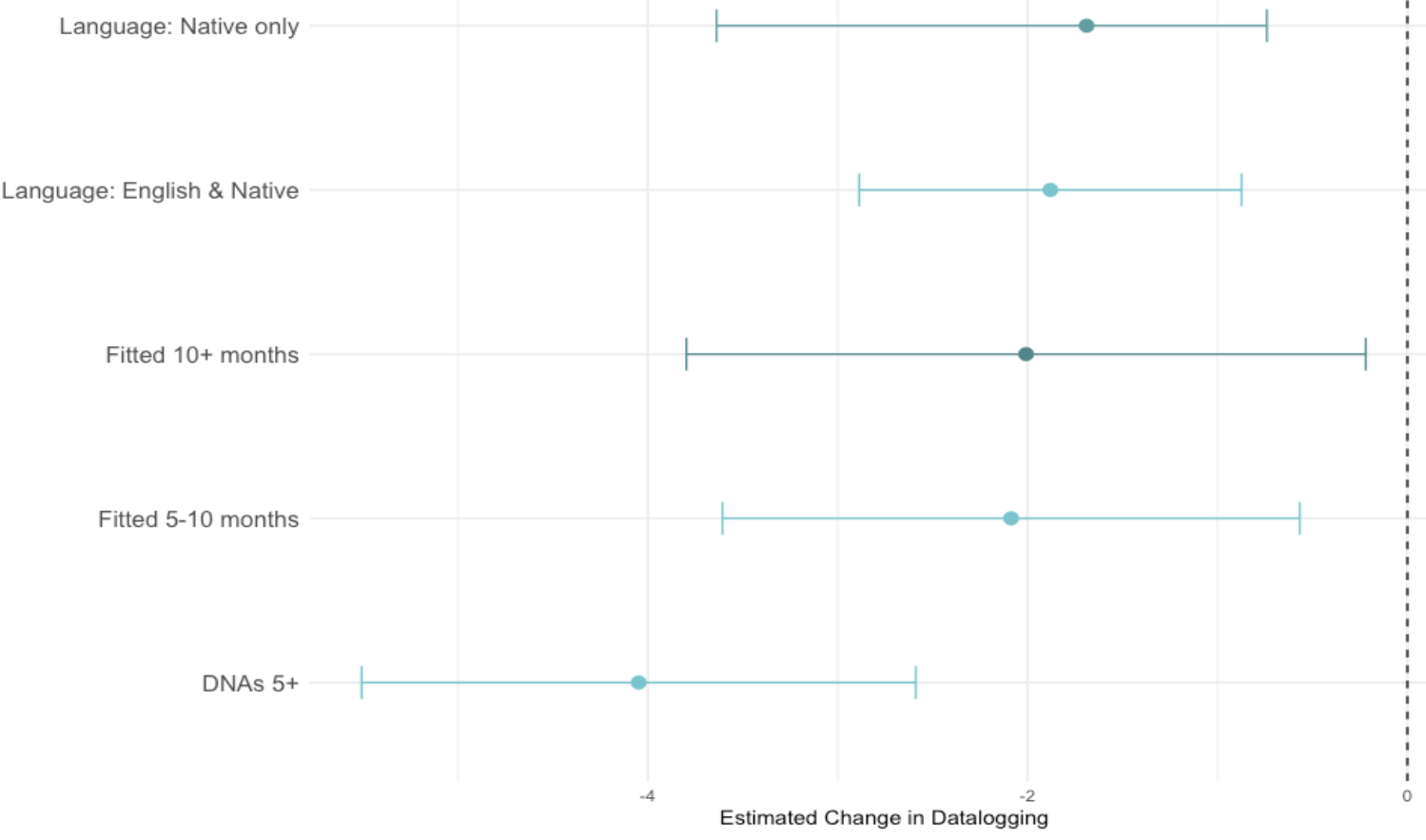


Figure 2 – Forest plot of categorical variables which had a significant effect on datalogging over time

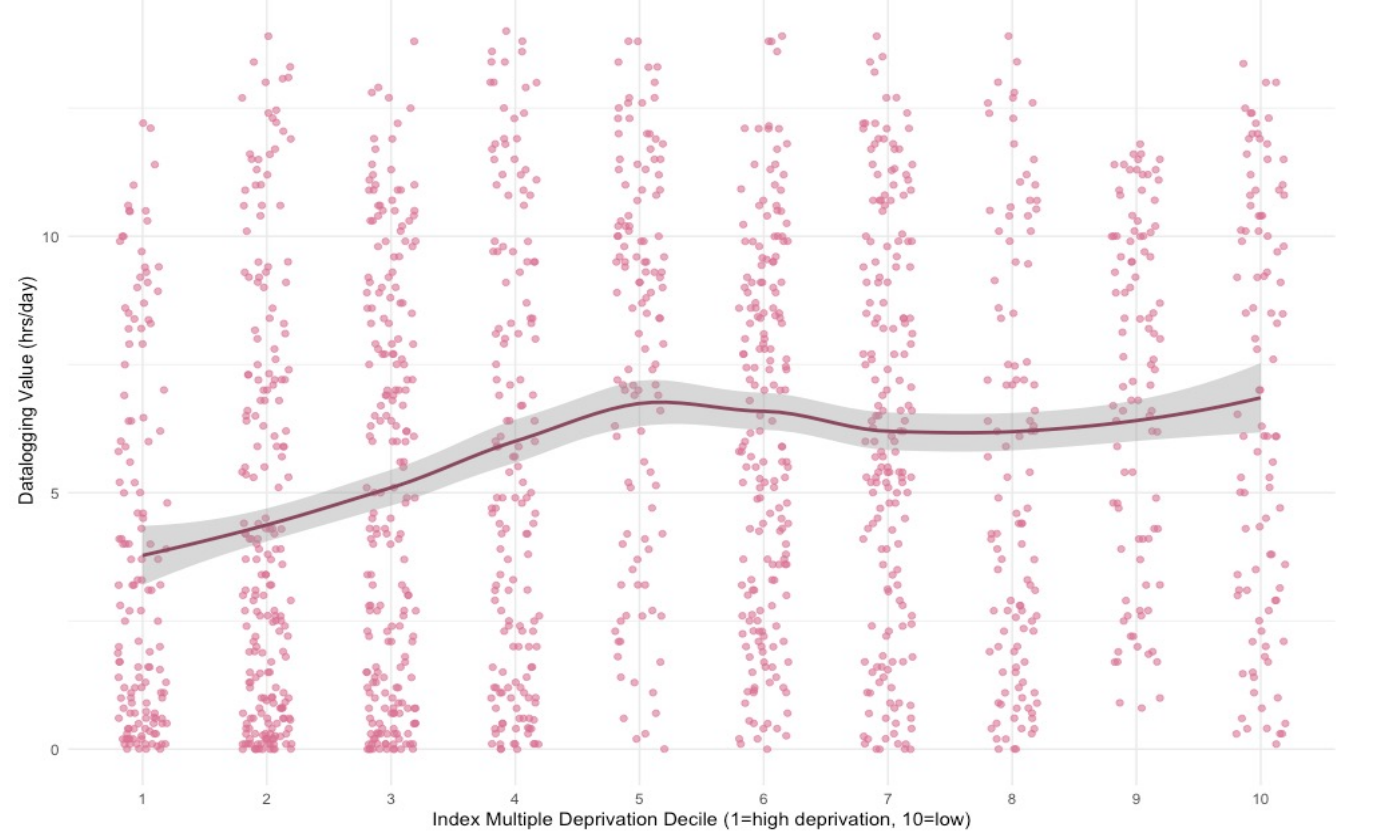


Figure 3 – HA datalogging by IMD score with LOESS curve (shaded area represents 95% confidence interval)

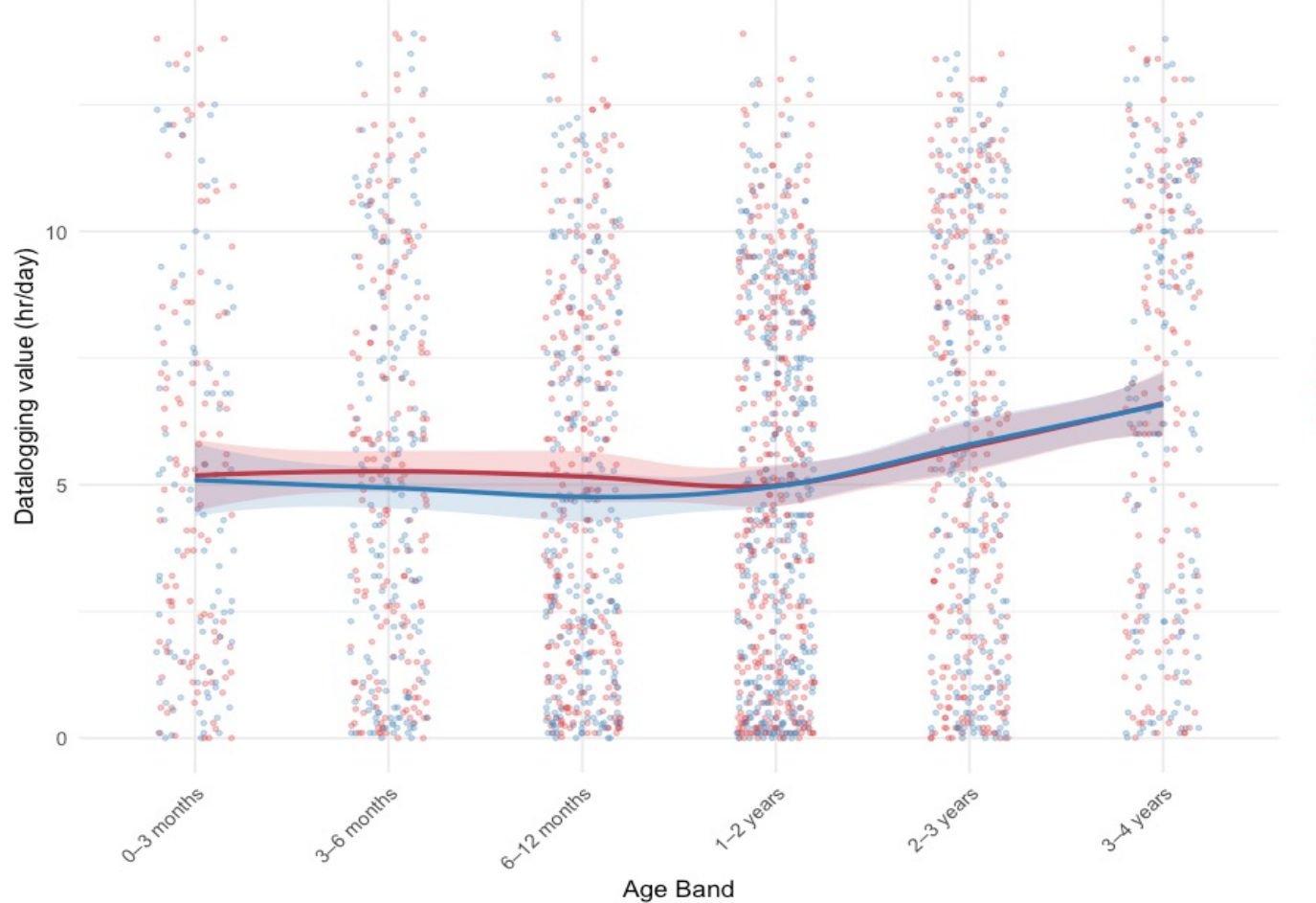


Figure 4 – HA datalogging by age band with LOESS curve (shaded area represents 95% confidence interval)

Discussion and Next Steps

- Children in our study cohort demonstrate HA use which falls significantly below the recommended 10 hrs/day for healthy development.
- Socioeconomic status, home language, age at fitting, number of unattended appointments and age of the child are associated with HA use in young children.
- Phase II and of The RESONATE Project will explore the experiences of caregivers and professionals to understand why these variables may have an influence on early HA use among families. We will use participatory design methodology to create an intervention which aims to achieve equitable HA use in young children.