University of Zurich[UZH]

GEO870 Applied Health Geography

Assessment of Speech and Language Therapy Utilization by Multilingual Children in the City of Zurich using a Bayesian Regression Approach in INLA

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Introduction: Table of Contents

Introduction: A Quick Recap

- The main language spoken in Zurich and its state-run schools is German, yet it is a multicultural city with inhabitants of various linguistic backgrounds. Zuerich (2022)
- Does this discrepancy in maternal language and state language influence speech and language therapy (SLT) utilization?
- Studies conducted in Germany and Scotland did not find a statistically significant association between multilingual background and SLT utilization. Rethfeldt (2019) Mennen and Stansfield (2006)
- What does the situation in Zurich look like?

Introduction: Research Questions

- Primary: Is there an association between the population's linguistic background and the proportion of speech therapy administration in the City of Zurich?
- Secondary: Is there an association between the population's linguistic background and the proportion of therapy administration in general in the City of Zurich?

Introduction - Research Question

mathematical notation because we're fancy :)

- $\text{Therapy}_{\text{speech}} \sim \beta_{P(non-german)}$:

$$\boxed{H_0 : \beta_{P(non-german)} = 0}$$

- $\text{Therapy}_{\text{general}} \sim \beta_{P(non-german)}$:

$$\boxed{H_0 : \beta_{P(non-german)} = 0}$$

Methods: Study design & Problem

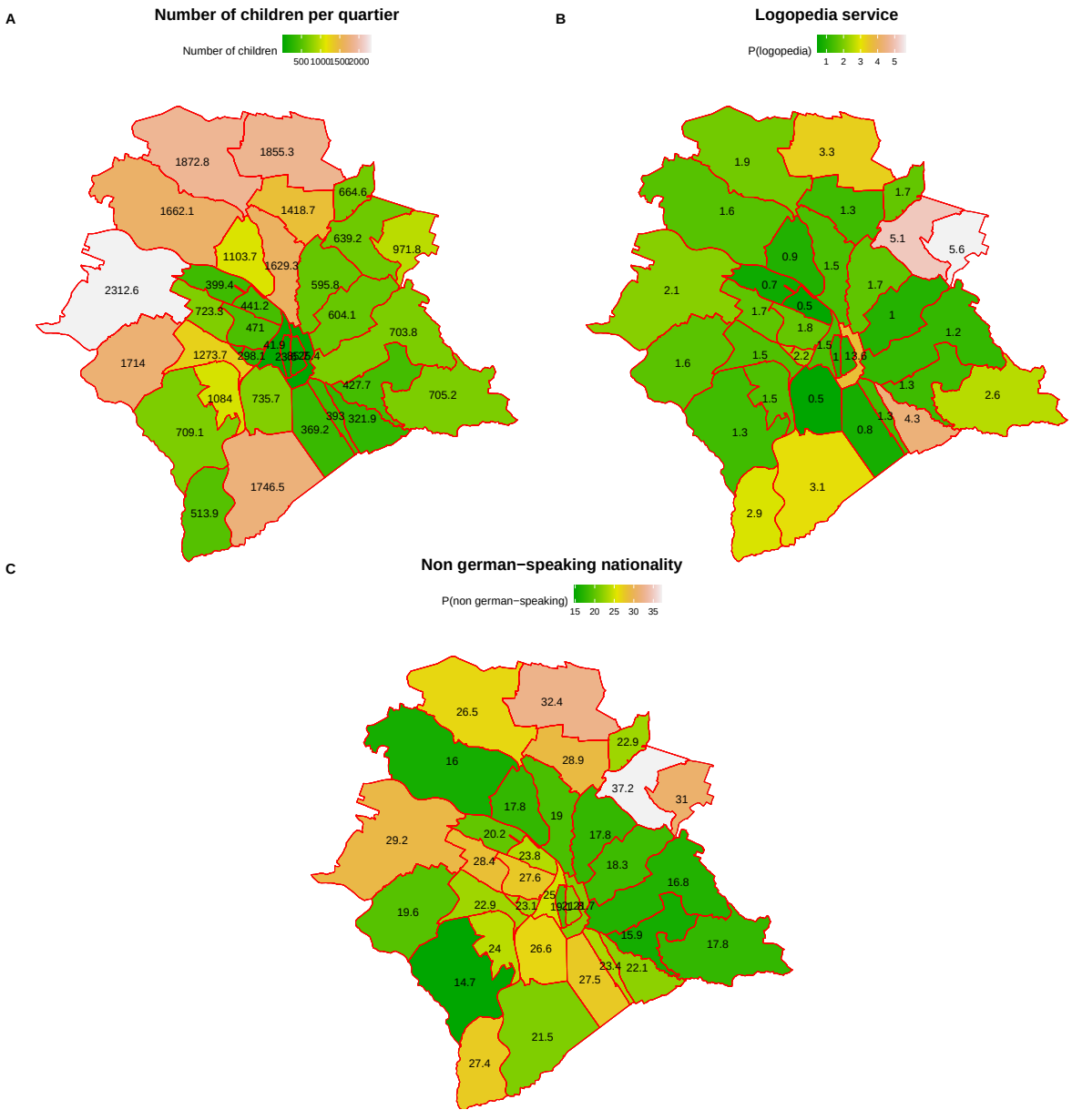
Design:

- Cross-sectional study
- Modelling of prevalence

Problem:

- Data 1: Counts of children in the service
- Data 2: Counts of children ($\sim$) german/non-german nationality

Methods: Descriptive Statistics per Quartier



Methods: Statistical Analysis

- Descriptive statistics
- Logistic regression
- Outcome: `cbind(cases,N)`
- Explanatory variable: `p_nongerman` (A proportion!) (Germany, Austria, Switzerland)
- Correct for independence violation with `R-INLA`

Methods: Besag-York-Mollie and friends

1. **Besag-York-Mollie**: all components
2. **Besag**: without spatially unstructured component
3. **IID**: without spatially structured component
4. **RAW**: without both

Model choice criteria with lowest *DIC* and *WAIC*

Methods: Besag-York-Mollie and friends

Core model (all makes **BYM**):

$$\text{logit}(p_i) = \eta_i = \alpha + \sum_{k=1}^{p} \beta_k \cdot x_{i,k} + v_i + u_i$$

Spatially unstructured component:

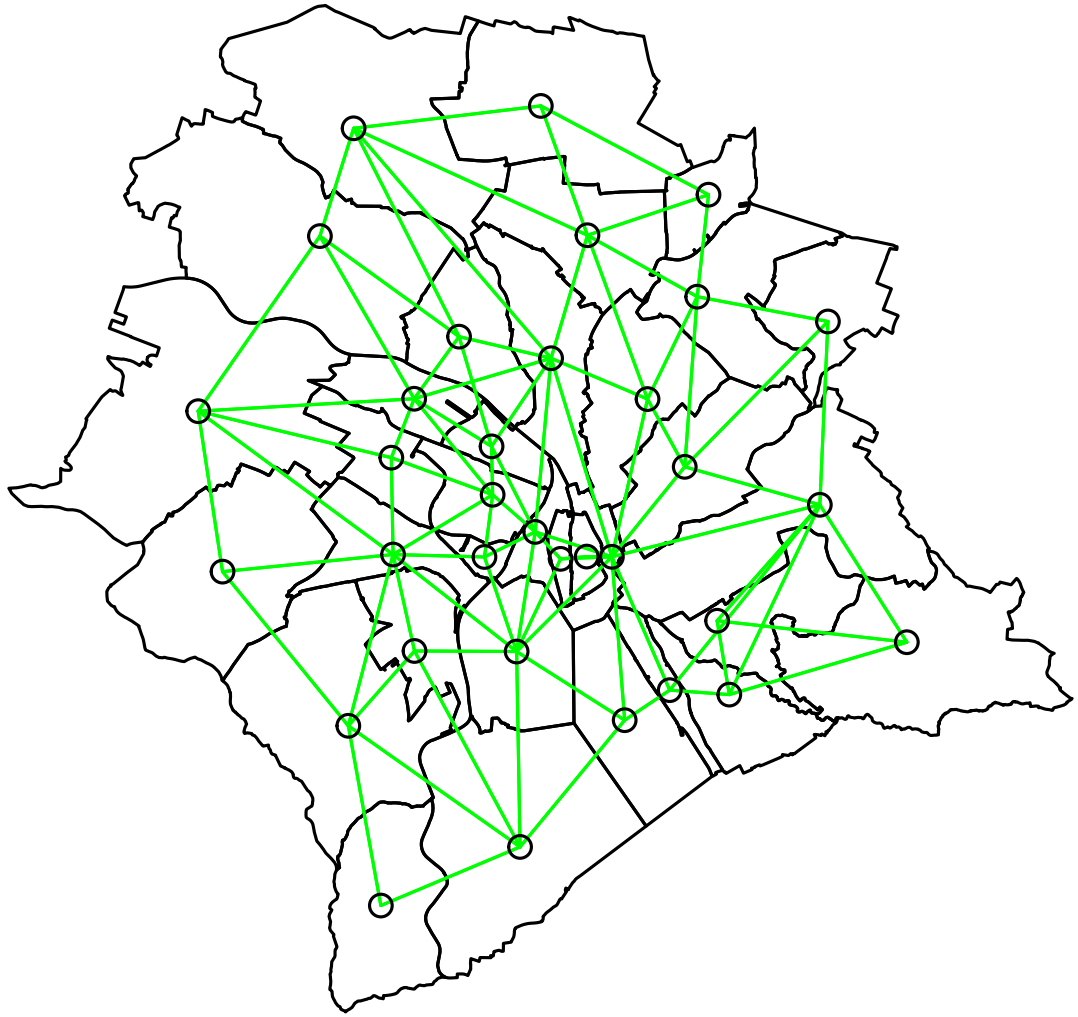
$$\pi\left(\boldsymbol{v} \mid \kappa_{\boldsymbol{v}}\right) \propto \kappa_{\boldsymbol{v}}^{\frac{n}{2}} \exp\left(-\frac{\kappa_{\boldsymbol{v}}}{2} \boldsymbol{v}^{\top} \boldsymbol{v}\right)$$

Spatially structured component:

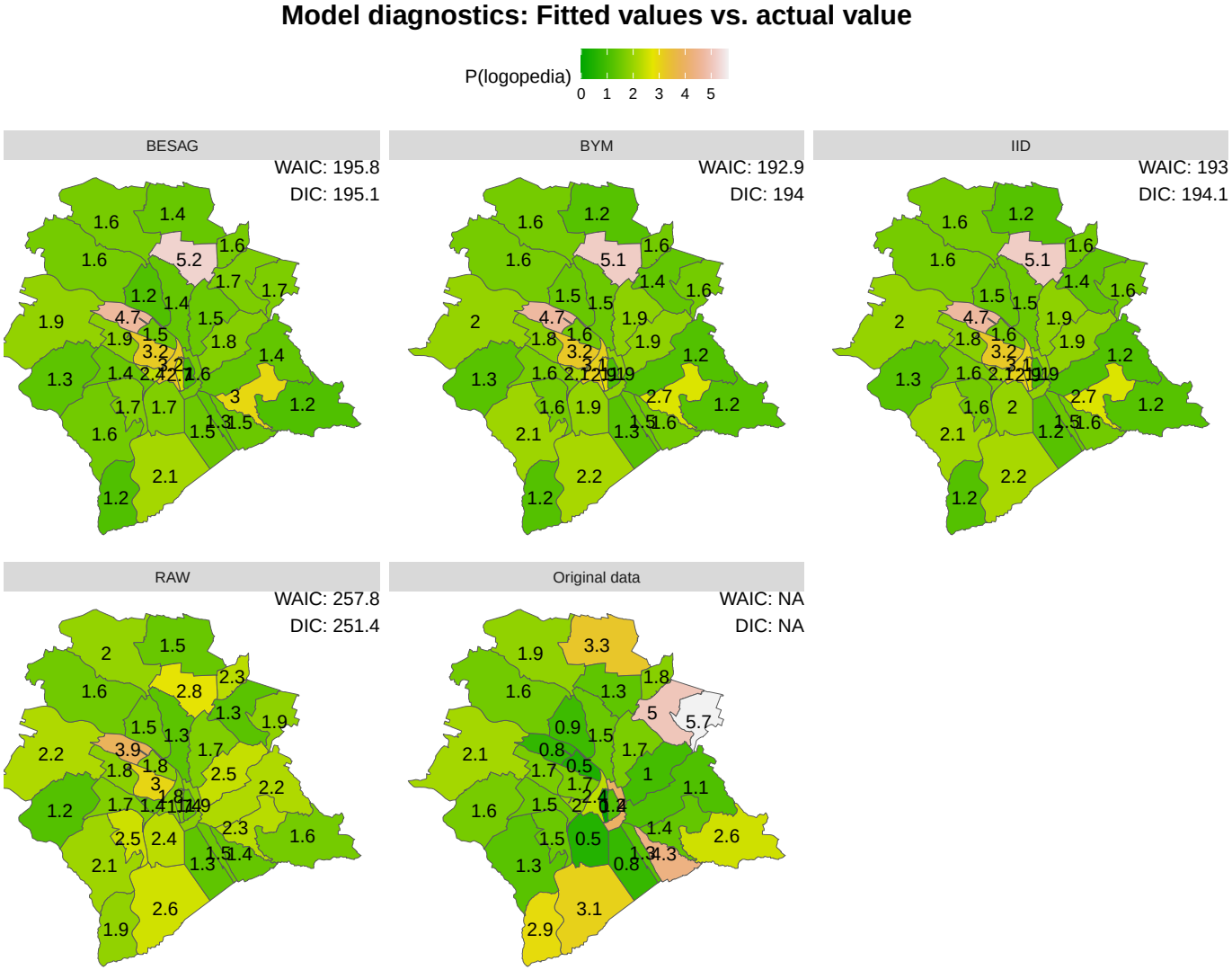
$$\pi\left(\boldsymbol{u} \mid \kappa_{\boldsymbol{u}}\right) \propto \kappa_{\boldsymbol{u}}^{\frac{n-1}{2}} \exp\left(-\frac{\kappa_{\boldsymbol{u}}}{2} \boldsymbol{u}^{\top} \boldsymbol{R} \boldsymbol{u}\right)$$

Methods: Spatial dependency in R-INLA

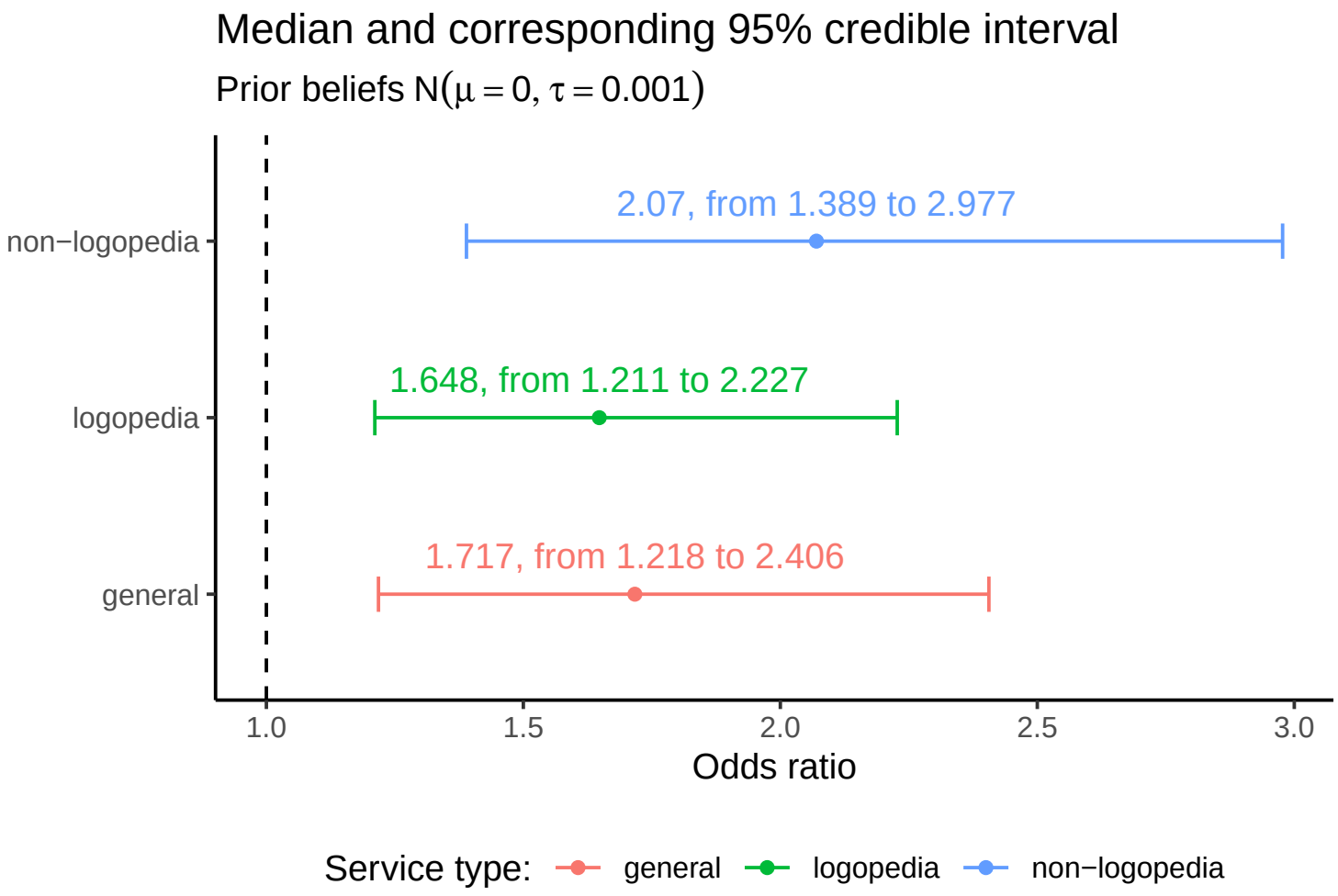
Spatial dependency between quartiers



Results - Logopedia Utilization as a Function of the Proportion of non-German-Speaking Children



Results - Comparing Service Utilization



Discussion

- Increased Odds to be in logopedia service when non-german
- But anyway increased Odds to be in service when non-german

$\rightarrow$ probably no association with the linguistic background

Limitations:

- Data merging
- Proportional odds assumption

Thank you for your attention!

References

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Appendix

What are the reasons that non-German-speaking children are using therapy services more frequently than German-speaking children?