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Geospatial Analysis of Access to Health Care: Child Development Needs and Available Care in the Canton of Zurich

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Background

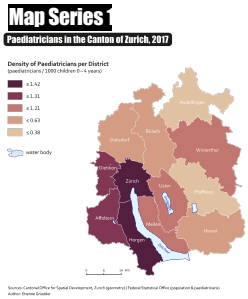
Developmental delay (DD) with a prevalence of 15 percent of all children is one of the most frequent disorders in early childhood affecting thousands of individuals in Switzerland every year. Early identification of children with DD is critical to ensure appropriate therapeutic interventions, to support the families, and finally to prevent chronic (i.e., life-long) health, educational, and social consequences. It is widely accepted that early intervention programs are both ethically mandatory and cost-effective for the society on a long-term perspective. However, we note that there is a large paucity of information about the spatial distribution of children in need, referring doctors, and therapeutic places in Switzerland. What extent is the spatial variation, and what are the potential influencing factors for spatial variation in health care need and services? This question can be answered based on data from the centrally organized register of all children with DD in need of early interventions Canton of Zurich, who are evaluated at the two Units of Special Needs Education (USNE).

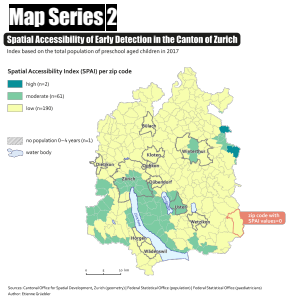
Methods

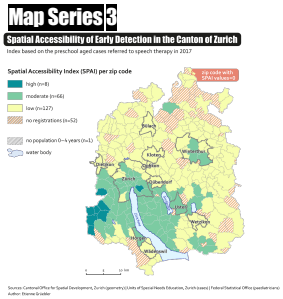
We have collected a comprehensive data set from all children (age 0-4) admitted to the USNE in 2017 (n=2033), who's parents did not opt against scientific use of their data (n=1971). Additionally, we included 76% of the pediatricians in private offices in the canton (n=115), and the therapists who are approved by the canton (n=171). We applied density visualisations and the 3-step floating catchment area method to calculate and visualize accessibility of services.

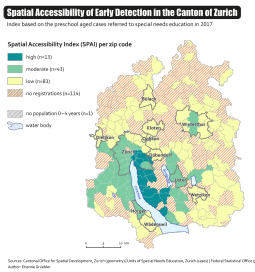
Results

Map Series 1: Early Detection

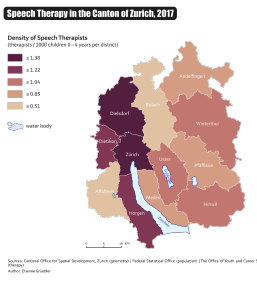


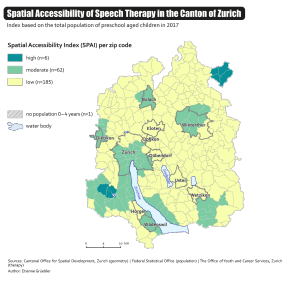


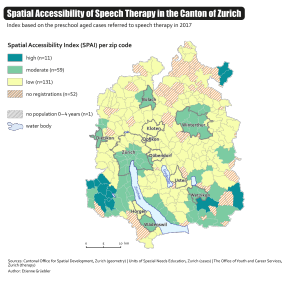




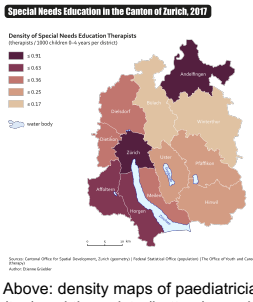
Map Series 2: Early Intervention (Speech Therapy)

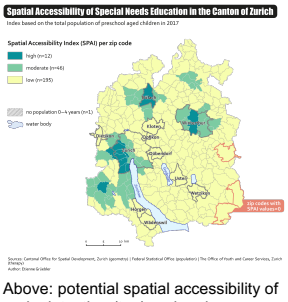


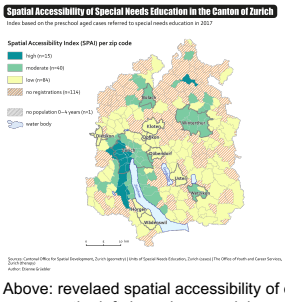




Map Series 3: Early Intervention (Special Needs Education)







Above: density maps of paediatricians (top) and therapists (bottom) as relevant healthcare suppliers represented as supplier per 1'000 children between 0-4 years per cantonal district (*Bezirk*).

Above: potential spatial accessibility of early detection (top) and early intervention (bottom) calculated from the total population of preschool aged children per zip code (*Postleitzahl*).

Above: revelaed spatial accessibility of early detection (top: based on speech therapy cases on the left, based on special needs education cases on the right) and early intervention (bottom) calculated from the cases referred to speech therapy and special needs education in the canton of Zurich in 2017 per zip code (*Postleitzahl*).

The spatial accessibility shows for each map distinct patterns and thus it becomes evident that spatial accessibility is even more pronounced than the density of the particular healthcare service.

Map Series 1 shows hotspots of high spatial accessibility in the center of Zurich and Winterthur as well as on the right shore of lake Zurich. Especially for special needs education cases, there is a high association between zip codes with no registrations and low spatial accessibility.

Map Series 2 & 3 reinforce these trends, with districts with higher densities of therapists producing high variability in spatial accessibility.

Conclusions

- Rates of early interventions for children are below expectations in the canton of Zurich.
- Remarkable differences are evident in the density and spatial accessibility of paediatricians and therapists.
- Zip codes with no registrations are mostly where spatial accessibility of paediatricians is low.
- Regional disparities in the distribution of paediatricians are linked to inequalities in utilization of therapies.

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