

Ethnicity-Based Differences in Individual Activity Spaces: A Study Using Call Detail Records in Estonia

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Motivation

The changing focus of segregation studies:

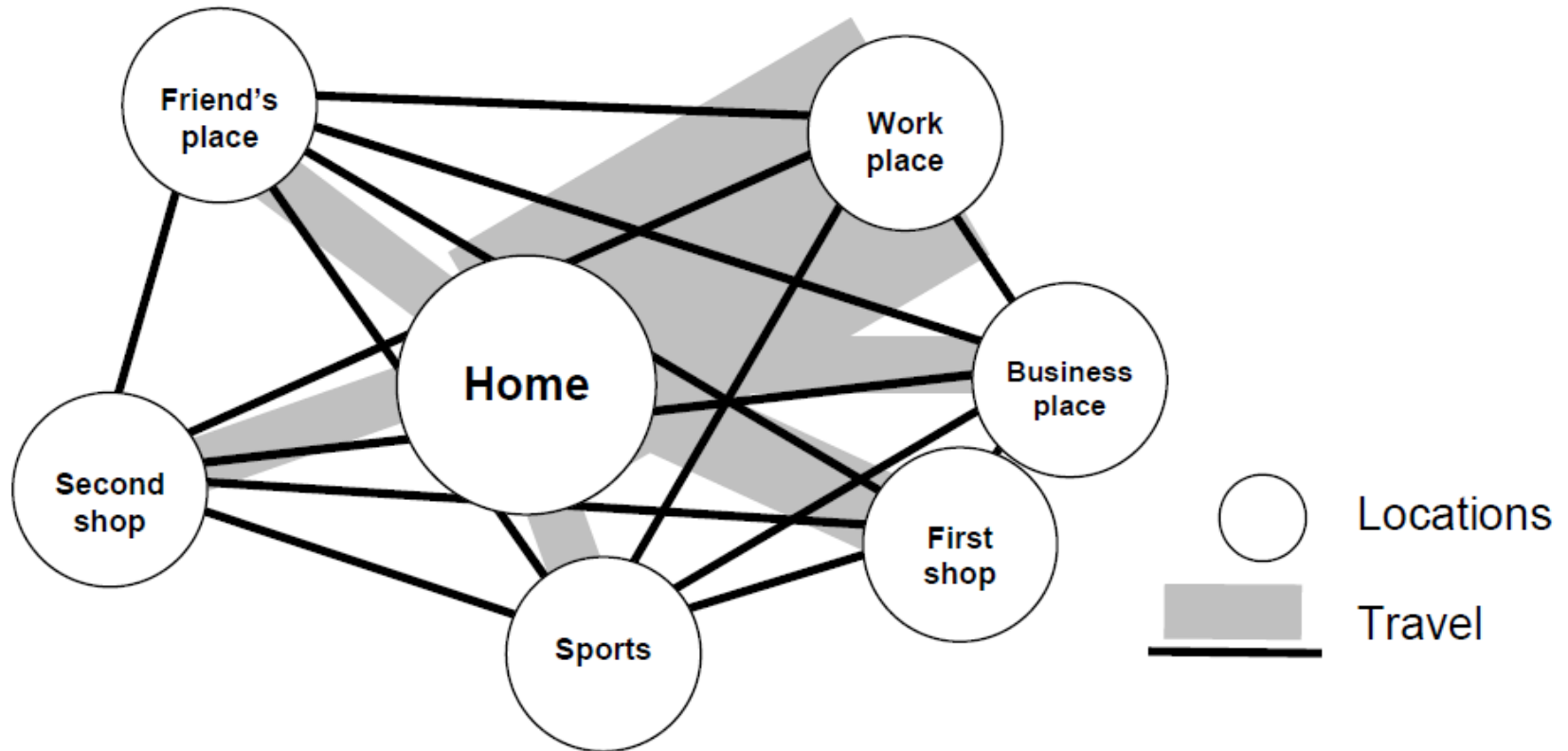
PLACE-BASED → **PERSON-BASED**

GROUP → **INDIVIDUAL**

RESIDENCE → **ACTIVITY SPACE**

(Farber et al. 2012)

Segregation across multiple socio-geographical spaces



(Maier et al. 1977)

Activity space approach

- Activity space

“...the subset of all locations within which an individual has direct contact as a result of his or her day-to-day activities.”

(Golledge & Stimson 1997, p. 279)

- 1) Home

- 2) Work / school / university

- 3) Out of home, non-employment activities and travel

Activity spaces and segregation

- Five distinct axes of measurement:
 - 1) evenness
 - 2) exposure
 - 3) centralization
 - 4) clustering
 - 5) **concentration – relative amount of physical space occupied by a minority group**

(Massey & Denton 1988)

Objective

... is to study differences between Estonian- and Russian-speakers' activity spaces as an expression of spatial ethnic segregation in Estonia.

- 1) How and to what extent individuals' activity spaces differ?*
- 2) What are the main factors behind these differences?*

Data and methodology

Passive mobile positioning

Grounding assumptions:

- 1) Mobile phone (SIM-card) = individual
- 2) Call activities = digital footprint in space and time
- 3) The more important place in individual's activity space, the more call activities are made there
- 4) Since phone is not used every time an individual visits an activity place, a longer study period enables to reveal his/her activity places and an activity space.
- 5) Communication language with a mobile operator is regarded as a mother tongue

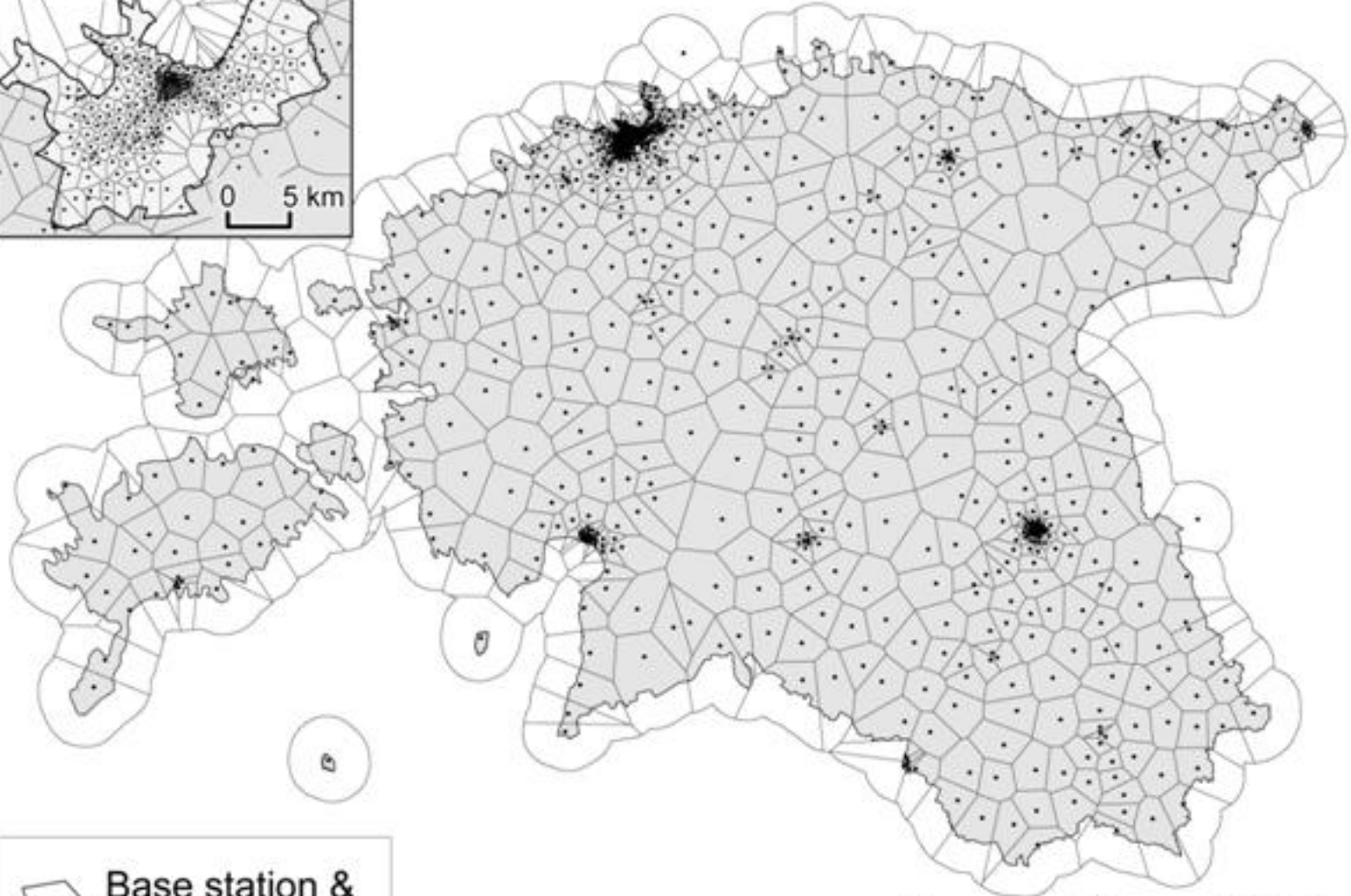
Data

- Passive mobile positioning data
- Log files of Estonian biggest mobile operator
- Attributes of an outgoing call activity:
 - 1) Time and date
 - 2) Geographical coordinates of a base station
 - 3) Random ID of a SIM-card user
 - 4) Birth year
 - 5) Gender
 - 6) Communication language with a mobile operator
- Anchor point model (Ahas et al. 2010) for identifying home and work-time locations

Sample

- Criteria for mobile phone users:
 - 1) Home and work-time location: Tallinn
 - 2) Age: 20 to 64
 - 3) An active phone user:
 - >25 days with call activities per month
 - Around 5 – 9 call activities per day
- Random sample, 560 individuals (280 + 280)
- Study period: one year (2009)
- Individual data

Study area



Base station &
coverage area

Standard deviational ellipse

- Simple geometry to characterize activity space and spatial mobility of an individual

(Buliung & Kanaroglou 2006)

- A calculation of the smallest possible area in which a defined share (95%) of all visited locations is situated
- Measure: size (km²)

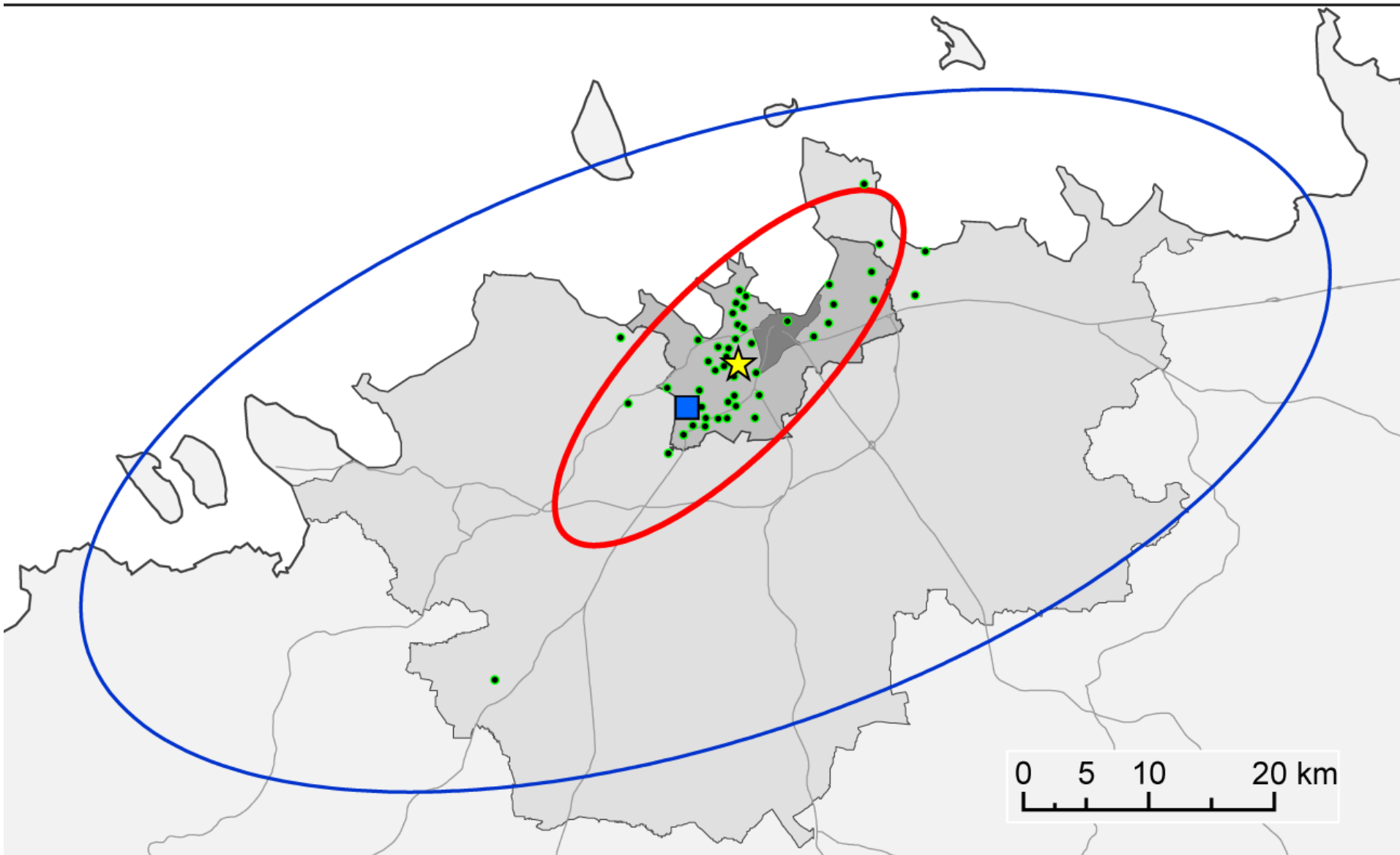
(Schönfelder & Axhausen 2010, p. 132)

Monthly activity locations

- ★ Home
- Work
- Call activity locations

Activity spaces

- Monthly
- Annual



General Linear Model

Dependent variables

Size of monthly activity space (km²)

Size of annual activity space (km²)

Independent variables

Fixed factors

Language (2)

Gender (2)

Age group (4)

Home location (8)

Work location (2)

Hourly call activity pattern (3)

Weekly call activity pattern (3)

Covariates

Home-work distance (km)

Call activities (N)

Days with call activities (N)

Call activities outside home & work (%)

Empirical findings

Monthly activity spaces

		Language	
		Est	Rus
Activity Space (km ²)	Q1	246	66
	Median	1290	139
	Q3	4257	441

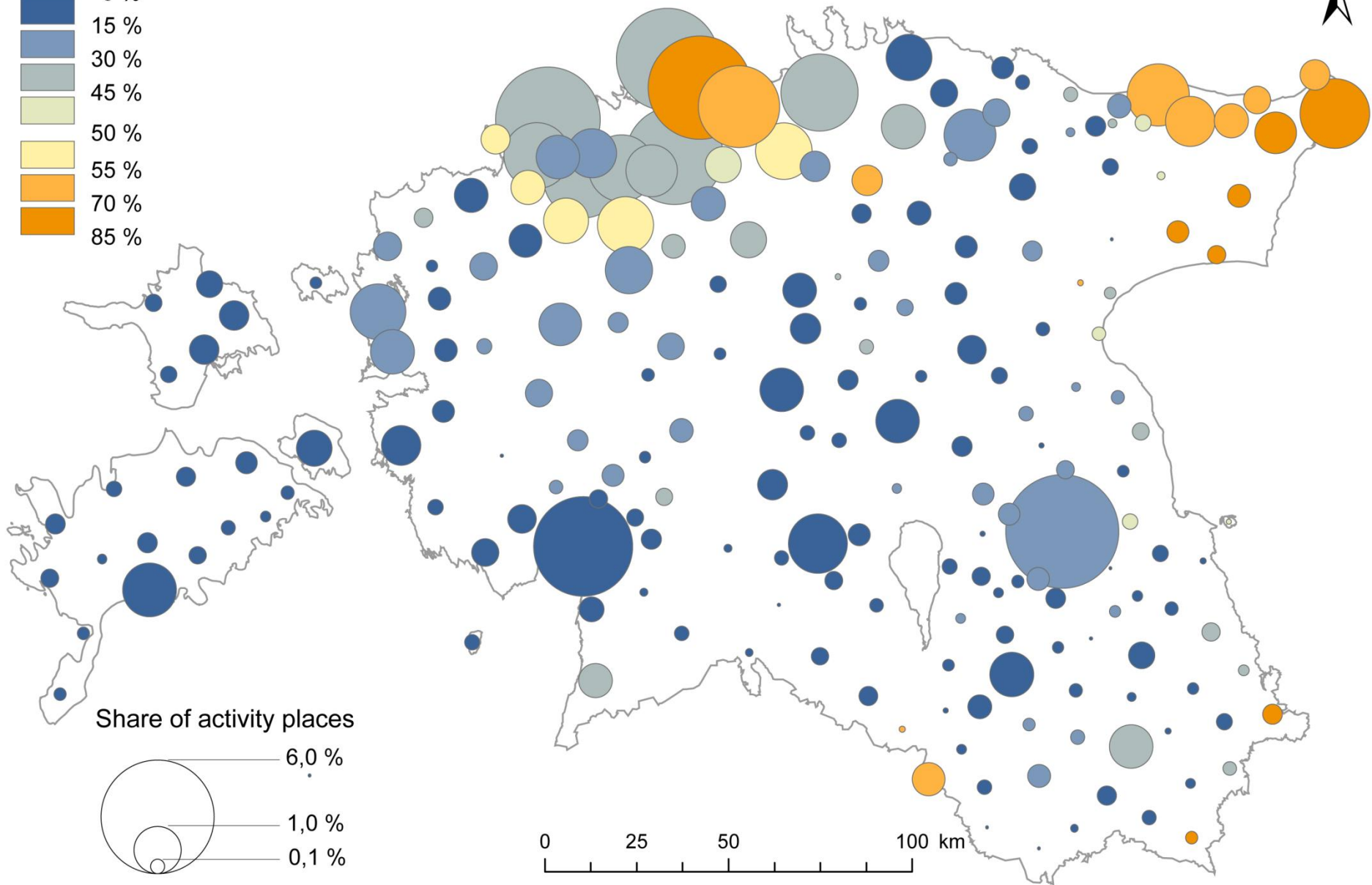
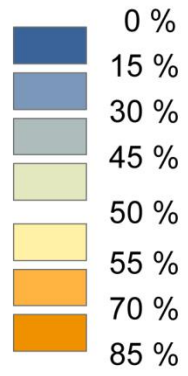
Independent factors		Monthly Activity Space	
		F	Partial Eta Squared
Corrected Model		13,890	0,394*
Social	Lang (L)	115,178	0,177*
	Gender (G)	0,696	0,001
	Age (A)	2,846	0,016*
	G * A	1,335	0,007
	L * A	0,634	0,004
	L * G	0,673	0,001
	L * G * A	3,085	0,017*
Locational	Home	2,743	0,005
	Work	4,709	0,009*
	H-W dist	8,793	0,016*
Phone Usage	Ghour	0,032	0,000
	Gweek	7,899	0,029*
	CAs	0,194	0,000
	CAdays	0,254	0,000
	notHW	84,778	0,137*

Annual activity spaces

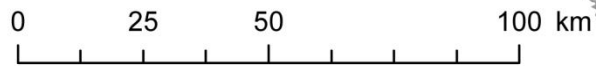
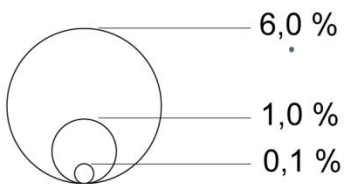
		Language	
		Est	Rus
Activity Space (km ²)	Q1	2497	310
	Median	6975	987
	Q3	12400	2825

Independent factors		Annual Activity Space	
		F	Partial Eta Squared
Corrected Model		14,937	0,412*
Social	Lang (L)	171,126	0,243*
	Gender (G)	1,998	0,004
	Age (A)	4,967	0,027*
	G * A	1,371	0,008
	L * A	0,530	0,003
	L * G	0,040	0,000
	L * G * A	4,271	0,023*
Locational	Home	0,036	0,000
	Work	0,641	0,001
	H-W dist	0,003	0,002
Phone Usage	Ghour	0,015	0,000
	Gweek	6,198	0,023*
	CAs	0,255	0,000
	CAdays	1,163	0,002
	notHW	63,120	0,106*

Share of Russian-speakers



Share of activity places



Conclusions

- Estonian-speakers' activity spaces are significantly larger than Russian-speakers'.
- Russian-speakers' activity places are concentrated into specific regions.
- The study stretches the concept of segregation and enables to gain more knowledge on the phenomenon.
- How to link new knowledge to traditional segregation research?

Thank you for your attention!

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