Theoretical and Methodological Framework for Measuring Physical Co-presence with Mobile Positioning Databases

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Objectives

To find the best spatial and temporal resolution for measuring co-presence from passive mobile positioning data

To measure ethnic segregation in Estonia

Goffman 1966, Urry 2003, Zhao 2003, Lawrence at al. 2006; Miller 2007:

- **Copresence is** being at the same place at the same time.
- Physical coprsence - sense of being physically located in mediated space.

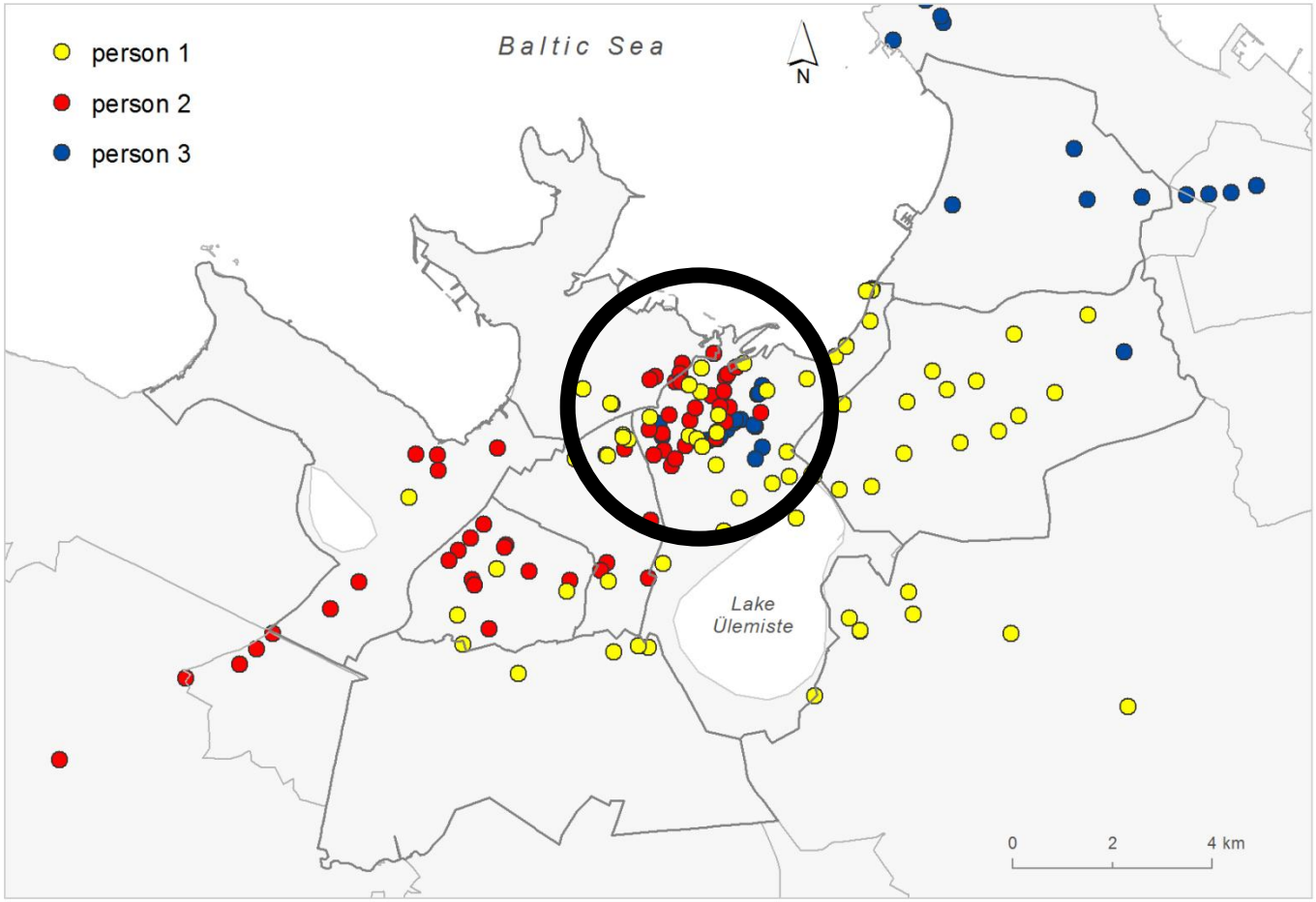
Communication modes based on their spatial and temporal constraints (Janelle 1995, Miller 2005).

	Physical presence	Telepresence
Synchronous	Face to face meeting	Phone, TV
Asynchronous	Notes, message boards	E-mail, newspaper

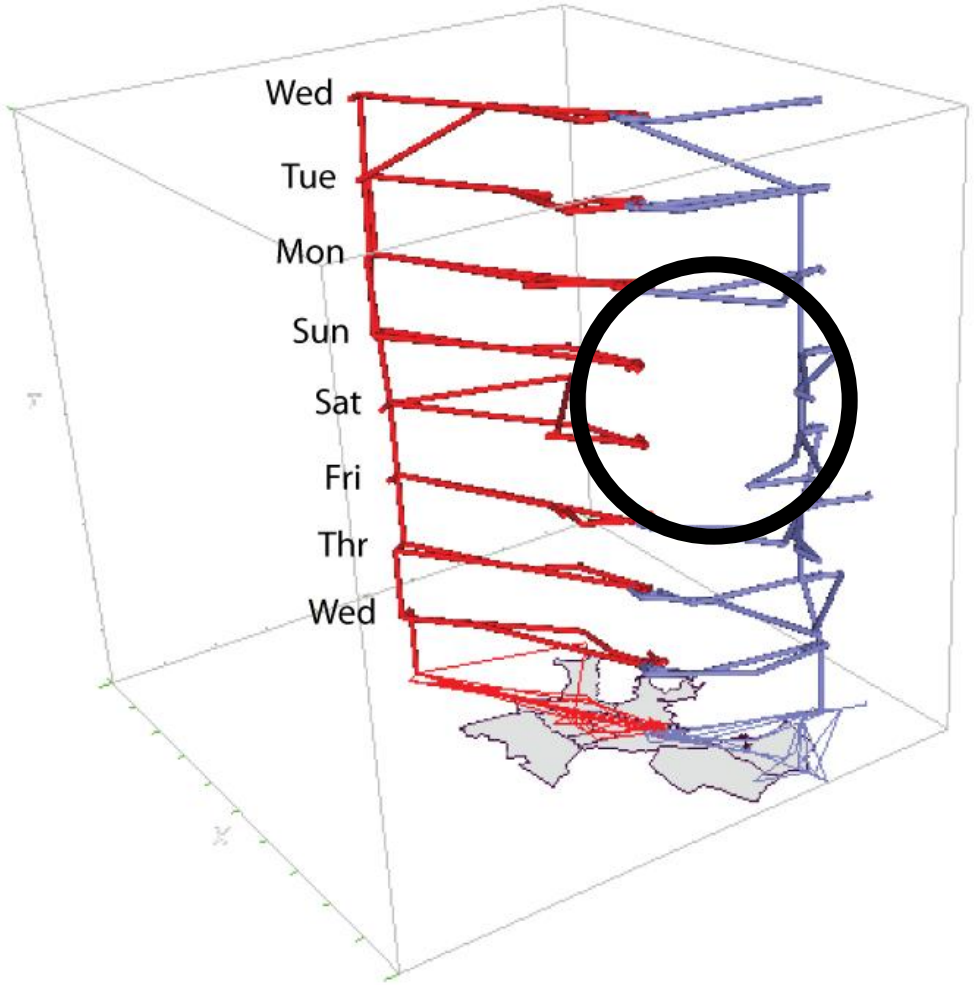
Corporal copresence is indicator of interaction

- **Face-to-Face meetings**: building networks, building trust, making decisions
- **Innovation studies**: diffusion of knowledge
- **Integration / segregation** between ehnic groups

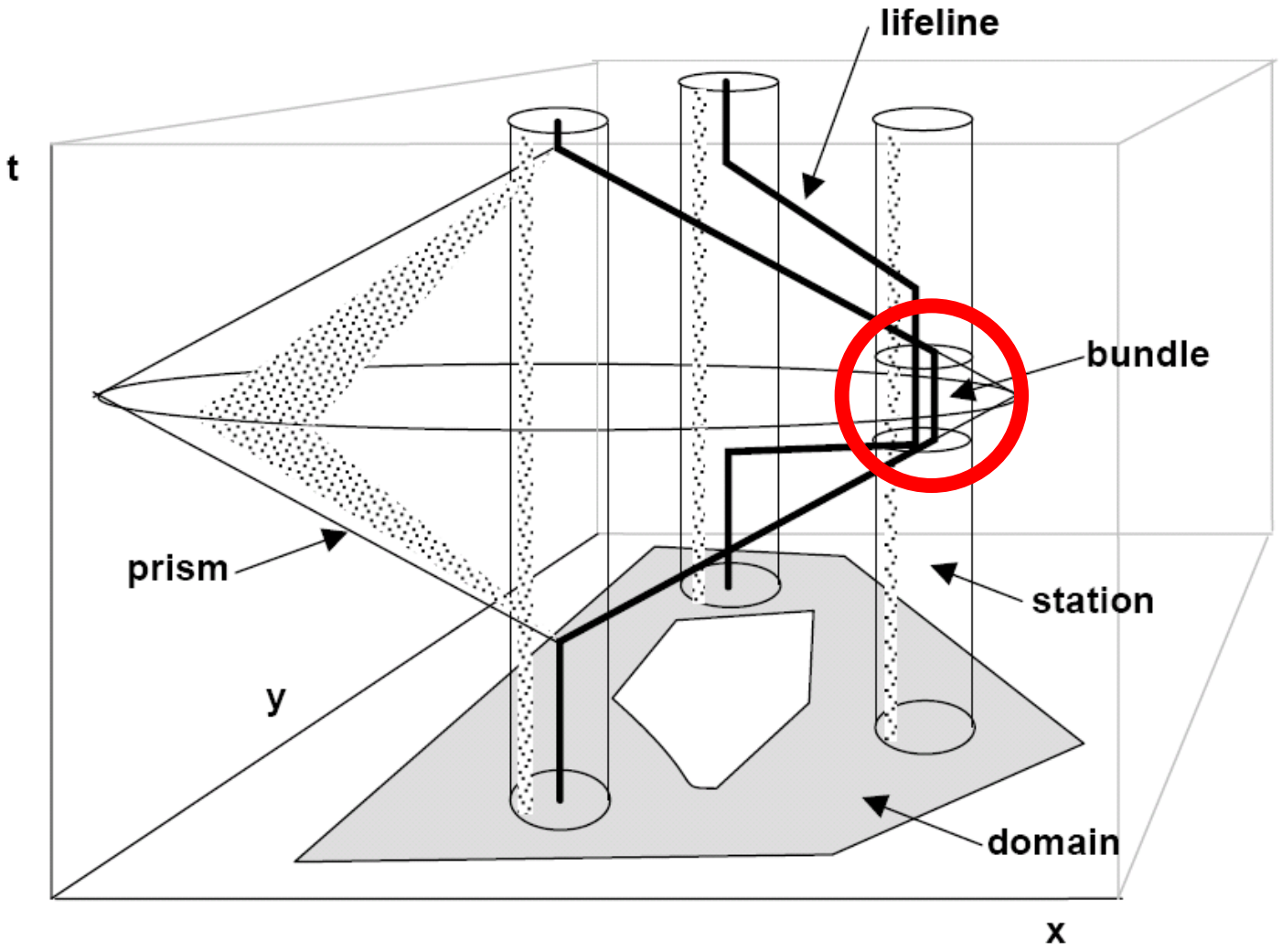
Spatial activity of persons



Co-presence in space-time



Detecting co-presence



Data and methods

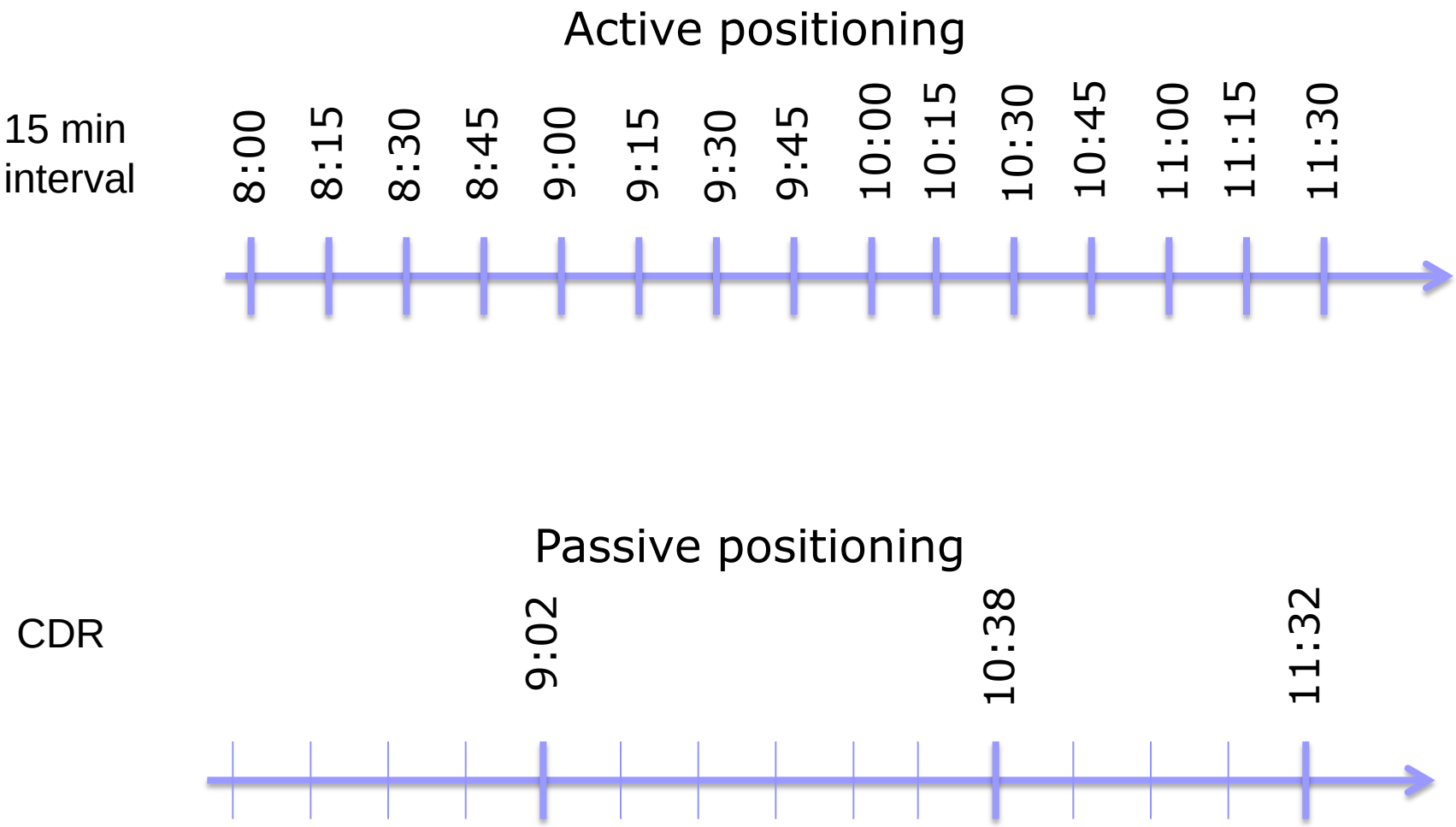
Passive mobile positioning data

- Anaonymous call detail records (CDR)
  - ID: anonymous identifier
  - Time: by second
  - Space: antennae, where CDR was made
  - Social characteristics: age, sex, nationality

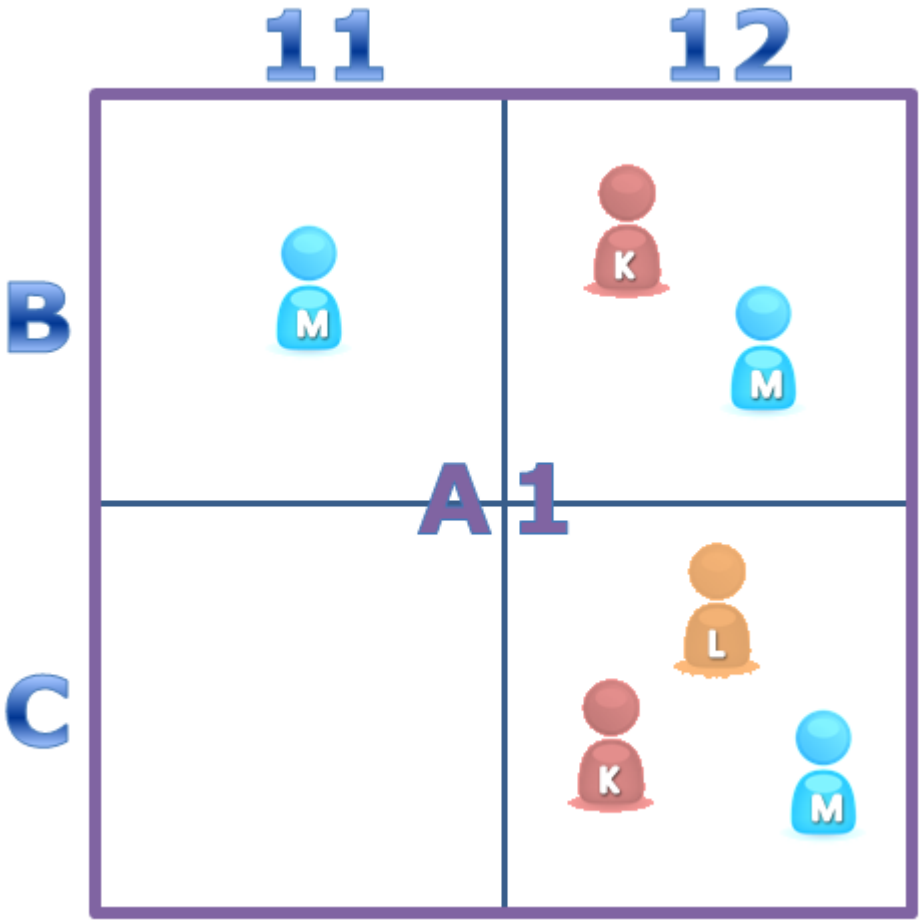
Sample

- EMT – biggest mobile operatir in Estonia, market share 47%
- Random sample of 350 000 phone users (Estonian population 1.3 million)
- 10 days in April 2011
- Average number of “calls out” in a day per hone is 5.25

Frequencies



Detecting co-presence (Miller 2007)



Place based

B12 – 2 co-presences

C12 – 3 co-presences

A1 – 3 co-presences

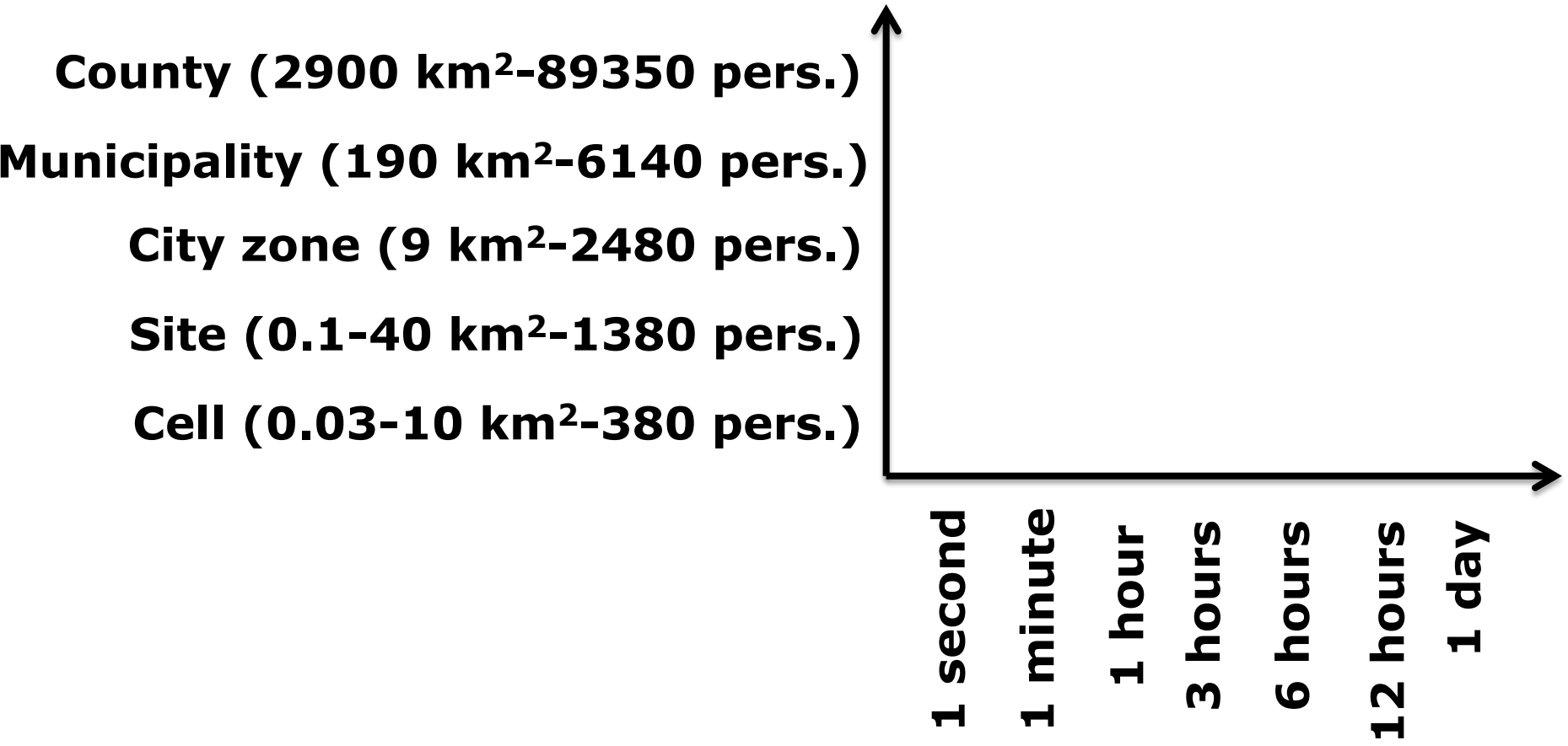
People based

B12 – 2 co-presences

C12 – 6 co-presences

A1 – 6 co-presences

Spatial and temporal units



Spatial units

Results

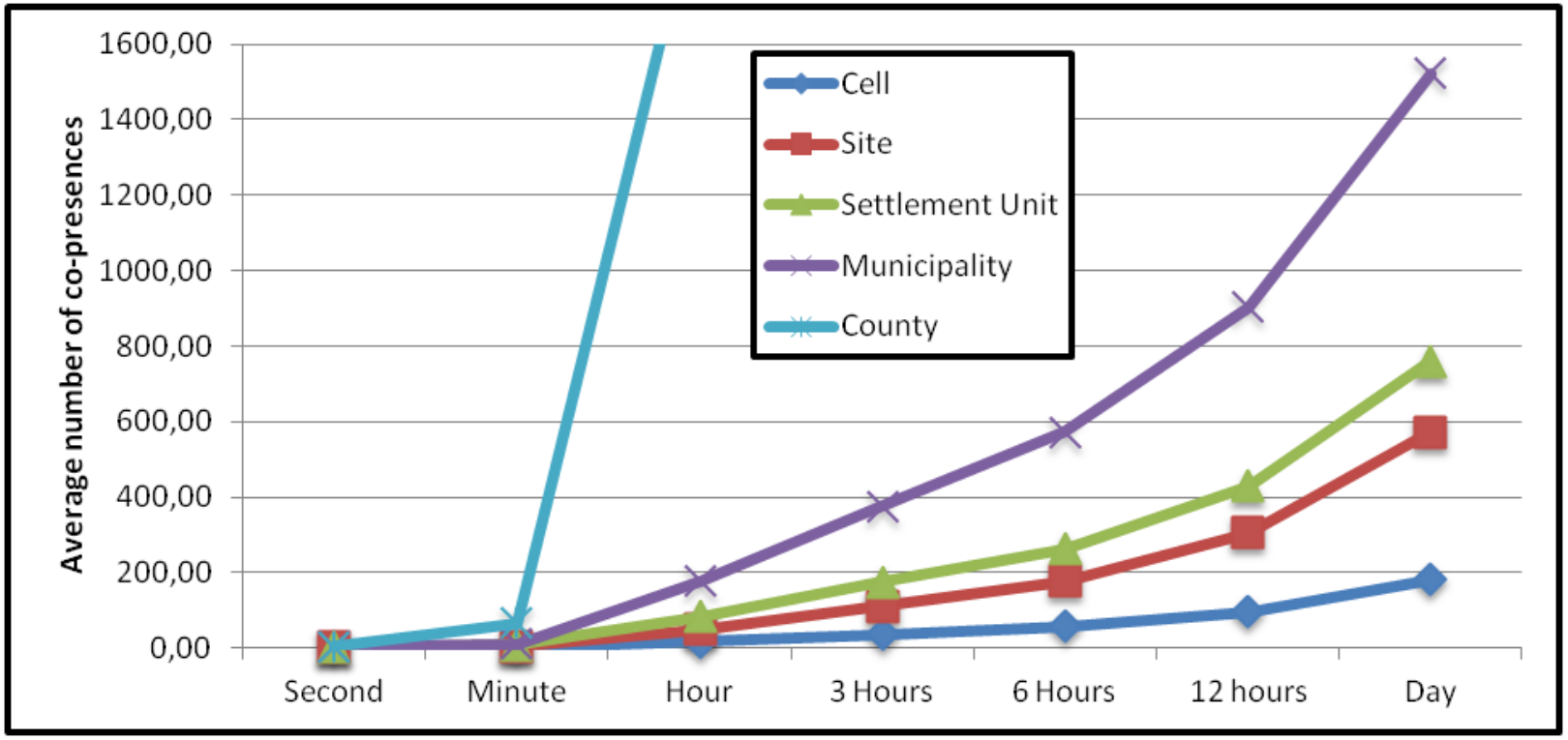
Co-presences in spatio-temporal window

Average number of co-presences

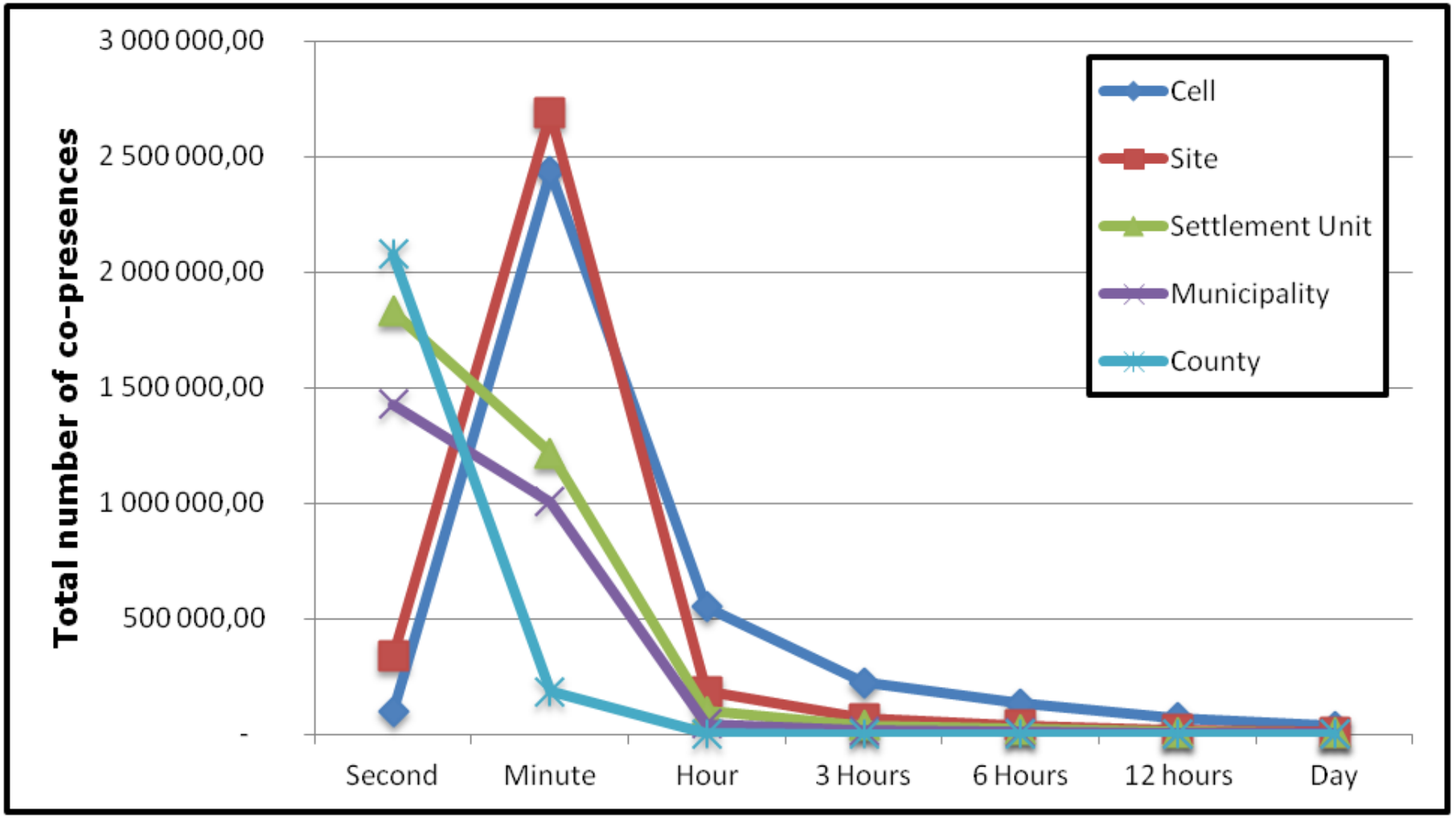
Time\Space	Cell	Site	Settlement Unit	Municipality	County
Second	2,01	2,03	2,72	4,78	4,90
Minute	2,52	3,68	9,01	11,68	66,53
Hour	17,21	48,94	82,70	177,10	2031,89
3 Hours	37,41	111,38	176,03	375,51	4498,49
6 Hours	56,96	178,38	263,75	572,98	6833,48
12 hours	95,43	305,57	428,70	903,92	10307,40
Day	180,87	572,85	760,80	1523,66	16160,33

Average number of co-presences

Increasing spatio-temporal window will increase number of co-presences exponentially



Total number of co-presences



Conclusions

- New knowledge about ethnic segregation
- Mobile data has advantages
- Largest number of co-presences is achieved with temporal unit **minute** and spatial unit **site or cell**
- For setting up the space-time “window” the **aim of the study** and **nature of the data** needs to be considered

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THANK YOU!

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