WENNBERG INTERNATIONAL COLLABORATIVE
SPRING POLICY MEETING 2018

A GIS BASED MODEL TO DETECT REGIONAL DIFFERENCES IN HEALTH CARE SUPPLY STRUCTURES

RETO JÖRG & NICOLAS LENZ

WIC WENNBERG INTERNATIONAL COLLABORATIVE

74 NRP Smarter Health Care National Research Programme

SSPH+ SWISS SCHOOL OF PUBLIC HEALTH

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Observatoire suisse de la santé
Osservatorio svizzero della salute
Swiss Health Observatory

Overall Topic & Content

Supply Density Indicator (SDI)
A method/measure to operationalize health care supply structures

1) **Example**
   → Supply Density of Primary Care Physicians

2) **Method**
   → How is the SDI calculated?

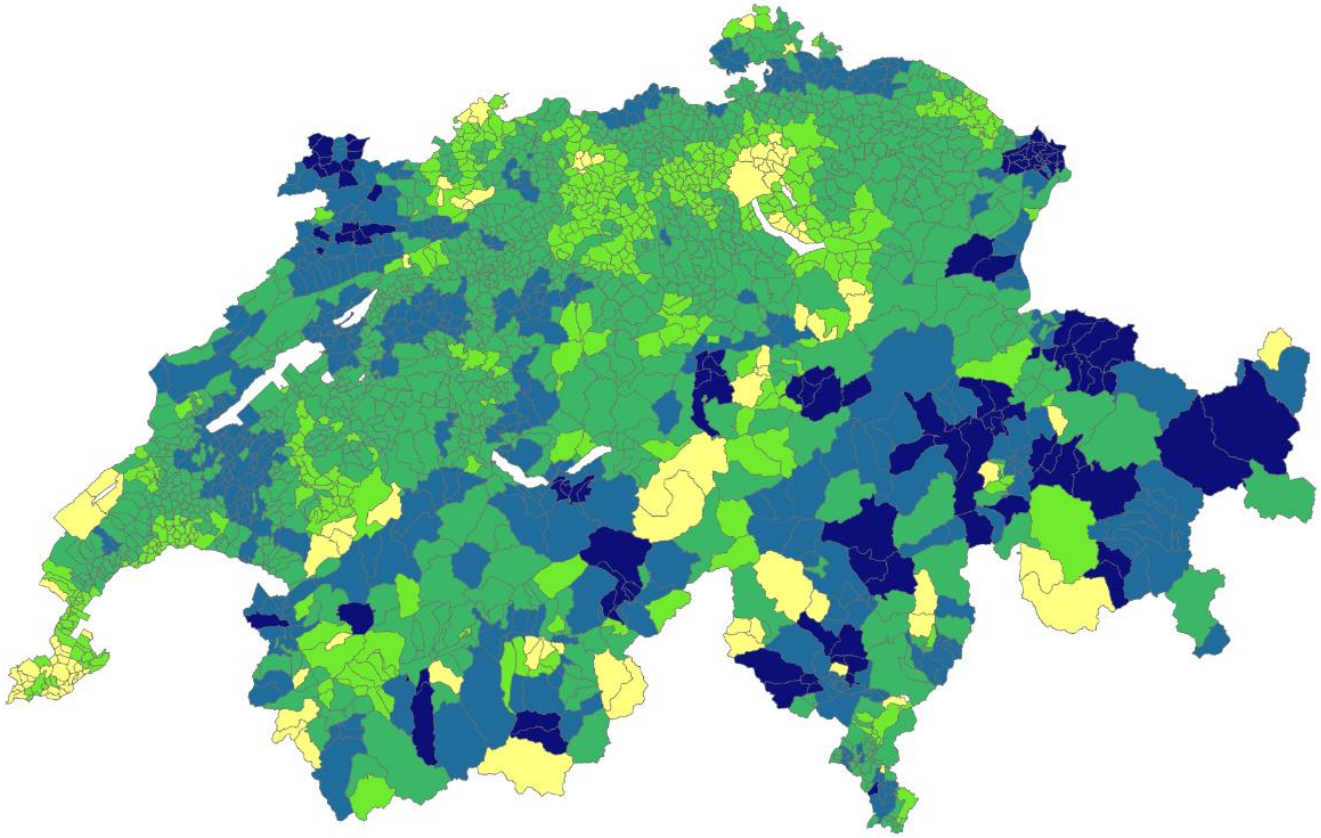
3) **Applications**
   → How can the SDI be used for health service research and health care planning?

Example

Supply Density of Primary Care Physicians 2016

Examples

Municipality	SDI 2016
Baden	0.157
Basel	0.083
Bern	0.179
Genève	0.070
Murten	0.184
Neuchâtel	0.195
Zürich	0.084



Data: FMH-Ärztestatistik, Swiss Medical Association (FMH)
Maps/Boundaries: Bundesamt für Landestopografie
Comment: preliminary results

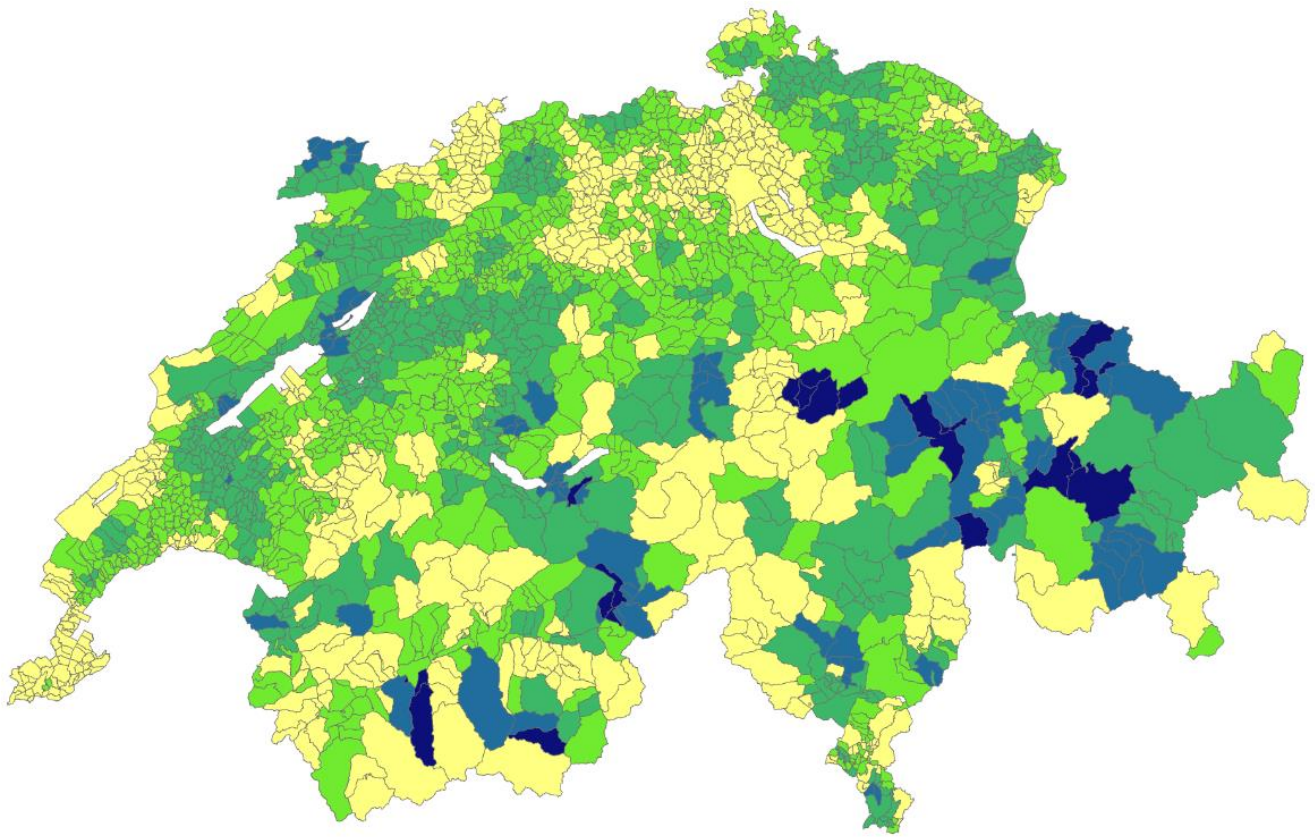
Example

Supply Density of Primary Care Physicians 2026 (Simulation)

Assumptions

- **Outflow**: reduction of level of employment and retirement based on empirical values (see table)
- **Inflow**: none (no new primary care physicians)
- **Population:** numbers and distribution stays the same

Status quo		Simulation (+10 years)	Level of employment
age		age	change in %
55	→	65	-50%
56	→	66	-55%
57	→	67	-60%
58	→	68	-65%
59	→	69	-70%
60	→	70	-75%
61	→	71	-80%
62	→	72	-85%
63	→	73	-90%
64	→	74	-95%
65+	→	75+	-100%



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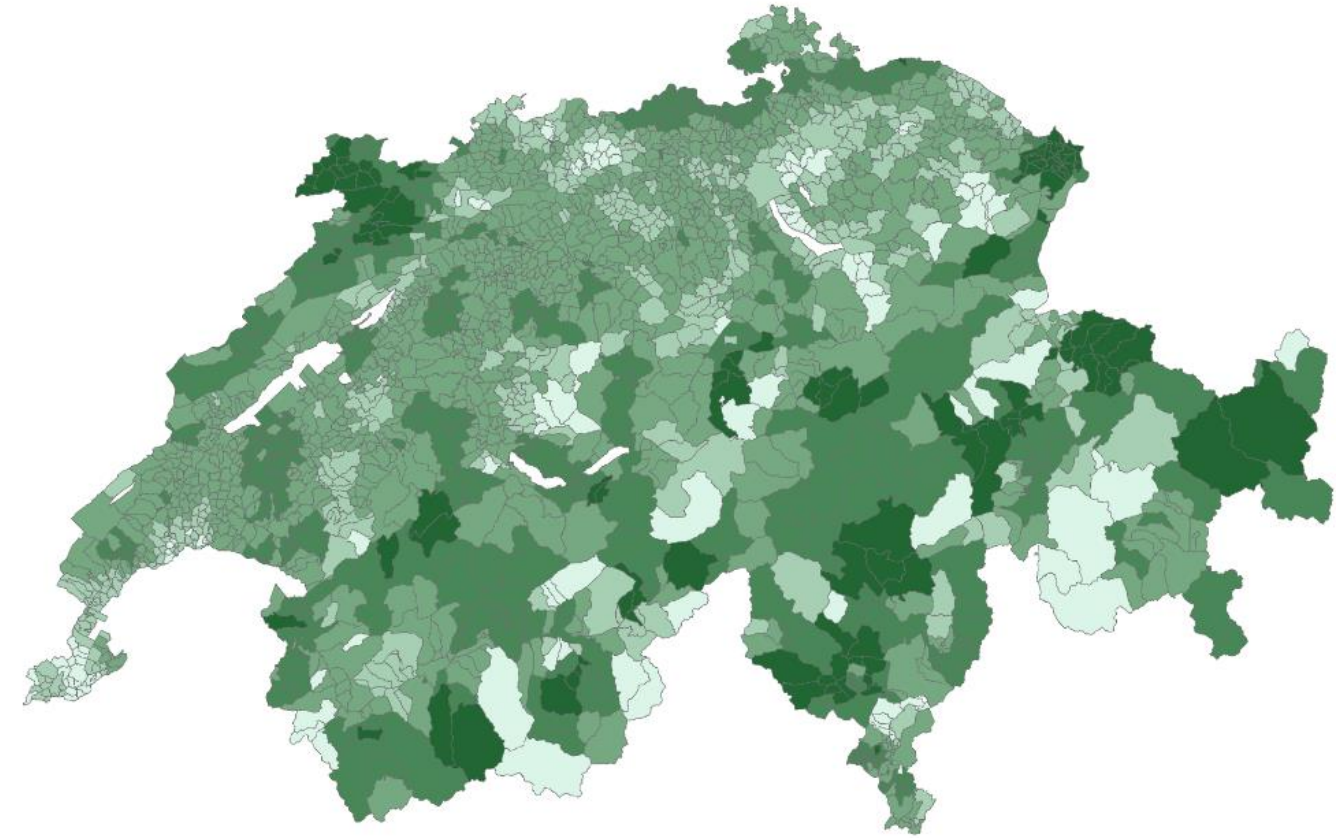
Supply Density of Primary Care Physicians

Change in SDI between 2016 and 2026 (simulated)

Examples

Municipality	Δ SDI
Baden	0.052
Basel	0.030
Bern	0.050
Genève	0.008
Murten	0.042
Neuchâtel	0.037
Zürich	0.020



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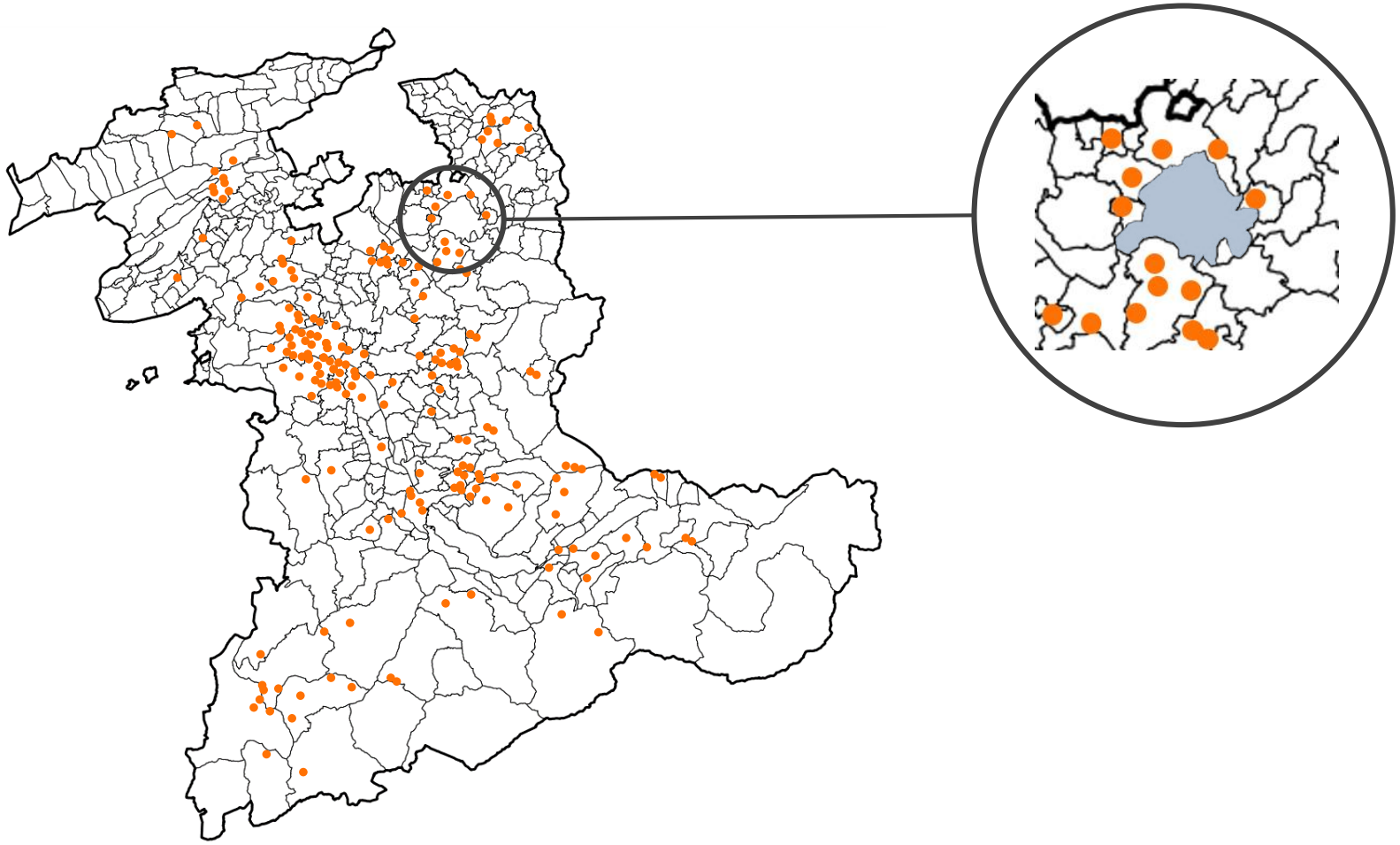
Operationalization of Health Care Supply Services

Traditional Indicators

- If the region is too big, it's not a valid description of specific areas
- Interdependencies between region are not taken into account, which is especially problematic, if the regions considered are small



Data: simulated data / Maps: Amt für Geoinformation des Kantons Bern

Supply Density Indicator (SDI)

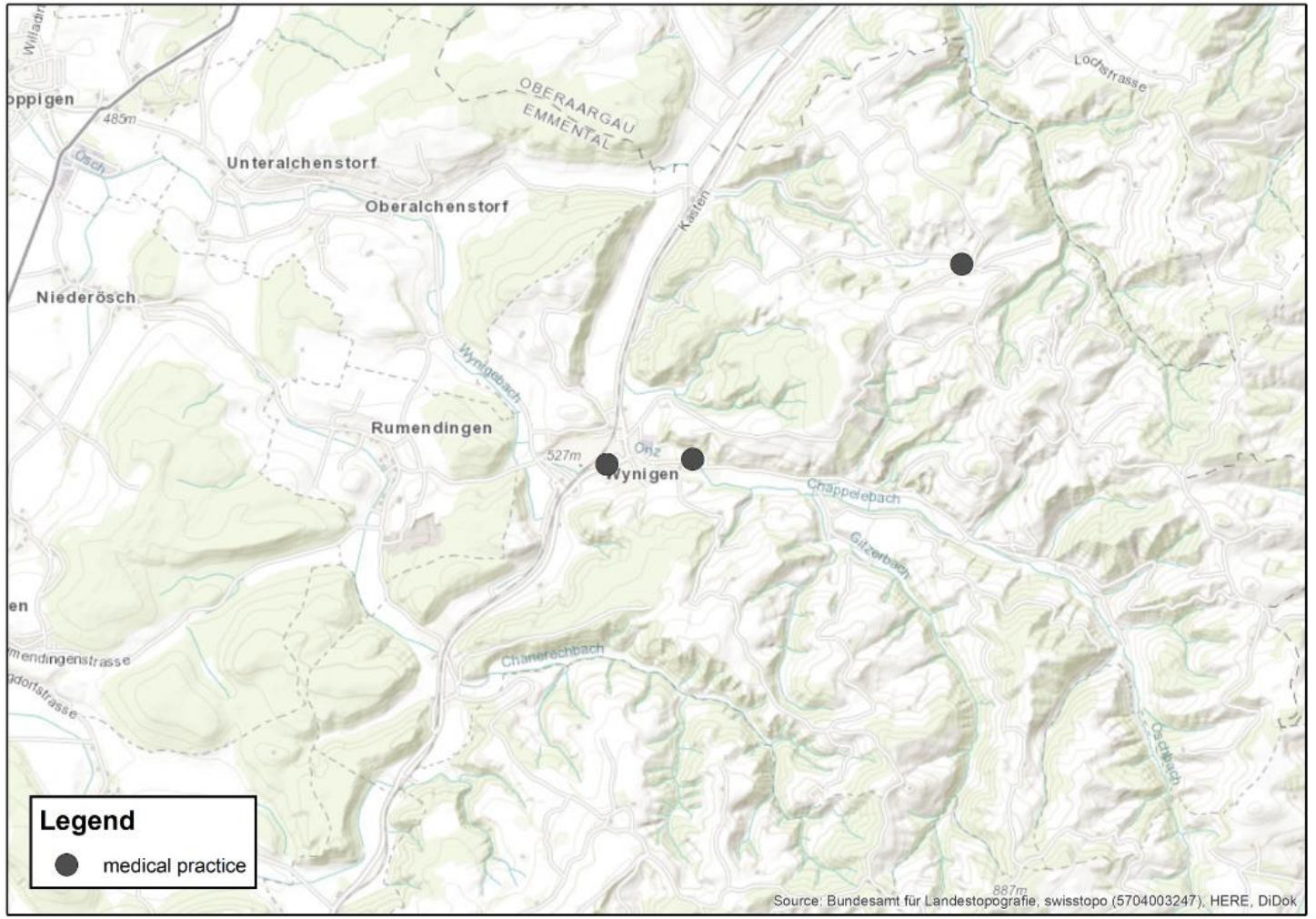
How is the SDI calculated?

Step 1

Definition of supply

Question

– Which health care services/providers are relevant in the context of the analysis?



Data: simulated data

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Supply Density Indicator (SDI)

How is the SDI calculated?

Step 2

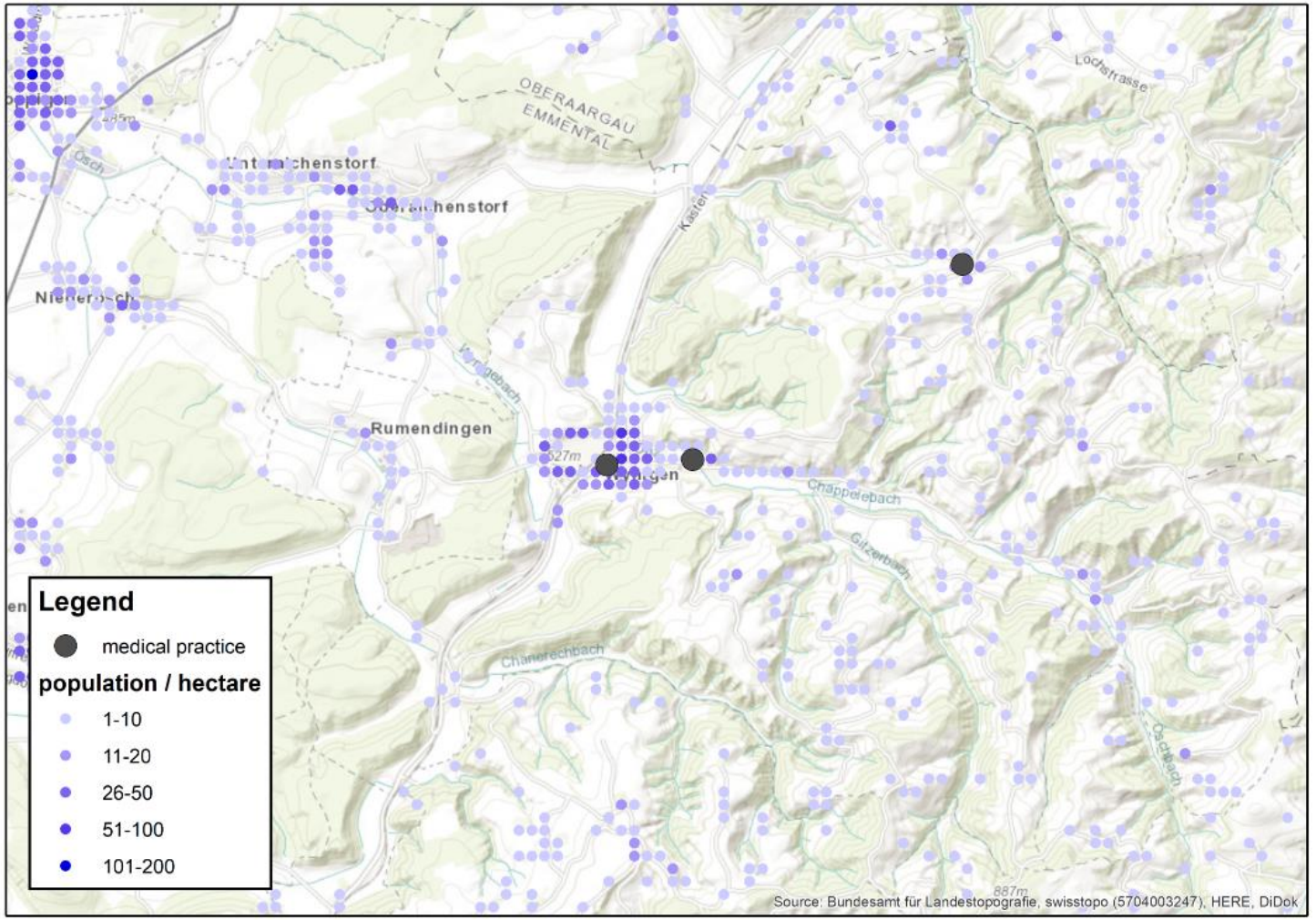
Determination of the target group

Question

– For whom is the considered supply system of relevance?

Example

– Swiss population



Data: simulated data

Supply Density Indicator (SDI)

How is the SDI calculated?

Step 3

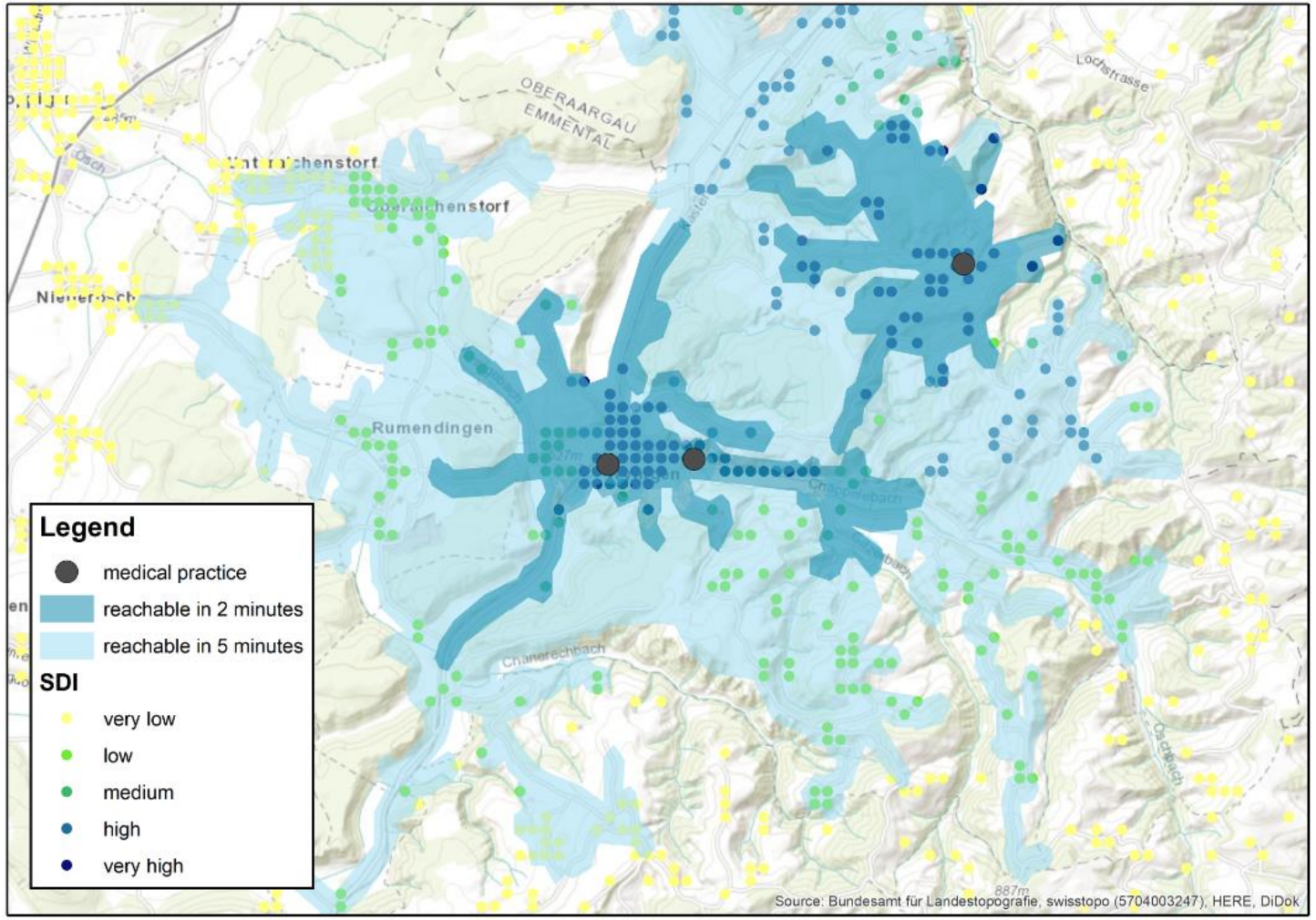
Calculating care supply radiuses

Question

– Which part of the target group is served by the supply system?

Example

– Radius of 2 and 5 minutes (private transport)



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Supply Density Indicator (SDI)

How is the SDI calculated?

Step 4

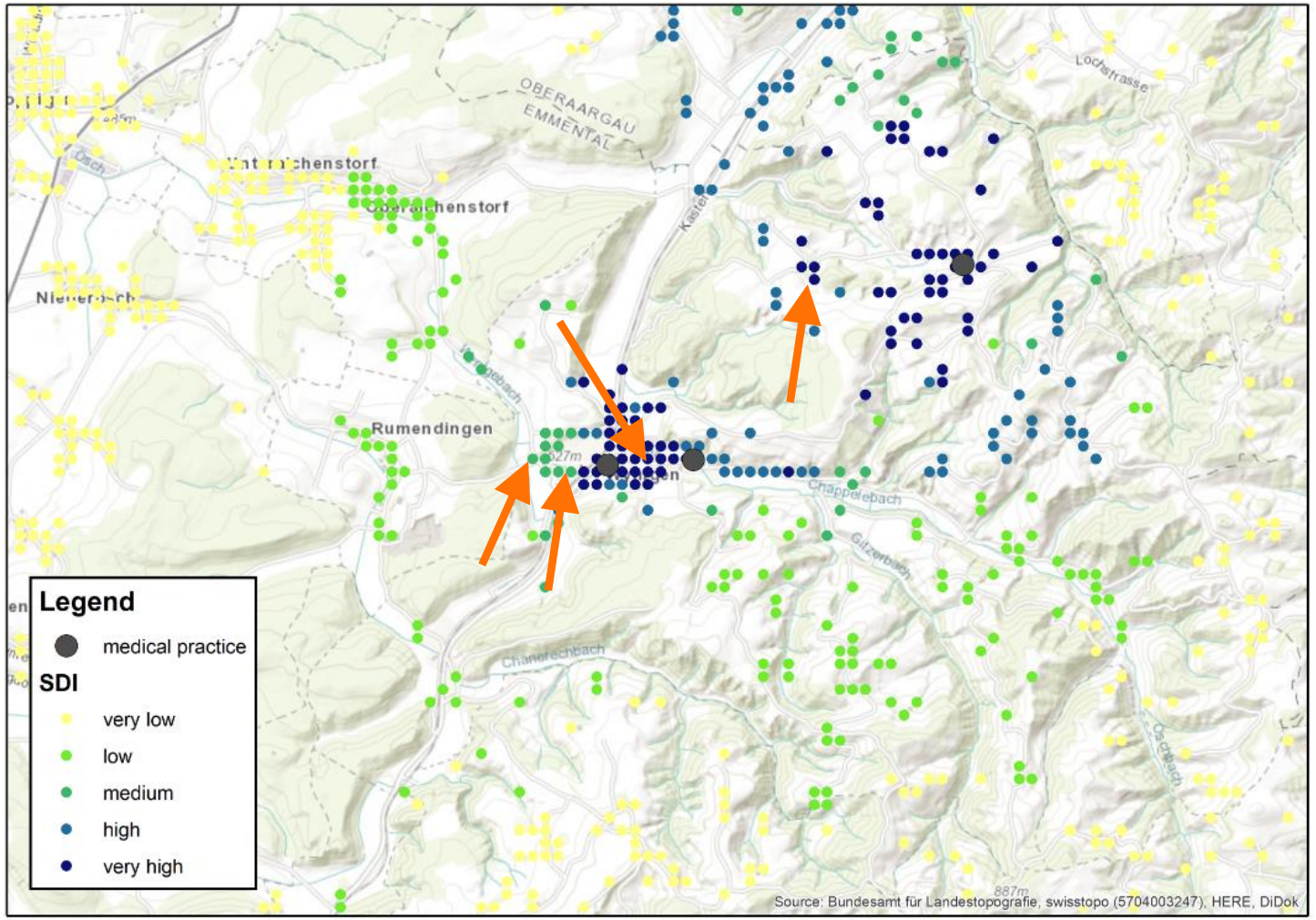
Calculating the supply density indicator for each point of the target population, considering the capacities of supply systems

Questions

- How many supply services are available (in a given time)?
- To which extent the supply system is available for the target population?

Example

- level of employment
- amount of target population, to which a specific supply service is the closest



Data: simulated data

Supply Density Indicator (SDI)

How is the SDI calculated?

Step 5

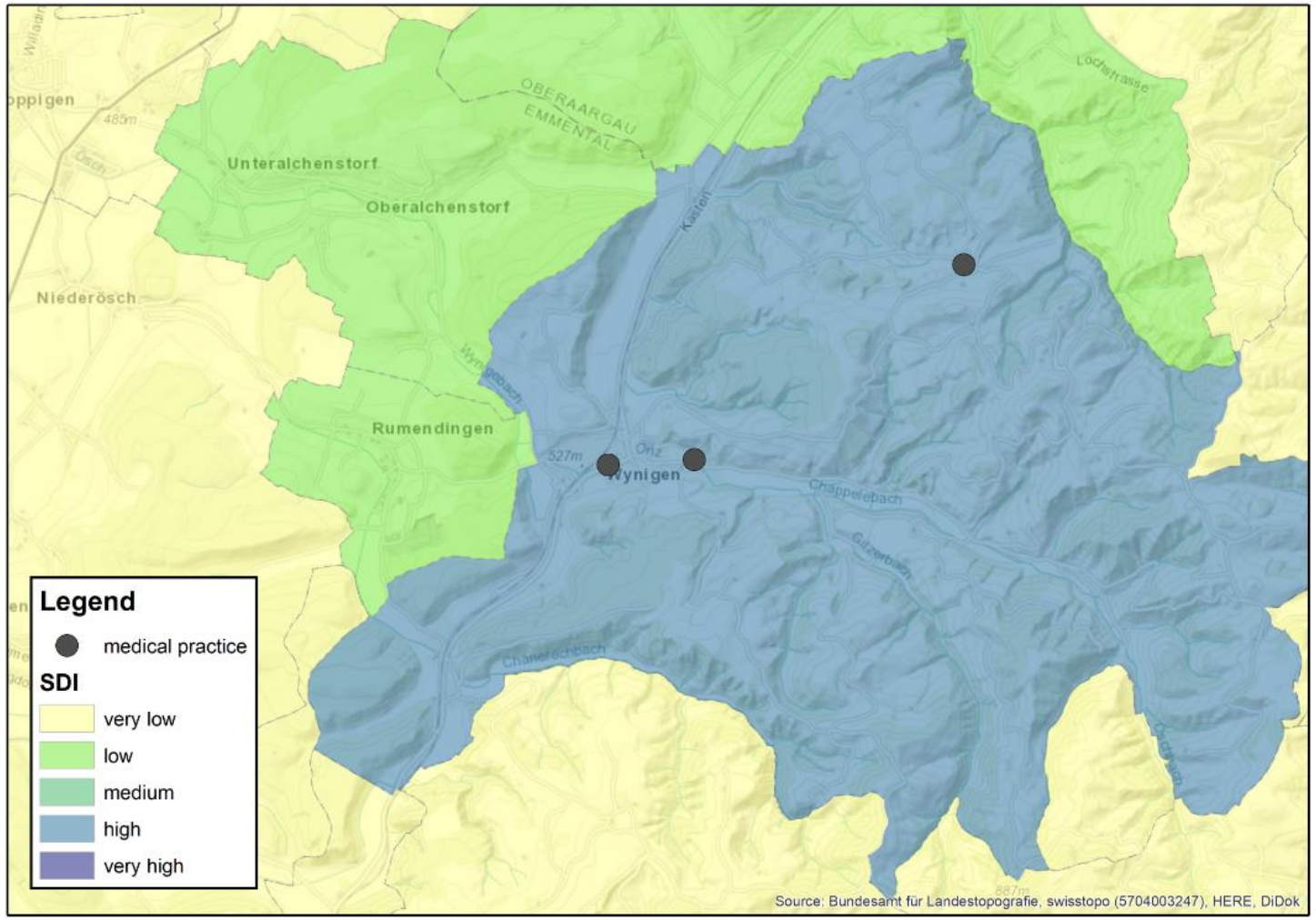
Aggregation to regions

Question

- Which regional differentiation is meaningful in the context of the analysis?

Examples

- Municipality, district, states, MedStat-Regions, etc.



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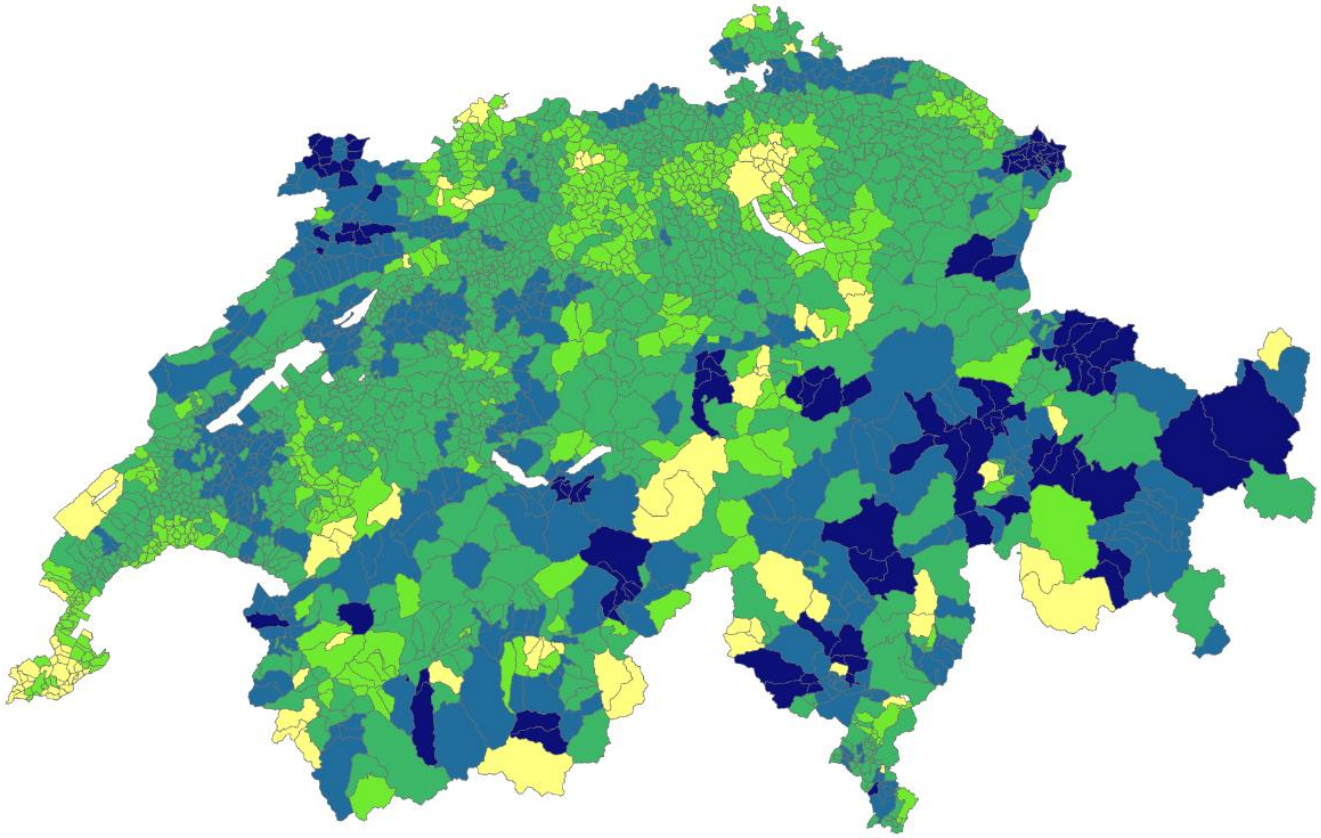

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Applications

- Identify regions of under- and oversupply
- Simulations to identify areas of risk of undersupply
- Site assessment an optimization
- Connect supply structures to health care utilization/costs
- Analysis of the relationship between inpatient and outpatient supply structures

Contact

Andreas Dvorak
socialdesign ag
Tel +41 (0)31 310 24 80
andreas.dvorak@socialdesign.ch
www.socialdesign.ch

Nicolas Lenz
geo7 ag
Tel. +41 (0)31 300 44 33
nicolas.lenz@geo7.ch
www.geo7.ch
www.geodatenanalyse.ch

Reto Jörg
Schweizerisches Gesundheitsobservatorium (Obsan)
Tel. +41 (0)58 467 31 69
reto.joerg@bfs.admin.ch
www.obsan.ch

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