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# GEOGRAPHIC CLUSTERS OF HIGH USE OF PREOPERATIVE CHEST RADIOGRAPHY IN SWITZERLAND

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# DISCLAIMER

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# BACKGROUND

## **Preoperative chest radiography**

is discouraged by most clinical recommendations

## **Evidence for Switzerland**

Substantial variation in the implementation of these recommendations

## **Research gaps**

- Specific regions where in Switzerland high use is most prevalent
- Locational risk factors

# RESEARCH AIMS

- 1) Investigate spatial clusters of risk of preoperative chest radiography
- 2) Assess whether the clusters persisted after adjusting for known influential factors
- 3) Explore the differential risk within clusters

# METHODOLOGY

## Data

- Swiss health insurance claims data
- Persons who underwent surgery during 2013 to 2015
- **Outcome:** Patients who received preoperative chest radiography two months before surgery (cases).
- Spatial level of analysis: Swiss Medstat level (N=705).

## Methods

Spatial scan statistic (SaTScan), Poisson model

- 1<sup>st</sup> model: Unadjusted
- 2<sup>nd</sup> model: Adjusted (socio-demographic, clinical, insurance, healthcare factors)
- Sensitivity analysis (varying % of background population at risk 10-50%, not reported)

# THE SPATIAL SCAN STATISTIC Kulldorff (1997)

Creates an infinite number of distinct geographic circles

radius of the circle windows varies continuously in size

Containing different sets of neighboring locations

Likelihood function for a specific window:

$$\left( \frac{c}{E[c]} \right)^c \left( \frac{C - c}{C - E[c]} \right)^{C - c} I()$$

C: total number of cases

c: observed number of cases within the window

E[c]: expected number of cases within the window under the null-hypothesis

C-E[c]: expected number of cases outside the window.

I(): indicator function, equal to 1 when the window has more cases than expected under the null-hypothesis, and 0 otherwise

The likelihood function is maximized over all window locations and sizes

P-value is obtained through Monte Carlo hypothesis testing

# SPATIAL CLUSTERS OF HIGH USE PREOPERATIVE CHEST RADIOGRAPHY

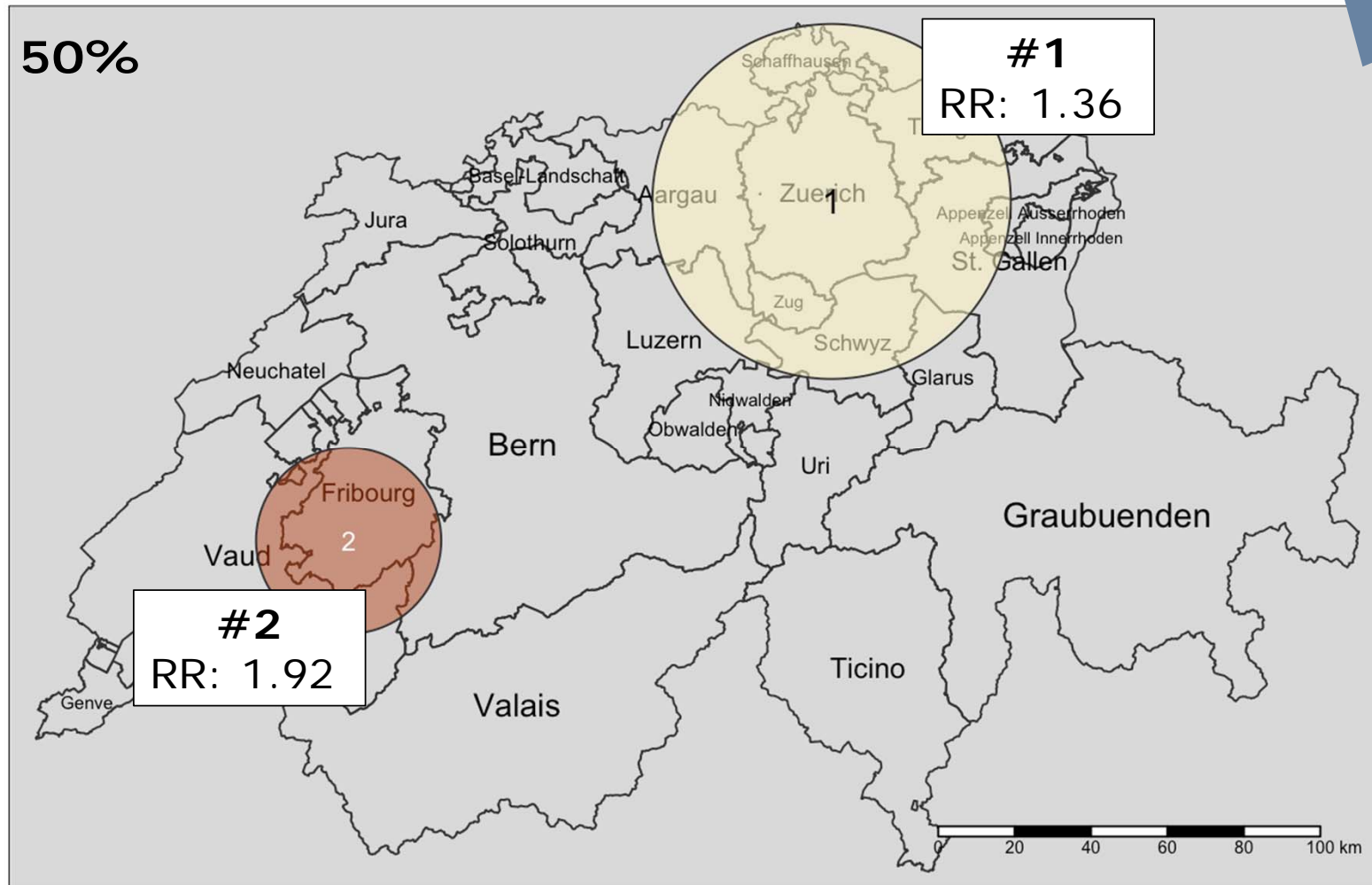
Un-  
adjusted

Cluster #	Radius (km)	# Observations	Relative risk (sig.)
<b>50%</b>			
1	46.2	215	1.36***
2	24.2	29	1.92***
3	13.9	17	1.44.

Significance coding: P <0.1., <0.05\*, <0.01\*\*, <0.001\*\*\*

# SPATIAL CLUSTERS OF HIGH USE PREOPERATIVE CHEST RADIOGRAPHY

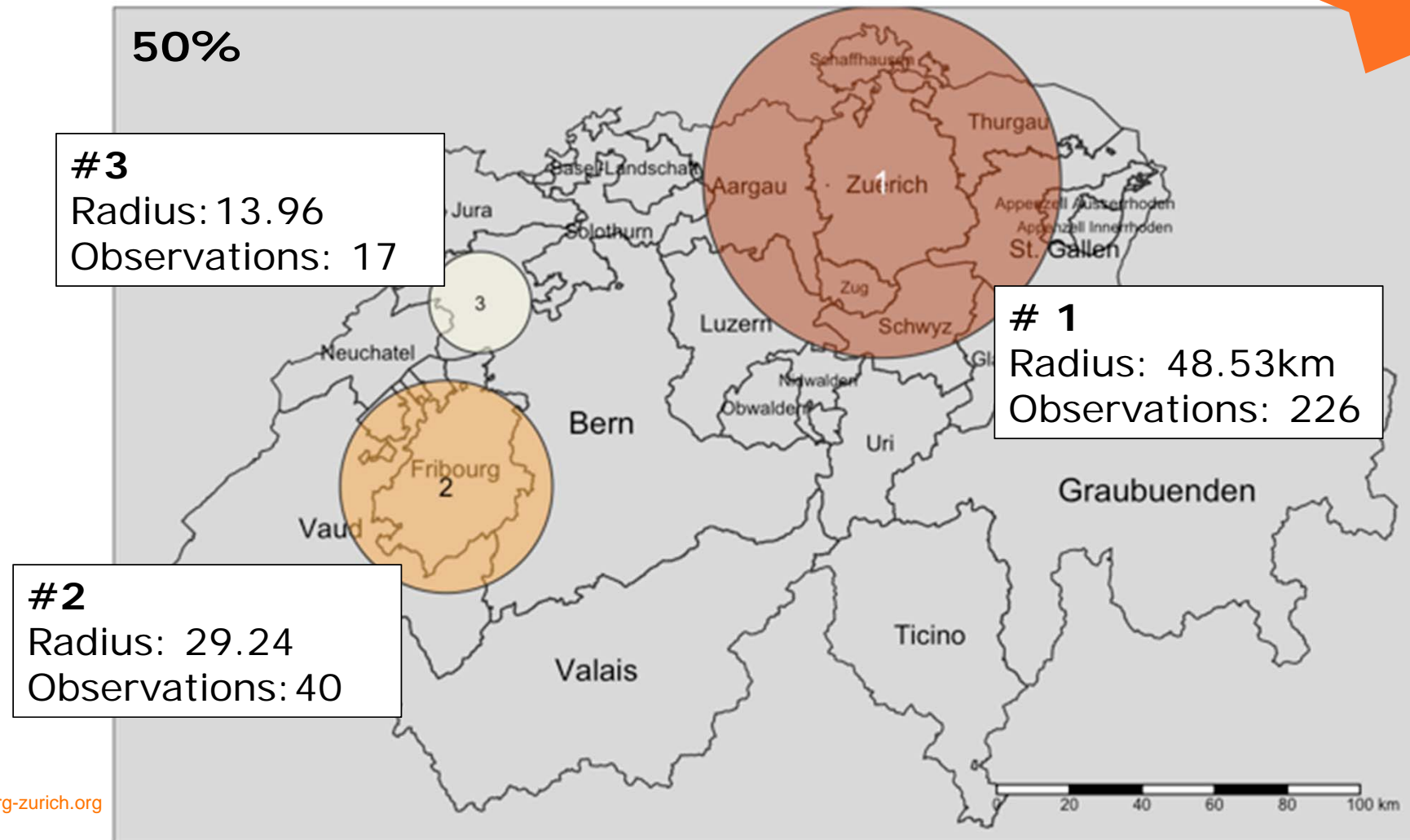
Un-  
adjusted





# SPATIAL CLUSTERS OF HIGH USE PREOPERATIVE CHEST RADIOGRAPHY

Adjusted



# SPATIAL CLUSTERS OF HIGH USE PREOPERATIVE CHEST RADIOGRAPHY

Adjusted

Covariate in cluster (50%)	Cluster #1 Relative risk	Cluster #2 Relative risk	Cluster #3 Relative risk
Older age (63 and above)	1.37***	<b>1.69***</b>	1.35***
Female gender	1.36***	<b>1.90***</b>	1.57***
High franchise (over 500 CHF)	1.33***	1.42***	1.24***
Supplementary hospital insurance	1.36***	<b>1.68***</b>	1.31***
Intrathoric pathology indication	1.39***	1.63***	1.46***
Multimorbidity	1.40***	1.61***	1.40***
Urban area of residence	1.39***	1.65***	1.51***
Specialized surgery only hospitals	1.58***	1.44***	NA
German language region	1.43***	1.44***	1.48***
High purchasing power of household	1.48***	1.64***	1.40***

Significance coding: P <0.1., <0.05\*, <0.01\*\*, <0.001\*\*\*

# DISCUSSION

- Clusters were found in the German and French speaking regions of Switzerland
- Clusters persisted and one additional emerged after adjustment
- Risk factors were consistent but strength varied across clusters

## **Limitations**

Medstat region as level of analysis, postal area code or Mobspat also possible

Data is only from one health insurance, combined claims data across different insurances will be beneficial for future analyses

# CONCLUSIONS

- High use of preoperative chest radiography is spatially concentrated in specific areas of Switzerland
- This is not explained by previously identified factors
- Identified factors exhibited different importance across regions

Our spatial epidemiological approach helps to

- identify geographic hotspots of potential overuse
- monitor implementations of clinical recommendations in subnational regions.

# THANK YOU!

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