



# Geospatial challenges of income and health statistics

igor.kuzma@gov.si

# Eurostat grant

- Income statistics
- Health statistics
- Statistical indicators and confidentiality
- STAGE 2.0 (web map application)

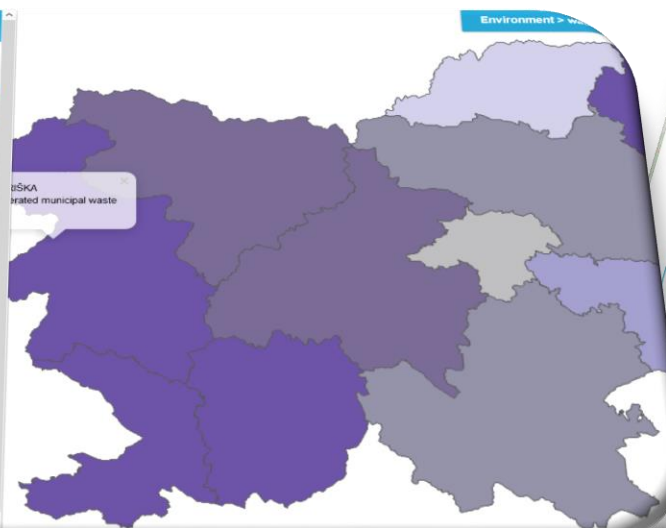
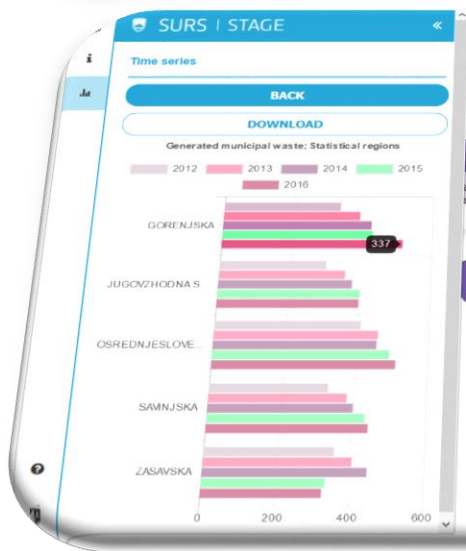
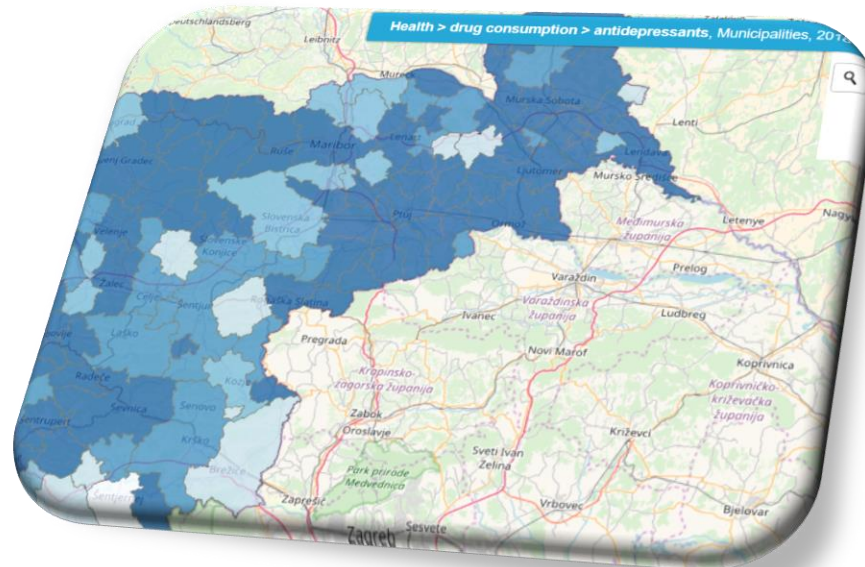
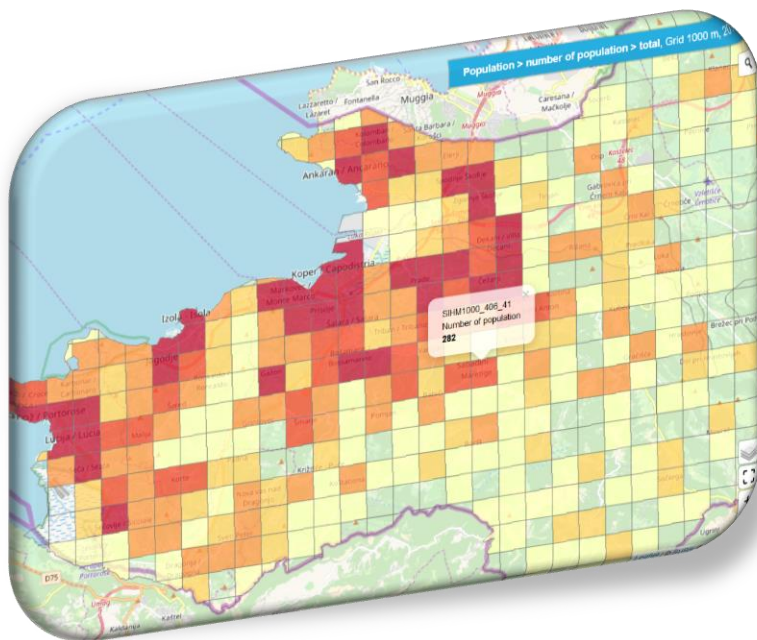


# Eurostat grant

- Statistical Office
- Health Institute
- Mapping Agency
- Geodetic Institute







# INCOME STATISTICS

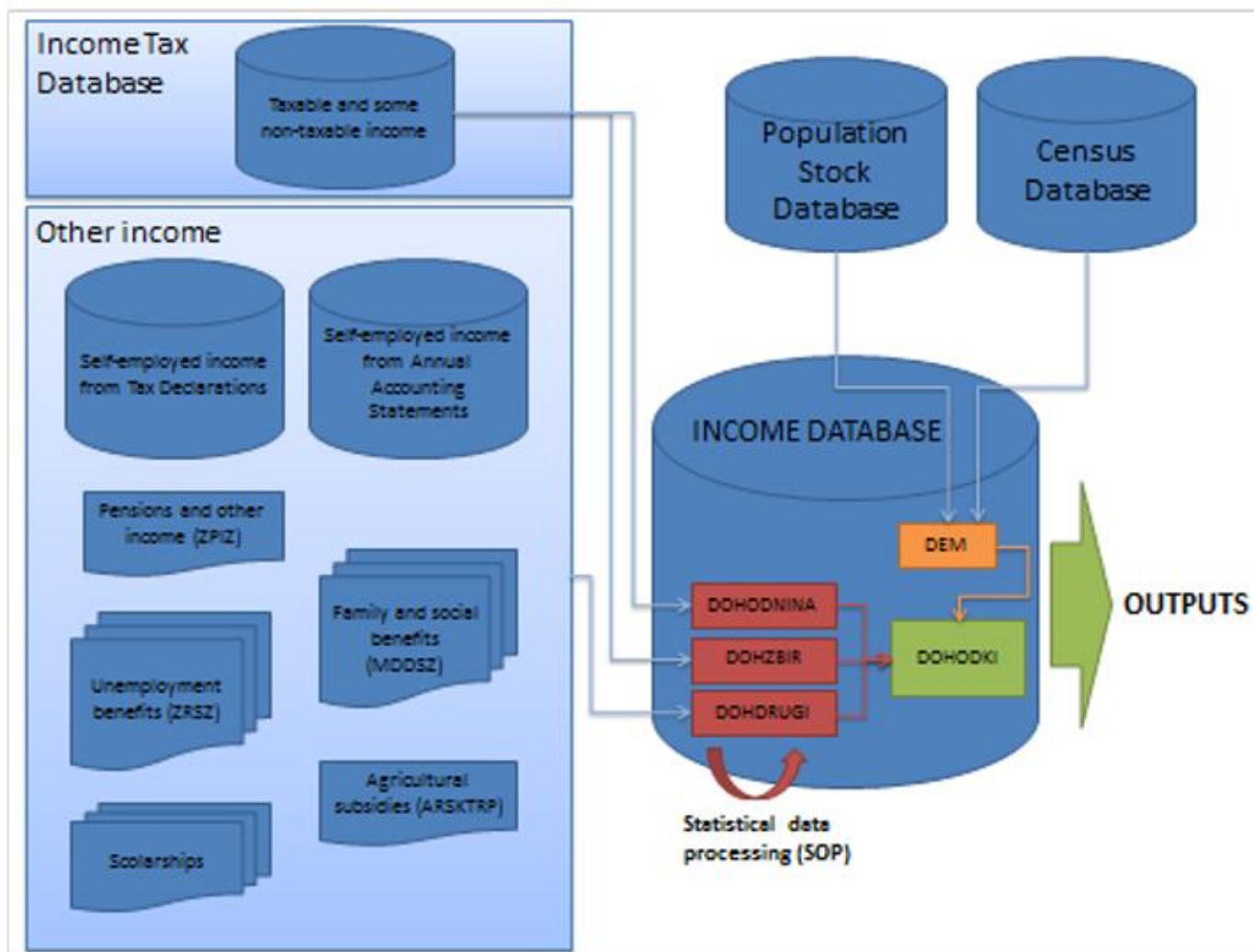


Figure 1: Income Database conceptual model

# INCOME STATISTICS

- Record swapping procedure
  - identifying rare individuals
  - swapping geographical variable
  - characteristic of an individual unchanged
- Cell-key method
  - perturbing small-valued cells

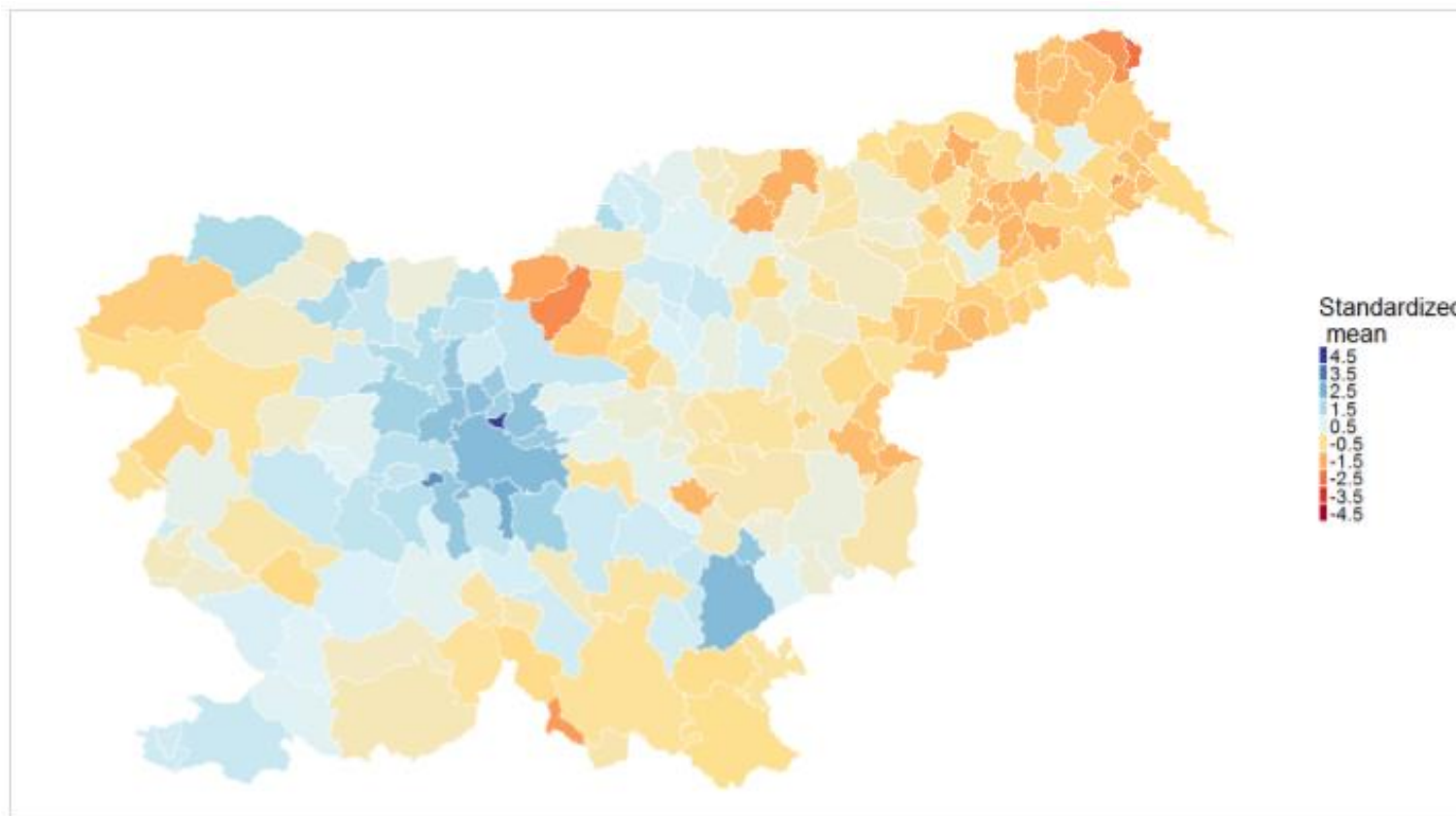
# INCOME STATISTICS

**Table 1: Comparison of the total population count on a 1 km<sup>2</sup> grid. Absolute differences (AD) were calculated between the original counts and swapped and perturbed data (O-SP), between the original and only swapped data (O-S), and between the swapped and swapped and perturbed data (S-SP). Descriptive statistics of these differences are reported: their standard deviation, the maximum value and cumulative distribution.**

Statistic/Comparison	O-SP	O-S	S-SP
$\overline{AD}$	1.53	0.94	0.59
$\sigma_{AD}^2$	186	187	0.47
$\max(AD)$	425	425	3
$p(AD = 0)$ [%]	51.5	99.3	51.8
$p(AD \leq 1)$ [%]	89.5	99.3	90.1
$p(AD \leq 2)$ [%]	98.5	99.3	90.2
$p(AD \leq 3)$ [%]	99.3	99.3	100
$p(AD \leq 6)$ [%]	99.3	99.3	100

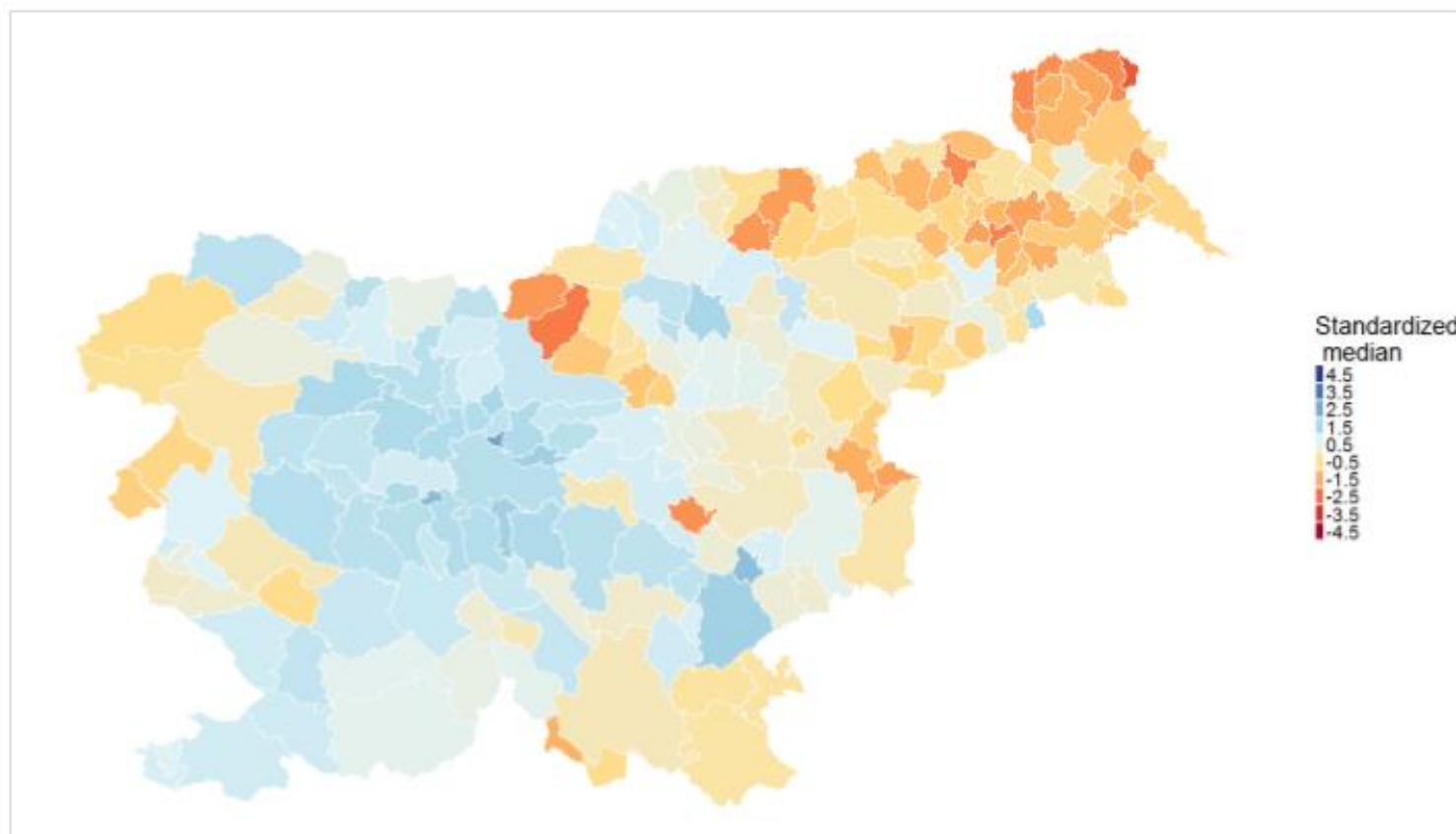


# INCOME STATISTICS



**Figure 3: Standardized mean of the total gross income by municipalities (LAU 2). Shown are standard scores: the individual municipalities' means are scaled so that their mean is 0 and their standard deviation 1.**

# INCOME STATISTICS



**Figure 4: Standardized median of the total gross income by municipalities (LAU 2). Shown are standard scores: the individual municipalities' medians are scaled so that their mean is 0 and their standard deviation 1.**

# INCOME STATISTICS

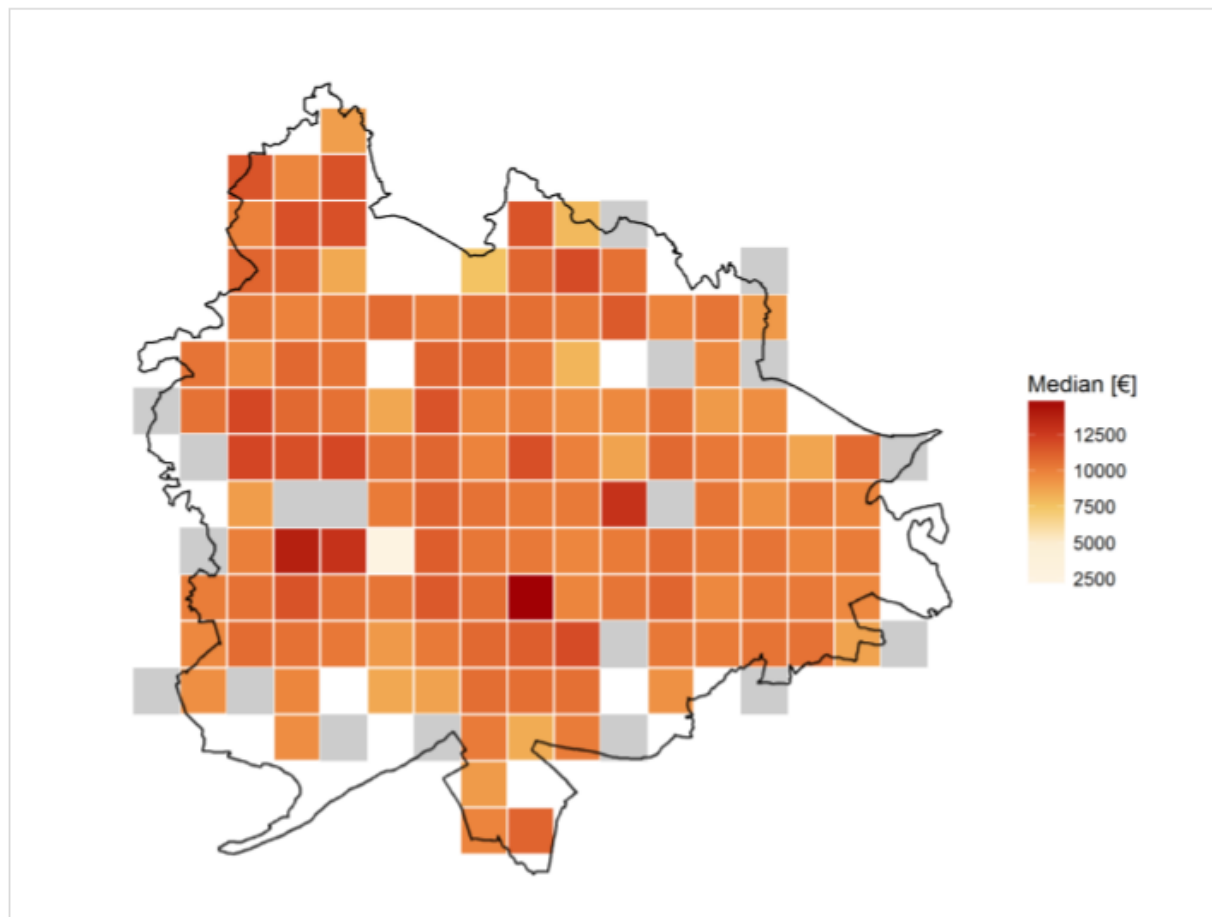


Figure 5: Median of the total gross income in Ljubljana, as shown on a 1 km<sup>2</sup> grid. The white cells were empty, while the grey ones were suppressed due to the chosen frequency rule.

# INCOME STATISTICS

- **First set of indicators (LAU2 and 1km grid):**
  - Median of the total gross annual income
  - Proportion of people in the first quintile as calculated among the whole population
  - The value of the first quintile (the 20th percentile) calculated within individual municipalities
  - Medians of the three categories of income: income from employment and self-employment, pensions, and benefits (which include parental and family benefits and social benefits)
  - Proportion of recipients of these three categories of income

# HEALTH STATISTICS

- Goals
  - set of indicators presented at lower territorial levels
  - frequent and timely updates of health indicators
  - downscaling methodology
  - interactive cartography



# HEALTH STATISTICS

- Risk factors:
  - physical fitness index of children
  - regular and occasional smokers
  - road traffic accidents caused by drunk persons
  - ...
- Prevention:
  - response rate in colorectal cancer screening
  - drinking water of good microbiological quality
  - ...

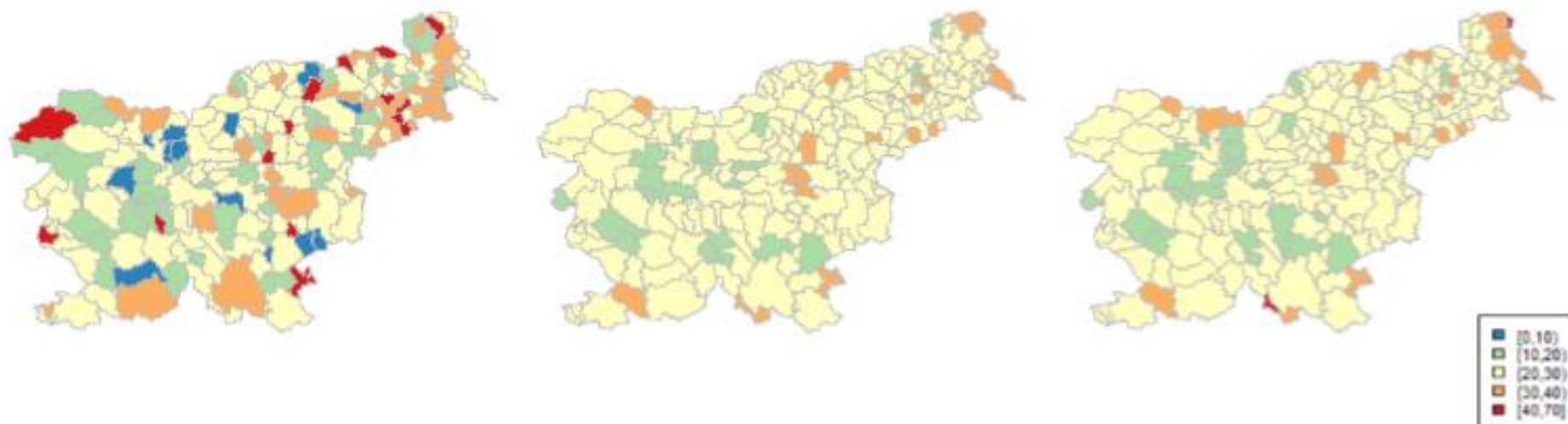
# HEALTH STATISTICS

- Health status:
  - self-assessed good health
  - persons receiving medicine for diabetes
  - stroke hospital admission rate
  - ...
- Mortality:
  - cardiovascular mortality rate
  - lung cancer mortality rate
  - ...

# HEALTH STATISTICS

- Some emphases:
  - reducing random variability 3 or 5-years moving averages were calculated
  - age adjustment procedures to allow comparison of populations
  - rates per 100,000 population → less SDC issues
  - auxiliary variables to improve estimates (admin sources)

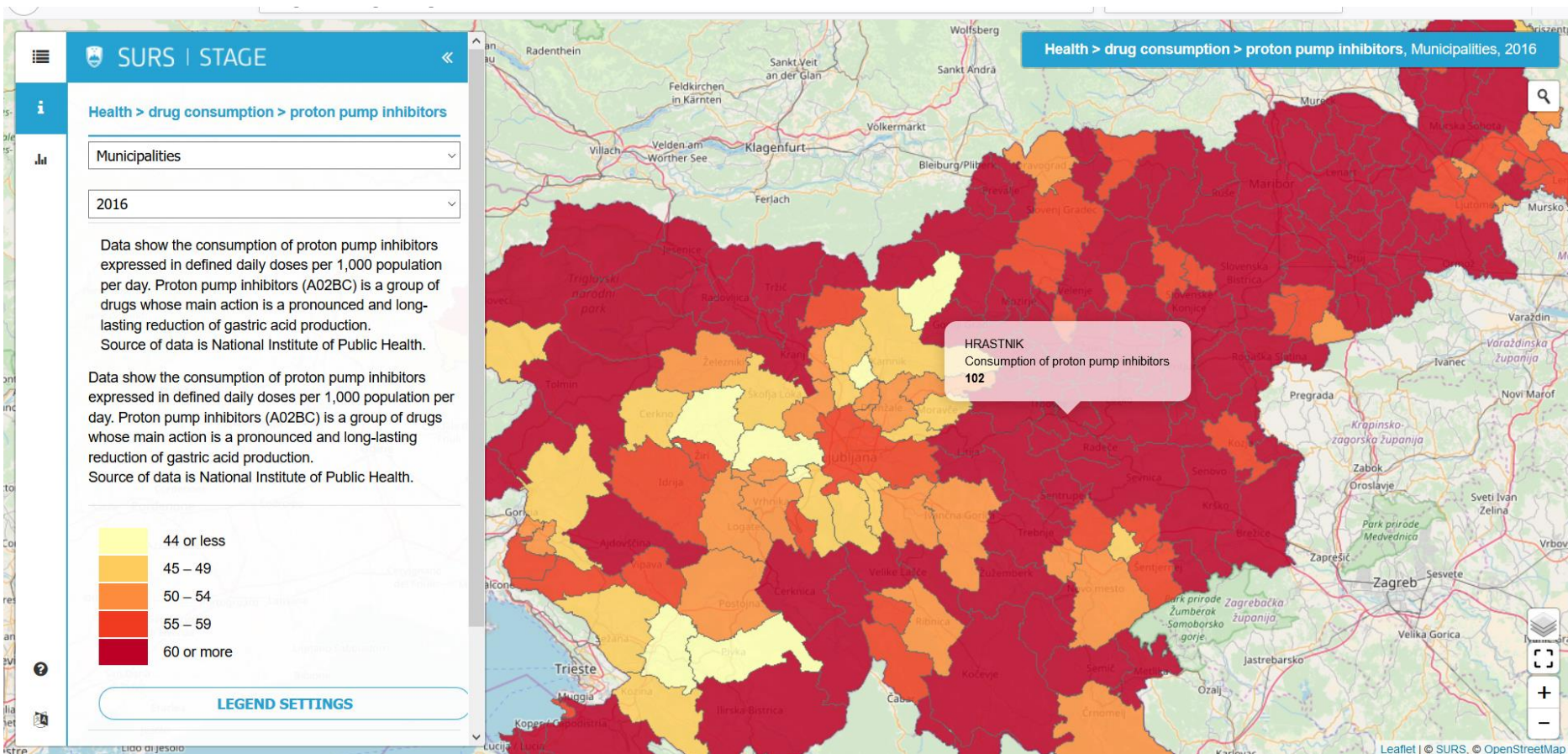
# HEALTH STATISTICS



**Figure 5: The percentage of current smoking: raw weighed percentages from EHIS (left), GLMM estimates (centre), R-INLA estimates (right)**



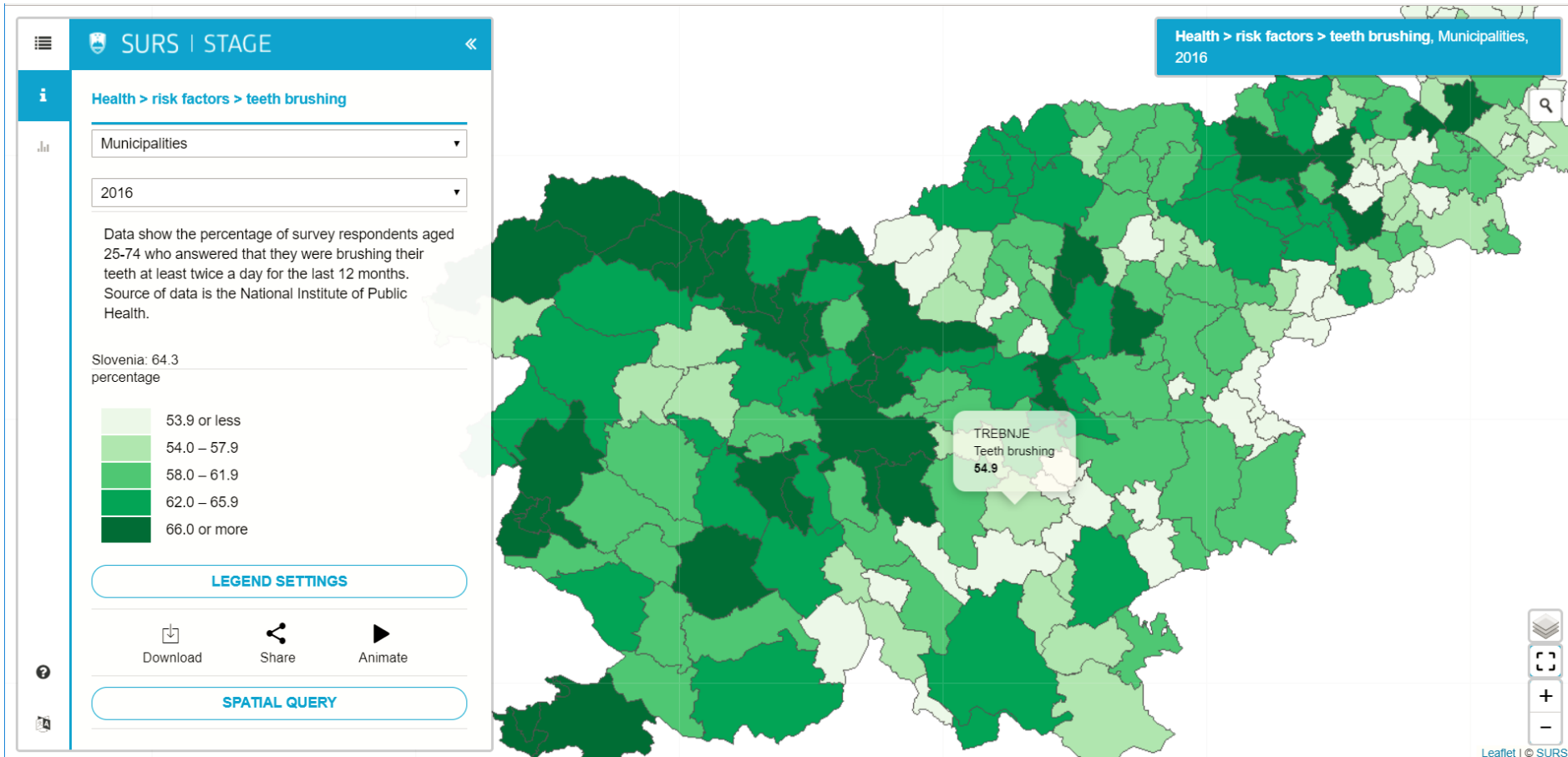
# HEALTH STATISTICS





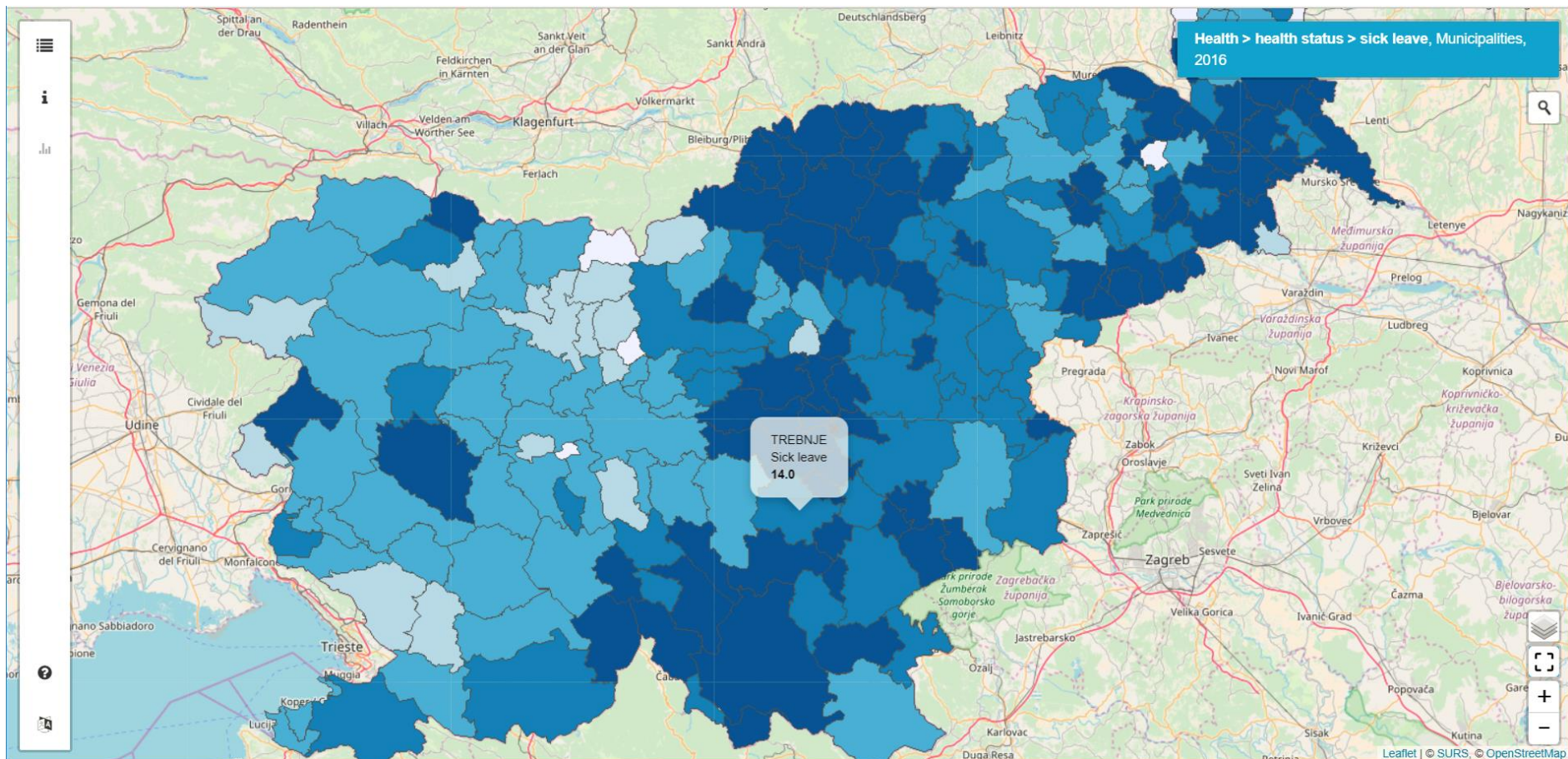


# HEALTH STATISTICS





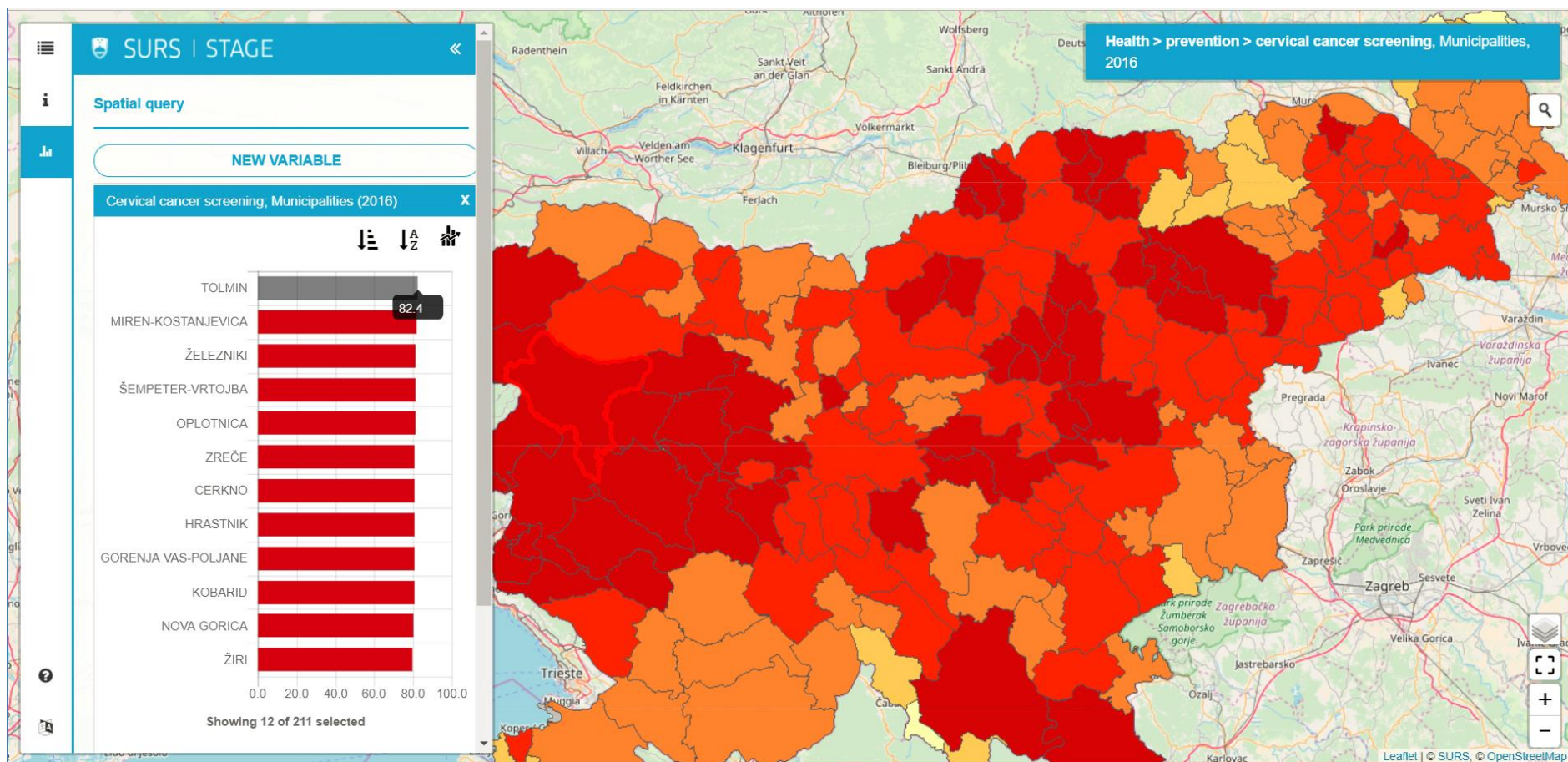
# HEALTH STATISTICS

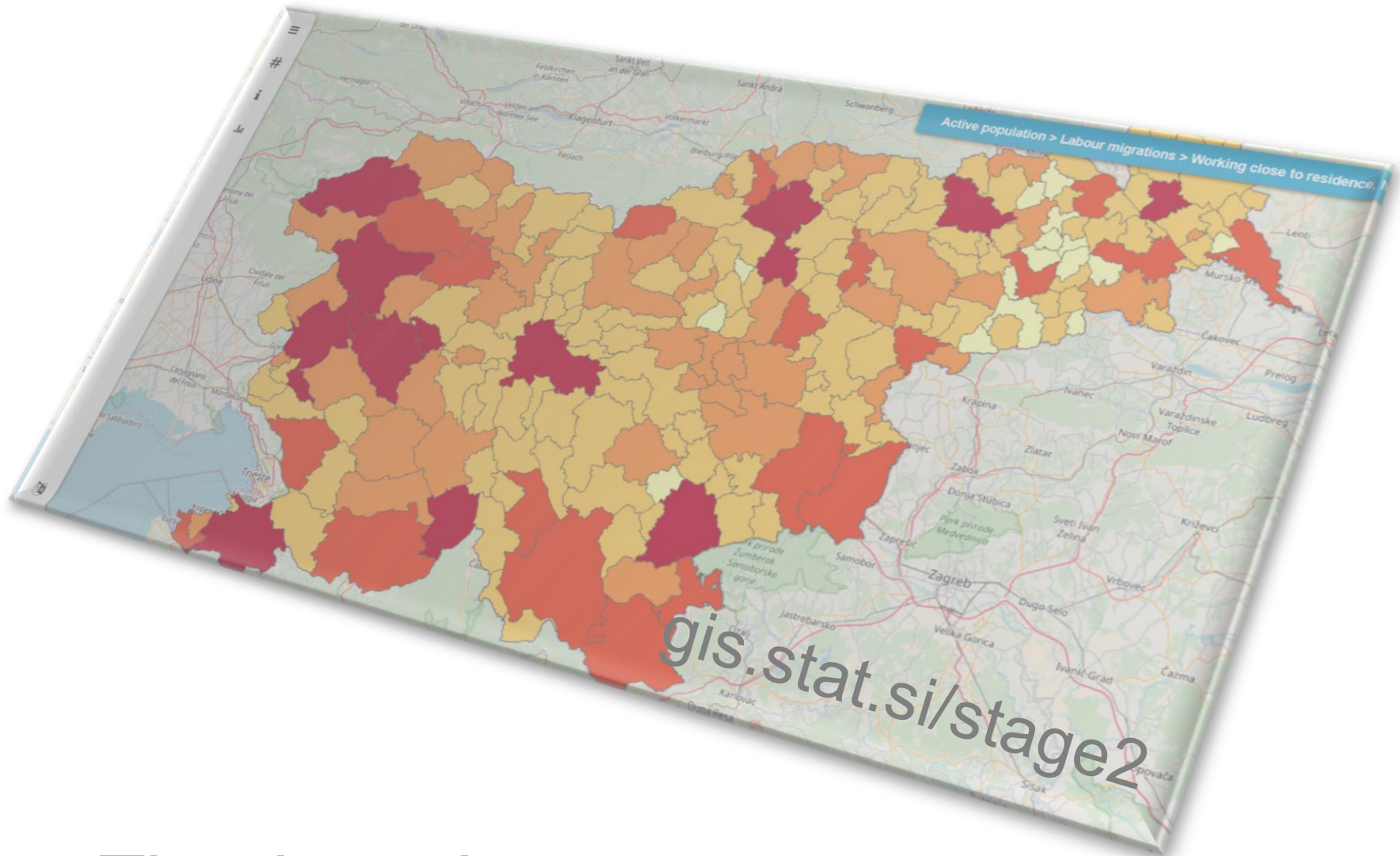






# HEALTH STATISTICS





Thank you!