



W A S A B Y

Work Package 6

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CANCER REGISTRY
REGISTER RAKA
SLOVENIJA



ONKOLOŠKI INŠTITUT
INSTITUTE OF ONCOLOGY
LJUBLJANA

Work Package 6

- Objectives

To determine methodologies suitable to perform spatial analysis with cancer data, using breast cancer incidence as an example.

- Deliverables

- ✓ D6.1 – Report on methods for spatial analysis of the cancer data
- D6.2 – Practical manual for CR's personnel
- D6.3 – Report on spatial analysis of breast cancer incidence data from interested CRs

- Milestones

- ✓ M6.1 – Creation of WP-6 group of experts on spatial analysis

M6.1 – WASABY group of experts on spatial analysis

- The experts on spatial analysis were identified through already established work and also according to the participation in the WASABY project or other past international collaborating actions on spatial analysing of the cancer registries' data.

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D6.1 – Report on methods for spatial analysis of the cancer data

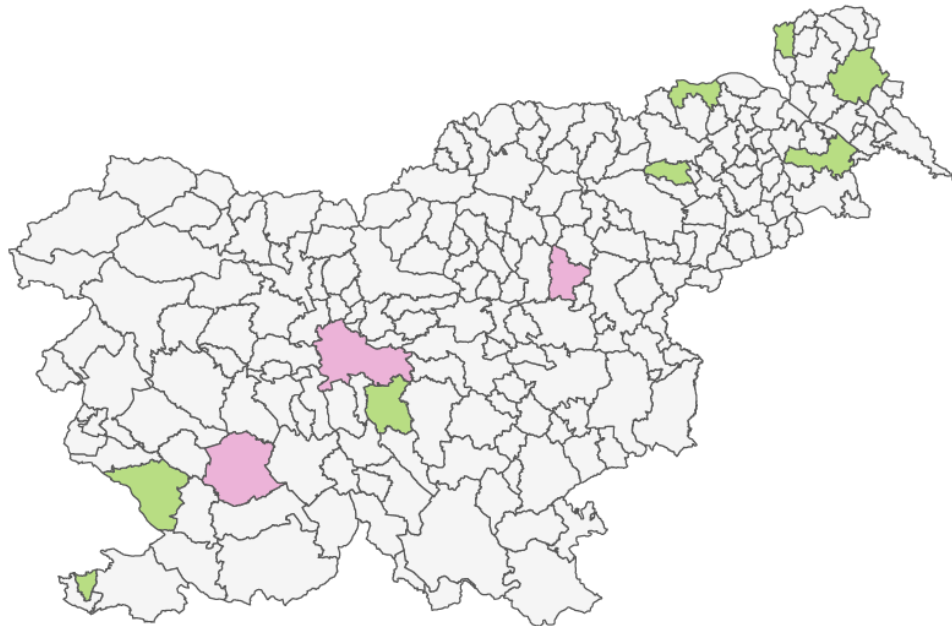
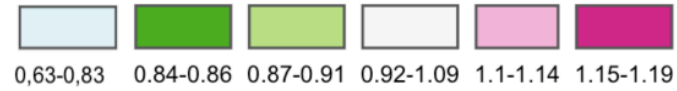
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“INLA study” – comparison with Gibbs

- We performed the comparison of two Bayesian spatial smoothing methods: INLA and Gibbs (package *NIMBLE* in R, uses MCMC).
- We used the BYM model with the CAR distribution for the spatial component. One approach to calculating the smoothed values of relative risk is with the established MCMC methods, using the Gibbs sampler, whereas the other is to use the approximative method INLA.
- We studied properties and application on data of the Slovenian Cancer Registry.

INLA and Gibbs



(a)



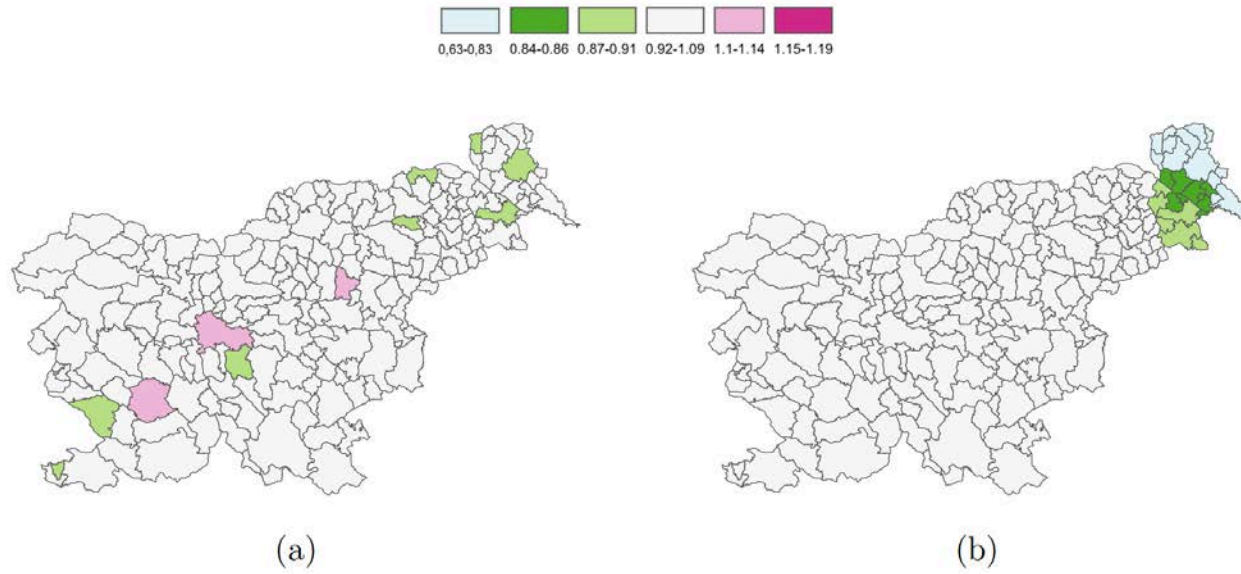
(b)

Smoothed SIR of breast cancer by Slovenian municipalities among women, aged 0 to 49. (a) with INLA (b), with Gibbs (2006–2015).

Age group	No of cases
< 20	0
20-24	9
25-29	51
30-34	199
35-39	368
40-44	712
45-49	1125
Total	2464

INLA and Gibbs

- When using the Gibbs sampler to calculate smoothed values, the calculations take a long time, unlike when using INLA, as INLA is an approximative method.
- In the example: INLA shows no clusters and estimates higher values.



INLA and Gibbs

Based on real data we can't decide which method performs better. In the second part we made a comparison of both methods on generated data, trying to generally answer the question on how the methods behave in different situations. When using the methods on real and generated data, we was able to observe minimal differences between them.

SIMULATED DATA:

- Generated and permuted municipalities' population data
- Based on chosen relative risk (known expected incidence for each municipality) the incidence was generated (Poisson distribution)
- EDI and shapes of Slovenia and municipalities remained unchanged.
- INLA and Gibbs are compared using:
 - squared error of deviation from known relative risk for each municipality
 - Squared error for Slovenia
 - Average of squared errors

D6.2 – Practical manual for CR's personnel

- „Based on the report on analysed breast cancer incidence data a practical handbook is prepared (including details on data preparation) for CR's personnel and other researchers aiming to promote spatial analysis of CR data in general.“
- The practical manual will :
 - follow the content of D6.1 – Report on methods for spatial analysis of the cancer data,
 - include theoretical background,
 - include practical instruction for preparing the datasets,
 - also be the manual for using the program.

D6.3 – Report on spatial analysis of breast cancer incidence data from interested CRs

- Not all CRs are producing the maps themselves.
- We can help those CRs by making the program that is free and easy to use.
 - For demonstration, we will prepare reports for CRs submitting the datasets using this program.
 - But the CRs will be able also to use the programme themselves for other datasets with the help of Practical manual for CR's personnel.

D6.3 – Report on spatial analysis of breast cancer incidence data from interested CRs

- Is written in R and Shiny.



Shiny is an R package that makes it easy to build interactive web apps straight from R.

Shiny from  Studio

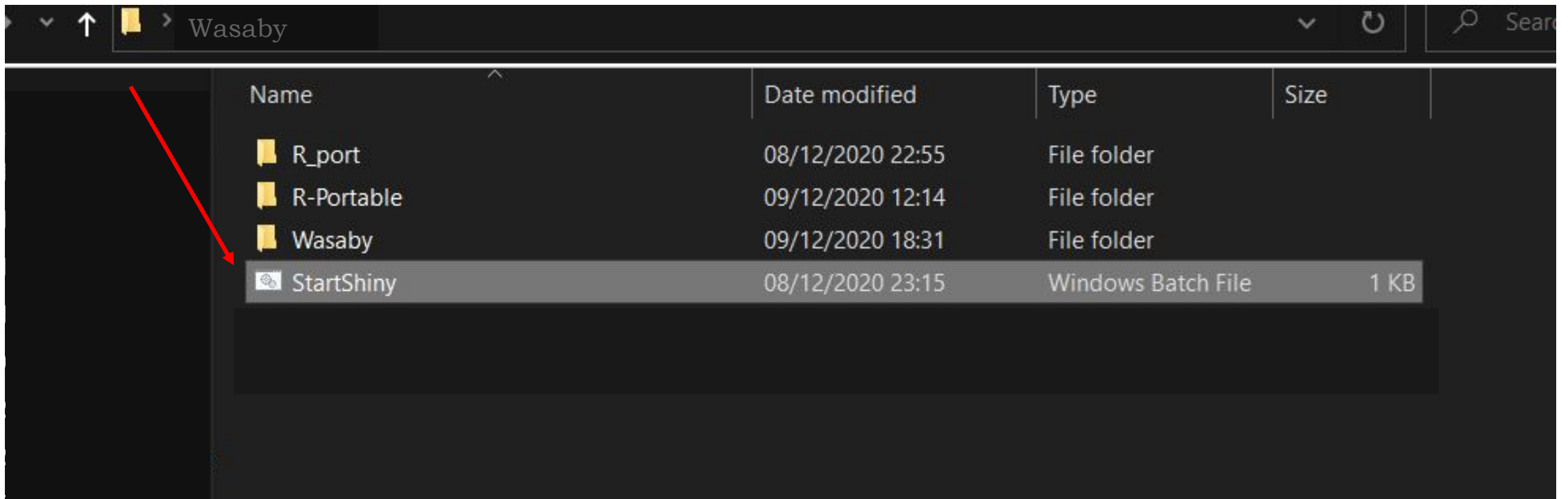
- The code is open – anyone can change it.
- Most of the development till now was put in the generality:
 - different datasets can be used,
 - errors are easy to understand and are meant to guide the user.

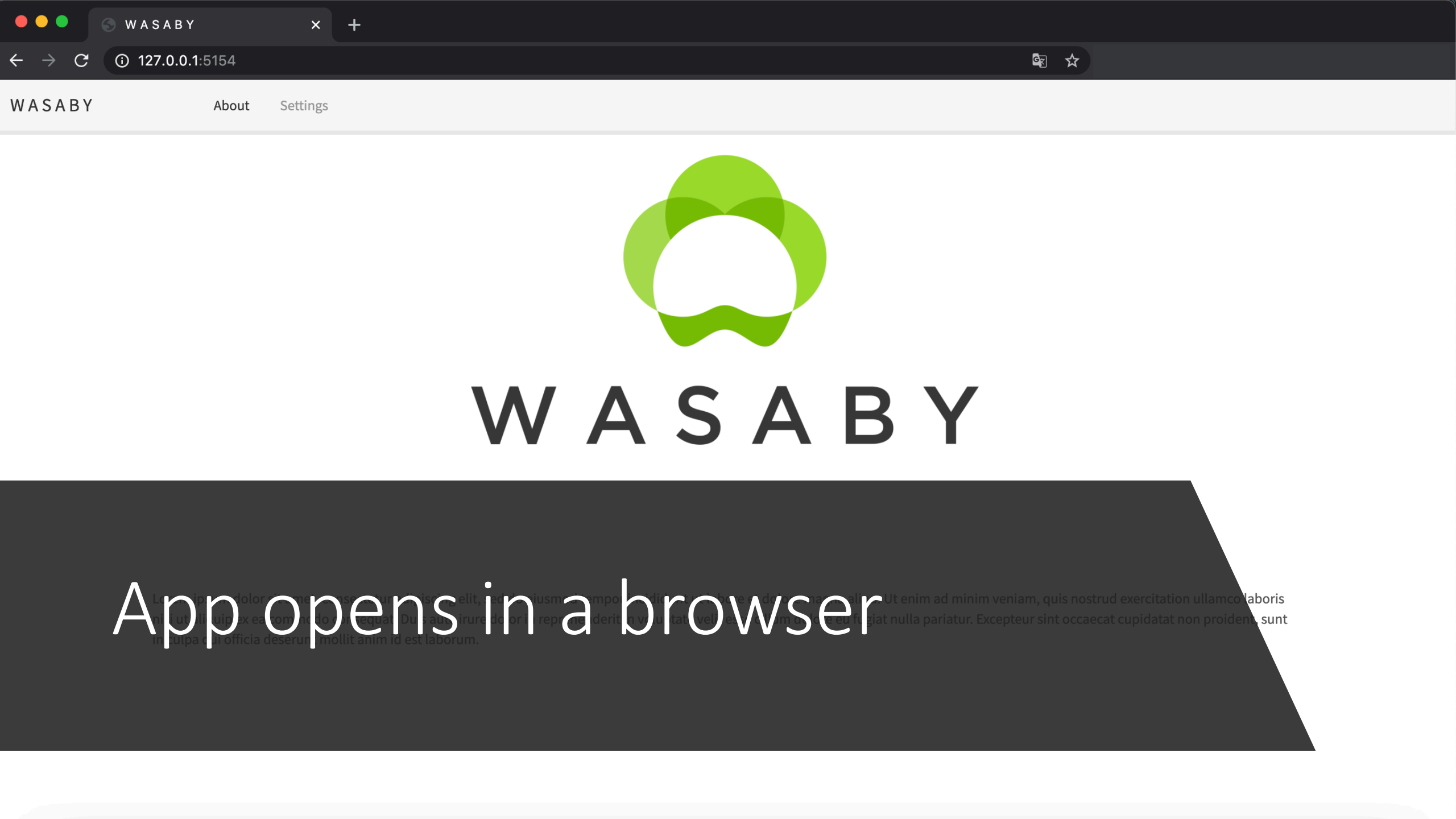


Program for drawing maps for CRs

Install and run

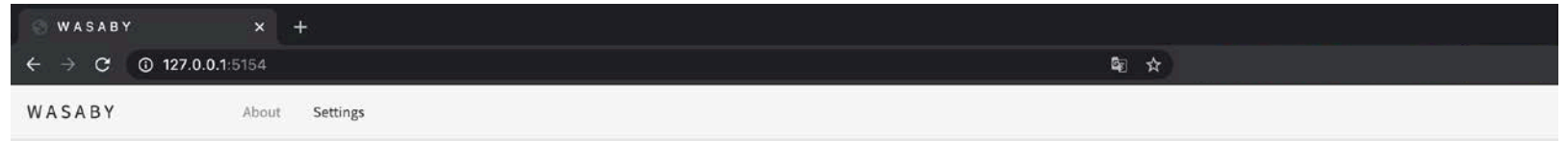
Run StartShiny





App opens in a browser

In the Settings tab you can change the required parameters.



Basic information ⓘ

Edit

Author:

Institution:

Date:

Population data ⓘ

Edit

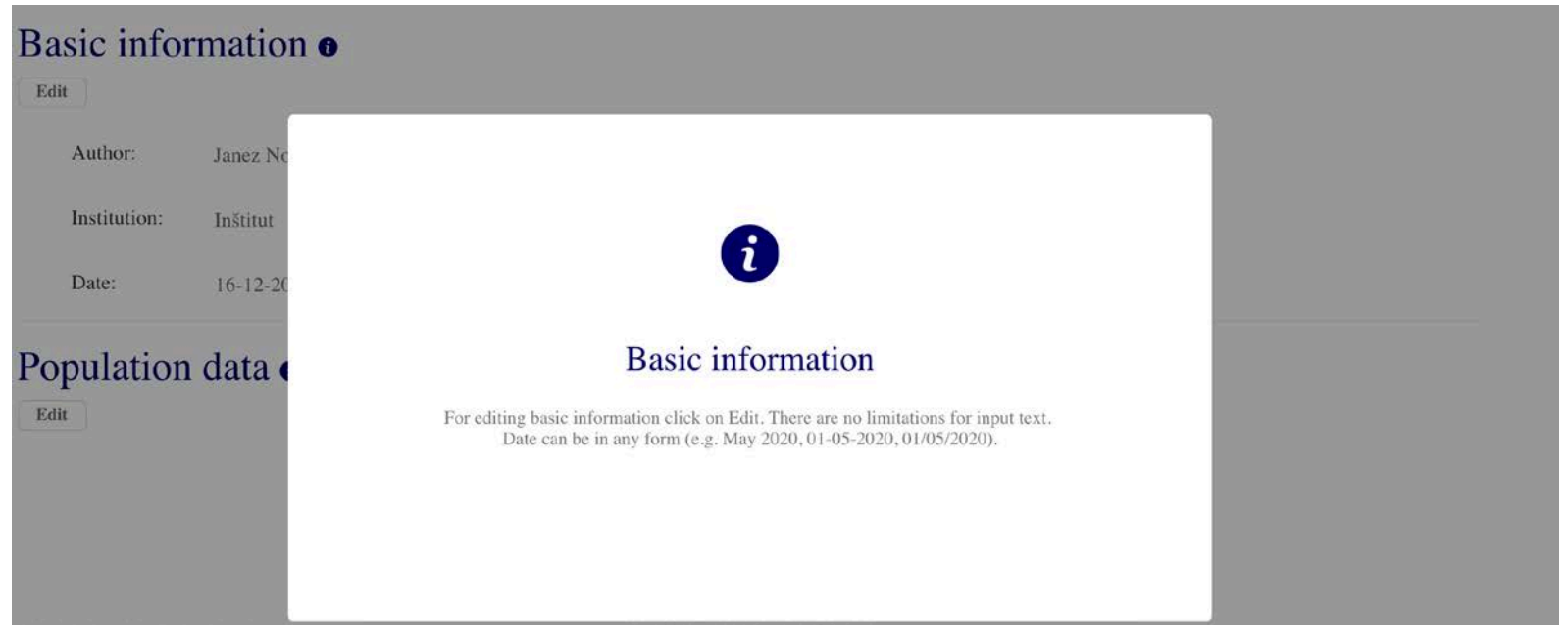
No data to show.

Incidence data ⓘ

Edit

No data to show.

For more information about each category, click the blue “i” button.



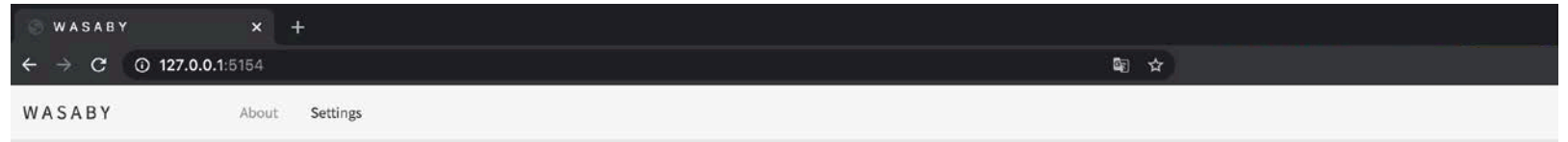
The screenshot displays a web interface with a modal window open. The background is a dark grey panel with the following content:

- Basic information** ⓘ
-
- Author: Janez Ne
- Institution: Inštitut
- Date: 16-12-20
- Population data** ⓘ
-

The modal window is white and contains the following text:

- ⓘ
- Basic information**
- For editing basic information click on Edit. There are no limitations for input text.
Date can be in any form (e.g. May 2020, 01-05-2020, 01/05/2020).

For editing data in each section click on Edit. After editing click Save.



Basic information ?

Author:

Institution:

Date:

Population data ?

No data to show.

Incidence data ?

No data to show.

You can edit only one section at a time.

Basic information ⓘ

Cancel Save

Author:

Institution:

Date:

Population data ⓘ

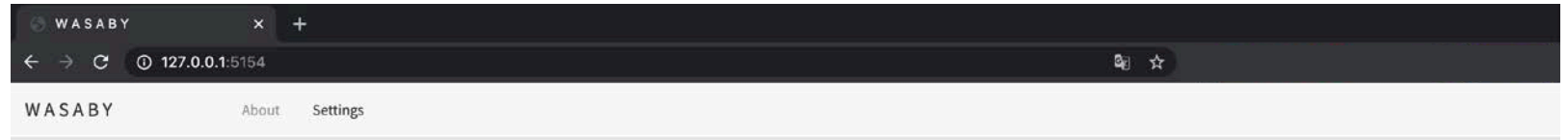
Edit



Warning

For editing Cancel or Save the currently active Edit.

Click on a
browse will
open a new
window from
where you can
select your file.



Basic information ⓘ

Edit

Author: Janez Novak

Institution: Inštitut

Date: 16-12-2020

Population data ⓘ

Cancel

Save

Browse

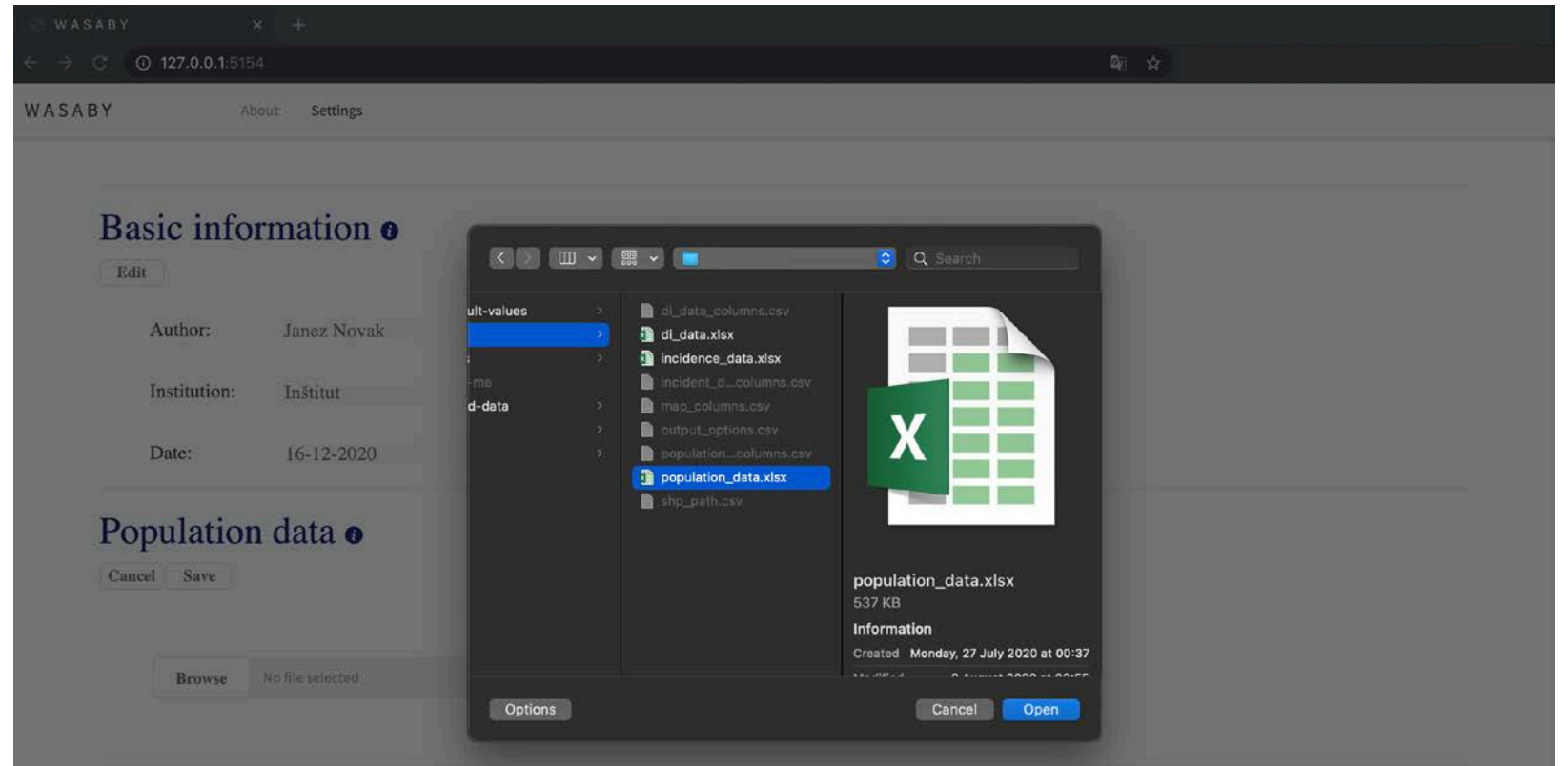
No file selected

Incidence data ⓘ

Edit

No data to show.

Upload .xlsx
file.



Select the type of data and the corresponding column names in your data.

Population data ?

Cancel Save

Browse population_data.xlsx
Upload complete

Select your type of data:

Age groups have to be split into 5-year periods, starting from age 0. The format of Region/Region ID has to correspond to the format of Region/Region ID in your shapefile.

AGE_GROUP	YEAR	REGION_ID	POP_NUMBER
AGE_GROUP			
AGE			

our data that match the data types above (in the right order):

AGE.GROUP	YEAR	REGION.ID	POPULATION.NUMBER
-----------	------	-----------	-------------------

After saving the uploaded data, the preview of your data will be shown.

Population data

Edit

Show entries

Search:

AGE_GROUP	YEAR	REGION_ID	POP_NUMBER
0-4	2006	1	406
5-9	2006	1	472
10-14	2006	1	506
15-19	2006	1	592
20-24	2006	1	597
25-29	2006	1	704

Showing 1 to 6 of 29,541 entries

PREVIOUS **1** 2 3 4 5 ...
4924 NEXT

Do the same for incidence data and deprivation index data.

Incidence data ?

Cancel Save

Browse incidence_data.xlsx
Upload complete

Select your type of data:

Age groups have to be split into 5-year periods, starting from age 0. The format of Region/Region ID has to correspond to the format of Region/Region ID in your shapefile.

AGE_GROUP YEAR REGION_ID CASES

Select columns from your data that match the data types above (in the right order):

AGE.GROUP YEAR.OF.DIAGNOSE REGION.ID NUMBER.OF.CASES

Deprivation index data ?

Cancel Save

Browse di_data.xlsx
Upload complete

Select your type of data:

The format of Region/Region ID has to correspond to the format of Region/Region ID in your shapefile.

REGION_ID DEPRIVATION_INDEX

Select columns from your data that match the data types above (in the right order):

REGION.ID DI.QUANTILE

Centroids are optional – depending on whether you want to draw a Finnish smoothed maps.

Centroids ?

Edit

Show

Search:

REGION_ID	X	Y
1	417400.3361	81840.84855
2	548516.8914	87664.3389
4	456418.2845	67972.24416
5	514488.0504	46250.10822
6	476824.8807	112245.2501
7	502967.375	161498.9529

After choosing a destination folder with a shapefile, application checks if a folder you selected contains the right files. After selecting a destination folder, chose a variable, or variables, that correspond with region data in previously uploaded data.

The image displays two sequential screenshots of a web application interface for handling shapefiles. Both screenshots feature a title bar labeled "Shapefile" with an information icon and two buttons: "Cancel" and "Save".

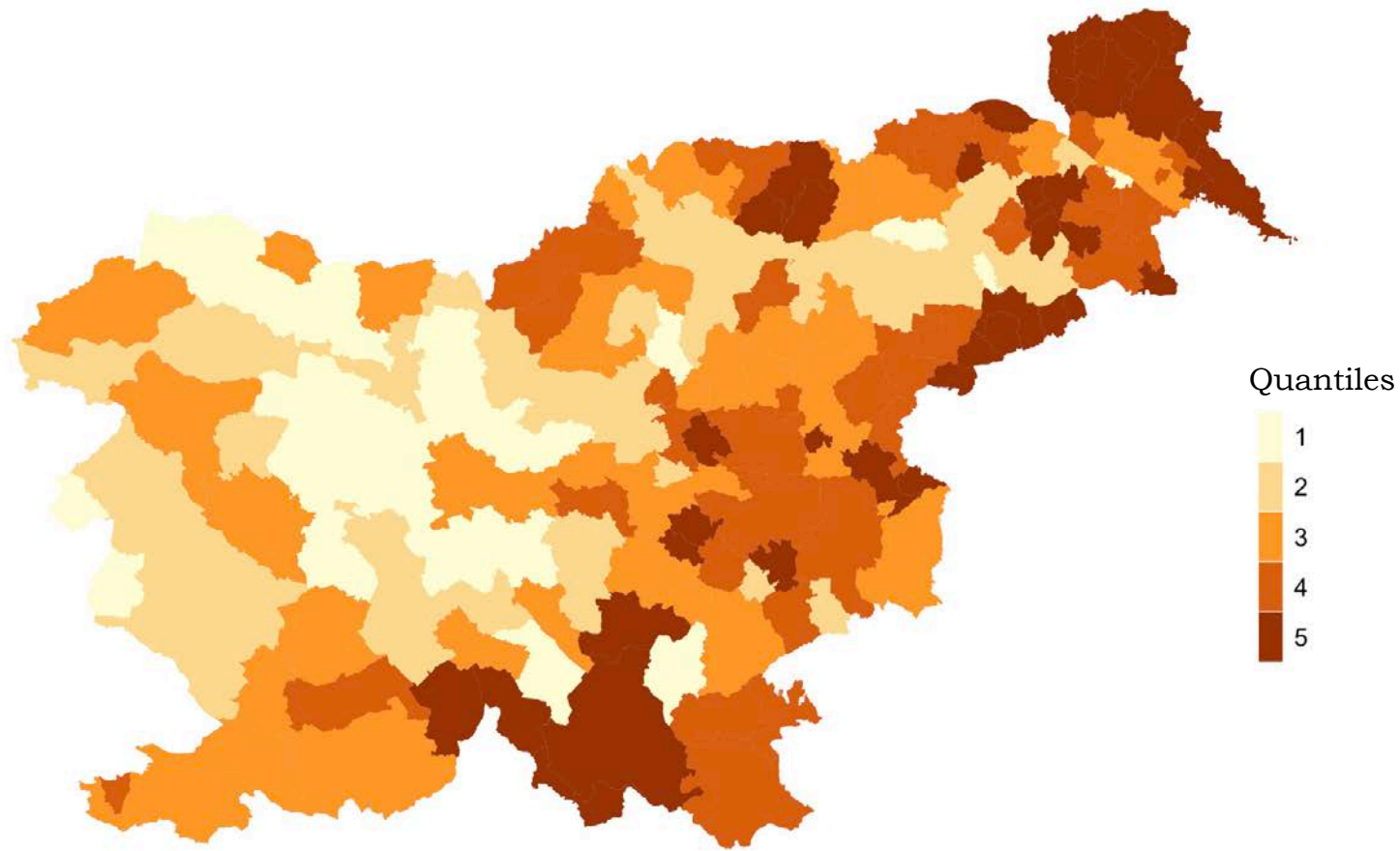
The top screenshot shows a button labeled "Choose A Destination Folder".

The bottom screenshot shows the same dialog box after a folder has been selected. The "Choose A Destination Folder" button now displays the path "users/data/shp". Below this, there is a text prompt: "Select column(s) with REGION_ID in the right order:", followed by an empty text input field.

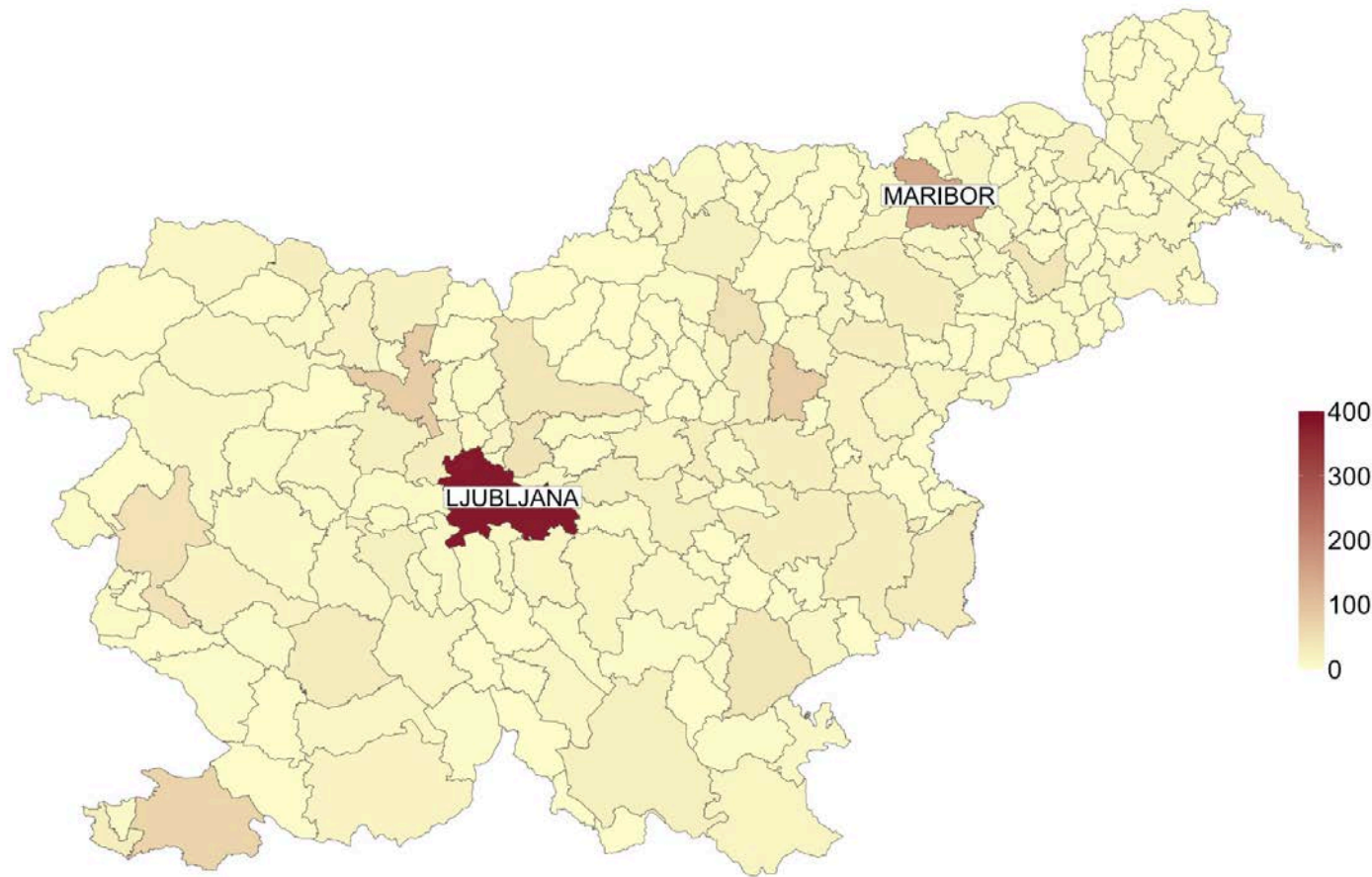
After clicking on the Output button, wait for the output files to be generated. Files will be generated in the Home folder.



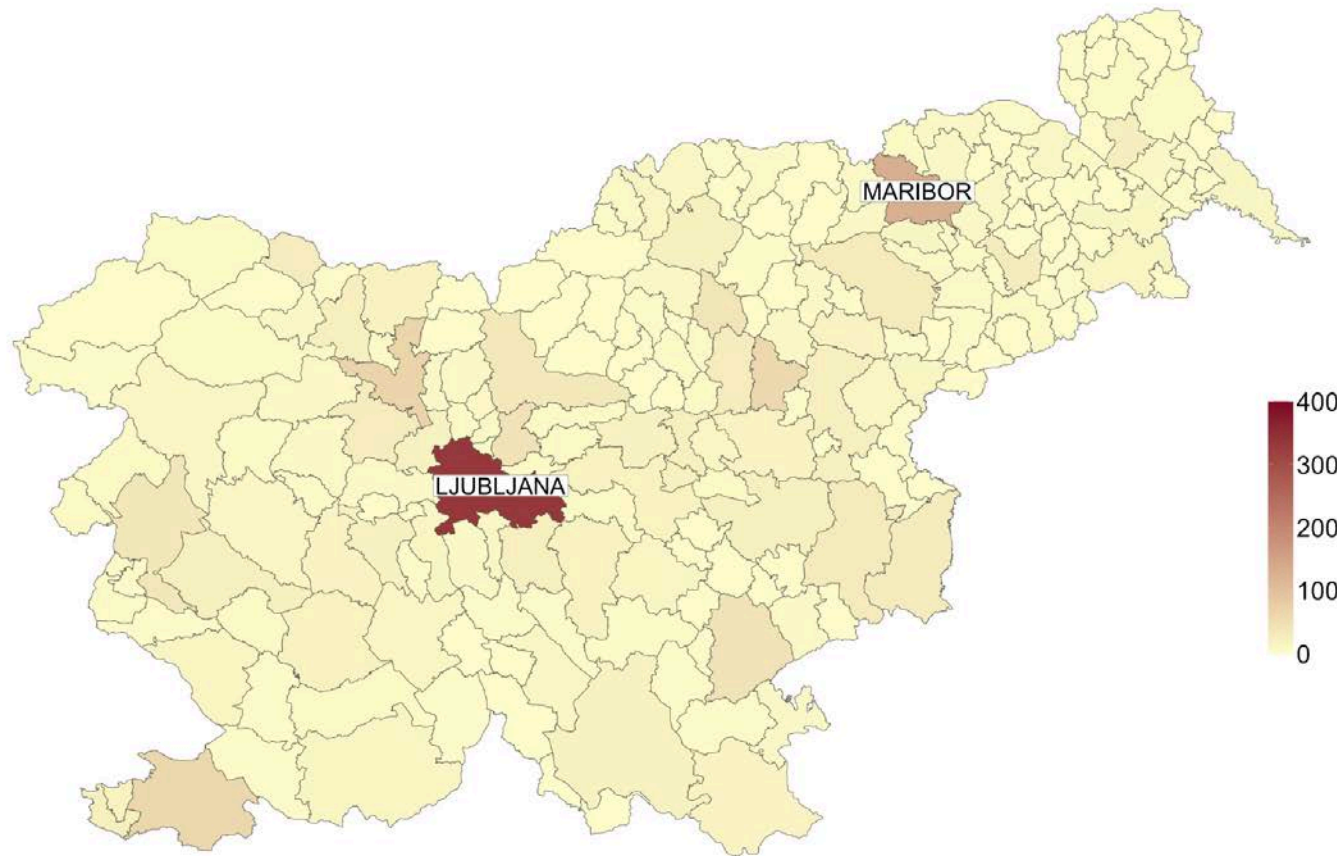
Output example – Breast cancer in Slovenia
(2006-2015, age: 0-49)



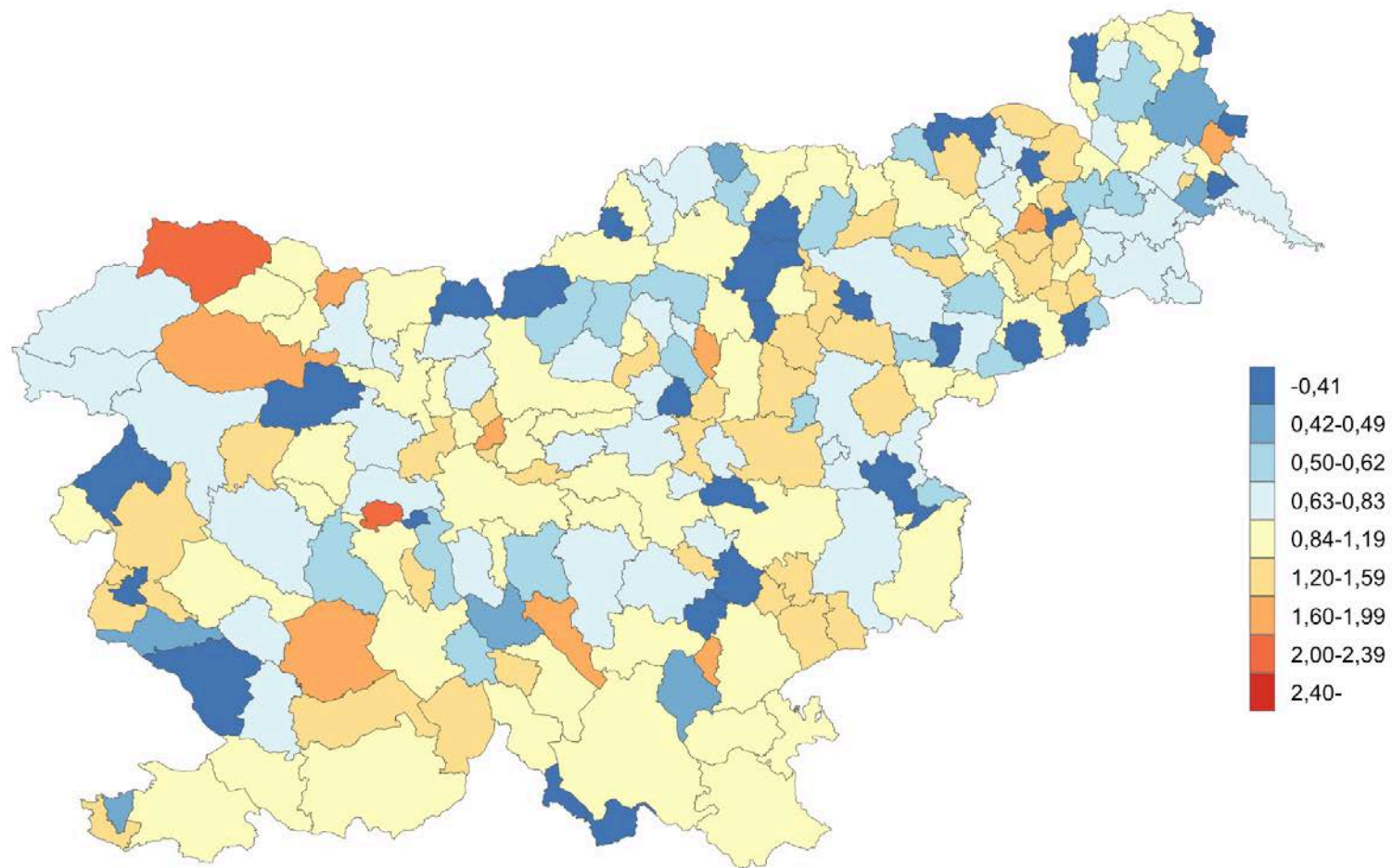
The distribution of quantile values of deprivation index by Slovenian municipalities for year 2011.



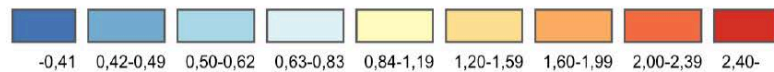
Unsmoothed absolute observed incidence of breast cancer among women, aged 0 to 49 for 211 municipalities in Slovenia (2006–2015).



Unsmoothed absolute expected incidence of breast cancer among women, aged 0 to 49 for 211 municipalities in Slovenia (2006–2015).



Standard incidence ratio (SIR) for breast cancer among women, aged 0 to 49, Slovenia (2006–2015).

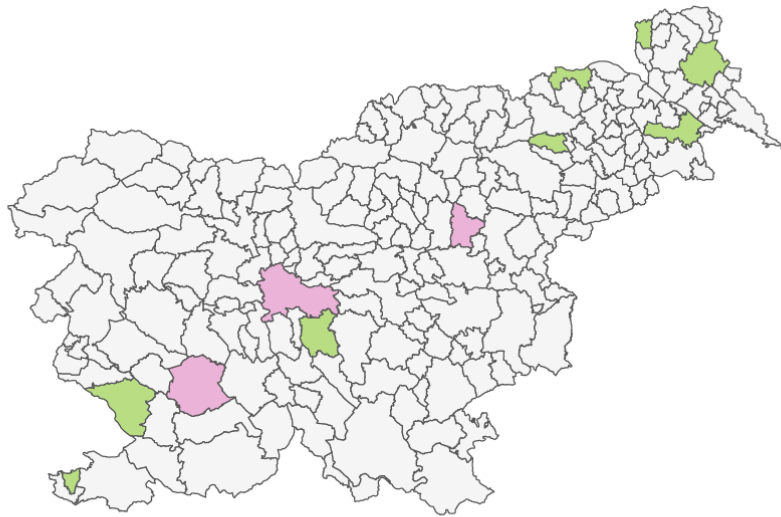
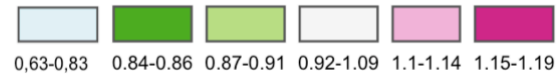


(a)



(b)

Smoothed SIR of breast cancer by Slovenian municipalities among women, aged 0 to 49. (a) with INLA (b), with Gibbs (2006–2015).

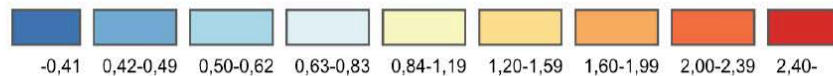


(a)



(b)

Smoothed SIR of breast cancer by Slovenian municipalities among women, aged 0 to 49. (a) with INLA (b), with Gibbs (2006–2015). Results shown on a different scale (0, 63–1, 19).



(a)



(b)

Smoothed SIR of breast cancer by Slovenian municipalities among women, aged 0 to 49, conditioned on the deprivation index. (a) with INLA (b), with Gibbs (2006–2015).

It's timely ...

- INLA is fast but Buggs is slow. In datasets with most areas (around 2000) Gibbs takes 7-10 minutes.
- But plotting the graphs takes even longer time. Plotting all the graphs takes more time than all calculations together.
- The user chooses which results he wishes to produce, so he doesn't need to wait for long every time.
- Errors for checking the source data are instant.

To be included in the final version:

- Choosing age standardization.
- Choosing deprivation index centiles (10%, 20% ...)
- Selection of output destination (currently everything is saved in *Home*).
- Output preferences: select which data, which map you want to save, select the colour scale for maps ...
- Smoothing: INLA, Gibbs, floating weighted averages method (Finnish smoothing method).
- Option for uploading a .csv file.
- Notification when output is created.
- ...

The next steps

- Sending the beta version of the program to the group of experts by the end of 2020:
 - proposals for improvement,
 - finding the name for the program (for example *Mapping for CRs*, but nicer).
- Preparing final version of the program.

- Writing practical manual for CRs.

- Distributing to the participating CRs:
 - practical manual,
 - results from the program for their CR,
 - the program.

- Putting the program and practical manual on the WASABY's page.
- On-line course on the program.