Centro Nacional de Epidemiología

Bioinformatics and Data Management

Subprograma de Vigilancia del Cáncer

Escuela Andaluza de Salud Pública
Consejería de Sanidad, Presidencia y Emergencias

TALLER DE TRABAJO ONLINE

Detección y priorización de áreas de riesgo en enfermedades crónicas

Ejercicio Práctico

Organizado por el Subprograma de Vigilancia en Salud Pública, CIBERESP, en colaboración con el Centro Nacional de Epidemiología y la Escuela Andaluza de Salud Pública

OBJETIVO

- Realizar un cribado espacial exploratorio en los municipios de la Comunidad Autónoma de Extremadura para discriminar aquellas áreas de interés en función de la mortalidad por cáncer colorrectal en hombres, con el fin de generar un ranking que oriente la vigilancia epidemiológica y la actuación en salud pública.

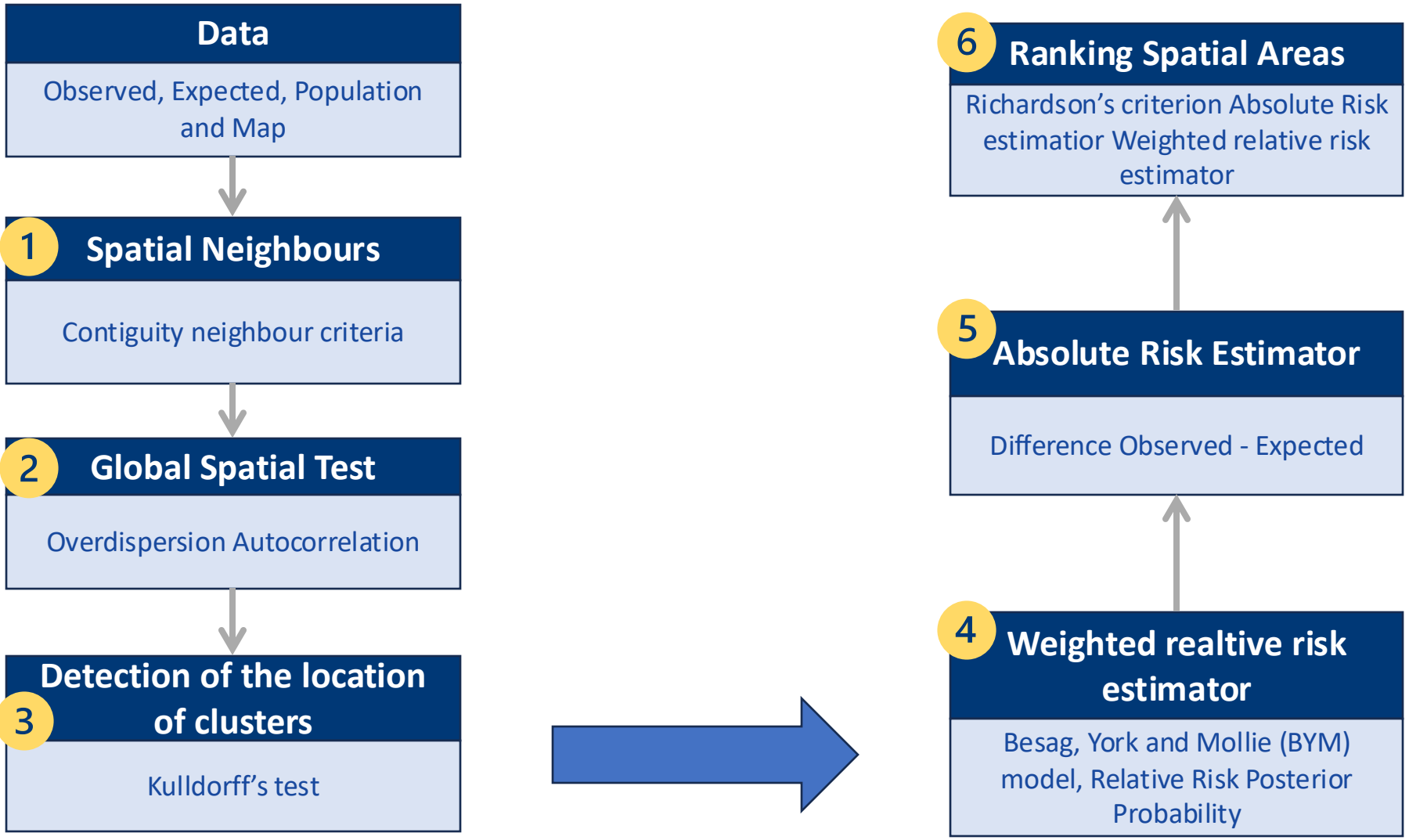
- Se empleará un pipeline hecho en R y la aplicación R Shiny "RANKSPA".

DATOS

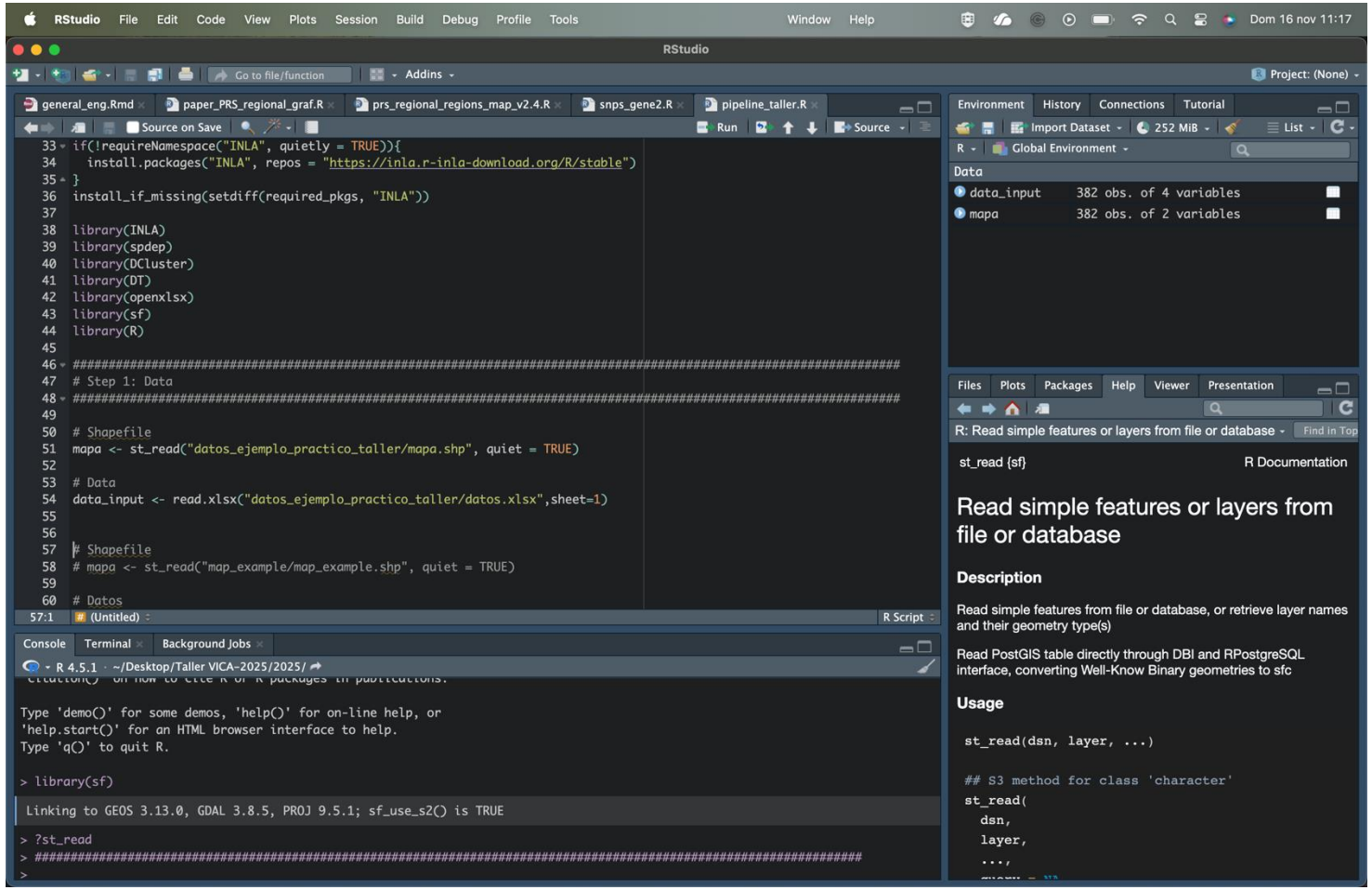
- Códigos INE de los Municipios
- Casos observados de mortalidad por cáncer colorrectal registrados entre 2005 y 2007 en hombres residentes en Extremadura, una región donde previamente se han descrito patrones espaciales relevantes en la mortalidad por esta enfermedad.
- Las defunciones fueron clasificadas de acuerdo con la Clasificación Internacional de Enfermedades, 10ª Revisión (C18-C21) y se distribuyeron por municipio (n=382)
- Los casos esperados se estimaron multiplicando las tasas de mortalidad específicas por edad para cáncer colorrectal en hombres en toda España (obtenidas para el periodo 2005–2009) por el número de personas-año de cada municipio (población de 2007 multiplicada por 5 años).
- Población de hombres en España desde (2005 – 2007)
- Mapa *(.shp file)* de municipios de la CCAA.

La elección del cáncer colorrectal como patología de estudio se debe a su alta incidencia y mortalidad en países desarrollados, así como a la disponibilidad de indicadores epidemiológicos fiables. Además, la supervivencia a 5 años continúa siendo moderada, lo que convierte a la mortalidad en un parámetro útil para monitorizar la carga de esta enfermedad a nivel local.

PIPELINE


Data
Observed, Expected, Population and Map
1
Spatial Neighbours
Contiguity neighbour criteria
2
Global Spatial Test
Overdispersion Autocorrelation
3
Detection of the location of clusters
Kulldorff's test
4
Weighted realtive risk estimator
Besag, York and Mollie (BYM) model, Relative Risk Posterior Probability
5
Absolute Risk Estimator
Difference Observed - Expected
6
Ranking Spatial Areas
Richardson's criterion Absolute Risk estimatior Weighted relative risk estimator

PIPELINE



R Studio®

RANKSPA APP

RANKSPA: Shiny web application for RANking SPAtial areas of risk in spatial surveillance

Introduction | Ranking Map | Ranking Table | Spatial Tests | RR Map | PP Map | Cluster Analysis | Complete Result Table | Glossary

R-Shiny web application that implements an initial screening of disease risk for exploratory purposes that allows to discriminate regions of interest by studying the spatial distribution in small areas, focused primarily on chronic diseases such as cancer. It allows to obtain a ranking of spatial areas attending to absolute and relative disease risk, and perform basic spatial statistical analysis, including a standard spatial cluster analysis.

Data Input : datos.xlsx

Upload complete

Shp Input (.shp, .dbf, .prj, .shx): 4 files

Upload complete

On the left side, users can upload the input files and select one of the parameters that is needed for the cluster analysis. On the right side of the page, there are nine tabs, where an application overview and the results of the different spatial statistical analyses carried out and the maps created by the application, can be visualized and downloaded.

Example files to test the application can be downloaded here. files

Cluster analysis: Fraction of the total population

15%

Process

NOTE: The results obtained when using the RANKSPA application must be carefully evaluated taking into account all the assumptions and limitations of the methodology implemented and the recommendations described in the article *Fernández-Navarro P, González-Palacios J, González-Sánchez M, Ramis R, Nuñez O, Palmí-Perales F, Gómez-Rubio V. Ranking spatial areas by risk of cancer: modelling in epidemiological surveillance. Annals of Cancer Epidemiology. 2020.*

RANKSPA

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Introduction tab

Application overview.

Ranking Map tab

A map of the areas belonging to the region of study is shown, displaying in colour only those areas that are relevant according to the ranking criteria of the pipeline describe in the article mentioned in the Introduction tab: areas with PP higher or equal to 80% and ranked first by the DOE and second by the WRR. The colour scale used in the map corresponds to the sextiles of the absolute measures of risk (DOE) of the spatial areas and the numbers shown inside the spatial units correspond to the identification code ID (see description of the variables included in the Ranking Table tab).

Ranking Table tab

A table is shown containing the relative and absolute risk estimates for the coloured areas in the map of the Ranking Map tab as well as information about whether these areas are located within a spatial cluster (the application allows users to download the table in .xlsx format).

The estimators and variables shown in the table are:

- ranking: Ranking position (number 1 means the highest level of importance).
- ID: Identification code of the spatial areas.
- population: Total population in each spatial area.
- Obs: Observed cases in each spatial area.
- Exp: Expected cases in each spatial area.
- SMR: Standard mortality/morbidity ratio (Observed/Expected)
- Diff_obs_exp: Difference between observed and expected cases (DOE).
- RR: Relative Risk.
- lCre: Lower limit of the RR Credible Interval.
- uCre: Upper limit of the RR Credible Interval.
- PP: Posterior probability (PP) that RR>1
- cluster_1 to cluster_n: cluster membership (cluster=belongs to a cluster; center=belongs to a cluster and is the central area)

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```
Chi-square test for overdispersion

        Type of boots.: parametric
        Model used when sampling: Multinomial
        Number of simulations: 999
        Statistic:  442.0353
        p-value :  0.028


Potthoff-Whittinghill's test of overdispersion

        Type of boots.: parametric
        Model used when sampling: Multinomial
        Number of simulations: 999
        Statistic:  2076509
        p-value :  0.001
```

```
Moran's I test of spatial autocorrelation

        Type of boots.: parametric
        Model used when sampling: Negative Binomial
        Number of simulations: 999
        Statistic:  NA
        p-value :  NA


Tango's test of global clustering

        Type of boots.: parametric
        Model used when sampling: Poisson
        Number of simulations: 99
        Statistic:  0.004357942
        p-value :  0.01
```

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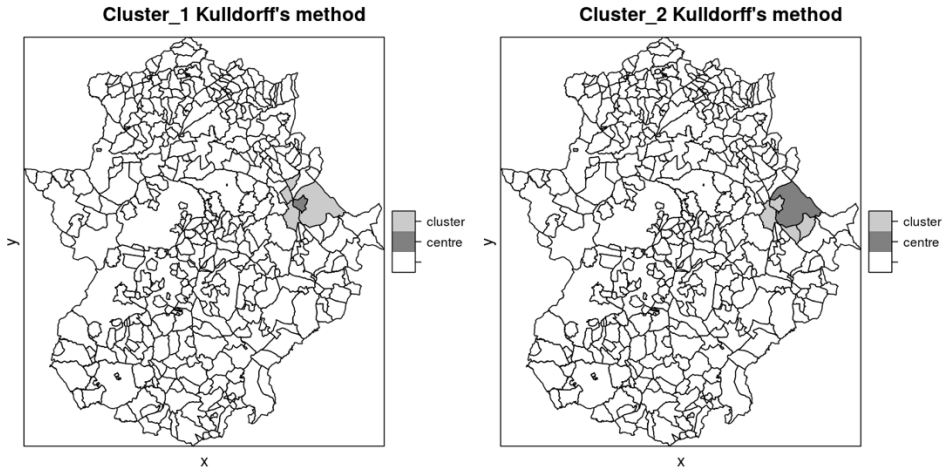

cluster	size	statistic	pvalue
1	5	1.2E+25	0.01
2	5	7.8E+24	0.01
3	8	8.2E+23	0.01
4	6	5.6E+23	0.01
5	13	1.7E+23	0.01
6	10	7.2E+21	0.01
7	15	8.3E+19	0.01
8	19	3.1E+19	0.01
9	16	2.1E+19	0.01
10	19	1.8E+19	0.01
11	21	2.4E+18	0.01
12	24	1.8E+18	0.01
13	20	1.6E+18	0.01
14	21	1.5E+18	0.01
15	23	1.2E+18	0.01
16	23	5.2E+17	0.01
17	25	9.7E+15	0.01
18	28	6.1E+15	0.01
19	33	1.1E+15	0.01
20	35	7.1E+14	0.01
21	13	6.2E+14	0.01
22	41	4.3E+14	0.01

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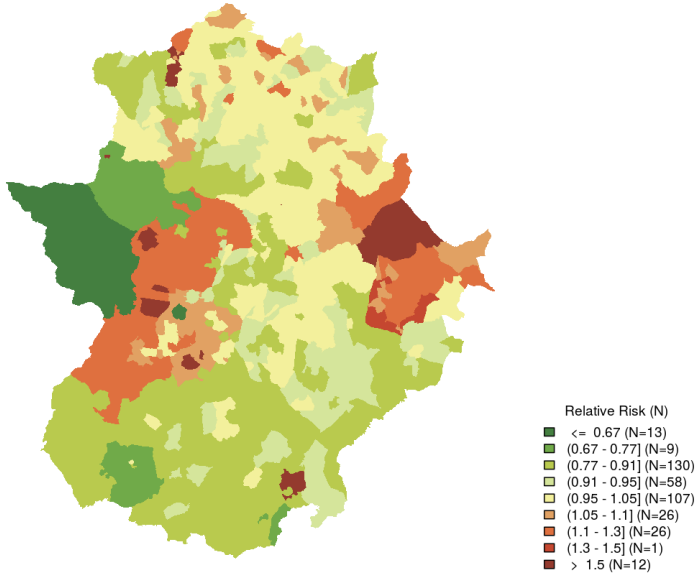

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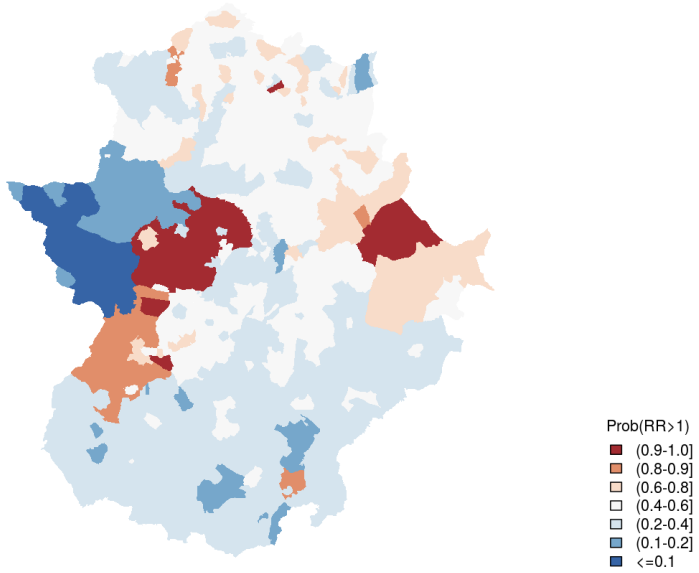

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Process

Introduction | Ranking Map | Ranking Table | Spatial Tests | RR Map | PP Map | Cluster Analysis | Complete Result Table | Glossary

Show 10 entries

Search:

ranking	ID	population	Obs	Exp	SMR	Diff_obs_exp	RR	lCre	uCre	PP	cluster_1	cluster_2	cluster_3	cluster_4
1	10044	410	110	51	2.16	59	1.91	1.58	2.3	1	cluster	cluster	cluster	centre
2	10087	405	105	49	2.14	56	1.95	1.6	2.34	1	centre	cluster	cluster	cluster
3	10017	400	100	50	2	50	1.8	1.48	2.16	1	cluster	centre	cluster	cluster
4	10054	71616	124	95.04	1.3	28.96	1.25	1.05	1.47	0.99				
5	6072	17145	34	25.43	1.34	8.57	1.24	0.91	1.65	0.92				
6	10037	12485	29	21.25	1.36	7.75	1.24	0.9	1.68	0.91				
7	6015	6483	15	11.38	1.32	3.62	1.2	0.81	1.73	0.82				
8	10134	7770	15	11.6	1.29	3.4	1.26	0.83	1.78	0.86	cluster			cluster
9	6115	261	4	0.77	5.2	3.23	5.39	1.76	12.49	1				
10	6019	642	4	2.06	1.94	1.94	2.01	0.66	4.66	0.9				

Showing 1 to 10 of 11 entries

Previous 1 2 Next

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RANKSPA

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BIODAMA
Bioinformatics and Data Management

Introduction | Ranking Map | Ranking Table | Spatial Tests | RR Map | PP Map | Cluster Analysis | Complete Result Table | Glossary

Data Input : datos.xlsx
Upload complete

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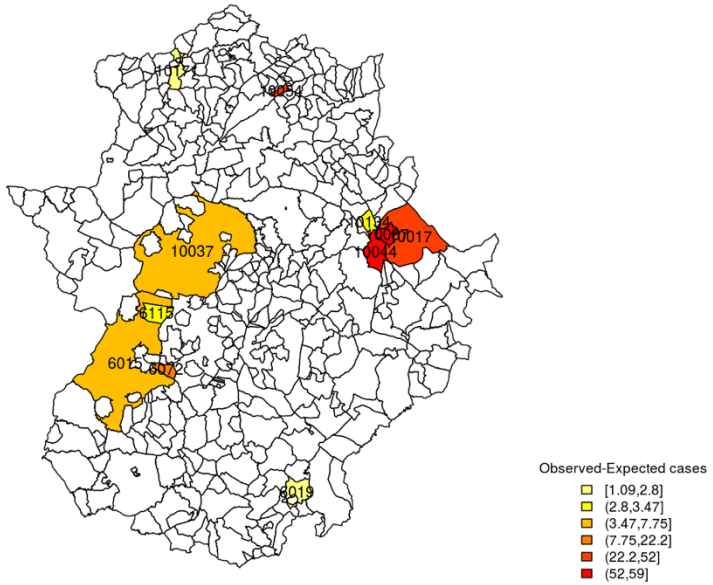
Cluster analysis: Fraction of the total population
15%

Process



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2	10087	405	105	49	2.14	56	1.95	1.6	2.34	1	centre	cluster	cluster	cluster
3	10017	400	100	50	2	50	1.8	1.48	2.16	1	cluster	centre	cluster	cluster
4	10054	71616	124	95.04	1.3	28.96	1.25	1.05	1.47	0.99				
5	6072	17145	34	25.43	1.34	8.57	1.24	0.91	1.65	0.92				
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10	6019	642	4	2.06	1.94	1.94	2.01	0.66	4.66	0.9				

Showing 1 to 10 of 382 entries

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