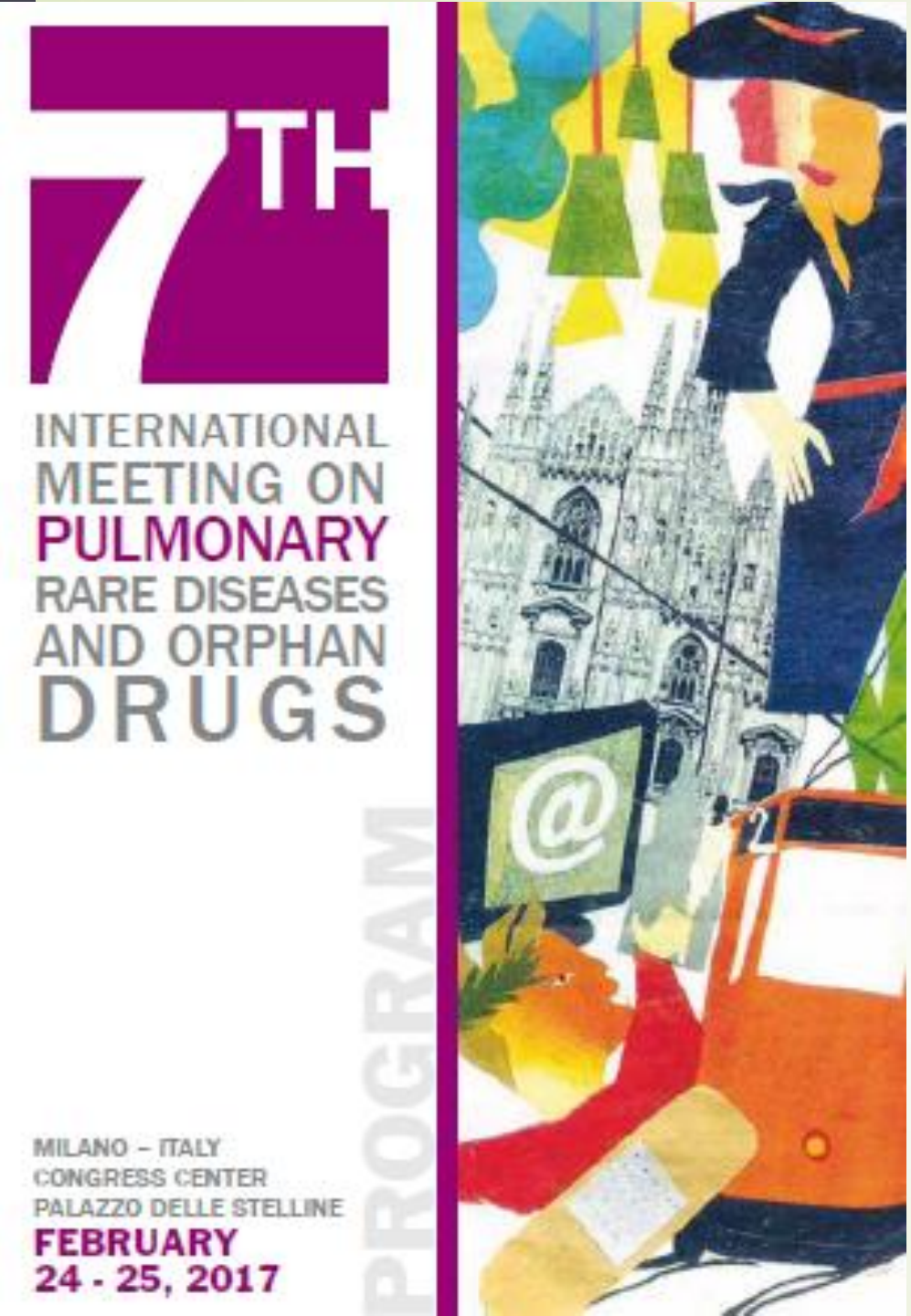

UNIVERSITÀ DI PARMA

DIPARTIMENTO DI MEDICINA E CHIRURGIA

Sarcoidosis in an Italian Province. Prevalence and Environmental Risk Factor.

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Background

- Sarcoidosis is a systemic inflammatory disease of unknown etiology characterized by accumulation of immune effector cells in affected organs along with the presence of non-caseating granulomas.
- The recent review of Valeyre et al. estimed that prevalence of sarcoidosis is 4.7-64 cases per 100,000 individuals.[1]
- Ophiolites are metamorphic rocks rich in fibrous minerals. Several studies have suggested a causal relationship between this exposition and mesothelioma or lung disease.
- The presence of particulate matter in the atmosphere can be evaluated through the analysis of the accumulation of pollutants in the tissue of mosses or lichens.

1. Valeyre, D., Nunes, H,, Bernaudin, J. F. (2014). Advanced pulmunary sarcoidosis. *Currente opinion in pulmonary medicine, 20* (5), 488-495
2. Bayram, M., Dongel, I., Bakan, N. D., Yacin, H., Cevit, R., Dumortier, P., Nemery, B. (2013). High risck of malignant mesothelioma and pleural plaques in subjects born close to ophiolities. *CHEST Journal, 143*(1), 164-171.

The Aim of Study

- The goal of the study is to:
  - Determine prevalence and distribution of sarcoidosis cases within Parma area and to identify potential exposures associated with sarcoidosis
  - Evaluate different sources of environmental pollution, exploring bioaccumulation levels of metals in lichen tissue

Material and Methods (1)

- Parma area (344,27 km^2) is comprised of 47 Municipalities Districts (MDs) belonging to 4 Health Districts (HDs). It is located in Emilia-Romagna and it is characterized by the presence of a river valley to the north and the Apennine Mountains to the south.
- The Apennines are a collisional mountain belt, formed during continental drift.
- They are comprised of ophiolites.

Material and Methods (2)

Data Collection and spatial distribution of sarcoidosis cases

Patients with sarcoidosis were enrolled at University Hospital of Parma between 2000 and 2013.

We retrieved the geographic coordinates of each patient and located them on the Parma area by a global position system (GPS).

We also specialized the analysis of the prevalence subdividing the population with respect to the MDs, to the HDs and to the altitude of residential site (plain, from 0 to <200 m a.s.l.; hill from 200 to <600 m a.s.l.; mountains above 600 m a.s.l).

For the most populated area corresponding to the municipality of Parma, prevalence was also computed inside 13 districts.

Material and Methods (3)

- **Environmental Biomonitoring**

11 stations were chosen for lichen sampling after patient georeferentiation and prevalence study.

All samples were collected from *Xanthoria parietina* cushions within a period of 20 days during the summer of 2014. Lichen specimens were collected by means of stainless steel blade with storage in Petri dishes

Results (1)

Characteristics	All patients
Number	223
Gender (%)	
Female	130 (58.3)
Male	93 (41.7)
Age at diagnosis (mean)	50.6 ± 15.4
Female	53.5 ± 15.5
Male	46.5 ± 14.4
Frequency for ranges of age (%) in year 2013	
<30	6.1
30-39	23.5
40-49	22.5
50-59	16.3
60-69	16.8
>69	14.8
Ethnicity (N, %)	
Caucasian	207 (92.8)
Other	16 (7.2)

A total of 223 patients were identified.

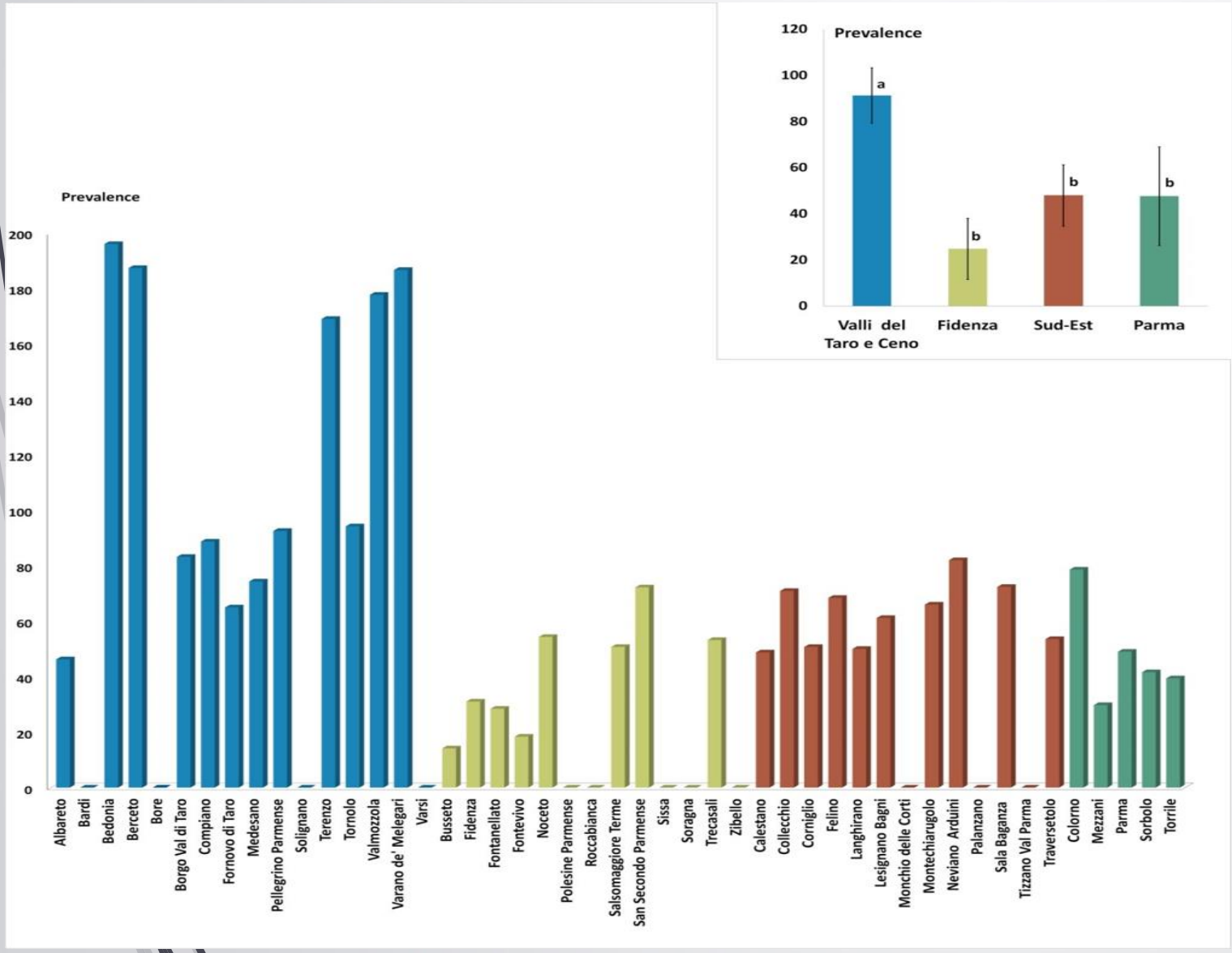
130 females and 93 males.

About 93% was of Caucasian ethnicity.

The mean age of the patient was 50.6 years.

Results (2)

Sarcoidosis prevalence per MDs and HDs



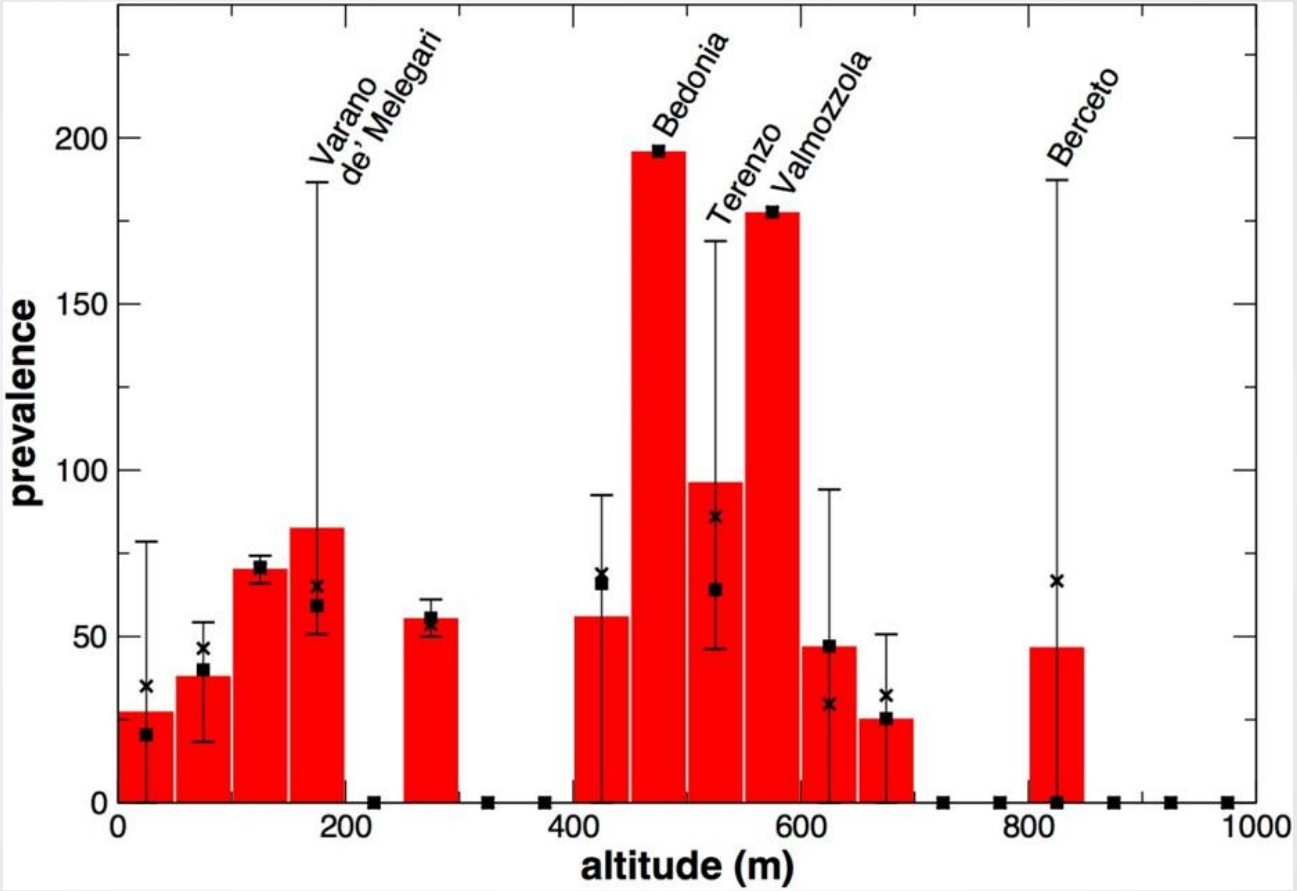
We observed that mean prevalence in the province of Parma was **49 per 100,000**.

The MD with the highest mean prevalence was "Bedonia": **196 per 100,000**.

The mean prevalence is about **91 per 100,000** individuals in the "Valli Taro and Ceno" HD, about **48** in "Parma" and "Sud-Est" HDs, and about **25** in "Fidenza" HD.

Results (2)

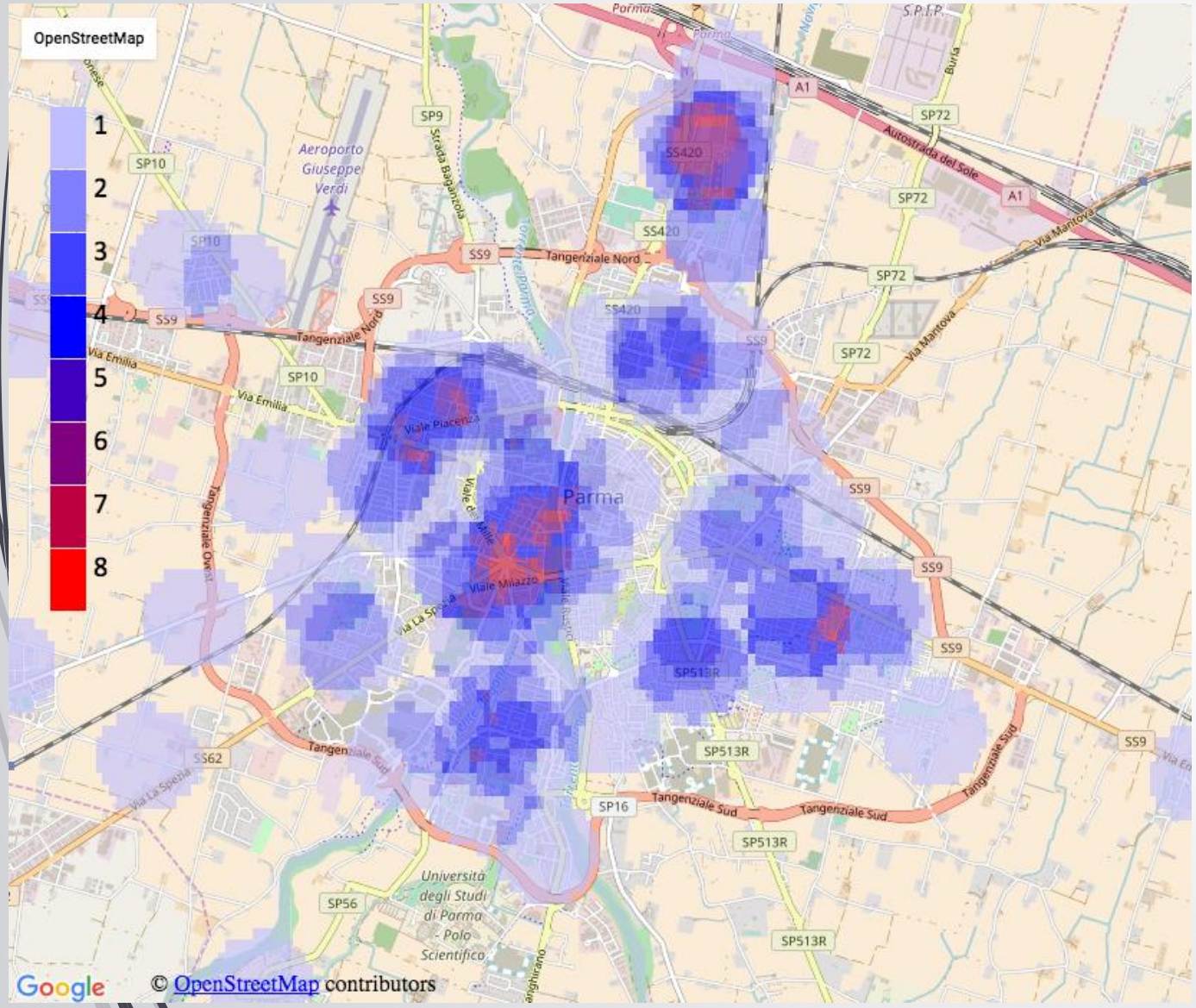
Sarcoidosis prevalence per altitude



By dividing the MDs according to the altitude, we observed that in lowland the mean prevalence is about **47 per 100,000 individuals**, in the hilly areas it is about **84** while in the mountains areas it is approximately **42**.

Results (3)

Heat map of distribution of sarcoidosis cases within the Parma area



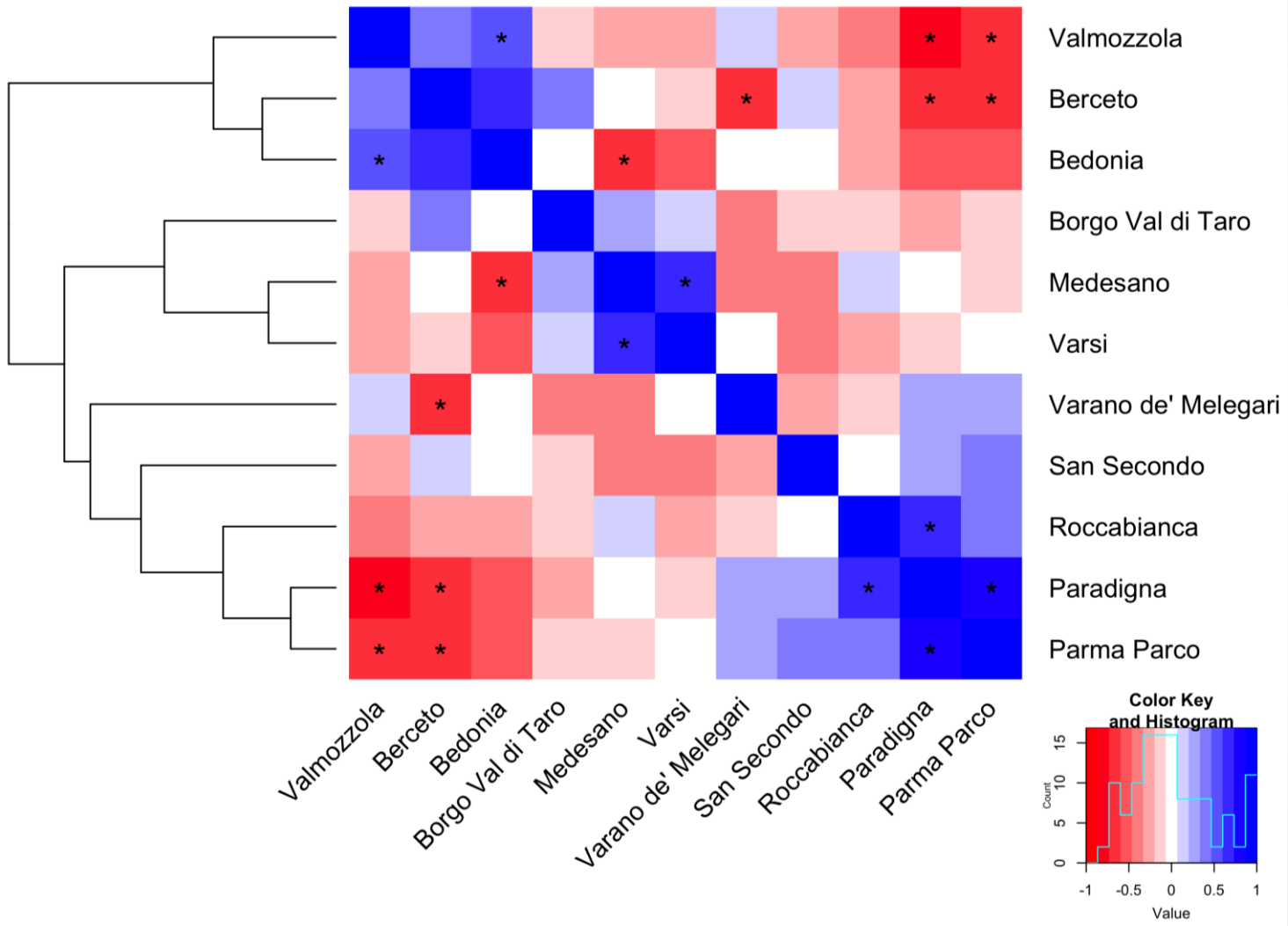
For each point on the map, a colour code indicates the number of patients within a range of 500 meters.

The red coloured areas on the map represent a local aggregate of 8 patients.

Within the city of Parma, we found at least 2 critical high prevalence areas:

- District "Cortile San Marino", close to an industrialized area (glass and ceramic materials factories), to heavy-traffic roads and an incinerator
- A point of junction of 3 different districts ("Molinetto", "Oltretorrente" and "Pablo"), residential area without identified potential sources of pollutions

Results (4)



In the clustering analysis of environmental biomonitoring, two main clusters are identified.

The **first cluster** consists of lowland stations. It is mainly characterized by the presence of **Cadmium**, **Zinc**, **Selenium**, **Arsenic** and **Mercury**, for heavy metals transport of industrial origin.

The **second cluster** consists of stations in pre-hilly areas, hills and mountains. It is mainly characterized by the presence of **Iron**, **Aluminium**, **Nickel**, **Copper**, **Lead**, for contribution of ophiolitic substrate and industrial activity.

Conclusion

- This study is the first attempt to produce a record that would collect all cases of sarcoidosis from 2000 to 2013
- Several high prevalence areas were found, especially within "Valli Taro and Ceno" HD and hilly areas. The related values were considerably larger than those reported in literature.
- A phenomenon of cases aggregation is a notable result
- The environmental biomonitoring through metals in lichens analysis was an effective method to identify the presence of mineral particles. However, it was not possible to prove a clear correlation between the onset of sarcoidosis and environmental risk factors
- A more in-depth study of sarcoidosis etiology within high prevalence areas would be suggested