



Consiglio Nazionale delle Ricerche

**Caratterizzazione spaziale di dati epidemiologici
ed ambientali**

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Il contenuto della presente nota e' stato presentato alla First International Health Geographics Conference (IHGC) tenutasi dal 16 al 18 ottobre del 1998 a Baltimora, Maryland, USA, nei locali del Maritime Institute. Alla conferenza, sponsorizzata dalla Johns Hopkins School of Public Health e dall' Environmental Systems Research Institute, Inc., parteciparono studiosi dei cinque continenti, mentre risulterebbe piuttosto scarsa la partecipazione italiana, a riprova del fatto che le interazioni interdisciplinari richiedono da noi piu' tempo che altrove per essere messe in atto. Dalla conferenza apparve ben evidente come l' approccio GIS sia ampiamente utilizzato a livello mondiale per trattare i dati relativi alla salute umana sia dal punto di vista conoscitivo, che gestionale, che della ricerca scientifica: gestione dell' informazione sanitaria, mappatura di fenomeni inerenti alla salute, modellazione di dati, applicazioni per la fornitura di servizi sanitari sul territorio, sono alcuni dei principali temi trattati nella conferenza.

Il materiale che viene riportato nel seguito e' stato utilizzato per la composizione del poster presentato alla conferenza ed e' stato ottenuto come studio preliminare per la trattazione di dati di origine epidemiologica ed ambientale considerati sotto l' aspetto geografico; sono state sperimentate tecniche di visualizzazione anche ai fini dell' analisi esplorativa spaziale; e' stata curata la rappresentazione di tematismi diversi in un unico contesto geografico per consentire una analisi visiva qualitativa.

Una immagine miniaturizzata del poster e' riprodotta a pagina 10.

IHGC98
First International Health Geographics Conference
Baltimore, Maryland, USA
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16-18 October, 1998

Event Sponsor
The Johns Hopkins School of Public Health
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SPATIAL FEATURING OF EPIDEMIOLOGICAL DATA OF A GENERAL POPULATION SAMPLE LIVING IN CENTRAL ITALY

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An epidemiological survey related to atmospheric pollution was carried out during 1991-1992 on a sample of about 2,800 people. Data were collected by means of standardized questionnaires, gathering information on the individual and his family, with special regard to respiratory aspects. Blood samples were taken at the interview and allergometric tests performed, as well as lung function tests. The data collected during the survey were widely inspected during these years within various disciplinary fields, such as epidemiology, lung disease, immunology, allergy, biochemistry, and cytogenetics. A specific characteristic of the study is the detection of antibodies anti-adducts to DNA of benzopyrene in the sera.

A geographical approach is currently being applied. A major goal is to develop a geographical model for air quality, derived from the effects of air pollution on human beings. To begin with we are investigating on relationships between health and the environment, analyzing the distribution of a respiratory symptom like wheeze, and the association between estimates of air pollution and the presence of circulating antibodies against specific DNA adducts due to airborne pollutants.

The method we are adopting for the geographical approach is as follows. In order to analyze the relationship between epidemiological data and the territory we decided to map the people who took part in the survey. These people are grouped per family, with perhaps more than

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Spatial Featuring of Epidemiological Data of a General population Sample Living in Central Italy

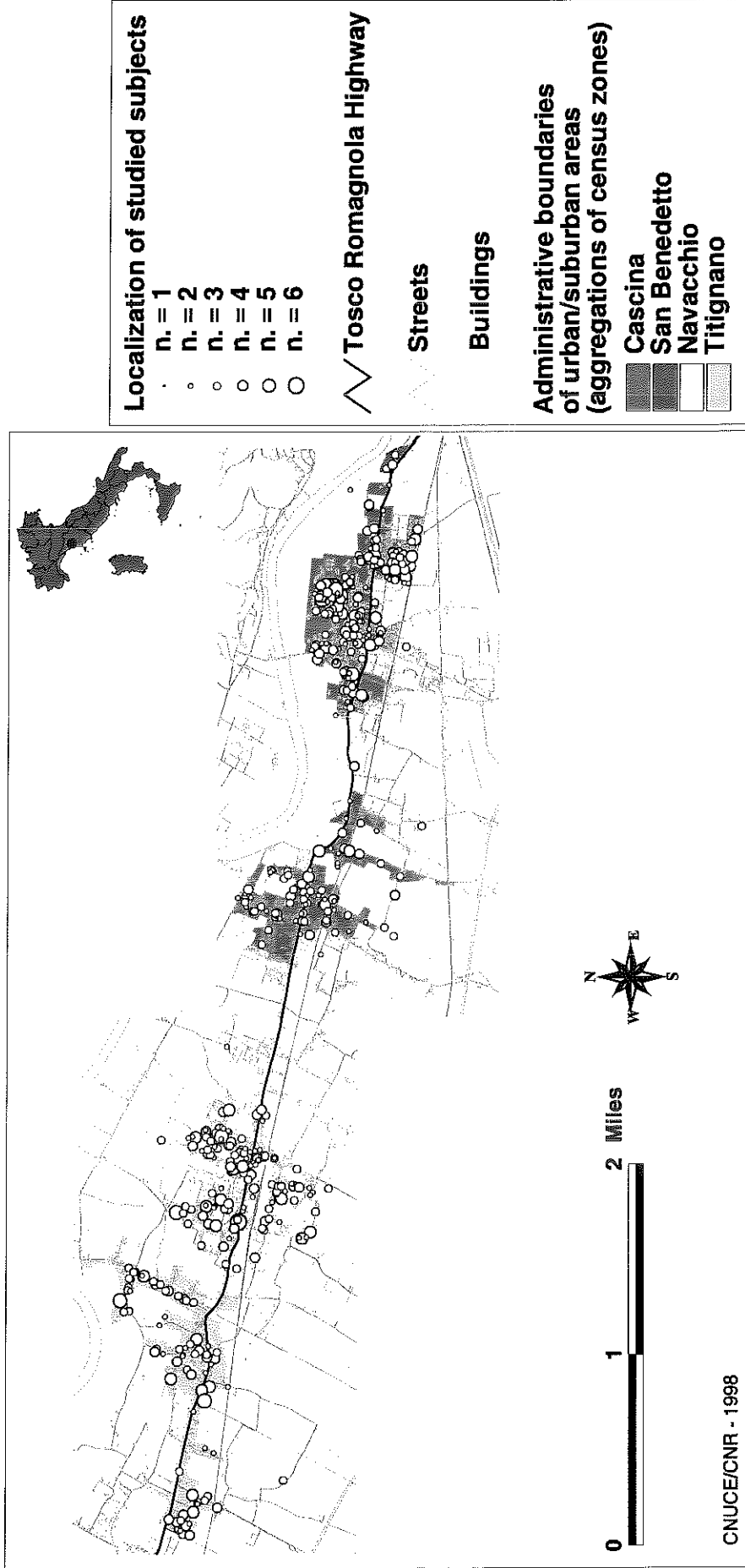


Fig. 1 - Geographical distribution of the studied subjects

Figure 1 shows the localisation of people who underwent Ab-BP-DNA test. The geographical constraints of the initial sampling were the nearness to Tosco Romagnola highway of the residences of studied people (within 800 m) and their belonging to selected census zones (supposed to be homogeneous for social status). Four urban/suburban areas constitute the aggregations of the selected census zones. Tosco Romagnola highway is heavily trafficked and it is considered the main pollutant source in the neighbourhoods. The map shows a clustered scatter of the points of measure (residences of the studied people). The points represent a number of subjects ranging from 1 to 6. A total of 1018 people correspond to 482 different points of measure. People sharing the same residence may belong to different families.

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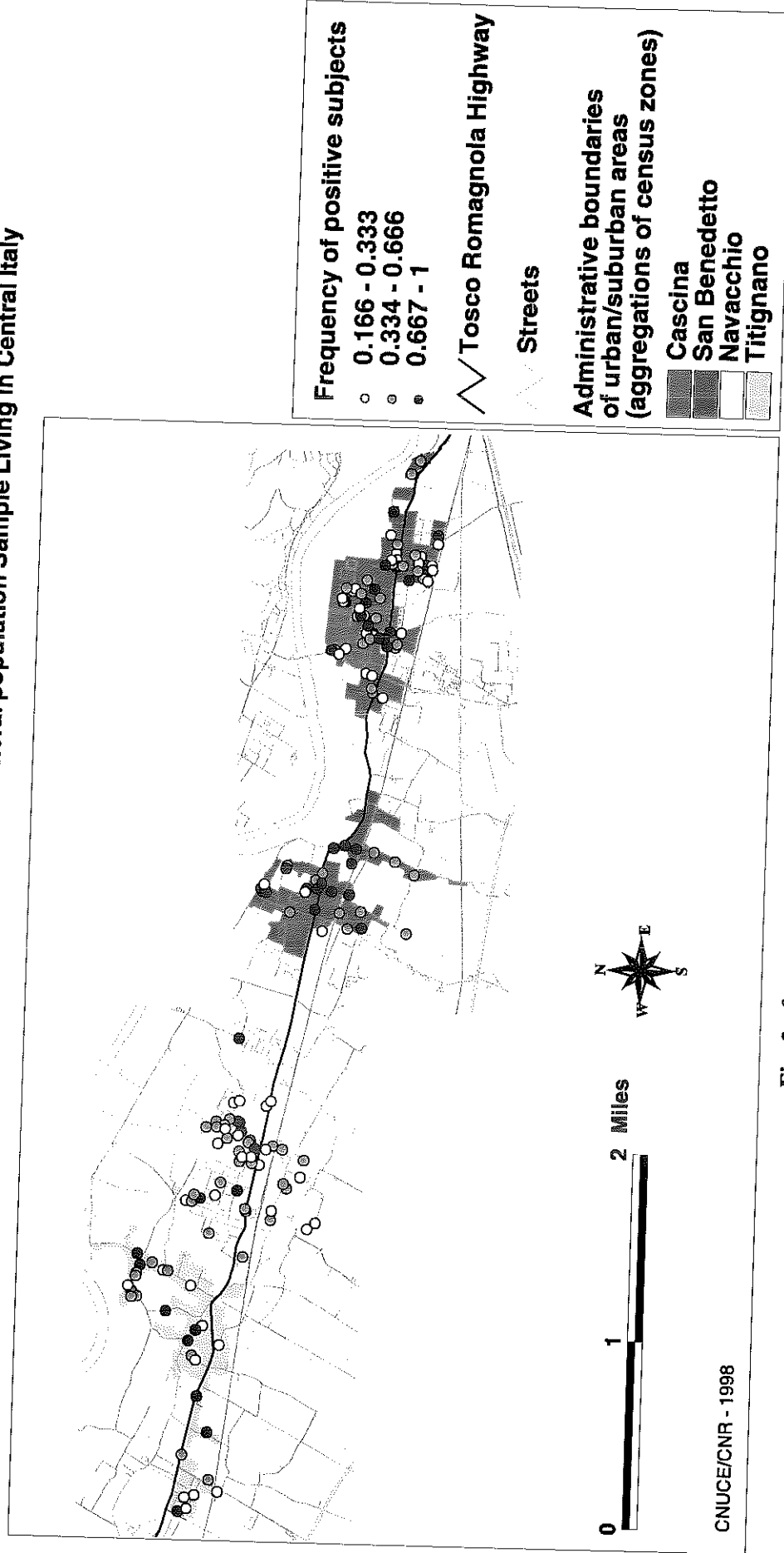


Fig. 2: frequency of positive subjects to Ab-BP-DNA test

In Figure 2 the frequency of positive subjects to Ab-BP-DNA is assumed as an index which is represented by tertiles. A total of 169 points of measure is mapped (the points corresponding to residences in which only negative subjects live are not shown).

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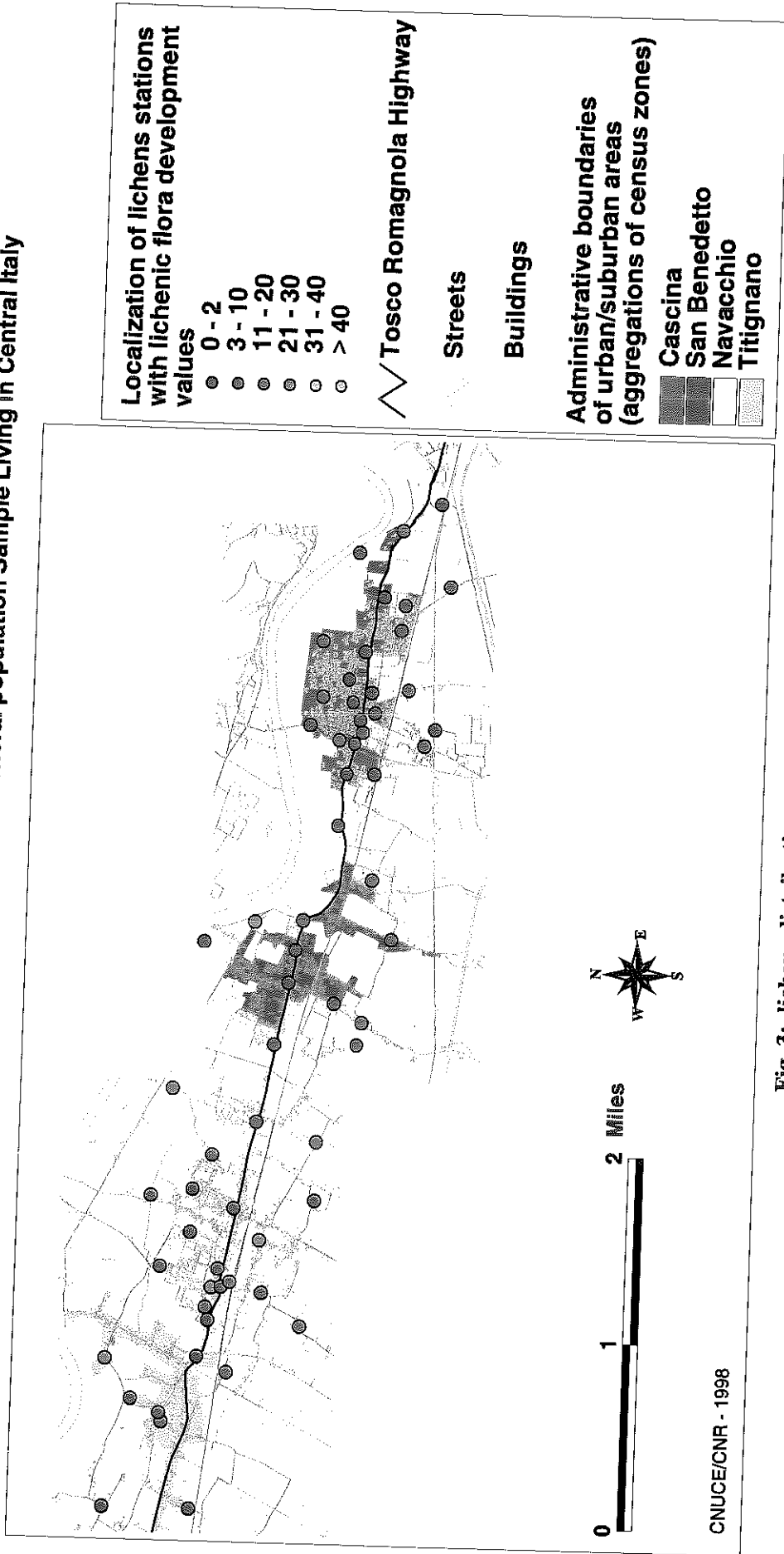


Fig. 3: lichens distribution and values

The survey on lichens was conducted approximately on the same area of the epidemiological survey, with less points of measure but a more regular distribution of the sample. A total of 69 points were mapped, corresponding to the trees examined for lichenic flora development. The geographical constraint was again the distance from Tosco Romagnola highway (within 1 Km) in the zone covered by the four urban/suburban areas. Figure 3 shows the distribution of the points of measure with the values assigned according to lichenic index, as shown in the legend.

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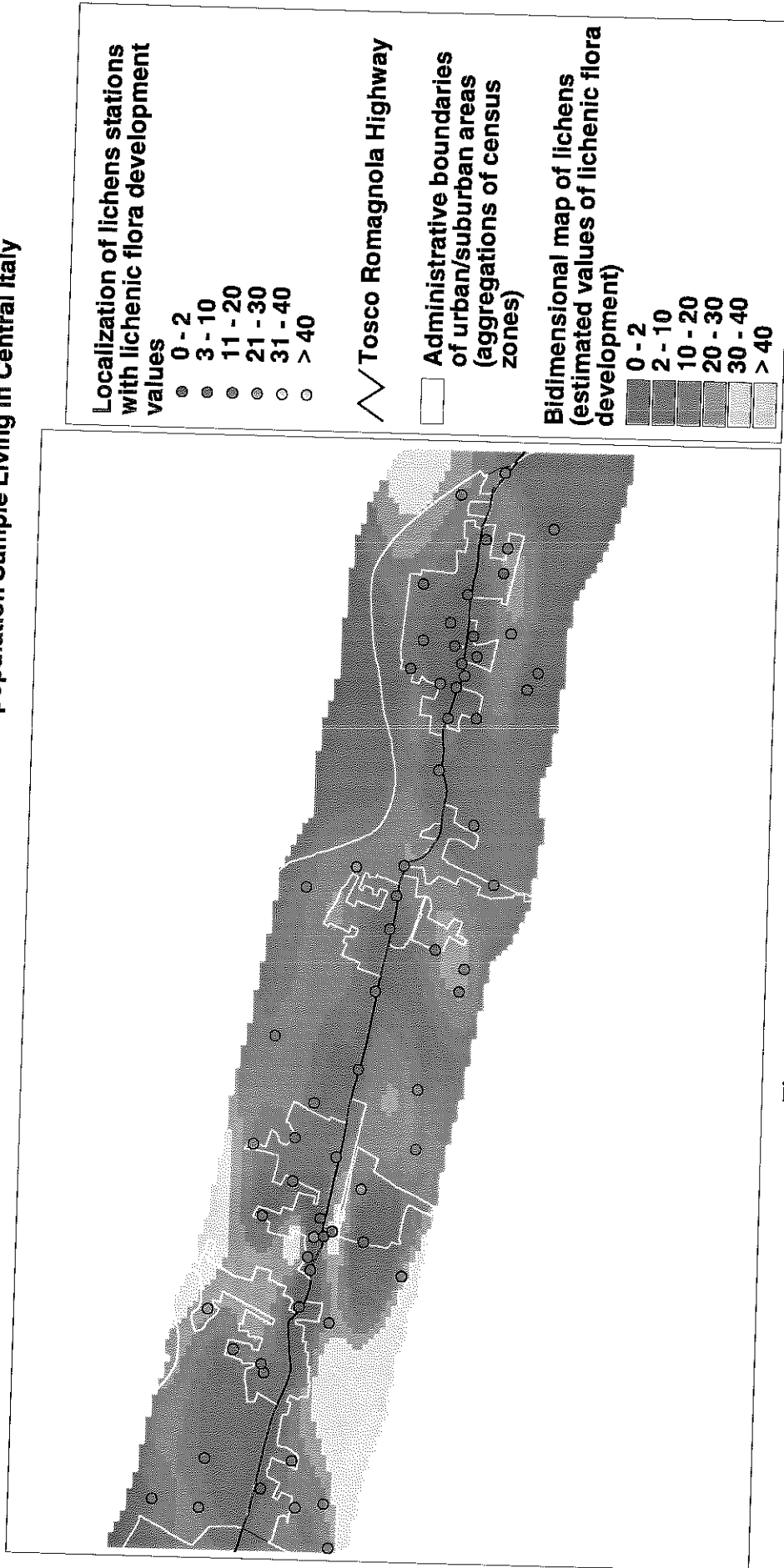


Fig. 4: air quality according to lichens

The values of the lichenic flora development were interpolated (spline method) to obtain the equipotential surfaces shown in figure 4; generating points are also shown, with values expressed according to the same colour legend as the surface. It is worth to note that the surface values should be considered more reliable in those zones where the points of measure are denser. Thus, at a visual spatial analysis, the nearness to Tosco Romagnola highway can be assumed as a factor of higher air pollution. The dimension of the grid cell is 50 m. The mapped area is a buffer of 1 km around Tosco Romagnola highway. The administrative boundaries of the areas on which epidemiological data are available are overlaid for reference.

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Fig. 5: map of distribution of positive subjects (nonsmokers only)

The frequency values of positive subjects to Ab-BP-DNA test were used to obtain equipotential surfaces by interpolation. Nonsmokers only were considered for a total of 741 individuals, corresponding to 408 points of measure. Smokers were excluded after a statistical study indicating the smoke of tobacco as a major cause of positivity. The map shown is the composition of the maps obtained for each of the four areas. The dimension of the grid cell is 10 m. By analysing this map, there is an influence of Tosco Romagna highway on the positivity of subjects to Ab-BP-DNA test, although it is not so evident as in the case of lichens (Fig. 4).

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Spatial Featuring of Epidemiological Data of a General population Sample Living in Central Italy



Fig. 6: comparison of lichenic flora development and Ab-BP-DNA test results
 Figure 6 shows, for Navacchio area as an example, the superimposition of the map derived from Ab-BP-DNA test to interpolated lichens distribution map. Contour lines of lichens surfaces are then overlaid to allow understanding the envelope of the hidden surfaces. In this way it is possible to try a visual comparison of the two phenomena. Some degree of correlation is apparent.

Conclusions and developments

These preliminary results indicate that visual spatial data analysis seems to be a valid tool for inspecting geographical features relating to epidemiological data. The use of interactive tools is recommended as they allow to easily investigate the characteristics of data much more than the few proposed maps can suggest.

So far we have applied only to one result of the epidemiological survey, nevertheless we have developed a methodology to map individuals on the territory and to get indexes with geographical meaning from individual data. The results obtained by using these indexes encourage to further proceed with this approach. The quality of the samples can be refined by filtering the noise on the subjects, e.g. as performed for smokers it is possible to discriminate people on the basis of sedentarity; the large number of studied subjects allow to get still meaningful subset after filtering.

Data sources

Base map: Carta 2000 – Tuscany Region (Italy)
Administrative boundaries: Municipality of Cascina
Epidemiological data: Survey performed in 1991-1993 by CNR (Italian National Research Council) and ENEL (Italian National Electricity Society)
Lichens: Biomonitoring survey performed in November 1994 by Environmental Science Department - University of Pisa

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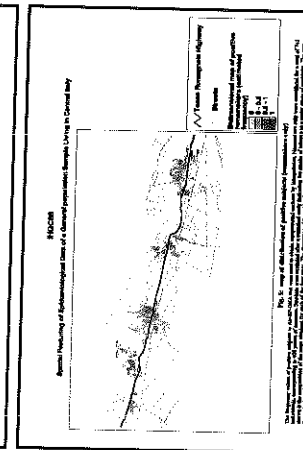
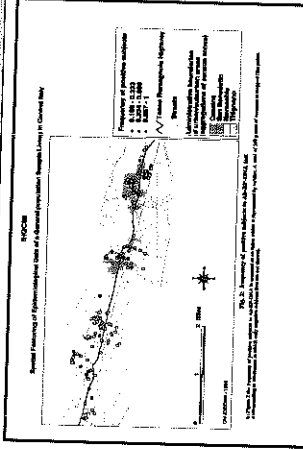
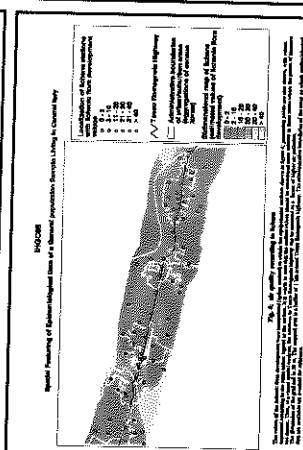
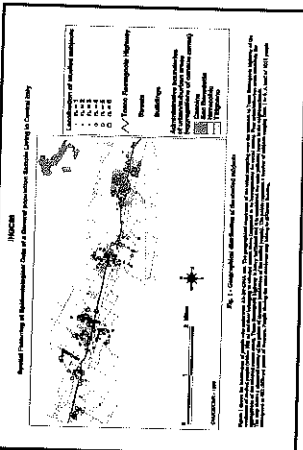
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Poster map

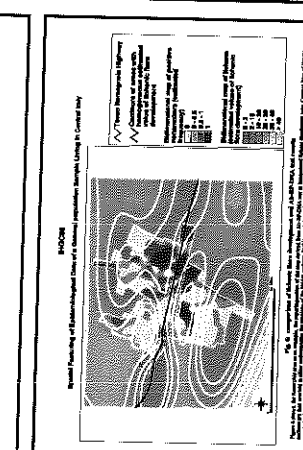
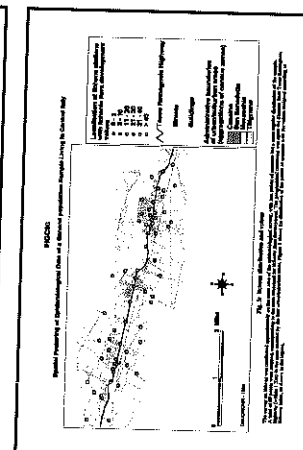
The epidemiologic survey aimed to investigate public health conditions in the area of the city of Rome, Italy, by means of standardized epidemiological, geostatistical and GIS methods, with special regard to respiratory diseases. The survey was carried out in the city of Rome, which is a large metropolitan area. The data obtained were used to investigate the spatial distribution of the diseases reported during three years (1991-1993). The data were analyzed using geostatistical methods, such as variogram, kriging, and GIS. A specific GIS approach is currently being applied, using the GIS software ArcView, to investigate the spatial distribution of the diseases. The aim of the study is to identify the main factors influencing the distribution of the diseases and to provide a better understanding of the relationship between health and the environment. The study is part of a larger project on the spatial distribution of air pollution and the environment. The results of the study will be used to develop strategies to improve public health and the environment. The study is part of a larger project on the spatial distribution of air pollution and the environment. The results of the study will be used to develop strategies to improve public health and the environment.

Spatial featuring of epidemiological data of a general population sample living in Central Italy

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 (14-18 October, 1998)



Chairman's address:
 The first international health geographers conference was held in Baltimore, Maryland, USA, in 1990. The conference was organized by the American Geographical Society and the American Public Health Association. The conference was a success and led to the formation of the International Health Geographers Association (IHGA). The IHGA is a multidisciplinary organization that brings together geographers, public health professionals, and other interested parties. The IHGA's main focus is on the study of the spatial distribution of health and disease. The IHGA's activities include the organization of international conferences, the publication of a journal, and the promotion of research in the field of health geography. The IHGA's website is <http://www.ihga.org>.

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