Geographic Database for Public Health in Portugal: Public Health National Charter

Ana Patuleia (1),* Marco Painho (2)

(1) Master's student, ISEGI, New University of Lisbon, Lisbon, Portugal; (2) Associate Professor, ISEGI, New University of Lisbon, Lisbon, Portugal

Abstract

Portugal's computerized Public Health National Charter is a dataset including population health parameters, health services, and socioeconomic and environmental factors that directly or indirectly affect human health. It presents data detailed to the administrative level of NUTS IV. The purpose of this article is to illustrate the charter's versatility and strength. It allows users to access a great number of spatially referenced indicators for producing maps and graphs and for evaluating various models. The collection, storage, and manipulation of geographic health data and other health-related information can influence the progress of health surveillance and environmental health assessment, as well as the allocation of health resources, as recognized in the European Charter on Environment and Health. This database is more flexible than traditional ones because it enables the user to select and modify the data presentation options. In addition to offering a set of spatially referenced information, the charter performs a valuable service in collecting and compiling data from myriad sources and making it available from one central repository.

Keywords: public health, spatial analysis, health surveillance, environmental health, epidemiology

Methods

Portugal's Public Health National Charter is based on the same development principles as other geographic information systems. Criteria that were considered in its development include characterizing potential users; determining and collecting information for the database; designing, codifying, and installing the system; and evaluating its operation and use to improve its performance and value to users. The Public Health National Charter presents data separated to administrative level IV of EUROSTAT's NUTS[1] classification system.

Goals underlying the establishment of the charter included:

- Compiling a large and diverse dataset by collecting information from the various entities that are directly or indirectly linked with health.
- Providing access to a wide spectrum of users.
- Integrating GIS into health and health-related issues, not only as a tool for making maps and graphs, performing spatial analysis, and modelling, but also for making and supporting health- and policy-related decisions.

* Ana Patuleia, ISEGI-UNL, Trav. Estevão Pinto–Campolide, 1200 Lisboa, Portugal; (p) 351-1-3870261; (f) 351-1-3872140; E-mail: m318@isegi.unl.pt

[1] NUTS refers to Territorial Units Nomenclature and is divided into different levels starting with NUTS I for countries. NUTS IV is for municipalities. Portugal has 275 municipalities, not including Madeira and Açores.

A driving force behind this effort is the introduction of the charter on the World Wide Web. This will permit different kinds of users, including those directly and indirectly involved with health and environmental issues, to have access to the database.

Data needs were identified through bibliographic searches. Of particular value were those data sources of the World Health Organization (WHO), such as the Health Environment Geographic Information System (HEGIS) project. It quickly became apparent that sources containing data on health and health-related issues are voluminous. In addition, the level of detail—NUTS IV—made the task of data collection more difficult. The enormous quantity of work to be done made it impossible to include all the parameters initially proposed for the database.

The information used in the charter is either published, or publicly available but not published. Data validity was assumed to be the responsibility of the sources; despite the potential for some inaccuracies, it seemed preferable to use the best available information. The spatial data were taken from the *Atlas do Ambiente* at the scale of 1:1,000,000 (1). Some simplifications were made so that municipalities could be represented by a single polygon. Each polygon has a designation (the name of the municipality); a 9-digit code provided by the Instituto Nacional de Estatística (INE), Portugal's national statistical institute, composed of 3 digits for the region, 3 for the district, and 3 for the municipality; and a NUTS IV code from EUROSTAT.

A set of over 700 variables was gathered. The attribute data refer to 1996, whenever possible. Exceptions include figures for mortality, which use data over a five-year period to create a statistical indicator, and figures for diseases with mandatory notification, which used data from 1994 to 1996. The application was developed using ArcView GIS (ESRI, Redlands, CA).

Results

The simple existence of this application has opened many doors for the use of GIS in health. In fact, Portugal's Ministry of Health is currently constructing a geographic database.

This article, which summarizes work presented at the August 1998 Third National Conference on GIS in Public Health, demonstrates some the possibilities of the National Charter database. While not a precise scientific study, it portrays the charter's potential value to health professionals. As an illustration, we include here one of the study profiles: Malta fever, or brucellosis.

Malta fever is one of the diseases with mandatory notification that, for a variety of reasons not discussed here, is underreported. The real numbers for the incidence rate are five to six times higher than those officially recorded.

Malta fever is a bacterial disease with both acute or chronic forms. It is related to contact with cattle and cattle products. Infection results from the ingestion of fresh cheese or infected meat, or from contact with secretions or other products from infected animals. In Portugal, the main sources are cows, goats, and sometimes pigs. Fever, weakness, and pain, especially in the joints, are characteristic symptoms (2).

To prevent this disease, it is essential to treat the milk to be consumed by humans, to vaccinate young animals, and to eliminate all infected animals, including healthy livestock from the same herd (3). For many reasons, but mainly because of economic factors, this prevention program has been difficult to implement.

In the fight against this disease, one of the main objectives is to use GIS to highlight the municipalities where Malta fever is endemic and where the disease frequency has been high over the years (Figure 1) (5). The variation of the incidence rate is shown in Figure 2. The municipalities that over the last three years had an incidence rate higher than 51.55 per 100,000 inhabitants were selected. These are illustrated in Figure 3 and highlighted in Figure 4 (7).

The active population, which is composed of those between the ages of 14 and 65, is the group most susceptible to contracting the disease. Many inhabitants in these areas have cattle, even if they are employed in occupations other than handling or raising cattle. This makes it important to identify the endemic municipalities, and to understand those indices that indicate higher rates of Malta fever. The charter provides ample opportunities for more detailed analysis than the example offered in this summary paper.

Conclusions

The development of the Public Health National Charter is a great opportunity and of immense practical value for all types of health professionals. As with any new database, however, it must be viewed as unfinished work since significant deficiencies remain. Nonetheless, it represents a positive opportunity and a significant step forward in the application of GIS to improving and better understanding health and health-related issues in Portugal.

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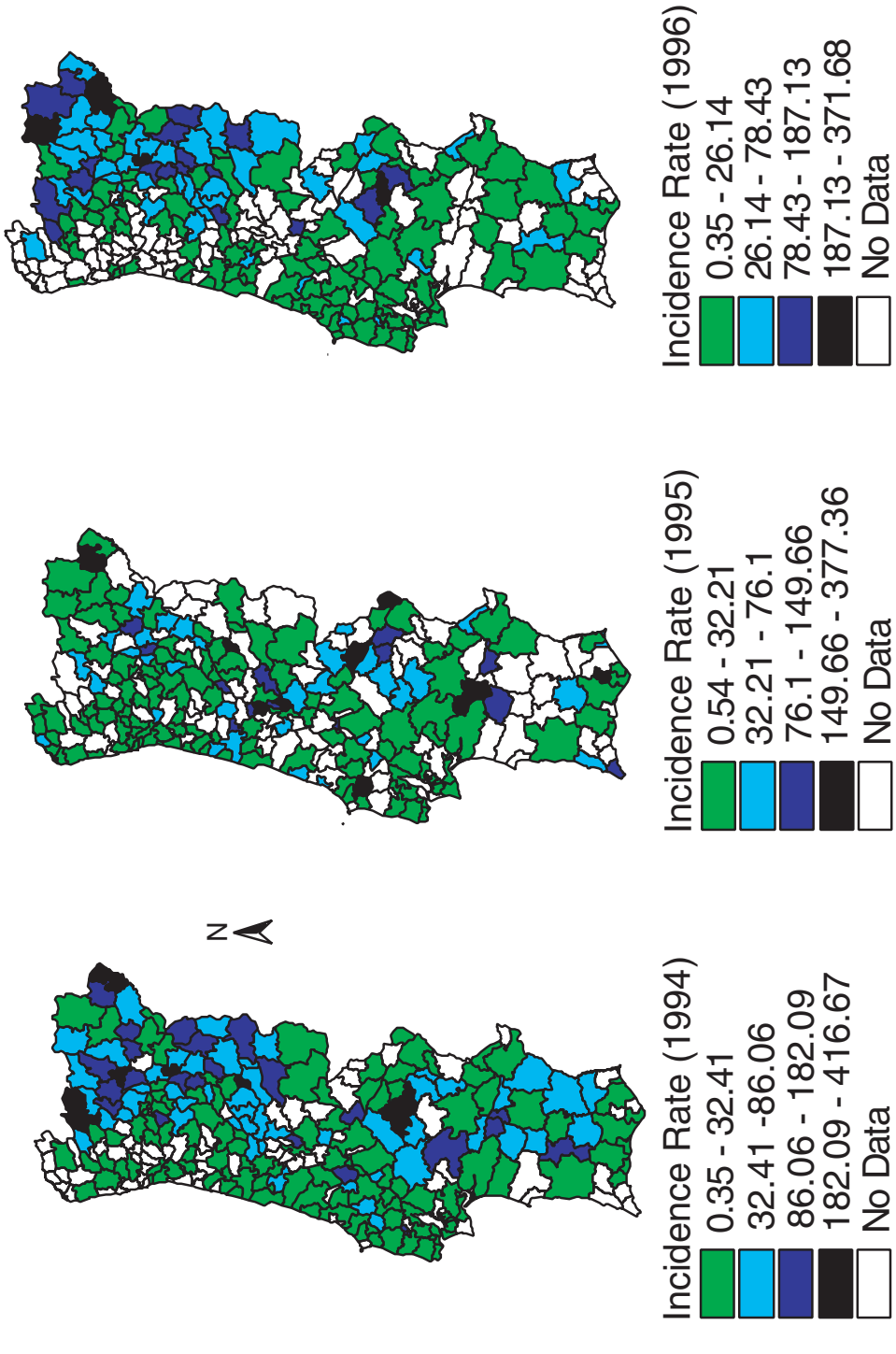

Figure 1 Malta fever reports per 1,000,000 inhabitants, Portugal, 1994–1996. Source: (4).

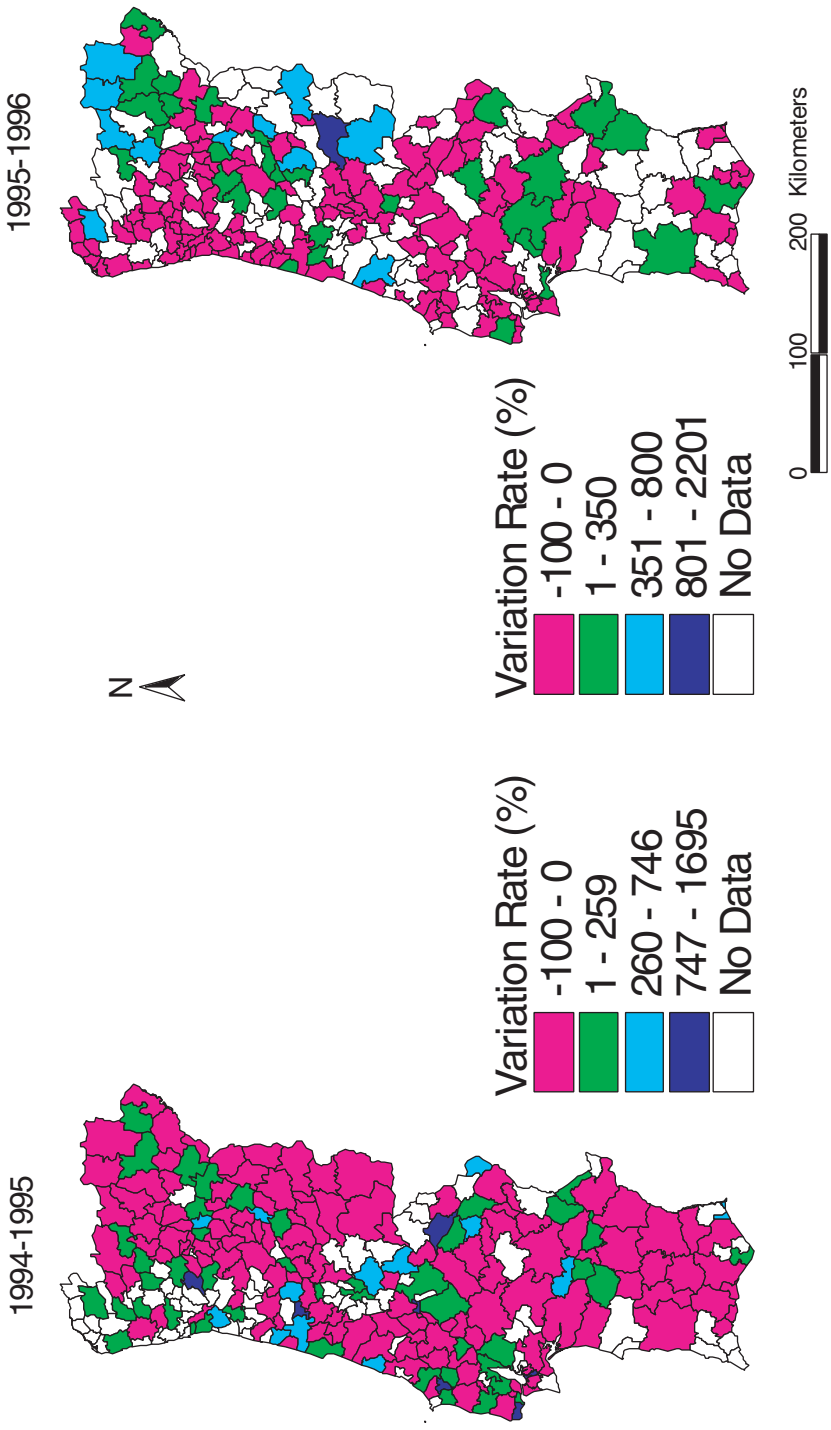

Figure 2 Year-on-year percent variation in Malta fever rate, by municipality, Portugal, 1994–1996. Source: (4).

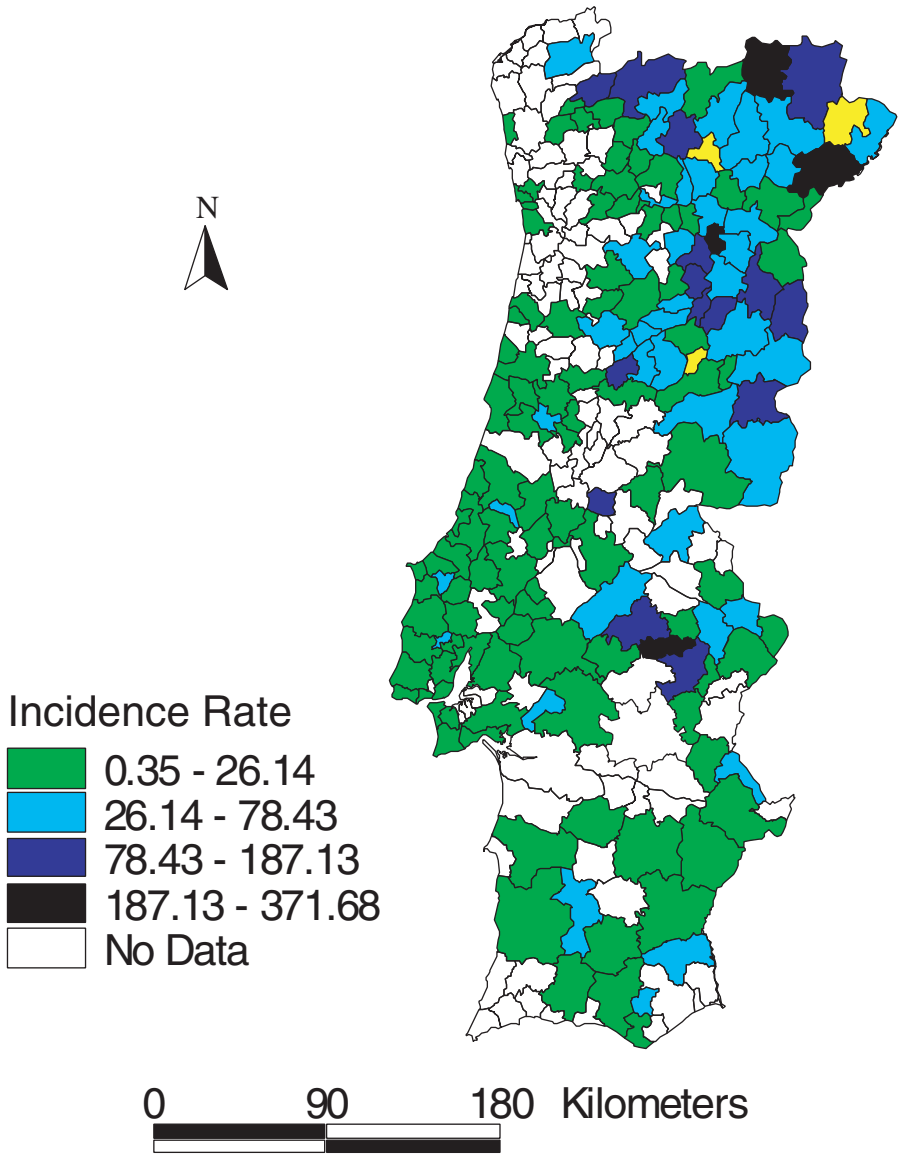

Figure 3 Endemic municipalities for Malta fever, where the incidence rate exceeded 51.55 per 100,000 inhabitants, Portugal, 1994–1996. Source: (4).

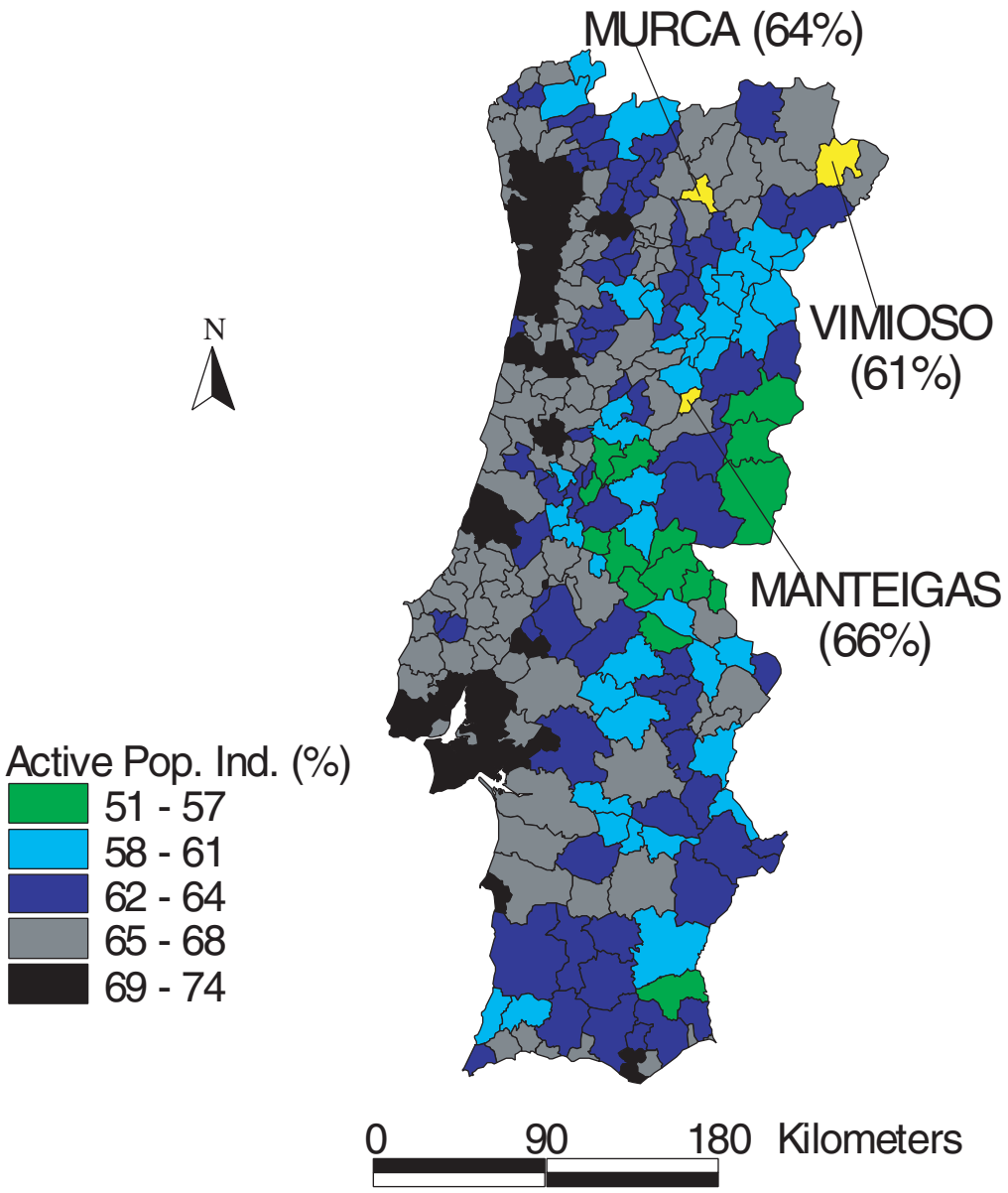

Figure 4 Active population index, 1995. Source (6).