„Environmental“ and other determinants of health
Conclusions from the Austrian Health Information System (ÖGIS)

Abstract

Development of ÖGIS

In line with the recommendations of WHO, ÖBIG (Austrian Health Institute) started to develop the Austrian Health Information System (ÖGIS) by combining GIS technology and common approaches of epidemiology (standardized mortality rates, incidence/prevalence rates, significance testing) in the early 1990ies. The roots of this GIS-based concept may be traced back to the 1980ies, when WHO recommended to establish a “Health and Environment Geographic Information System for the European Union” (HEGIS), using standard GIS-packages already available on the market at that time (ArcInfo, SPANS). Today, ÖGIS covers all major data sources relevant to health and health determinants in Austria and is mainly used for epidemiological research and health reporting. In early stages of the ÖGIS project, emphasis was on environmental epidemiology, but by the time this focus was decreased

- due to methodological difficulties and
- due to the predominant role, which socio-economic conditions seem to play for morbidity and mortality in comparison to environmental factors (at least in Austria).

Data and indicators available in ÖGIS

Epidemiological indicators are available in ÖGIS on four levels of spatial resolution (ranging from the 9 Austrian provinces to the level of the around 2.300 communities). They are organized in five data modules, which are the following:

- Basic **geographic** data (such as administrative boundaries, waters, traffic lines etc.);
- **socio-economic** and **lifestyle** data such as demographic parameters, age and gender structure, degree of education, parameters of regional economics, smoking habits, sports practising etc.);
- **environmental** indicators (such as population density, data on air pollution with respect to SO_2, NO, NO_2, O_3 and TSP, radioactivity, drinking water quality - especially contamination by nitrates etc.);
- **health-related** indicators such as life-expectancy, diagnosis-specific mortality and morbidity out of mortality statistics, cancer registries and hospital admission statistics, survey data on health status, military medical check-up data, traffic accident data etc.);
- regional parameters of the **health care system** (such as availability of hospital beds, general practitioners, emergency services etc.).

Indicators of ÖGIS are available on five levels of spatial resolution:

- 9 provinces (NUTS-II-level of EUROSTAT, population ranging from 200.000 to 1.5 million inhabitants);
- 35 NUTS-III-regions (population ranging from 30.000 inhabitants to 1.5 million inhabitants);
- 121 political districts (population ranging from 10.000 to 200.000 inhabitants);
- 2.300 communities (populations ranging from 100 to 200.000 inhabitants);
- spot-related indicators regarding environmental data (e.g. air pollutants concentration at around 180 sites).

Data quality & reliability

In terms of data quality, data reliability and completeness of databases we have evidence that none of these requirements is really covered to an absolutely satisfying degree in Austria. For example, we know the Austrian cancer registries (containing persons with new cancer diseases) to be incomplete at least for some provinces. Moreover there are many people

who doubt, that diagnosis selecting and coding in hospital admission statistics is of sufficient quality and reliability. These are only two examples of a much larger entity of supposed data-specific restrictions, not to talk of methodological problems when dealing with issues of epidemiology. As we know, there are similar problems in other European countries, which seriously hamper the establishment of reliable international information systems (e.g. HIEMS).

Methodology of data linkage in environmental epidemiology

In ÖGIS, we usually have to deal with health and socio-economic indicators related to areas an the one hand and with enviromental indicators, which are mostly related to measuring locations on the other hand. Moreover, health effects from environmental pollution usually are long-term-effects caused by long-term-exposition to low doses of pollutants, which complicates analysis of relationships. This is why we did not find methods of proper linkage of these two types of information up to now, but we know, that sophisticated methodology has been developed for these purposes in recent years. We did not make extensive use of such methods, but rather decided to go another way.

What we are trying in terms of environmental epidemiology, is to find so-called „hot spots“ of certain environment-related diseases (e. g. clusters of regions with extremely high incidence /mortality rates of asthma and bronchitis), which we propose as „priority areas for further research“. We imagine, that detailed epidemiologal studies should be processed in these regions in order to get further empirical evidence about the reasons of this clustering. Frequently, we have a plausible explanation for such clustering phenomena and in rare cases we also found statistical evidence about relationships (e.g. via time series analysis of COPD hospitalisation rates and air pollution in Vienna). But the evidence we found on relationships between socio-economic conditions and life-style factors on the one hand and “health outcome” on the other hand was much more convincing and promising for further investigation.

“Hidden environmental factors”

Therefore, ÖGIS today is mostly used for investigation of non-communicable diseases and their relations to socio-economic and life-style factors. Environmental factors like air pollution, traffic noise, radioactivity or drinking water quality play a comparatively small role due to the above mentioned reasons. But facing the Austrian situation with significant gaps in life expectancy, morbidity and health-related life-style-factors between the mountainous western parts and the plain regions of eastern Austria, we have to ask, whether there might be “hidden environmental factors” like landscape, mentality of the regional population or social networks, which much more influence health than environmental factors usually covered by measuring instruments do.

There is one striking example, which indicates, that socio-economic conditions (regional economic performance, family income, education of population) may not always be the best explanatory factors for health outcome: In the district of Lienz in the Southwest of Austria we observed a rather poor “socio-economic performance” on the one hand, but the highest life expectancy in the last decade on the other hand. Lienz is to be characterized as a low industrialized, tourism-oriented district within a lovely mountainous region and with outstanding health-related parameters of the residence population (e.g. much sports practising, very low body-mass-index on average, dense social networks, extremely good self-reported health) – all those in spite of the relatively poor socio-economic performance.

This is just one of the hints pointing to an explanation, that it is the mixture of a lot of factors, which finally determines regional health and that we have to be aware also of “hidden environmental factors” not addressable by the usual indicators when searching for answers to the questions: “Why do people develop diseases and - foremost - what keeps people healthy?”