Health GIS Applications and Its Future Trends in Turkey

Tahsin YOMRALIOGLU [1], *Ebru COLAK* [1], *Halil SOGUT* [2], *Turkey*

[1] Department of Geodesy and Photogrammetry Engineering, Karadeniz Technical University,
GISLab, 61080, Trabzon, Turkey.
[2] ESRI Turkey, 06800, Ankara, Turkey.

Abstract

Health GIS in Turkey is a new approach which is realized over the past 5 years. The Health Transition Project has been developed by Turkish Ministry of Health in order to achieve more efficient and effective health services entire country. With this project, health data are organized digitally on the national and international health data standards. It is aimed that health data are integrated into Geographic Information Systems in order to ensure knowledge to decision makers. Thematic maps are created concern about managing and planning of health services, managing of services of emergency aid, the investigation of spatial variation in disease risk and disease maps. Although there are only a few Health GIS applications which are worked together epidemiologists and GIS experts, their future trends are increasing on these studies day by day.

Key words: Health, GIS, spatial epidemiology, disease map, Turkey.

1. INTRODUCTION

The environment affects people's health and well-being. Geographic Information System GIS) provide a digital perspective for exploring relationship between people, their health and well-being, and changing physical and social environments. GIS can be used to map and analyze the geographical distributions of populations at risk, health outcomes, and risk factors. It can be used to explore associations between risk factors and health outcomes and to address human health problems (Cromley and Mclafferty, 2002).

Because many public health problems have a geographic component, GIS are being used increasingly in public health research. A GIS is basically defined as "a computer system for input, storage, management, analysis, and output of geographic or location-based information". A GIS can layer information about cases of disease, population demographics, hazardous exposure data, and health facilities. Using statistical techniques and the odds of disease occurrence, spatial analysis can reveal patterns and relationships that are difficult to find with other types of analyses (Roche, et al., 2002).

GIS are being used in spatial epidemiology to model where people live and their environments and make it easily possible to monitor residential distributions. Through the developments of GIS technologies and statistical methods in spatial epidemiology, health and population data are examined together. It is enabled to be research logical spatial variation for disease risk. Spatial epidemiology concerns the analysis of the spatial distribution of the disease risk or incidence. Many epidemiologists, public health

professionals and GIS experts have traditionally used disease maps when analyzing relationship between location, environment, and disease (Clarke, et al., 1996).

GIS provide ideal platforms for the convergence of disease information and their analyses in relation to population settlements, surrounding social and health services and the natural environment. They are highly suitable for analysing epidemiological data, revealing trends and interrelationships that would be more difficult to discover in tabular format. Moreover GIS allows policy makers to easily visualize problems in relation to existing health and social services and the natural environment and so more effectively target resources (WHO, 2003). However, GIS can play an important role in the detection, management and response to health problems. With the recent advances in GIS technologies, public health administrators in the countries are beginning to rely on consistent surveillance and health information data for routine decision-making (WHO, 2003).

2. A GENERAL OVERVIEW OF HEALTH SYSTEM IN TURKEY

Turkey is a democratic, secular, unitary, constitutional republic whose political system was established in 1923. Turkey's area is 774.815 square kilometers (Figure 1). The population of Turkey is approximately 67.803.927 and the population density is 80 person per square km according to the results of Census 2000 year (URL-1, 2007).

Whereas Turkey is the world's 17th most industrialized nation, it ranks only 96th out of 175 countries in the 2003 United Nations Development Programme human development index. Life expectancy is nearly ten years below the Organization for Economic Co-operation and Development (OECD) average, and infant and maternal mortality rates are among the highest of middle-income countries.
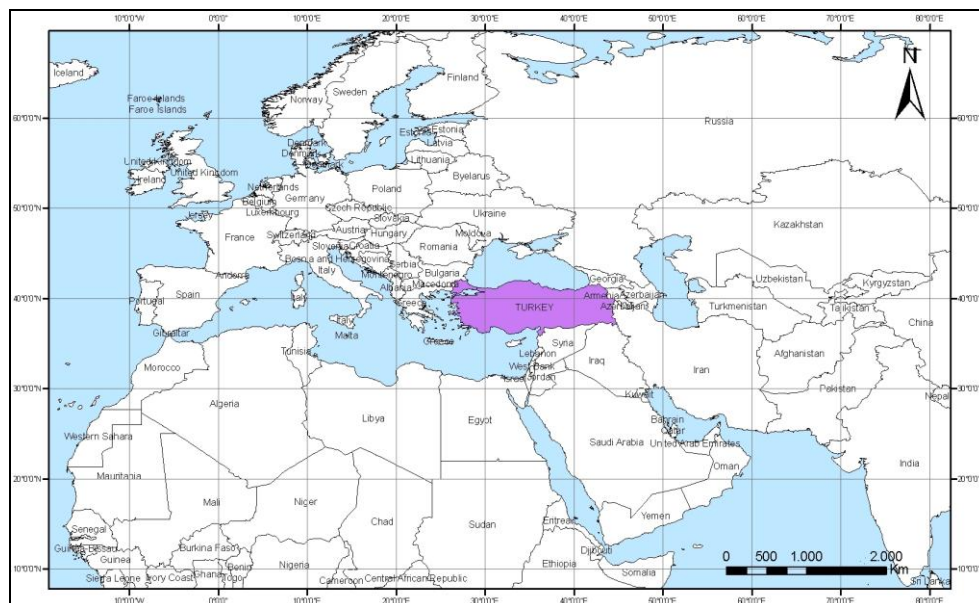

Figure 1. Location of Turkey

In Turkey, in 2003 there was one doctor for every 700 people, one nurse for every 590 people, and one hospital bed for every 400 people. The rural population is poorly served by the health-care system, which is much more developed in the western half of the country. Between 80 and 90 percent of the population, including self-employed workers, have health care provided by the national pension system, but the low quality of care encourages the use of private health providers in urban areas. The public health situation in Turkey has some important weaknesses to focus on: high infant and adult mortality rates, malnutrition, high prevalence of communicable diseases with low and uneven vaccination rates, unequal distribution and access to healthcare services, poor information systems, etc. According to the Minister of Health (MoH), the most important causes of mortality are infectious diseases during infancy and infectious diseases and their complications, mostly associated with malnutrition among 1-4 years old children. Accidents among adolescents and the population in their early twenties; heart diseases and accidents among the 25-44 age group; and heart diseases and respiratory disorders among the 45-64 age group are the leading causes of mortality.

The Turkish health care system is a highly complex structure, centralized and fragmented at the same time. The health care service is provided by public, social security, university, private and philanthropic organizations. Health policy-making and planning are divided and unevenly distributed between various stakeholders, but as a norm, provision of healthcare is linked to the financing institutions. There is not a "national health service" concept, and, according to some data, as much as a third of the population has no health insurance coverage at all. Turkey spends 6,6 % of GDP on health, representing 13 % of the total government expenditure (EU, 2006).

The ambitious "Health Transformation Programme" (PTH) launched by the Turkish Government in 2003, seeks to tackle all structural deficiencies, namely: universal health insurance, improve access and quality of healthcare services, the solid establishment of the Primary Care Network, role of the Minister of Health (MoH), change of the legislative environment, autonomy of healthcare facilities, capacity building and health professional training, enhancing patients' rights, accountable health information systems as well as drug and medical devices independent control institutions (EU, 2006).

Most international and multinational organizations, such as the European Commission (EC), World Bank (WB) and World Health Organization (WHO), have relevant intervention programmes in the health sector in Turkey. It is stated that they will share information regarding the scope of their work, and tendering and procurement of goods and consultant services to prevent any duplication and to ensure that their respective investments will complement each other. By most accounts, the health sector in Turkey is under-performing in achieving health outcomes commensurate with its level of socio-economic development. Substantial and sustained efforts will have to be made in the coming years if the country is to meet the objective of improving the health status of its people, including meeting the health targets of the Millennium Development Goals (MDGs) by the year 2015 (The World Bank, 2004).

3. HEALTH GIS IN TURKEY

Spatial analysis and mapping in epidemiology have a long history but until recently, their use in public health has been limited in the world. For more than 200 years researchers have used maps to visually represent data on disease incidence and mortality in order to discover clues and identify sources of risk (Jarcho, 1969). In Turkey, Health GIS concept is a new approach which is realized over the past 5 years. The spatial epidemiology applications using GIS are carried out by different academicians such as GIS expert, geographer, or surveying engineering rather than epidemiologist. The strategic action plan which was developed by The Ministry of Health of Turkey is to be enclosing studies on these fields and begin their works.

The Ministry of Health has developed the Health Transition Project in order to achieve more efficient and effective health services in Turkey. With this project, health data are organized digitally the national and international health data standards. It is aimed that health services are integrated GIS in order to ensure knowledge to decision makers. Thus GIS have enabled effectively results on such matters as the investigation of spatial variation in disease risk, the assessment of environmental risk, putting control strategies relative to health events, managing and planning of health services and resource allocation.

Thematic maps are basically created concern about managing and planning of health services, managing of services of emergency aid, the investigation of spatial variation in disease risk and disease maps. Although there are only a few Health GIS applications which are worked together epidemiologists and GIS experts, their future trends are increasing on these studies day by day. In comparison to epidemiologists, surveying engineers and geographers increasingly are interested in academic researches on Health GIS in Turkey. Epidemiologists and surveying engineers work together in a few projects. There are limited numbers of scientific researches include spatially and statistically analysis. However, diseases mapping at the small-area scale or province-based are generally being carried out in Turkey.

There are health GIS examples such as cancer maps and investigating between cancer cases and environmental risk factors in the province of Trabzon (Figure 2-3), monitoring of fenilketonuri illness (Figure 4), tracking hereditary blood disease, and mapping the distribution of dialysis patient and obesity for the Konya province, the epidemic distribution of measles for a district of Istanbul province, planning of emergency services (Figure 5), air pollution mapping and its influence for human health, and water pollution assessment by GIS (Colak and Yomralioglu, 2005; Colak, et al., 2006; Durduran, et al., 2004; Durduran, et al., 2005a; Durduran, et al., 2005b; Durduran, et al., 2005c; Ozatan and Durduran, 2006)
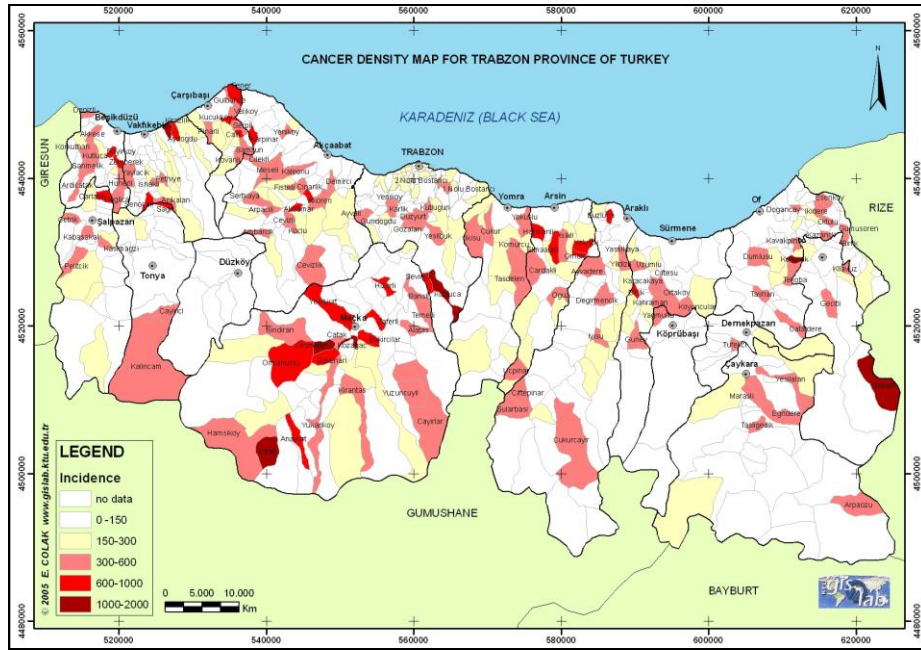
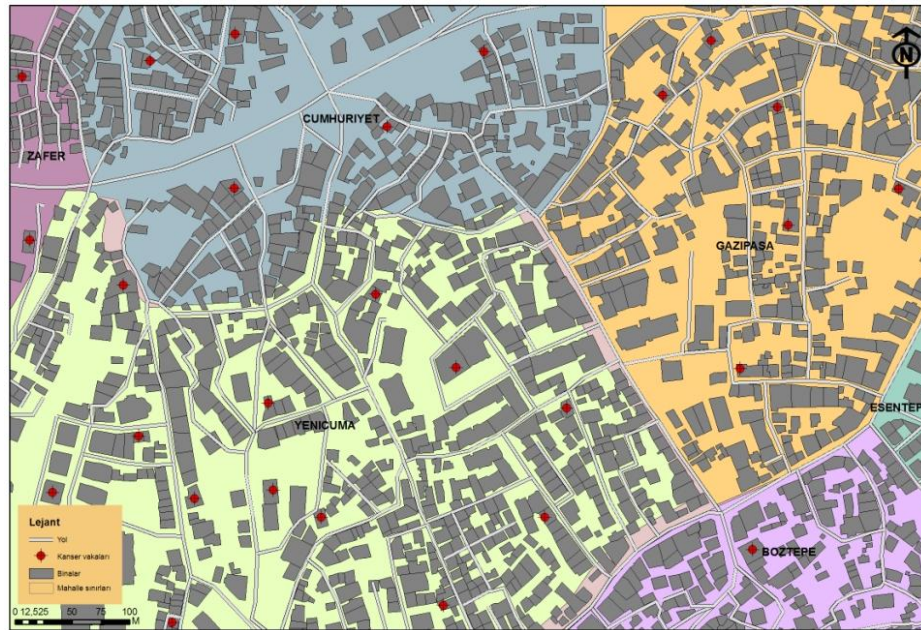Figure 2. Cancer Density Map of Trabzon Province (Colak and Yomralioglu, 2005)

Figure 3. Geographical distribution of cancer cases in Trabzon city centre (Colak and Yomralioglu, 2005)
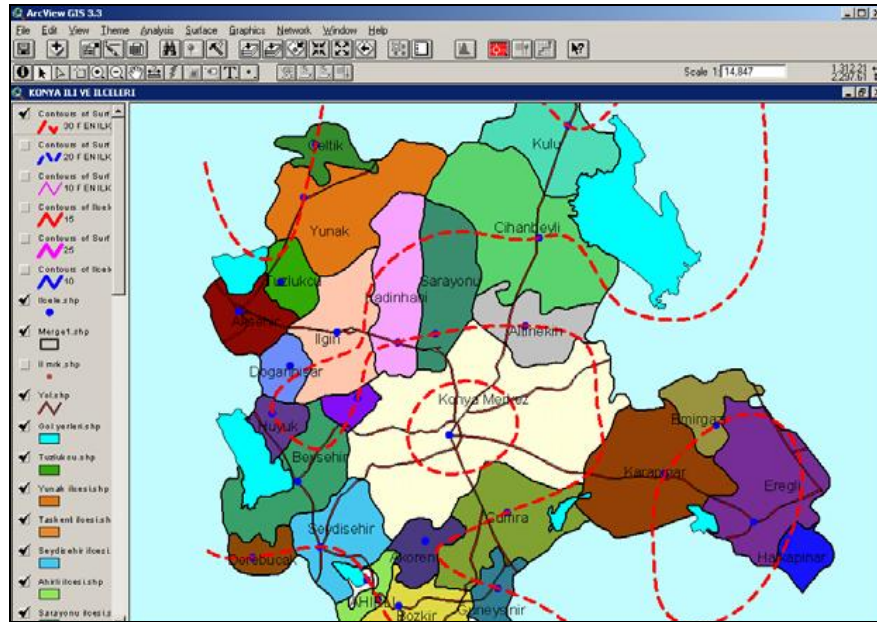
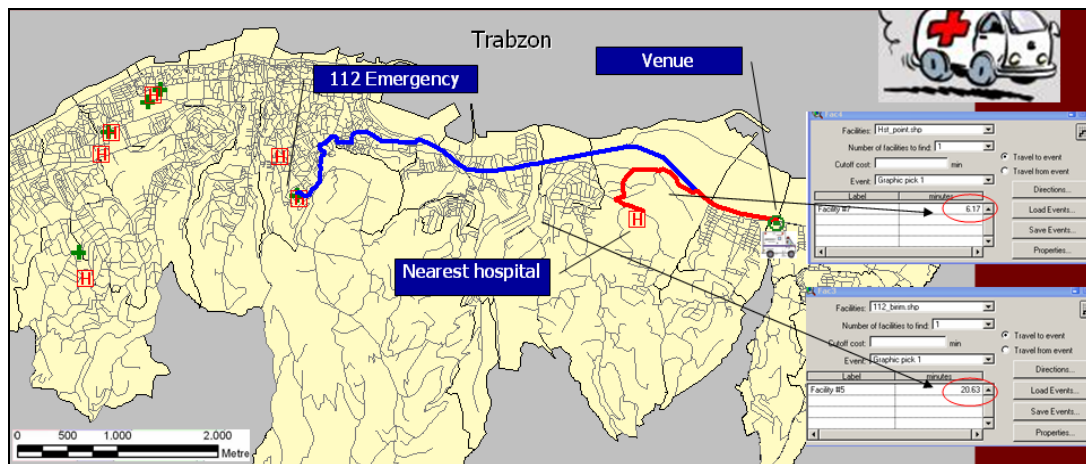Figure 4: Map of Fenilketonüri in Konya (Durduran, et al., 2004)

Figure 5. A case study of emergency service map (Colak, et al., 2006)

There are thematic disease map applications which are country-wide studies by WHO. So as to WHO produce Global Health Atlas, The Ministry of Health of Turkey gives WHO to health statistic data. For Turkey, WHO produce atlases such as no communicable and communicable disease maps (cholera, polio, rabies, tuberculosis, yellow fever, influenza, malaria) (Figure 6), the geographic, age and gender distribution of health-workface maps, health status indicators maps (child and adult mortality, prevalence of high blood pressure and adult obesity, healthy life expectancy, HIV prevalence, maternal and neonatal mortality, etc.), maps of behavioral and risk factor indicators (alcohol consumption, population using solid fuels, tobacco use, water access), maps of basic demographic and socio-economic indicators (WHO- Global Health Atlas, 2008).
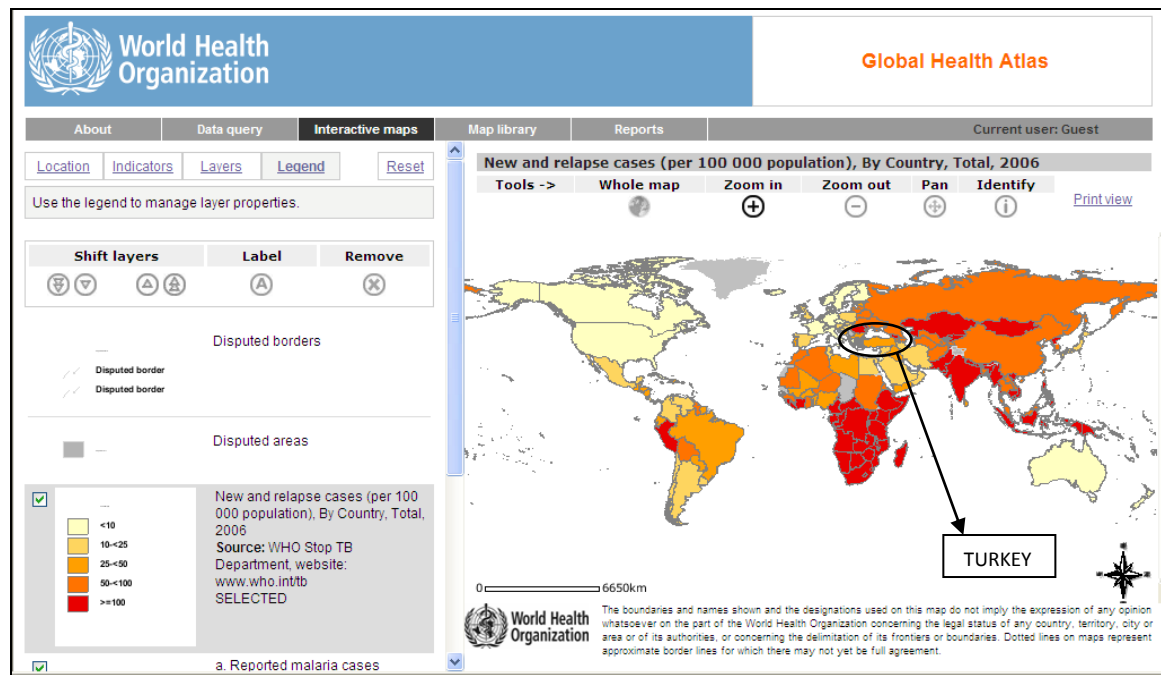
Figure 6. Map of new and relapse Tuberculosis cases (per 100 000 population), By Country, Total, 2006 (WHO- Global Health Atlas, 2008).

4. CONCLUSION

In this paper, Health GIS applications and its future trends in Turkey has been mentioned. Health GIS is a new idea which is realized over the past 5 years in Turkey. Through the developments of GIS technologies and statistical methods in spatial epidemiology, health and population data have started to be examined together. It enabled the research on logical spatial variation of disease risk. Disease mapping has made contributions to public health and epidemiology. In Turkey, many Health GIS applications have been produced such as temporal and spatial patterns of hazards for environmental health problems, infectious disease maps, cancer density maps, heart disease maps, hereditary blood disease maps, air pollution mapping etc. Thematic maps are basically created concern about managing and planning of health services, managing of services of emergency aid, the investigation of spatial variation in disease risk and disease maps. Although there are only a few Health GIS applications which are worked together epidemiologists and GIS experts, their future trends are increasing on these studies day by day.

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BIOGRAPHICAL NOTES

Tahsin YOMRALIOGLU graduated from the Department of Geodesy and Photogrammetry Engineering at Karadeniz Technical University (KTU) in Turkey in 1985. He received his MScE degree at KTU in 1988 and PhD degree at University of Newcastle upon Tyne in England in 1993. He appointed as Assistant Professor in 1994 and as Associated Professor in 1995 at KTU. Now he is a Professor on Land Management&GIS at KTU since 2001.

H. Ebru COLAK is a research assistant at Karadeniz Technical University (KTU), Turkey. She graduated from the Department of Geodesy and Photogrammetry Engineering at KTU in 2001. She received her MScE degree with thesis entitled "Producing Cancer Maps for Trabzon Province with Geographic Information Systems" in August 2005. She is studying on her PhD thesis. Her research interests are Geographic Information Systems, Health GIS and GIS History.

CONTACTS

Tahsin YOMRALIOGLU (PhD) & H. Ebru COLAK (MSc)
Karadeniz Technical University
Dept. of Geodesy, GISLab
61080 Trabzon / TURKEY
Tel. +90 462 3773657
Fax + 90 462 3280918

Email: ecolak@ktu.edu.tr / tahsin@ktu.edu.tr