A Parcel-based Health Information System in Turkey

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Key words: Geoinformation, Health information system, Geographic information systems (GIS), Turkey

SUMMARY

The health status of the Turkish population has improved significantly over the past few decades, accompanying improvements and functioning of the health-care system. The National Health Information System (NHIS), proposed by Turkish Ministry of Health, was started to perform the major reforms implemented under Turkish Health Transformation Program since 2003. E-Health aims to improve healthcare services in Turkey by developing a Secure Health Information Platform using latest Information Technologies. It is planned to establish an Electronic Health Records (EHR) for 71 million people which are the population of the country. Currently electronic health record of 71 million patients have been recorded that Family Physician Information systems provides for primary care. This paper aims at designing a parcel-based health information system that provides spatially the link between patient and primary health care. It is emphasized necessity of a parcel-based health information system for Turkey which is a model integrating together with the NHIS and The Address Based Population Registration System (ABPRS) including demographic data. Moreover, produced this model using GIS is oriented primary care services on the dynamic maps and linking together with the NHIS, the ABPRS and Urban Information Systems or Land Information Systems including spatial data.

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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).

The mission of recent research topics is to develop and support research innovation through integration of geographic information science, medical informatics, community informatics, and public health. 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).

Hospitals, health systems, public health agencies and decision makers increasingly use GIS as a tool for understanding population health and program planning and generating performance measurements for use as key components of management information systems. Additionally, e-Health initiatives can leverage GIS to achieve disease surveillance and outbreak detection objectives (ESRI, 2009).

Spatial analysis and mapping in epidemiology have a long history but until recently, their use in public health has been limited in the world (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 (Colak, 2008).

The health status of the Turkish population has improved significantly over the past few decades, accompanying improvements and functioning of the health-care system. 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 (Yomralioglu, et al., 2008).

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2. HEALTH SYSTEM IN TURKEY

Turkey is a democratic, secular, unitary, constitutional republic whose political system was established in 1923. Turkey's area is 783.562 square kilometers (Figure 1). The population of Turkey is approximately 72.5 million and the population density is 92.6 people per square km according to the results of Census 2009 year (URL-1, 2010).

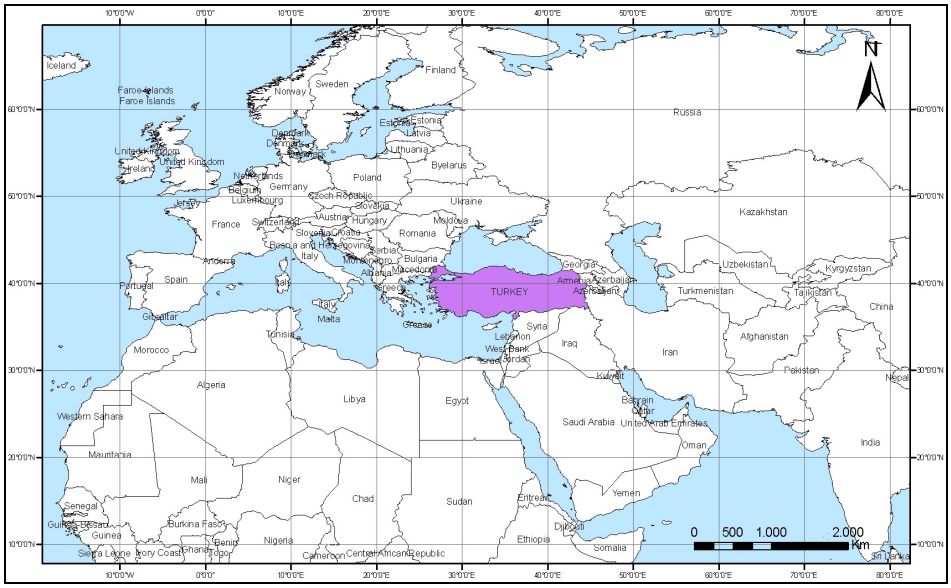

Figure 1. Location of Turkey

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.

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).

Turkish Ministry of Health has initiated the Health Transition Program in order to achieve more efficient and effective health services in Turkey and started to obtain results after setting up required components under this program. The ambitious "Health Transformation Programme" (HTP) 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 Ministry of Health, 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 by the year 2015 (The World Bank, 2004).

3. HEALTH INFORMATION SYSTEM

An optimum management is a requirement in order to increase the efficiency of health services. Making more works with fewer sources, using the sources effectively is increasingly becoming more important for the health sector. The purpose of the efforts for the health systems is enabling the presentation of the service by a tool to minimize the losses of the service at the level of effectiveness.

WHO had long time ago indicated that health information systems were a criteria to reach to "health for all" in 2000 (Mahler, 1986). It is also emphasized that advanced health information systems were required for an effective management. In this context, the Ministry of Health in Turkey made a decision to use the information systems as a tool in order to increase the effective management of the health services.

Turkey's National Health Information System (NHIS) initiative has started with the launch of the Health Transformation Programme in 2003. NHIS provides a nation-wide infrastructure for easy and efficient sharing of electronic health records. Turkish Ministry of Health established 10 working groups for NHIS. These working groups conducted the assessment of the current situation, projects, initiatives, and policy studies in their respective fields.

The conversion of the existing LAN-WAN into a true health network platform to be known as Sağlık-Net, providing linkages, services and databases (e.g. minimum data sets of Electronic Health Records) to the all those authorized in the health sector (Figure 2). The start of a National Health Care / Management Information Systems (NHC / MIS) comprising of a hospital MIS and reduced version of that as a clinic MIS (Ozcam, 2007).

The data sources of the health statistics are the administrative registers of the Ministry of Health and the surveys carried out by the Ministry of Health and Turkey Demographic and Health Survey realized for every five years. ICD-10, suggested by WHO, is used for collecting the inpatient statistics. Data of the health care services statistics, inpatient statistics and other statistics are collected by the Ministry of Health for whole Turkey.

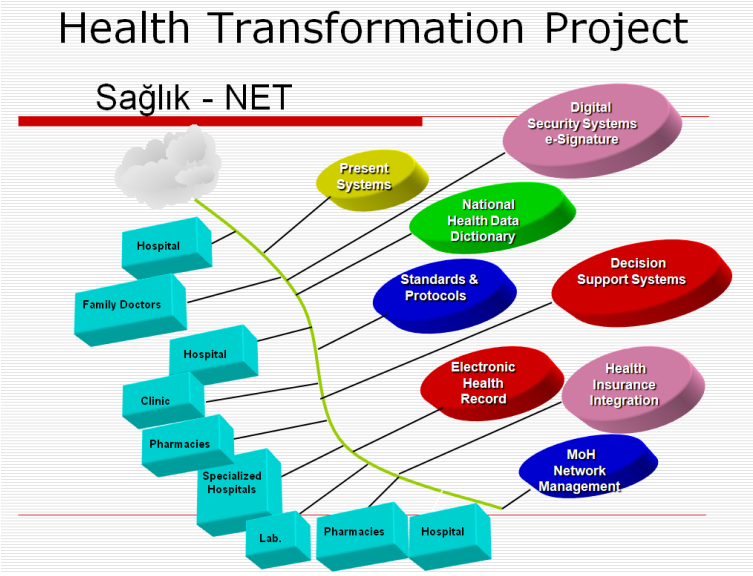

Figure 2. Saglik-NET on Health Transformation Project (Ozcam, 2007)

4. ADRESSES BASED POPULATION REGISTRATION SYSTEM

In Turkey, Addresses Based Population Registration System (ABPRS) is set up by TURKSAT in order to record updated population information of localities and monitor population movements. Address Based Population Registration System is established by setting up the National Address Database and matching usual residence addresses and the MERNIS (Central Population Registration System) registers according to the Turkish Republic identification numbers (TURKSAT, 2010).

The National Address Registry System (NARS) is set up to standardize addresses, monitor the address qualifications up-to-date and conduct the address-based public services more effectively and efficiently. In every residence, the numeration studies held in accordance with this standard and this address information is conveyed into the National Address Database developed by TURKSTAT over web in order to share this information with the public institutions and organizations of the NARS. Each address in Turkey is recorded in the detail level of quarter, street and including the interior door numbers. For each study which necessitates address information, the National Address Database will constitute the basic infrastructure. Each quarter, street and avenue in the database will be given a constant presentation number; thus monitoring of the changes in address components (e.g. name changes, divisions, unions) backswept will be possible. Each address will have a constant presentation number and compose the base of the ABPRS (TURKSAT, 2010). In order to match persons and their usual residence addresses in the National Address Database, field study was realized and the ABPRS set up in 2007 by TURKSTAT.

5. DESIGNING PARCEL BASED HEALTH INFORMATION SYSTEM BY GIS

In this paper, designing a geographical information system that evaluates the health data, personal information and spatial information all together was aimed. It was also aimed to integrate this system with the Address Based Population Registration System (ABPRS) and the National Health Information System (NHIS) and to evaluate it together with spatial information through maps.

In the designed system, there is a relationship between electronic health registers lying under the NHIS which is tried to be formed by the Ministry of Health and the ABPRS. In the electronic health registers, all data about individuals exist. In the ABPRS, on the other hand, there are information about all demographic information of individuals and also the information of the addresses they reside on. The identification number of each individual enables the relationship between these two databases. From this point of view, as it is seen on Figure 3, health data could be geocoded by the address information of the person id from the ABPRS and by person id number from the electronic health records. In a similar way, it is possible to access to both health registrations and demographic data with the person id numbers of individuals residing on the buildings on each parcel. With the help of this system, all health events could be followed spatially. In this study, Geographic Information System is being used as the most effective tool, in which both spatial and non-spatial data could be evaluated all together and the relationship with the related database could be provided.

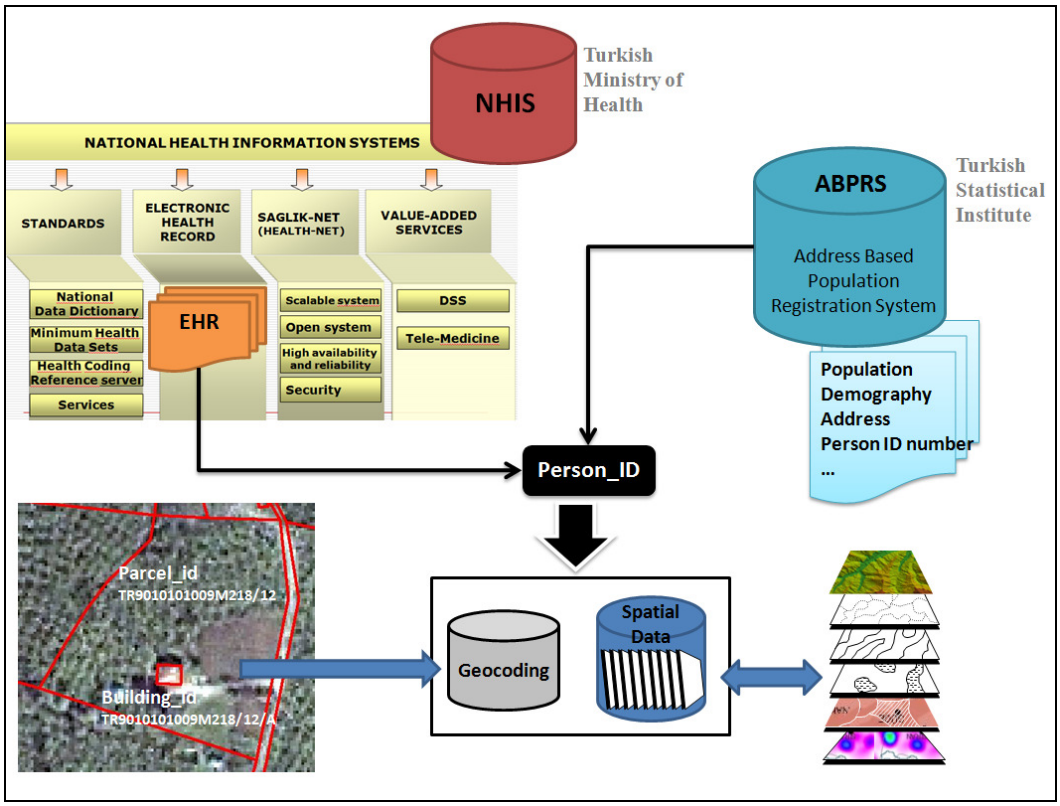

Figure 3. Designing parcel based health information system

In this designed system, the parcels available on the cadastral structure have a unique code. The buildings on these parcels and flat door numbers which are independent sections on these buildings, on the other hand, are described as in relation with that parcel number (Aydinoglu, 2009). The relationship between parcels and the houses on each parcel is provided by these unique codes. The individuals residing on each house are also described by associating the person id number and the building id number. This association is carried out by being geocoded on the cadastral map according to address information of individuals in the ABPRS. The individuals are positioned as geographically by geocoding. Unique address code, in which the address is defined in accordance with individual address information from the national address database which is one of the sub constituents of the ABPRS, is taken as base in the geocoding process. Accordingly, on Figure 4, the geographical relationship between the parcels on the cadastral map, the exist buildings on the parcel and the residents.

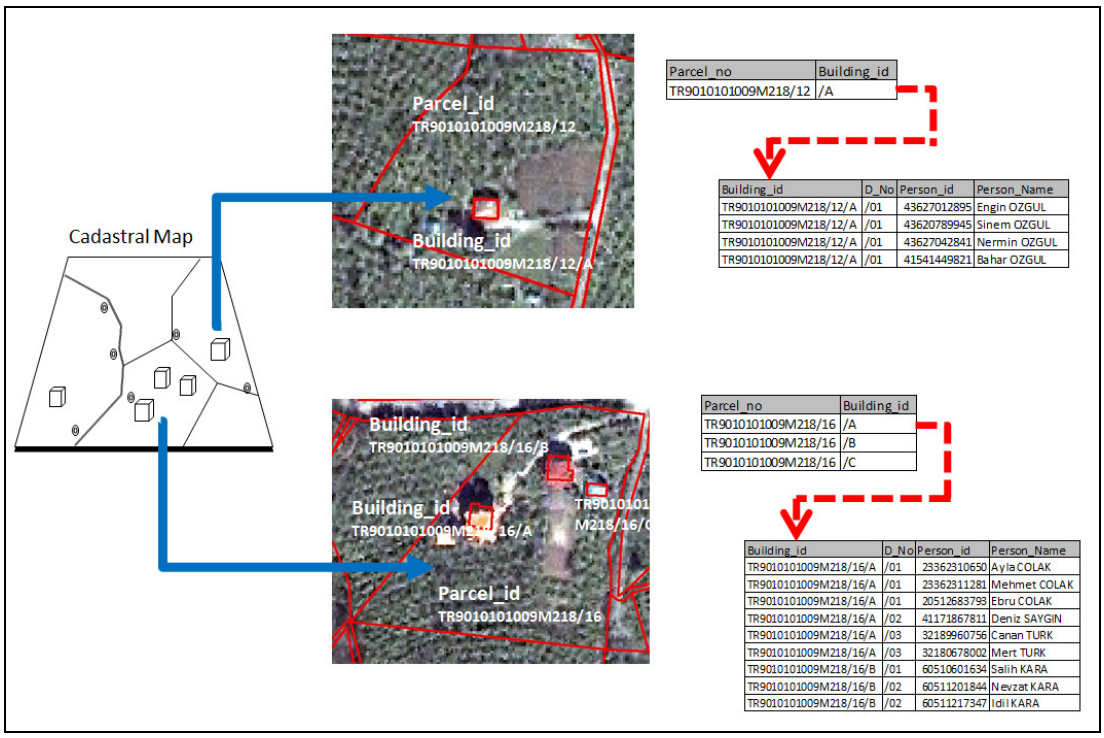

Figure 4. The geographic relationship between parcel, building and person id numbers

6. CONCLUSION

In this paper, to associate with geography the Turkey Health Information System, which has been tried to be performed since 2003, an integrated geographical information system design was planned. In this designed system, Turkey Health Information System and the ABPRS are evaluated all together and also their relationship is enabled spatially. Therefore, it was aimed to follow the distributions of health services and events on geography. Additionally, a geographical information system, in which two separate database, which are under the charge of different institutions and which include different information could spatially be evaluated all together is designed. Through the designed parcel based health information system for

Turkey, it is enable to information about parcels, which are accepted to be the smallest unit of the cadastral aspect, the buildings on the parcels and even the residents in these buildings. These information constitute the basis of the epidemiologic studies, in which the health events related to these individuals are examined and demographic information are evaluated all together. Thus, base maps should be acquired in the studies of following and controlling several health events.

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BIOGRAPHICAL NOTES

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