THE USE OF GEOGRAPHIC INFORMATION SYSTEM - SIGEPI FOR MONITORING OCCUPATIONAL DISEASES AND THOSE RELATED TO PROFESSION FROM ARAD COUNTY

LADINIA ARDEU[1], DORIN IOSIF BARDAC[2], CARMEN DANIELA DOMNARIU[3], IONELA MANIU[4]

[1]PhD candidate "Lucian Blaga" University of Sibiu, [2,3,4]"Lucian Blaga" University of Sibiu

Keywords: *state of health, SIG SIGEPI, demographic data, economic data, specialized medical cabinets, risk factors*

Abstract: *Maintaining the state of health and the battle against diseases falls among the oldest human concerns. Professional pathology includes occupational diseases but also work-related diseases. "Geographic Information System- SIG is seen as a special case of general information systems. The information is derived from the data interpretation which is the symbolic representations of characteristics". As a working hypothesis, we started from the premise that specific SIG operations, over the data space, make these systems both effective tools for the visualization of multiple data in the forms of maps, and tools for the analysis of information regarding land surface. The study material contains aspects from the information system of Arad county, which can be included into a geographic information system, so: demographic data, economic data and specialized medical cabinets. SIG applicability can be accomplished in occupational medicine, for obtaining the following functions: hierarchy of occupational problems; establishing lines of actions; policies development, strategies and programmes aiming the possible illnesses and work-related diseases; ensuring work conditions and elimination of risks; protecting the population against the risks from the workplace; monitoring professional diseases and work-related diseases; consequently improving the population's state of health, which will be reflected in health indicators.*

Cuvinte cheie: *stare de sănătate, SIG SIGEPI, date demografice, date economice, cabinete medicale de specialitate, factori de risc*

Rezumat: *Păstrarea stării de sănătate şi lupta împotriva bolilor se înscriu printre cele mai vechi preocupări ale omului. Patologia profesională cuprinde bolile profesionale dar şi bolile posibil legate de profesie. "Sistemele Informatice Geografice, prescurtat SIG, sunt văzute ca un caz special de sisteme informatice generale. Informaţia este derivată din interpretarea datelor care sunt reprezentări simbolice ale caracteristicilor".Ca şi ipoteză de lucru s-a pornit de la premiza că operaţiile specifice GIS, asupra datelor spaţiale, fac din aceste sisteme atât instrumente eficace pentru vizualizarea unor date multiple sub forma hărţilor, cât şi instrumente pentru analiza informaţiilor privitoare la suprafaţa terestră. Materialul de studiu cuprinde aspecte din cadrul sistemului informaţional al judeţului Arad care pot fi incluse într-un sistem informatic geografic, astfel: date demografice, date economice şi cabinete medicale de specialitate. Aplicabilitatea SIG se poate realiza în medicina muncii, pentru realizarea următoarelor funcţii: ierarhizarea problemelor de medicina muncii; stabilirea direcţiilor de acţiune; dezvoltarea politicilor, strategiilor şi programelor vizând bolile profesionale şi bolile posibil legate de profesie; asigurarea condiţiilor de muncă şi eliminarea riscurilor; protejarea populaţiei împotriva riscurilor de la locul de muncă; monitorizarea bolilor profesionale şi a bolilor legate de profesie; în consecinţă, îmbunătăţirea stării de sănătate a populaţiei, care s-ar reflecta şi în indicatorii de sănătate.*

Maintaining the state of health and fighting against diseases falls among the oldest human concerns and therefore, from ancient times till few a decades ago, almost all the medical scientific achievements have been used exclusive for healing the patient, the term used for defining this medicine's character being "curative medicine".

From the moment the medicine has advanced and began to focus on the preventive aspect of health activities, the priority objectives of today's sanitary activities are the prophylactic ones.

Knowing the health status of the population or communities starts from defining the individual state of health and it is important because it:

- allows to establish the priority issues and health needs.
- leads to the elaboration of interventions for individual, community and factors that influence the health.
- "must be an important indicator in the planning and allocation of resources, both in territorial profiles and regarding the types of health services",
- "health is a priority of development, not an annexe to the advance of society".

The history of occupational medicine falls on the long road from the caveman to that launched into the space "as a noble and thrilling adventure in the history of human civilisation and culture".

Professional pathology includes occupational diseases and work-related diseases.

[1]Corresponding author: Ladinia Ardeu, Str. Simion Balint, Nr. 10, Arad, România, E-mail: ardeul@yahoo.com, Tel: +40742 015232
Article received on 02.07.2013 and accepted for publication on 01.10.2013
ACTA MEDICA TRANSILVANICA December 2013;2(4):170-173

"Geographic Information Systems – SIG is seen as a special case of general information systems. Information is derived from data interpretation which is a symbolic representation of characteristics".

The value of information depends on several elements, including the temporal character, circumstances in which they are applied and the cost of collecting, storing, processing and description. From the total cost of accomplishing a geographic information system, the collection of data represents about 70%.

Occupational morbidity study in Romania highlights some general and specifics overall aspects, namely:

- The correct recognition of occupational risks and their supervision at the working place represents the basis of the work domain of occupational health physicians, imposing the access to occupational health services to all workers from Romania, regardless of the working place, for the real coverage of these issues.
- The occupational physician is the employer specialist in problems related to health risk management, a member of health and security committee in work, having the duty to report and communicate occupational hazards in order that those responsible to take early prophylactic technical, organisational and medical measures.

As a work hypothesis, we started from the premise that specific GIS operations over the space data make this systems both effective tools for the visualisation of multiple data as maps, and tools for the analysis of information on land surface.

The study material comprises aspects within the information system of Arad County that can be incorporated into a geographic information system, such as:

I. Demographic data:
   a. Stable population, on localities;
   b. Population density.

II. Economic data:
   a. Economic units on industrial branches;
   b. Number of workers per unit, industrial branches and localities;
   c. Risk factors on economic units and localities;
   d. Morbidity by work-related diseases.

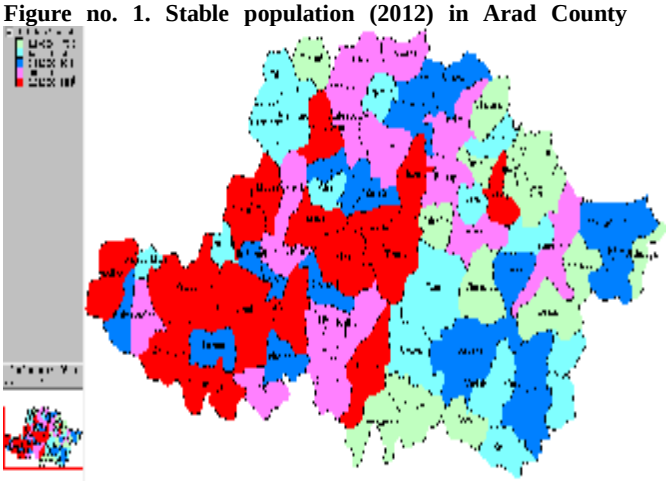
III. Specialized Medical Cabinets:
   a. Family Doctors;
   b. Occupational Medicine Doctors.

The map of the administrative-territorial units of Arad county was achieved at a scale of 1:100000 using scanned cartographic support, the georeferenced digitization of this map being made available by the Faculty of Geography from "Babeş-Bolyai" University of Cluj Napoca (Prof.Univ.Dr. Ionel Haidu and his collaborators)

Arad County covers a total of 75 settlements with a population over 300 and below 150000 inhabitants, the most populated cities being the one with red colour, in the west of the county, these having more than 5000 inhabitants.

The areas occupied by these communities are over 2000 and under 26000 ha, totally 775409 ha, the largest cities hovering in mostly the south-central part, west, these having more then 10000 ha.

Figure no. 1. Stable population (2012) in Arad County



Population density is higher in the west of the county, the most populated localities are: Arad, Vladimirescu, Livada, Şofronea, Curtici, Macea, Sântana, Fântânele, Lipova, Pâncota, Chişineu-Criş, Ineu, Sebiş.

Figure no. 2. Arad County surface

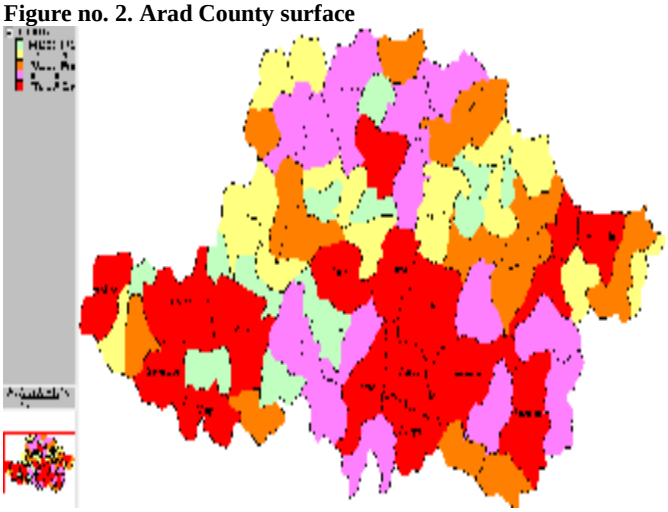
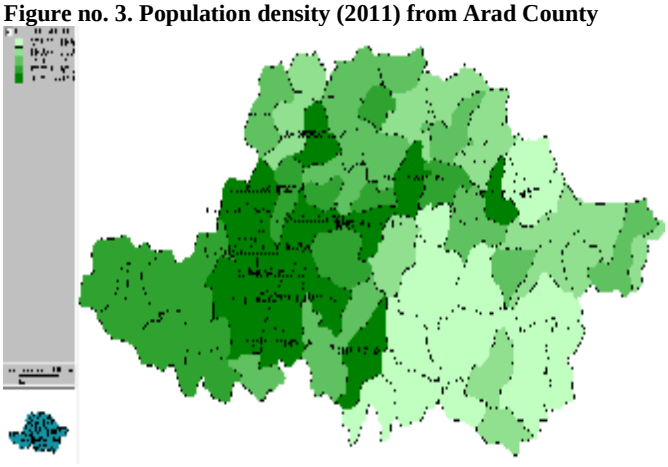
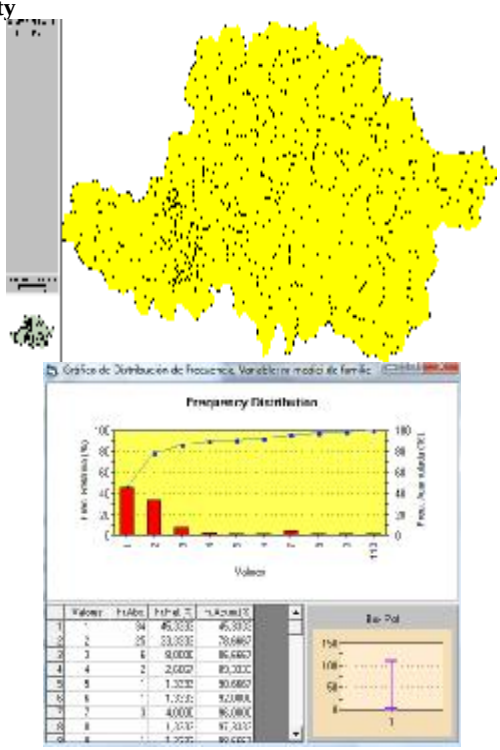


Figure no. 3. Population density (2011) from Arad County



45 % of the localities form the county have one family doctor, 25 % have 2 family doctors, the largest number of family doctors being, as it is normal, in the city of Arad, 110.

Figure no. 4. Number of the family physicians of Arad County



The occupational medicine doctors, from the existing records within the Public Health Department of Arad, can be found only in the city of Arad (35 occupational medicine doctors).

Figure no. 5. Number of occupational medicine doctors from Arad County

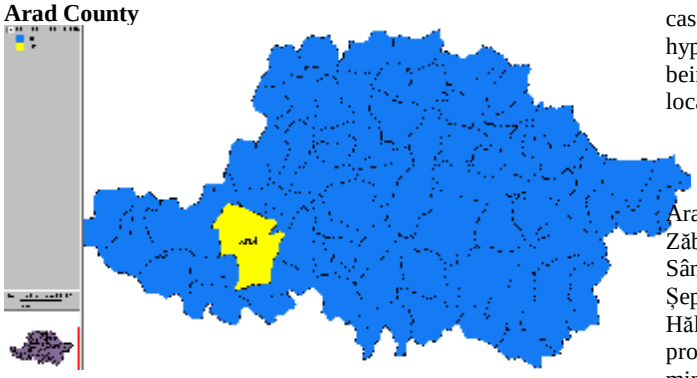
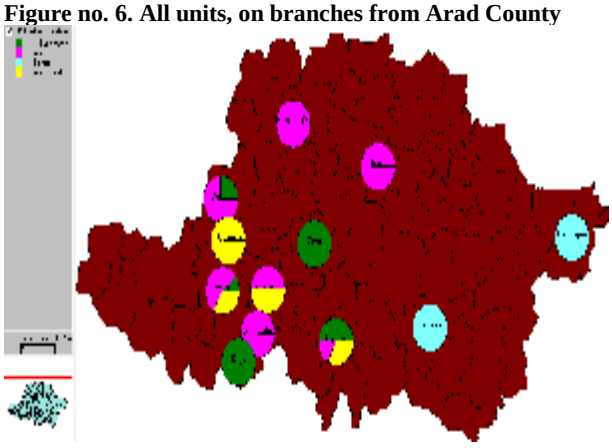


Figure no. 6. All units, on branches from Arad County

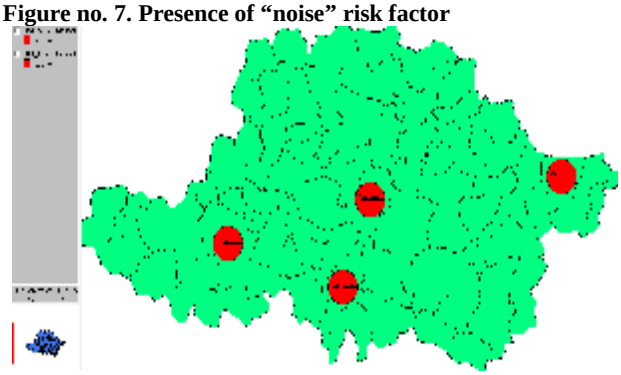


In the city of Arad, there are predominantly industrial units (over 50%), agricultural and trade units. Most of the units from Arad County have an industrial profile, in Arad, Vladimirescu, Fântânele, Curtici, Chișineu-Criș, Ineu, Lipova. Trade units in Arad, Vladimirescu, Lipova and Curtici, and agricultural units in Arad, Șagu, Lipova, Șiria, Curtici. Mining units operate in Bârzava and Hălmagiu, but there are professional diseases reported from other mining exploitation from outside of the county due to the residence outside the Arad county.

- **Risk factors: Noise à deafness, professional hypoacusis**

"Noise" risk factor appears in units from the localities Arad, Lipova, Târnova and Vârfurile, in the workers coming from units with this profile: Minister of Industry (SC IMAR SRL, SC ASTRA VAGOANE SRL, SC IMAR SRL, SC Termoelectrica SA, SC CET SA) for the city of Arad, (SC CIMVEST) for Lipova, (SC SILFOR SRL) Vârfurile, SC Foraj Sonde) for Tarnova.

Figure no. 7. Presence of "noise" risk factor

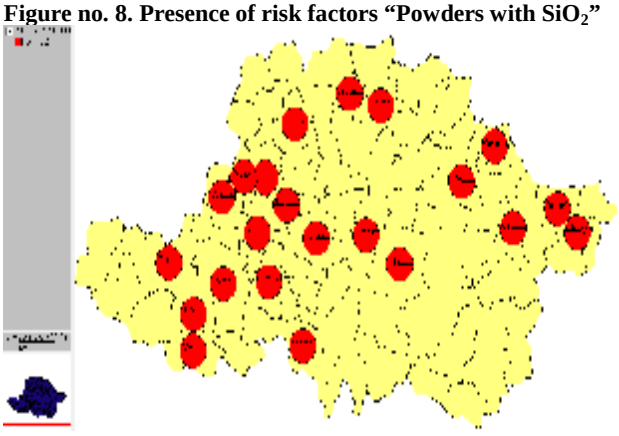


"Noise" factor "noise" caused the appearance of 14 cases of professional diseases, including: deafness, professional hypoacusis, between 2001, 2002, 2004, 2009, most of the cases being found in the city of Arad (11) and only one case in other localities.

- **Risk factor: Powders with SiO_2 à silicosis, silicosiderosis**

The risk factor "Powders with SiO_2" appears in units from Arad and the surroundings localities: Pecica, Felnac, Vinga, Zăbrani, Vladimirescu, Zimandu Nou, Curtici, Macea, Șimand, Sântana, but also in units in north-eastern county: Chișineu-Cris, Șepreuș, Cermei, Sebiș, Moneasa, Gurahonț, Vârfurile, Hălmagiu and in the centre: Șiria, Târnova, Tauț, units with the profile of activity: Mechanical engineering, cleaning castings, mining.

Figure no. 8. Presence of risk factors "Powders with SiO_2"

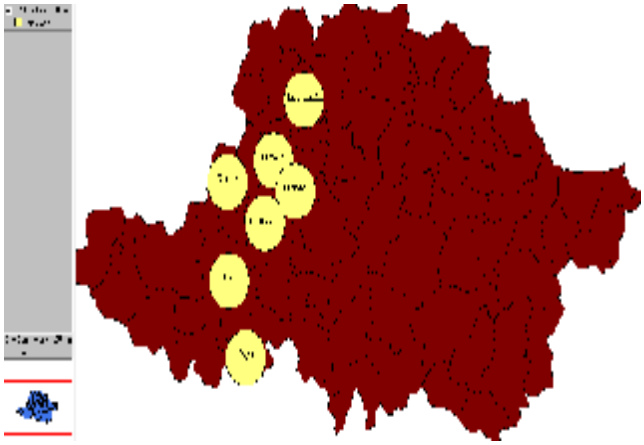


In Arad county, there were 138 cases of occupational diseases in total caused by the risk factor "Powder with SiO_2" (silicosis, silicosiderosis), such cases being reported each year during 2001 and 2011, most of the cases being found in Arad (93), Hălmagiu (14), Vladimiresu (3), Șimand (3), Târnova (3).

- **Risk factor: Mineral oil, other chemicals à dermatoses**

The risk factor "mineral oil, other chemicals" appears in units from Arad and the localities of Șagu, Zimandu-Nou, Sântana, Curtici, Șimand, Chișineu-Cris, in the workers coming from units with profile activity of: Mechanical engineering, Locksmiths, Ministry of Agriculture.

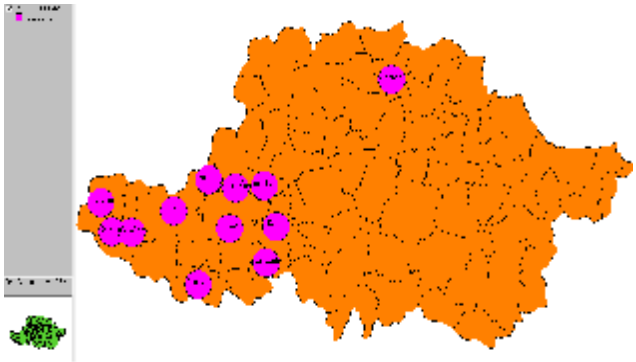
Figure no. 9. Presence of risk factors "mineral oil, other chemicals"



- **Risk factor: Gas welding, iron oxides à siderosis**

The risk factor "Gas welding, iron oxides" appears in the units located in the western-central area of the county: Arad, Iratoșu, Șofronea, Zimandu-Nou, Vladimirescu, Fântânele, Pecica, Vinga, Nădlac, Șeitin, Semlac, Cermei in the workers coming from units with profile activity of: Mechanical engineering, welder.

Figure no. 10. Presence of risk factor "Gas welding, iron oxides"



85 of the cases presented professional diseases caused by "Gas welding, iron oxides", 71 of those cases being in the city of Arad (71) and in the surrounding localities between 2004 and 2009, 2011.

One of the major advantages of Geographic Information Systems is that it allows an effective map-based communication of data regarding occupational medicine.

In conclusion, SIG applicability can be achieved in occupational work for accomplishing the following functions:

- hierarchy of occupational problems;
- establishing lines of actions;
- development of policies, strategies and programmes aiming at possible illnesses and work-related diseases;
- ensuring work conditions and risks elimination;
- protecting the population against the risks from the workplace;
- monitoring professional diseases and work-related diseases;
- consequently, improving the population's state of health, which will be reflected in health indicators.

BIBLIOGRAPHY

1. Marcu A şi colaboratorii, Sănătate Publică şi Management Sanitar, Editura All, Bucureşti; 2002.
2. Bardac DI, Stoia M. Elemente de Medicina Muncii şi Boli Profesionale, Editura ULB Sibiu; 2007.
3. Băduţ M. Sisteme Geo-Informatice pentru Administraţie şi Interne-GIS, Editura Conphys; 2006.
4. Benea I. Analiza spaţială SIG şi organizarea spaţiului geografic, Universitatea Spiru Haret; 1998.
5. Revista ACTTM nr. 2, Agenţia de Cercetare pentru Tehnică şi Tehnologii Militare, Bucureşti; 2005.