Health Scope. 2013 November; 2(3): 116-8. DOI: 10.17795/jhealthscope-14730

Published online 2013 November 3. **Editorial**

The Role of GIS in Occupational Health Practice: A New Approach

Seyyed Ali Moussavi Najarkola [1,*], Ramazan Mirzaei [2]

[1]Department of Occupational Hygiene Engineering, Collage of Health, Shahid Beheshti University of Medical Sciences, Tehran, IR Iran
[2]Health Promotion Research Center, Zahedan University of Medical Sciences, Zahedan, IR Iran

*Corresponding author: Seyyed Ali Moussavi Najarkola, Department of Occupational Hygiene Engineering, Collage of Health, Shahid Beheshti University of Medical Sciences (SBUMS), P. O. Box: 19835-35511, Tehran, IR Iran. Tel: +98-2122432040-41, Fax: +98-2122432037, E-mail: mosavi58@gmail.com.

Received: September 8, 2013; **Revised:** October 1, 2013; **Accepted:** October 4, 2013

Keywords: Occupational Health; Occupational Health Practice; Geographic Information System; GIS; Spatial Analysis

1. Introduction

Parallel to the development of the knowledge in occupational health practice, use of various tools or systems for better understanding of the spatial mapping of exposures and diseases is inevitable. Geographic information system (GIS) is one of the most applicable softwares that can help the occupational hygienists. GIS is a common product of computer and geographic science that integrates a set of components, including hardware, software, geographic data, geographic users and methods to view and manage the data associated with specific spatial positions, analyzing the relationship between spatial data and spatial modeling processes that assists the user in data management, complex problem solving and decision making (1, 2). Therefore, use of GIS in occupational health practice programs can play an important role for better understanding of the exposure risks and making decisions for problem solving (3). Creating a spatial relation in occupational health practice such as the relationship between diseases and their distribution in different areas is so important (4, 5).

2. Geographic Information System (GIS)

Information related to geographical location called geographic information, describing the spaces on the earth (3). These data have mainly three important dimensions: the spatial dimension that answers to the question of where; the nature of the studied concerns that answers to the question of what and occasionally a third dimension of time for dynamic phenomena that answers to the question of when (1, 2). Therefore, the space dimension plays a key role in the geographic information. Location of phenomena on the earth is defined on the geographic coordinate system as the geographic latitude and longitude (2). The best method to display the geographic information is the map which through a graphical representation provides the possibility of more effective understanding of geographic information to users (4). GIS or science is a computer-based tool for analyzing and mapping spatial data (1-3). GIS, as a set of software, is a computer-based system for input, storage, manipulation, and output of geographic information that integrates hardware, software, data, user, and methods to solve the problem, make the decision, and help planning (5). These capabilities make GIS as a valuable tool for explaining events, predicting outcomes, and planning strategies in a wide range of public and private enterprises (2).

3. Fundamental Elements of GIS

GIS integrates several fundamental key elements including: hardware, software, data, users, and methods (1-4). GIS Hardware is a computer as well as a printer and other complementary devices on which GIS is set up, implemented and displayed by monitors or makes hard copies of the results (2). GIS software with different versions (such as ARC/INFO GIS) runs on a wide range of hardware types, from personal computer (PC) to laptop or even other networked configurations. GIS software provides the abilities of storing, analyzing, and displaying geographic information. Arc-Info and Arc-View are two commonly used types of GIS software available commercially (3, 4). GIS data seems to be the most important element of GIS integral. A GIS tool must be able to convert point data to continuous area data and consequently, to the spatial and global data as required. Geographic and tabular data, images from aerial photographs, and maps are three common types of data presentation in GIS (2, 3). GIS users range from GIS specialists to non-special users

Implication for health policy/practice/research/medical education:
This article especially pays attention to the role and applications of the Geographic Information System (GIS) in occupational health practice, mainly in occupational health situation analysis and practice for the prevention and control of health problems (diseases) resulted from exposure to physical, chemical, ergonomical, psychological and biological harmful agents by producing spatial or global maps.

such as public, environmental and occupational hygienists for their different purposes (3). GIS Methods imply on the organizational practice plan, procedures and rules governing on each organization. But some resources are believed that there are five main components to a GIS including network, hardware, software, database, and management (4). GIS network relies highly on the internet or intranet networks for quick communication and sharing the electronically information regarding topology, geography, etc. (1, 2). GIS management includes all organizational procedures and rules affecting on data management, reporting and mapping on GIS (4).

4. Functions of GIS

GSI uses different interpolation methods, mainly Kriging interpolation method, for interpolating and converting the originally point data to continuous area with adequate precision and appropriate cell size (2, 4). The map resulted from interpolation allows the possibility of analysis of data status in different parts of the desired areas on the earth (4). It is possible to determine and compare the continuous areas of obtained different classes by classification of prepared map (3). Finally, the desired contours map (contours lines) is obtained from the continuous data map using three-dimensional analysis methods presented in GIS (4). Spatial coordinates obtained within a desired area can be easily transferred to the global coordinate system (5).

5. GIS in Occupational Health Practice

Nowadays, occupational health practice is one of the most important concerns in many industrial developed and developing countries. GIS can also be used for point, surface and spatial data management, spatial analysis, configuration and visualization, and mapping in occupational health practice (6, 7). Application of GIS in occupational health practice can help the occupational hygienists to better understand and make decisions for problem solving (8). Using GIS mapping in occupational health practice is somewhat a new approach (8). GIS can be used for: noise monitoring (8, 9), noise-induced hearing loss (NIHL) screening (8, 9), ionizing and non-ionizing radiation, lighting assessment, air pollution control, air pollution dispersion models, air emissions behaviors, occupational and environmental toxins, animals health and their relationship to human health, occupational health tracking network, mapping based on the organizational patterns, exposures trends overtime, exposure modeling, occupational population at risk, occupational health services, occupational pollutants exposure mapping, acute or chronic diseases site mapping, practitioners' demographic information, occupational risk factors assessment, occupational cancer, injury prevention, work-related musculoskeletal disorders (WMSDs) prevention, epidemiological studies, environmental toxic agents monitoring (heavy metals, mineral materials, organic materials, gases and vapors, dusts, volatile organic compounds (VOCs), plant and animal poisons), outburst unsafe zones, emergency and preparedness response master plan, and occupational health interventions (8-10).

GIS can provide relation among human sites, pollution sources and environmental conditions on a spatial map as layer-on-layer. GIS can assist the occupational hygienists by steering in occupational health situation analysis to prevent health problems (occupational diseases or disorders) resulted from exposure to physical, chemical, ergonomical, psychological and biological harmful agents by creating spatial or global maps.

Briefly, GIS can be used in occupational health practices, mainly in occupational health situation analysis for prevention and control of health effects due to exposure to physical, chemical, ergonomic, psychological and biological harmful agents by creating spatial or global maps. Thereby, application of GIS in occupational health practices, as a new approach, can play key role in control of diseases following exposure to different harmful agents and help the occupational hygienists and managers to eliminate, control, reduce, or minimize such exposures.

Acknowledgements

There is no acknowlegement in this study.

Authors' Contribution

This study has been done equally by authors.

Financial Disclosure

There is no conflict of interest.

Funding/Support

There is no support for this study.

References

1. Luo W. Using a GIS-based floating catchment method to assess areas with shortage of physicians. *Health Place.* 2004;**10**(1):1–11.
2. Star J, Estes J. *Geographic information systems.*: prentice-Hall Englewood Cliffs; 1990.
3. Ormsby T. *Getting to know ArcGIS desktop: basics of ArcView, ArcEditor and ArcInfo.*: ESRI, Inc.; 2004.
4. Goodchild MF, Steyaert LT, Parks BO, Johnston C. *GIS and environmental modeling: progress and research issues.*: Wiley; 1996.
5. Murad AA. Creating a GIS application for health services at Jeddah city. *Comput Biol Med.* 2007;**37**(6):879–89.
6. Donovan TL, Kurc A, Sambol C, Carpenter J, Moore KM. GIS Mapping of Occupational Health Visit Data from a Southeastern Ontario Tertiary Care Hospital.2008; 5: 26.
7. Koh D, Aw TC. Surveillance in occupational health. *Occup Environ Med.* 2003;**60**(9):705-10.
8. Ko JH, Chang SI, Lee BC. Noise impact assessment by utilizing noise map and GIS: A case study in the city of Chungju, Republic of Korea. *Appl Acoust.* 2011;**72**(8):544–50.
9. de Kluijver H, Stoter J. Noise mapping and GIS: optimising quality and efficiency of noise effect studies. *Com Environ Urban Sys.*

2003;**27**(1):85–102.
10. Wang F, Luo W. Assessing spatial and nonspatial factors for healthcare access: towards an integrated approach to defining health professional shortage areas. *Health Place*. 2005;**11**(2):131–46.