

# Introduction to the use of GIS in spatial epidemiology using ArcGIS9.x

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## Welcome

Welcome to the distance learning course the “*Introduction to the use of GIS in spatial epidemiology using ArcGIS9.x*”. This on-line course is presented at a post-graduate level and consists of two parts. In the theoretical part you will gain a conceptual understanding of the role GIS can play in epidemiological studies. The second part of this module consists on hands-on exercises using ArcGIS-software. You will acquire basic skills on how to use GIS in epidemiological studies. You will be expected to gain a thorough understanding of the material by actively researching the field of study. You are also encouraged to interact with your fellow students and thus stimulate creative thinking.

## Aims

The purpose of this GIS-course for beginners is to familiarize veterinary and medical doctors with the use of geographic information systems (GIS) in particular reference to spatial epidemiology and the development of spatial decision support systems. Upon completion of the course, you will have a profound conceptual and technical knowledge of GIS. You will have acquired basic skills on how to use ArcGIS in epidemiological studies and be able to contribute to the development and implementation of GIS in health related issues.

## Requirements

### Required software:

- ArcGIS9.x - software: ArcView-edition with ArcGIS Spatial Analyst extension. This software is not part of the course material. The applicant will receive directions on how to obtain a free 2-months Evaluation License or, if applicable, a one year Student License through ESRI. As it stands, each student needs to individually obtain a license. If students can only have access to a free 2 months Evaluation License, a special program will be developed for them in order to accomplish the course in due time. A full license of ArcGIS with the Spatial Analyst extension costs 4.000 US \$. Possible reduction has to be negotiated with the local vendors of the ArcGIS software. Avia-GIS has negotiated a free one year educational Arc-GIS license (ArcGIS and Spatial Analyst) for African candidates. It is nevertheless recommended to plan the purchase (as part of your ICONZ budget) of a full operational academic license after that period to enable full long term benefit of the course for ICONZ and your department. European Participants are invited to contact their national ESRI dealer to request a free one year educational Arc-GIS license (ArcGIS and Spatial Analyst). It is also recommended to plan the purchase of a

full operational academic license after that period to enable full long term benefit of the course for ICONZ and your department.

**Minimum computer skills required (computer literate):**

- Fluently operate an MS-Windows computer and have basic skills on standard MS programs

**Minimum computer system requirements:**

- PC-Intel Platform with a Windows operating system (Windows Vista, Windows 2000 or Windows XP)
- 1GB RAM
- 1.6 GHz- processor
- Have access to internet

## Price

For the approved ICONZ applicants (1 student per partner), this course is offered for free. For others, pricing details can be requested at [info@avia-gis.be](mailto:info@avia-gis.be).

## Course coordinators

This module is organised and coordinated by Avia-GIS ([www.avia-gis.com](http://www.avia-gis.com)). Avia-GIS, "Agriculture and Veterinary Information and Analysis", is a Belgian consultancy company founded in 2001 that specializes in the collection, processing and analysis of spatial information, and the development of space-time information systems with particular reference to animal health and production, agriculture, public health and health-environment. Emphasis is put on vector-borne diseases, zoonoses and emerging diseases. It has an internationally recognised experience in this field. Avia-GIS has a strong reputation in capacity building. They provide several online distance learning courses and in situ courses on the use of GIS in spatial epidemiology.

The course coordinators of this module are:

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| <b>Dr. Guy Hendrickx</b>   | <b>Position</b><br>Managing Director  |
| <b>Telephone</b> Int + 32 3 458 29 79  | <b>Office</b><br>Avia-GIS<br>Risschotlei 33<br>B-2980 Zoersel<br>Belgium  |
| <b>Fax</b> Int + 32 3 458 29 79  |   |
| <b>E-mail</b> <a href="mailto:ghendrickx@avia-gis.be">ghendrickx@avia-gis.be</a> |   |
| <b>Field of interest</b>   |   |
| Teaching interest:   | GIS, Remote Sensing and epidemiology.   |
| Research field:  | Spatial modeling of disease lifecycle components: vectors, hosts, pathogens; Spatial epidemiology; Spatial information systems for disease management |
| Continuing education interest:   | Spatial information systems for disease management and decision making.   |

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| <b>ir Els Goossens</b><br>MSc, agronomy  | <b>Position</b><br>Project Manager                                       |
| <b>Telephone</b> Int + 32 3 458 29 79  | <b>Office</b><br>Avia-GIS<br>Risschotlei 33<br>B-2980 Zoersel<br>Belgium |
| <b>Fax</b> Int + 32 3 458 29 79  |  |
| <b>E-mail</b> <a href="mailto:egoossens@avia-gis.be">egoossens@avia-gis.be</a> |  |
| <b>Field of interest</b>   |  |
| Teaching interest:   | GIS and Remote Sensing   |
| Research field:  | Remote sensing applied to epidemiology                                   |
| Continuing education interest:   | Spatial epidemiology, e-learning, education                              |

## Program

### General structure of the course

The course is thematically organized around 9 topics. Each topic consists of a theoretical background, where concepts explained and discussed as well as a set of exercises that will guide you to obtain the necessary technical skills of how to use ArcGIS. These exercises are worked out in detail and you should be able to reproduce them using your own ArcGIS-software. The level of difficulty of the exercises is gradually increased. At the end of each topic, your own exercises should be submitted to the course facilitators for evaluation. During each topic, a discussion forum is opened where you can interact with your fellow students or with the course facilitators. In this discussion forum you are encouraged to discuss the content of the theoretical part or to ask further information about the exercises. The 9 topics are listed below:

- 1 GIS, Spatial Data and Epidemiology
- 2 Tabular Data Operations
- 3 Map Making
- 4 Query Data
- 5 Geographic Projections
- 6 Vector Operations
- 7 Raster Operations
- 8 Introduction to spatial modeling
- 9 Introduction to spatial epidemiology

To gain most benefit from this module it is imperative that you adhere to the scheduled activities so that you are able to make significant contributions, especially during the discussions. Your enthusiastic participation will enhance the level of theoretical experience both you and your colleagues gain from this module. All communication, course content, data files can be access through the web portal of the course.

### Duration of the course

The course will start on February, 1<sup>st</sup> 2010 and will end on July, 12<sup>th</sup> 2010.

### Study load

A study load of 180h is needed for this course. Preferentially, the study load should be equally spread during the course with a minimum of 8h a week.

### Evaluation

A permanent evaluation will take place and will be based on the assignments (Exercises) and your participation and relevant contributions in the different discussion forums of the course (Discussions). In addition, at the end of the course a dataset will be provided to you. These data should be processed and manipulated using the skills you have gained throughout the course in order to answer specific questions (Assessment Exercise). Next to this, you will have to make a critical reflection on the use of GIS in your

own professional environment or for a specific epidemiological topic. The allocation of marks is detailed below:

|                     | %   |
|---------------------|-----|
| Exercises           | 45  |
| Discussions         | 25  |
| Assessment Exercise | 15  |
| Written assignment  | 15  |
| Total               | 100 |

Upon successful evaluation, the participant will receive a certificate acknowledging their capabilities of using GIS in spatial epidemiology.

## Study Component

### Learning resources

All learning resources are accessible through the distance learning platform of Avia-GIS. Learning resources are thematically bundled and consists of a set of exercises, datasets needed to make these exercises as well as theoretical background and selected literature on this specific topic.

### Learning outcomes

1. You will have a conceptual knowledge on the role GIS in health related issues. You will understand the different components of a GIS and can give some examples where GIS is used to analyze a health related problem.
2. You will understand all data-related aspects of a GIS, such as the data models in GIS, data input, data editing and data output; projection issues; metadata and managing a spatial database; importing and linking tabular data;
3. You will be able to find data sources on the web
4. You will be able to querying, manipulation and simple analysis of geographical data. You will understand how data are queried, manipulated and analyzed, how buffer operations are carried out and how map algebra is performed.
5. You will be able to make advanced analyses of geographical data with specific reference to health related issues
6. You will know how to build spatial models and understand the different type of models that can be build using a GIS (priority models, risk models, statistical models)
7. You will know how to perform epidemiological analysis using a GIS: how to calculate epidemiological parameters and how to perform point analyses.
8. You will obtain the technical skills to conduct a GIS-project in epidemiology.
9. Know how to look for pertinent articles pertaining to the course material and discuss the most important findings of the article.
10. You will be able to reflect on the role of GIS in your own professional environment or for a specific epidemiological issue.