MGIS Masters in Geographic Information Science

UC UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

GISC411
GIS in Health
Department of Geography, University of Canterbury

Course outline
This course will provide students with an introduction to the use of Geographic Information Science (GIS) in health geography. Health geography is the application of geographical information, perspectives, and methods to the study of health and disease, and can provide a spatial understanding of a population's health, the distribution of disease, and environmental effects on health and disease. Health geography also deals with accessibility to health care and the spatial distribution of health care providers. GIS is a powerful tool that can integrate geographical information for application in the study of health, disease and health care.

Course aims and learning outcomes
The aims of this course are to:

- Examine GIS within a health geography framework, providing a critical overview of GIS in the context of health geography
- Examine GIS and socio-economic/environmental data related to health, covering data sources, data types, spatial resolution and data limitations
- Examine GIS concepts and techniques applied in health geography including mortality rate calculations, geocoding, cluster and network analysis, visualisation of spatial information and statistical analysis
- Examine GIS in health delivery and health policy, and how it is applied in health service delivery and for informing health policy

By the end of this course students should have the skills to:

- Recognise the value of GIS applications within a health geography framework
- Develop an awareness of health (socio-economic/environmental) related spatial data sources, data types, spatial resolution and data limitations
- Identify key GIS concepts and techniques, including statistical techniques, relevant to GIS applications in health
- Provide practical experience using GIS to undertake spatial investigations of health and health care issues through visualisation and spatial and statistical analysis of data to better inform health policy related to these issues
- Prepare an analytical project on a health geography topic area, written in a similar style to an academic journal, including a brief background section, data and methods focusing on GIS techniques used in this course, results and a brief discussion of findings.

Course coordinator

Dr Angela Curl (Geography) email: angela.curl@canterbury.ac.nz

Other teaching staff

Dr Melanie Tomintz (GeoHealth Lab) email: melanie.tomintz@canterbury.ac.nz
Dr Paul Beere (GeoHealth Lab) email: paul.beere@canterbury.ac.nz

Mode of course delivery

- Block taught seminar series
- Self-guided laboratory work; tutors will be available by appointment for laboratory help
- The course is also available to students at the Victoria University of Wellington and AUT.

Assessment

Formal assessment for the course is based on course assignments.

Assessment	**Due Date**
• Project presentation – feedback (10%) *-This presentation should be a proposal of your project - includes title, introduction, research questions/hypotheses, data, and proposed methods*	Monday 4 April (UC, WEEK 7, 5PM)
• Laboratory Assignments (30%) *-The earlier that you complete these, the better, so feel free to submit prior to the due date*	Monday 9 May (UC WEEK, 9, 5PM)
• Research project (60%) *-See final pages*	Friday 3 June (UC WEEK 12, 5PM)

Course Timetable: in UC teaching weeks!

UC Teaching Week	Date/Time	Delivery mode	Topic
2	Mon 29 February 9-12	Lecture	Introduction to course and description of final project (MC, AC)
3	Mon 7 March 9-12	Lecture	Examples of GIS in Health, (AC, MC, PB, MT)
4	Mon 14 March 9-4pm	Workshops	Methods (PB, MT, AC)
5	Mon 21 March 9-4pm	Workshops	Methods (PB, MT, AC)
7	Mon 4 April 9-12	Project presentation	AC, MT, PB (feedback given)
MID TERM BREAK			
8	w/c 2 May	Drop-in clinic	Meetings by appointment (PB, MT)
9	w/c 9 May	Drop-in clinic	Meetings by appointment (PB, MT)
10	w/c 16 May	Drop-in clinic	Meetings by appointment (PB, MT)
11	w/c 23 May	Drop-in clinic	Meetings by appointment (PB, MT)

Workshop Timetables

Mon 16th March: Workshop 1	Topic
Monday 14th March, 9am – 4pm	1. Assignment structure
	2. Health data
	3. Visualising data
	4. Using point data
	5. Cluster analysis
	6. Network analysis
	7. GIS Health Research

Mon 23rd March: Workshop 2	Topic
Monday 21st March, 9am, - 4pm	1. Spatial Statistics: Descriptive Statistics
	2. Spatial Statistics: Inferential Statistics

Reading

Key references include:

- GIS Tutorial for Health (2009). K. Kurland and W. Gorr. ESRI Press
- GIS and Public Health (2002). E.K. Cromley and S.L. McLafferty. The Guilford Press
- GIS and Health (2007). M. Loytonen. Taylor & Francis

In addition, relevant journals include:

International Journal of Health Geographics, Health and Place, and *Social Science and Medicine*

Software and Data Needs

To complete laboratory assignments, the presentation, and the research project, you will need access to:

- Microsoft Office software, including Powerpoint, Word and Excel
- SaTScan (if using cluster analysis as a method). SaTScan is freeware
- ESRI ArcGIS software, available from Geography lab computers
- Skype software with a microphone (if you wish to ask questions during virtual office hours)
- The laboratory analysis dataset, available via Learn
- Research project datasets, varies case by case
- Optional, but strongly encouraged: R and RStudio, installed either on your laptop or as a 'Tarball' on a flash drive. Both are freeware
- Optional, but strongly encouraged: SPSS. Available on UC computers. May be a small number of home licenses available through ITS or student licenses are available online from a number of distributors.

Drop-in Clinic Hours

Paul Beere and Melanie Tomintz will be available via email for queries about your final projects as well as for meetings face-to-face and Skype. Please arrange these ahead of time via the contact details provided below:

Dr Melanie Tomintz:	GeoHealth Laboratory, University of Canterbury
Email:	melanie.tomintz@canterbury.ac.nz
Skype:	mel.tomintz
Phone:	03 384 2987 x4048

Dr Paul Beere:	GeoHealth Laboratory, University of Canterbury
Email:	paul.beere@canterbury.ac.nz
Skype:	paul__beere
Phone:	03 384 2987 x4049

Plagiarism
You are strongly encouraged to discuss your reading and ideas with others, but you must write up your work in your own words. Plagiarised work automatically fails (with a right of appeal). Plagiarism is copying other people's work or lifting text/ideas from written sources or the internet *without acknowledgement*. For a detailed description of plagiarism, including UC policies, please see: http://library.canterbury.ac.nz/services/ref/plagiarism.shtml

Deadlines and extension
Extensions will only be given in circumstances such as illness, accident or bereavement. The application forms for an extension are available outside the Geography departmental office on the 5th floor, or via your course coordinator.

Late work penalties
Late work handed in without an extension is subject to these penalties:

- Up to 1 week late – 2 grade penalty (e.g. A to B+)
- More than 1 week late but before coursework handback – 4 grade penalty (e.g. A to B-)
- After coursework handback – 8 grade penalty (e.g. A to D)

Web access & File Space
In order to participate satisfactorily in this course you must regularly check the course web pages. The course web pages are used to post discussion topics, and assessment outlines. These need to be checked regularly. **Please ensure that the email that you check regularly is the email address assigned to your LEARN/Moodle account.**

You will be allocated additional personal file space quota on the IT servers for the duration of the course. This file space quota will be removed at the end of the course.

Lab access
The Computer Teaching Laboratories are normally accessible 24/7, **provided they are not being used for formal teaching.** During busy periods, word processing tasks and internet access should be done elsewhere. You may need to use remote access to use the software in these labs.

Research Project

Description:

This project will involve reading relevant literature and making a case for the research project. You are to identify a gap in knowledge that your research addresses. You must explicitly state your research questions.

Then, you will be designing methods (using techniques learned in this course) to answer your research questions. After applying the methods you choose, you will present your findings and finish with a discussion of those findings.

This project will be written in the style of an academic journal, and submitted as such. You will be writing in the style of *Social Science and Medicine*, please refer to their webpage: http://www.journals.elsevier.com/social-science-and-medicine/ (NOTE that you do not need to include keywords, author affiliations, research highlights, referencing style or formatting of tables and figures). Below is a general template to help you plan your project write-up. Word limits: Abstract (300) Introduction to Discussion (5000). Submission must be in MicroSoft Word compatible format (.doc, .docx, .rtf, .odt). Do not submit your project as a PDF.

Total points = 100

Author

Your full name. You do not need to include author affiliations, addresses or corresponding author information.

Title and Abstract (5 points)

Please consider the title very carefully, as these are often used in information-retrieval systems. Please use a concise and informative title (avoiding abbreviations where possible). An abstract of up to 300 words must be included. An abstract is often presented separately from the article, so it must be able to stand alone. It should state briefly and clearly the purpose and setting of the research, the principal findings and major conclusions, and the paper's contribution to knowledge. For empirical papers the country/locations of the study should be clearly stated, as should the methods, the dates, and a summary of the findings/conclusion. Please note that excessive statistical details should be avoided, abbreviations/acronyms used only if essential or firmly established, and that the abstract should not be structured into subsections. No references cited in the abstract.

Introduction (15 points)

The introduction starts with a broad basis and then narrows it down to your particular field of study, explaining the rationale behind each step. Think of it as an inverted pyramid, where you start with a wide overview but move towards the thesis statement or hypothesis, which should be the final element of the introduction. In the introduction, you are attempting to inform the reader about the rationale behind the work, justifying why your work is an essential component of research in the field.

The introduction does not have a strict word limit, unlike the abstract, but it should be as concise as possible. Note that the introduction to the discussion section does have a limit of 5000 words.

The introduction gives an overall review of the paper, but addresses a few slightly different issues from the abstract. It works upon the principle of introducing the topic of the paper and setting it into a broad context, gradually narrowing down to a research problem, thesis and hypothesis. A good introduction explains how you mean to solve the research problem, and creates ‘leads’ to make the reader want to delve further into your work.

The first task of the introduction is to set the scene, giving your paper a context and seeing how it fits in with previous research in the field. Whilst not the only way, this section, comprising the first paragraphs of your introduction, can be based around a historical narrative, from the very first research in the field to the current day. Or it could involve a recent change in research in the field.

This leads into the rationale behind the research, revealing whether it is building upon previous research, looking at something that everybody else has overlooked, or improving upon a previous research project that delivered unclear results. This section can then flow into how you are going to fill the gap, laying out your objectives. You are trying to predict what impact your research will have if everything works as it should, and you ultimately reject the null hypothesis.

Methods (15 points)

Any scientific paper needs to be verifiable by other researchers, so that they can review the results by replicating the experiment and verifying validity of the results. To assist this, you need to give a completely accurate description of the equipment and the techniques used for gathering the data. Finally, you must provide an explanation of how the raw data were sourced, compiled and analysed.

Whilst there are slightly different variations according to the exact type of research, the methodology can be divided into a few sections.

- Describe the materials and equipment used in the research.
- Explain how the data were gathered, compiled or restricted.
- Explain how the measurements were made and what calculations were performed upon the raw data.
- Describe the statistical techniques used upon the data.

The writing for the method should be clear and direct, concise and straight to the point. The major point is not to stray off into irrelevance. Whilst not always possible, the methodology should be written in chronological order, always using the past tense. A well laid out and logical methodology will provide a great backbone for the entire research paper, and will allow you to build an extremely strong results section. The only real difficulty with the methods section is finding the balance between keeping the section short, whilst including all of the relevant information.

Results (15 points)

The results section is not for interpreting the results in any way; that belongs strictly in the discussion section. You should aim to narrate your findings without trying to interpret or evaluate them, other than to provide a link to the discussion section. For example, you may have noticed an unusual correlation between two variables during the analysis of your results. It is correct to point this out in the results section. Speculating why this correlation is happening, and postulating about what may be happening, belongs in the discussion section.

It is very easy to put too much information into the results section and obscure your findings underneath reams of irrelevance. If you make a table of your findings, you do not need to insert a graph highlighting the same data. If you have a table of results, refer to it in the text, but do not repeat the figures – duplicate information will be penalised. Often the best way to use the results section is to show the most relevant information in the graphs, figures and tables. The text, conversely, is used to direct the reader to those, also clarifying any unclear points. The text should also act as a link to the discussion section, highlighting any correlations and findings and leaving plenty of open questions.

Be sure to include negative results – writing a results section without them not only invalidate the paper, but it is extremely bad science. The negative results, and how you handle them, often gives you the makings of a great discussion section, so do not be afraid to highlight them.

Discussion (35 points)

This is the most important part of your project, and this is reflected in the points available. You will need to demonstrate that not only have you understood your results, but also that you can critically reflect on/interpret those results.

In an ideal world, you could simply reject your null hypothesis according to the significance levels found by the statistics. That is the main point of your discussion section, but the process is usually a lot more complex than that. It is rarely clear-cut, and you will need to interpret your findings.

For example, one of your graphs may show a distinct trend, but not enough to reach an acceptable significance level. Remember that no significance is not the same as no difference, and you can begin to explain this in your discussion section. Whilst your results may not be enough to reject the null hypothesis, they may show a trend that later researchers may wish to explore, perhaps by refining the experiment. For this purpose, you should criticize the experiment, and be honest about whether your design was good enough. If not, suggest any modifications and improvements that could be made to the design. Can you think of other reasons that you did not find a significant correlation?

The discussion section is not always about what you found, but what you did not find, and how you deal with that. Stating that the results are inconclusive is the easy way out, and you must always try to pick out something of value.

In addition, you should always put your findings into the context of the previous research that you found during your literature review. This is the part that students in previous years have executed poorly and have lost

marks in, so please spend some time linking your work to the literature. Do your results agree or disagree with previous research? Do the results of the previous research help you to interpret your own findings? If your results are very different, why? Either you have uncovered something new, or you may have made a major flaw with the design of the experiment.
Finally, after saying all of this, you can make a statement about whether the experiment has contributed to knowledge in the field, or not. Try not to be too broad in your generalisations to the wider world.

General (15 points)

Finally, more general aspects of your assignment will be assessed, in much the same way that a manuscript reviewer would do. These are 'easy marks', but some effort is still required. First, you will be assessed on whether your approach was suitable to address assignment topic. You will get some valuable feedback on whether your chosen approach is suitable during the Project Presentation session. Second, points will be awarded for how well you covered the topic. We are not expecting you to account for every variable, but you will need to account for the most important factors. Finally, you will be assessed on spelling, grammar, punctuation, word count, and correct citation of references and bibliography. You may have produced the most amazing piece of research ever, but errors can undermine your credibility in the publishing world so do spend some time checking your work. Use APA referencing style. See LEARN page for more information.