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GeoHealth Laboratory
Te tai whenua o te hau ora

GeoHealth Laboratory: 11th Annual Report

June 2017

GIS Expertise & High Quality Research for Public Health

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UC GEOHEALTH LABORATORY

CONTENTS

Health & Disability Intelligence   3   **Dept. of Geography**

MINISTRY OF HEALTH
MANATU HAUORA

GIS Expertise & High Quality Research for Public Health

UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
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Executive Summary

This report details the activities undertaken by the GeoHealth Laboratory between July 2016 and June 2017. The report describes the infrastructure, work plan, milestones, achievements and key events in the 11th year of operation of the Laboratory; as well as outlining the aims and work plan for the coming year (July 2017 to June 2018).

2016-17 Key Achievements

A key aim of the GeoHealth Laboratory is to undertake innovative and policy-relevant research in the areas of health geography, spatial and social epidemiology, and Geographic Information Systems (GIS); and to increase research capacity and research outputs in the health and GIS academic sectors. Some of the projects have been funded directly with core GeoHealth Laboratory funding and others from other external sources through opportunities which have arisen due to the profile of the Laboratory.

Research projects have continued to utilise a wide range of Ministry of Health and other data sources including the New Zealand Health Surveys, mortality information and other administrative data sets. Key projects this year have included:

- One PhD candidate (Niamh Donnellan) successfully completed and defended her PhD studies. Alison Watkins is in her final year of a PhD which looks at spatial microsimulation modelling and obesity. Another PhD student (Jesse Wiki) is conducting spatial analysis related to diabetes and built environment.

- Kirsten Curry completed her Masters thesis titled "An exploration of the effects of roads and traffic on mental health in Auckland, New Zealand".

- A series of projects and papers on the health effects of living near green (parks) and blue (water) spaces, including the relationship between academic achievement and green space exposure/access, have been published.

- The development of a digital road network layer for New Zealand (facilitating access analysis) has been completed and is available for use.

- Spatial microsimulation models for obesity and smoking, including policy relevant scenario models

- Participation in the New Zealand Health and Ageing Research Group (University of Canterbury, University of Otago, CDHB, South Island Alliance) utilising interRAI data

During 2016-17 the Laboratory had multiple health-related research articles published. A number of these publications were outputs of planned projects approved by the Ministry of Health. These directly fed into policy development and some have been presented to the Ministry of Health staff. In 2016-17, one student successfully completed their Master's degree, two students commenced study for a Master's degree, and three PhD candidates made good progress with their research (presenting findings at international conferences and in academic journals), and one student successfully completed his PhD studies and secured a job in Germany. Two of the PhD candidates are funded directly by GeoHealth Laboratory Scholarships.

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Plans for 2017-2018

The GeoHealth Laboratory received funding for another three years. A major change in the nature of the contract is that the research program, is more closely aligned Ministry of Health priorities, and policy teams are now more involved in the ongoing individual projects.

Next year the GeoHealth Laboratory intends to:

- Increase its collaboration with the Ministry of Health by undertaking designed projects that reflect issues that have been discussed with representatives from the Ministry of Health or that are of high interest to specific policy groups.

- Utilise data collected in the New Zealand Health Survey and administrative surveys, as well as other data sets provided by the Ministry of Health or related parties.

- Undertake research which complements the Health & Disability Intelligence (HDI) work plan.

- Support students (PhDs, MSc's) that work on projects within the GeoHealth Lab.

- Move into new premises as part of the ongoing repair and rebuild build of the University campus. The Lab will be located in purpose built accommodation in the new Regional Rutherford Science and Innovation Centre.

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Introduction

The GeoHealth Laboratory was established in 2005 as a partnership between Health & Disability Intelligence (HDI) (formerly Public Health Intelligence (PHI)), in the Ministry of Health, and the Department of Geography, University of Canterbury. It was launched by the then Minister of Health, the Hon. Annette King MP, in November 2004 at the *GeoHealth 2004* Conference in Wellington, and formally opened on the 18th February 2005.

The Laboratory seeks to advance Ministry of Health policy and the University of Canterbury's health sciences research agenda for the mutual benefit of the New Zealand health sector. The aims of the Laboratory are to:

- Build a strategic partnership around health geography, spatial epidemiology, and Geographical Information Systems (GIS).
- Increase research capacity and research outputs in health and GIS.

This is the 11th Annual Report of the GeoHealth Laboratory and describes the activities undertaken between July 2016 and June 2017. The report outlines the infrastructure, work plan, milestones, achievements, and key events in the 11th year of operation of the Laboratory; as well as setting out the aims and work plan in detail for the coming year (July 2017 to June 2018). It includes all the work of the Laboratory, and not just the work funded directly by the core Ministry of Health contract.

Section 2 "GeoHealth Research Laboratory Infrastructure" outlines how the Laboratory is structured, including information about funding, personnel, facilities, equipment, and management. Sections 3 "Work Plan Core Activity: Research" and 4 "Work Plan Core Activity: Scholarships" describe publications, completed projects, policy impacts, ad hoc work, scholarships, and awards and recognition for the Laboratory. Section 5 "GeoHealth Laboratory Promotions" covers the important publicity and promotional activities undertaken to increase awareness and publicise the Laboratory; whilst Section 6 "Plans for 2017-18" outlines the immediate goals for the coming year and the strategic direction beyond.

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1. GeoHealth Research Laboratory Infrastructure

The structure of the Laboratory is explained under the following five sub-headings:

- 2.1 Funding
- 2.2 Personnel
- 2.3 Facilities
- 2.4 Equipment
- 2.5 Management

2.1 Funding

The Laboratory has two principal funding streams, one directly provided by the Ministry of Health and the other indirectly provided by the Department of Geography at the University of Canterbury. These are supplemented by additional funding sources.

Ministry of Health (direct funding)
A contract was signed in October 2014 for additional funding extending the length of the contract to June 2017.

University of Canterbury (indirect funding)
The University of Canterbury provides indirect funding to the Laboratory through the Department of Geography in the form of staff time and associated resources. In addition, the Laboratory also benefits from the time given for research by its many visitors (see end of section 2.2).

Additional Funding
The Laboratory attracts additional funding beyond that provided as part of the GeoHealth Laboratory contract and from the University. In the past this has included support from Canterbury Medical Research Fund for a project looking at *Breath Exposure and Response – does increased ambient acetonitrile in the workplace environment affect the exhaled amount* and from the Cooperative Research Centre for Spatial Information (CRCSI) for a project on *Geographic Variations in Natural Disaster Impact* and from the CRCSI/Future Position X (Sweden) on *Real-time environmental sensors to improve health in the Sensing City*.

2.2 Personnel

The Laboratory employs three full-time researchers (Postdoctoral Fellows). Two are based in the GeoHealth Laboratory at the University of Canterbury (Christchurch), named Dr Paul Beere and Dr Melanie Tomintz, and one, Dr John McCarthy, is based at the Ministry of Health. Dr McCarthy has resigned in February 2017 and his position was filled by Dr Niamh Donnellan between February 2017 and May 2017.

As part of the partnership, the time and associated costs of the management team is provided and funded by the UC Department of Geography external to the contract costs. The Laboratory also funds Masters and PhD Scholarships (detailed in section 4 below). These students are located in, and contribute to the work of, the GeoHealth Laboratory. The Laboratory draws upon the wider expertise of Department of Geography staff. In this respect, the Laboratory also hosts a number of Department of Geography postgraduate students and Research Assistants. An outline of Laboratory personnel is provided in Table 1 (see section 2.5).

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UC GEOHEALTH LABORATORY

Part of the budget (amounting to approximately 3% of salary of the Laboratory Researcher posts) is allocated for training and conference attendance to enable staff development and lift the profile of the work of the Laboratory.

The flexible hosting arrangement of the Laboratory affords access to a larger pool and greater diversity in expertise than the three posts, some of whom are named Table 1. This number can be added to by including the visitors to the University of Canterbury who are attracted by the presence of the GeoHealth Laboratory. These have included:

- Dr Eun-Hye Enki Yoo (University at Buffalo, The State University of New York, 2015)
- Dr. Lily Bui (Massachusetts Institute of Technology, USA, 2015)
- Dr. Ronan Foley (National University of Ireland Maynooth, Ireland, 2015)
- Prof. Gerry Kearns (National University of Ireland Maynooth, Ireland, 2014)
- Prof. Philippe Apparicio (Institut National de la Recherche Scientifique (INRS), Canada, 2012)
- Prof. Mike Emch (University of North Carolina, USA, 2011)
- Prof. Ian McKendry (University of British Columbia, Canada, 2011)
- Prof. Graham Bentham (University of East Anglia, UK, 2010)
- Prof. Bob Haining (University of Cambridge, UK 2009)
- Prof. Danny Dorling (University of Sheffield, UK, 2005 and 2009)
- Assoc. Prof. Howard Bridgman (University of Newcastle, Australia, 2009)
- Prof. Rich Mitchell (University of Glasgow, UK, 2007)
- Prof. Peter Brimblecombe (University of East Anglia, UK, 2007)
- Prof. Graham Moon (University of Southampton, UK, 2006)
- Prof. Robin Flowerdew (University of St Andrews, UK, 2006)
- Dr. Iain Lake (University of East Anglia, UK, 2006)
- Prof. Robin Haynes (University of East Anglia, UK, 2006)

2.3 Facilities

The Laboratory is located in a dedicated room situated within the Department of Geography. The Laboratory room is fitted with eight workstations and a hot desk. There is also a common laptop to use by anyone in the lab when required. In addition, there is a large meeting table, projector and screen, a small library, a secure safe for data storage, and a white board. The laboratory is locked and has swipe-card protected entry available to Laboratory employees only. The Laboratory layout was carefully considered to provide a conducive working and research environment with an extra capacity beyond initial requirements to allow for growth and to accommodate visits from collaborators.

2.4 Equipment

The GeoHealth Laboratory has been refurbished to provide desk space and computer terminals for up to nine people. At present there are eight networked PCs complete with either 22 or 24-inch screens. There is a dedicated GeoHealth network drive for the storage of the geodatabase and other health-related data files which are regularly archived.

Each PC has ArcGIS software, a number of statistical applications (SPSS, R) as well as standard PC word processing and numerical software tools. These applications are updated

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and maintained through University of Canterbury site licenses. Technical support is provided by GIS specialists and management within the Department of Geography, and University of Canterbury central IT services.

2.5 Management

The directorship and management of the Laboratory is undertaken primarily by Prof Simon Kingham and Dr Malcolm Campbell of the Department of Geography; who are responsible for the work activities of the Laboratory. Additional research guidance and support is provided by Prof Jamie Pearce (International Advisor). Oversight and governance are provided by Denise Hutana and John McCarthy at the Ministry of Health who, along with the Directors, are responsible for generating and agreeing the Ministry-funded Laboratory work programme.

Table 1. GeoHealth Research Laboratory Personnel 2016-17

Post	Location	Name
Directors	Dept of Geography	Prof Simon Kingham
	Dept of Geography	Dr Malcolm Campbell
International Advisor	Uni of Edinburgh	Prof Jamie Pearce (Adjunct Professor)
UC Adjunct Staff	CDHB	Dr Michael Epton (Adjunct Professor)
	CDHB	Dr Malina Storer (Adjunct Senior Fellow)
	University of Auckland	Dr Daniel Exeter (Adjunct Senior Fellow)
Postdoctoral Research Fellows	GeoHealth Laboratory	Dr Paul Beere
	GeoHealth Laboratory	Dr Melanie Tomintz
Principle Technical Specialist for Geospatial Analytical Projects	Ministry of Health	Dr John McCarthy (resigned February 2017)
PhD students	GeoHealth Laboratory	Niamh Donnellan (completed PhD in Dec 2016 and employed by the GHL from Feb 2017 to May 2017)
		Alison Watkins (started March 2013)
		Jesse Wiki (started March 2016)
Masters students	GeoHealth Laboratory	Kirsty Curry (completed August 2016)
Other UC academic staff	Dept of Geography	Dr David Conradson
		Dr Kelly Dombroski
		Dr Ben Adams
		Dr Ioannis Delikostidis
	Dept of Maths & Stats	Prof Jennifer Brown
		Dr Elena Molchanova
Other UC technical staff	Dept of Geography	John Thyne
		Paul Bealing
	Geospatial Research Institute	Wayne Tyson

GIS Expertise & High Quality Research for Public Health

UC GEOHEALTH LABORATORY

3. Work Plan Core Activity: Research

The Laboratory work plan is centred on three core activities: research, scholarships, and training. As these three programmes form the bulk of the Laboratory work, they are outlined in detail in the separate sections that follow.

3.1.   Introduction

An integral component of the GeoHealth Laboratory's strategic aims is to undertake ground breaking and policy-relevant research in the area of health, spatial analysis techniques, and health services. Key drivers of our research have been the New Zealand Health Strategy and the HDI work programme. Attention to these drivers has assisted us in developing policy-relevant research projects which are of key strategic importance to the Ministry of Health. Our approach has been to develop projects which are not only of particular policy relevance, but also lend themselves to high quality research in line with the Department of Geography's research strategy, and are relevant to contemporary scholarship in health geography. A number of academic and research staff have been heavily involved in developing and undertaking these projects.

Following on from the progress made in previous years, we have continued to undertake joint and individual projects. Some of the projects are ongoing from previous years, whilst others are new, just commencing, or in the pipeline. Projects have been funded through a range of sources, published in high quality journals and employed a number of different researchers. Some of the projects have been funded directly with core GeoHealth Laboratory funding and others from other external sources through opportunities which have arisen due to the rising profile of the Laboratory. In this section, we list publications from Laboratory staff, students, and affiliated academic staff (section 3.2). We also provide a brief synopsis of the GeoHealth staff's key projects undertaken during the past year (section 3.3) and plans for 2017-2018.

Research projects have continued to utilise existing Ministry of Health data sources such as the New Zealand Health Surveys, mortality, cancer registration, hospital admissions/discharge data collections, and other administrative data sets. For example, regression modelling techniques have allowed us to explore the relationships between individual health status and behaviours from routine surveys (such as BMI, diet, physical activity), and neighbourhood level contextual measures affecting obesity. Working relationships with the Christchurch District Health Board (DHB) and City Council have also provided administrative data to the lab for research projects. The Laboratory has also been proactive in creating unique data sets to facilitate wider health research, including an enhanced road network layer for New Zealand.

3.2.   Publications 2016-17

The publications are listed according to their submission status and in chronological and alphabetical order. Publications directly funded by the MoH contract are indicated with a *.

2017

* Beere P, 2017, Creating a Road Network Analysis Layer with Travel Time Estimates from Open-source Data. White paper report, GeoHealth Laboratory, New Zealand. Access http://www.geohealth.canterbury.ac.nz/working/beere2016.pdf

* Beere P & Kingham S, 2017, Greenspace Exposure and Academic Achievement in Urban New Zealand Primary Schools. New Zealand Geographer. http://doi:10.1111/nzg.12155

* Griffin E, McCarthy J, Thomas F & Kingham S, 2017, New Zealand Healthline call data used to measure the effect of travel time on the use of the emergency department. Social Science & Medicine 179, 91–96.

Marek L, Campbell M & Bui L, 2017, Shaking for innovation: The (re)building of a (smart) city in a post disaster environment. Cities 63: 41-50. 2016.12.013. http://dx.doi.org/10.1016/j.cities.2016.12.013.

Pattinson W, Kingham S, Longley I & Salmond J, 2017, Potential pollution exposure reductions from small-distance bicycle lane separations. Journal of Transport & Health *4, 40–52*.

Tomintz MN, Kosar B & García-Barrios VM, 2016, simSALUD – an open source spatial microsimulation tool for novices and experts. *The International Journal of Microsimulation*, 10, 2, 118-143, http://www.microsimulation.org/IJM/V10_2/IJM_2017_10_2_4.pdf

2016

Apparicio P, Carrier M, Gelb J, Séguin A & Kingham S, 2016, Cyclists' exposure to air pollution and road traffic noise in central city neighbourhoods of Montreal. Journal of Transport Geography, 57, 63-69. http://doi:10.1016/j.jtrangeo.2016.09.014

* Bowie C, Campbell M, Beere P & Kingham S, 2016, Social and spatial inequalities in Rotaviral enteritis: supporting universally funded vaccination in New Zealand. New Zealand Medical Journal 129, 1431, 59-66.

Campbell M & Ballas D, 2016, SimAlba: A spatial microsimulation approach to the analysis of health inequalities. Frontiers in Public Health 4. http://dx.doi.org/10.3389/FPUBH.2016.00230.

Hogg D, Kingham S, Wilson T & Ardagh, M, 2016, The effects of spatially varying earthquake impacts on mood and anxiety symptom treatments among long-term Christchurch residents following the 2010/11 Canterbury earthquakes, New Zealand. Health & Place 41, 78-88. http://dx.doi.org/10.1016/j.healthplace.2016.08.002

Hogg D, Kingham S, Wilson T & Ardagh M, 2016, Spatio-temporal variation of mood and anxiety symptom treatments in Christchurch in the context of the 2010/11 Canterbury earthquake sequence. Spatial and Spatio-temporal Epidemiology, 19, 91-102. http://dx.doi.org/10.1016/j.sste.2016.08.001

Hogg D, Kingham S, Wilson T, & Ardagh M, 2016, The effects of relocation and level of affectedness on mood and anxiety symptom treatments after the 2011 Christchurch earthquake. Social Science & Medicine, 152, 18-26. http://dx.doi.org/10.1016/j.socscimed.2016.01.025

* Nutsford D, Pearson A, Kingham S & Reitsma F, 2016, Residential exposure to visible blue space (but not green space) associated with lower psychological distress in a capital city. Health and Place 39, 70-78.

Pattinson W, Langstaff J, Longley I & Kingham S, 2016, Using an ambient air pollution exposure model to explore the impact of local residents' proximity to a major highway. Air Quality, Atmosphere and Health, 9, 4, 335–357

Sabel C, Hiscock R, Asikainen A, Bi J, Depledge M, van den Elshout S, Friedrich R, Huang G, Hurley F, Jantunen M, Karakitsios S, Keuken M, Kingham S, Kontoroupis P, Kuenzli N, Liu M, Martuzzi M, Morton K, Mudu P, Niittynen M, Perez L, Sarigiannis D, Stahl-Timmins W, Tobollik M, Tuomisto J & Willers S, 2016. Public health impacts of city policies to reduce climate change: findings from the URGENCHE EU-China project. Environmental Health 15 (Supp 1): 25. http://ehjournal.biomedcentral.com/articles/10.1186/s12940-016-0097-0.

UC GEOHEALTH LABORATORY

Schluter P, Ahuriri-Driscoll A, Anderson T, Beere P, Brown J, Dalrymple-Alford J, Davidson A, Gillon D, Hirdes J, Keeling S, Kingham S, Lacey C, Menclova A, Millar N, Mor V & Jamieson H, 2016, Comprehensive Clinical Assessment of Home-based Older Persons within New Zealand: an epidemiological profile of a national cross-section. Australian & New Zealand Journal of Public Health, 40, 4, 349–355.

Tomintz MN, Kosar B & Clarke GP, 2016, smokeSALUD: exploring the effect of demographic change on the smoking prevalence at municipality level in Austria, *International Journal of Health Geographics*, 15, 1 http://dx.doi.org/10.1186/s12942- 016-0066-4

Tomintz MN & Garcia-Barrios VM (2016). *simSALUD - Towards a Health Decision Support System for Regional Planning*, in Lombard J, Clarke GP and Stern E (eds.): Applied spatial modelling and planning, Routledge, London.

Zmölnig J, Tomintz MN & Clarke GP, 2016, Mapping the distribution of diabetes for public health support in Austria, *GIS.Science*, Wichmann, 3, 86-97.

3.3. *Selected Projects 2016-17*

COMPLETED (all funded by the MoH)

A Geospatial approach to understanding the impact of the built environment on active transport behaviours and health (ND, SK, MC)

A recent trend in the literature has been on investigating the effects of the built environment on active travel behaviour and related health outcomes. Research to date has focused mainly on walkability, and to a lesser extent, bikeability, of the built environment. However, other modes of transport commonly used in daily life such as public transport and car use have received less attention. One of the main aims of this research is to build on previous research and create GIS based indices of walkability, bikeability, public transport-ability and drive-ability for neighbourhoods in two cities in New Zealand: Auckland and Wellington. A second aim is to assess how these indices relate to active transport behaviours and health outcomes. These indices may be used by city planners and policy makers alike in deciding where to situate neighbourhood and community resources, as well as identify areas that can be developed to promote more active forms of transport. It is also important for health research to help inform why residents of some neighbourhoods actively engage in physical activity in their local environment while others do not. Having completed a comprehensive review of the literature on the indicators of the built environment that influence active transport and health, the first indicators in GIS are now being developed. The next step will be to assess the relationship between these indicators, and specific health outcomes, such as physical activity and mental health. This research began in February 2012 and forms the basis of Niamh Donnellan's PhD research, which was successfully completed in 2016.

Towards smokefree Aotearoa 2025: Spatial modelling of smoking (MT, MC)

New Zealand (NZ) aims to be the first smoke-free country by 2025, where smoke-free is defined as a population with 5% or less smoking. Over time, smoking prevalence has decreased, which shows some current and on-going policy actions have been successful. However, the decreasing smoking prevalence is not seen in the Māori population. Spatial microsimulation modelling will be an important tool when it comes to target specific population groups and to apply policy relevant analysis for the current situation, but also for future scenarios. NZ is one of the few, if not the only country that collect current smoking behaviour (smoker, ex-smoker, never smoked) in the Census. This data is available at the smallest

geographical unit, i.e. Meshblocks. However, there is no additional smoking data, for example on quit attempts. We use a spatial microsimulation model developed within the framework simSALUD, by first estimating smoking behaviour, to validate the results against real world data (simulated smokers versus smokers recorded in the Census). After having a robust and validated model, we then simulate different scenarios that are relevant to the NZ context. These scenarios are designed and discussed with the Ministry of Health, the Tobacco Control Group and other Health Promotion Organisations to give real world applicability. The NZ data allows us to contribute to gaps in the current literature in terms of external validation of spatial microsimulation. In addition, smoking can be a strong predictor for other related health problems, such as heart disease, that will be modelled in future.

Blue Space and Mental Health: Analysis of the relationship between proximity and exposure to blue spaces (rivers, lakes, the ocean) and mental health in New Zealand

A recent study of NZHS data revealed that higher levels of blue space visibility were associated with lower levels of psychological distress in Wellington, New Zealand. The researchers called for further research as to whether increased visibility of blue space could promote mental wellbeing and reduce stress in other cities in New Zealand. Using PRIMHD mental health and addiction data collected by the Ministry of Health from DHBs and NGOs, the Blue Space and Mental Health project undertakes analyses of a nationwide population who have interacted with mental health and addiction services. This study also has the added benefit of being geocoded at a household, rather than meshblock, level. This will increase the accuracy of the results produced by a viewshed analysis of distance, and exposure, to blue spaces. The research findings will add great value to emerging literature around the relationship between public health and blue spaces.

ONGOING

Using the New Zealand Health Survey for microsimulation of small areas health statistics for obesity (AW, MC) (funded by the Ministry of Health)

The early stages of this project involved a literature review of what is known about the geography of obesity in New Zealand. This is currently undergoing revision in preparation for resubmission. Additionally, the programming framework for the model was constructed and tested using small data sets. The project has moved from the initial application of a spatial microsimulation model of obesity for NZ using the New Zealand Health Survey, the New Zealand Census and spatial microsimulation algorithms, to modelling patterns of obesity by small area unit. The first model has been constructed and validated against the National Diabetes Register. The next stage will involve further testing, construction, and validation of the spatial microsimulation model. This research began in March 2013 and forms the basis of Alison Watkins' PhD scholarship.

Understand the geographical distribution and spatial risk factors of obesity and T2DM in NZ and the implications this has for health policy and planning (JW, SK, PB, JM) (funded by the Ministry of Health)

Type 2 diabetes mellitus is a growing and serious health issue. It develops when the body is insulin resistant or not producing enough insulin to control blood glucose levels and is commonly onset by obesity. Certain ethnic groups are more susceptible to developing type 2 diabetes mellitus, a fact which is especially important to consider in New Zealand given its multi-cultural population and ethnic diversity. Recent statistics on type 2 diabetes mellitus from the New Zealand Health Survey 2013/14 demonstrate its prevalence and highlight the need for research into spatial patterns and risk factors. This project will explore four aspects of type

2 diabetes mellitus in New Zealand; geographical distribution, the relationship with obesity, spatial variations in risk factors, and, its use as a measure of obesity, where BMI is acknowledged as a crude measure. This research began in March 2016 and forms the basis of Jesse Wiki's PhD scholarship.

Resilience and ageing: interRAI assessments and community exposures (PB, SK) (funded by Healthy Ageing National Science Challenge)

The GeoHealth Laboratory has been working with the New Zealand Health and Ageing Research Group to add geospatial capacity to understanding ageing and community resilience in New Zealand. interRAI is an international collaboration to improve the quality of life of vulnerable persons through a seamless comprehensive clinical assessment system. We have been supplied the interRAI data for New Zealand 2012-2016, which consists of ~105,000 records. The aim of the GeoHealth component is to explore geospatial trends in the data, such as whether better access to services predicts community resilience. The New Zealand Health and Ageing Research Group has advised us that we will continue to have access to subsequent interRAI data requests, so this will be an ongoing project into the future. There is the potential for these data to be used to explore Ministry-related priorities, and for the interRAI to be used to validate findings produced via existing Ministry dataset such as the NZHS.

The following research projects will be continued during the year 2017-2018:

1. **Using the New Zealand Health Survey for microsimulation of small areas health statistics (AW, MC, MT)**

2. **Towards smokefree Aotearoa 2025: Spatial modelling of smoking (MT, MC)**

3. **Understand the geographical distribution and spatial risk factors of obesity and T2DM in NZ and the implications this has for health policy and planning (JW, SK, PB, JM)**

4. **Resilience and ageing: interRAI assessments and loneliness (PB)**

These projects will commence in 2017-18.

- **Spatial analysis on smoking and e-cigarettes (MT)**
  E-cigarettes are a hot discussed topic globally and opinions about their influence on health divide between having no significant influence on a person's health to having a negative influence. It seems many people are able to swap from cigarettes to e-cigarettes and therefore a spatial analysis can help to identify areas with high and low uptake of e-cigarette smoking, including the characteristics of people. The aim for this project is to take international evidence on the change of cigarette and e-cigarette smoking behaviour to identify possible future impacts for New Zealand. This study will heavily depend on available datasets but the need for such analysis is given, especially when discussions arise if e-cigarette should be classified as a smoking cessation aid or not. There are also discussion to add this variable in future surveys/census.

- **Examine the applicability of the software framework simSALUD to New Zealand Health Survey data for policy support (MT, MC)**
  The spatial microsimulation software simSALUD was developed by MT and colleagues within a former funded research project in Austria, with the goal of international usage. New Zealand allows to access data that is required to do the analysis. In this case we need data on individuals form the NZHS (in anonymised form) and the Census data. We have built a spatial microsimulation model of smokers in New Zealand with three main

purposes: (1) validate model outcomes with census data. This is very unique as no other country provides this data for small geographies. (2) to model missing data, such as non-respondents, (3) to model other health variables using this approach, such as diabetes and (4) to model what-if scenarios, as the latter will be most important for the MoH. First results were presented at the International Microsimulation Association conference 2016 in Budapest, including the submission of a conference paper. The main focus for the year 2017-18 will be the modelling of relevant what-if scenarios for New Zealand.

- **Explore spatial relationships between smoking status and influences on health, such as cardiovascular disease, obesity or nutrition (MT, MC, SK)**
  It is scientifically proven that smoking is a trigger for many other diseases, such as cardiovascular diseases. Therefore, knowing the relationship between smoking and other health issues plus the demographic characteristic of the high risk groups is very valuable. This information can then be applied to small geographical areas to model the likelihood of people with smoking and other health risks to identify high risk areas for small geography to demonstrate where more support in future will be required. However, it is not only interesting to study smokers, but also to study ex-smokers to identify more or less successful areas in terms of quitting. This can further lead to link this information to other areas, such obesity, to see if areas with a higher rate of ex-smokers have also an increased average weight gain. If the latter could be proofed then it can be argued that a smoking cessation services should also provide information e.g. on healthy nutrition or outdoor activities to prevent weight gain.

3.4.   *Ad-hoc Tasks Completed for the Health Sector*

The role of GIS is becoming more prominent in the health sector; however GIS capability varies greatly among DHBs as developing expertise is both expensive and time consuming. In addition to the research outlined above, GIS technicians and GeoHealth Laboratory staff in the Department of Geography and the Ministry of Health continue to play an important role in providing GIS ad-hoc services for the Ministry of Health. These range from email and telephone advice, training, geocoding and mapping tasks to more advanced analytical support. Projects include:

- Create and supply customised DHB boundary data (ACC)
- Create and supply GIS data containing obesity information for training workshop (LINZ)
- Create and supply GIS data – Regional boundaries (Population Policy, MoH)
- Geospatial analysis of cardiac arrest and AED data (St John NZ)
- Geocoding of healthcare services, append Meshblock code (Strategy and Policy, Contractor, PWC)
- Analysis of Women aged 15-44 by deprivation (Client Insights and Analytics)
- Assessing geospatial variation in coronary heart disease and associated risk factors in NZ DHBs (Collaboration with Inbal Salz, (HDI), JM and members of long term conditions team, MoH)
- Write project proposal for evaluation of cycleway intervention in Whangarei and prepare research design and methodology (Collaboration with MoH, Martin Dutton, (Physical Activity) NZTA, active transport team, and Whangarei)
- Update Service location Analyses Guidebook for use within MoH (MoH, JM)
- Provide area (msq) of DHBs (MoH)

UC GEOHEALTH LABORATORY

4. Work plan Core Activity: Scholarships

4.1. Introduction

A core driver of the Laboratory is to ensure that the New Zealand health sector has access to a pool of young and talented individuals that are amongst the 'best and the brightest' and have practical GIS skills in the emerging areas of geohealth research. To meet this aim the Laboratory provides two Master's Degree scholarships per year, and one PhD scholarship. The scholarships have two aims: firstly, for undertaking multidisciplinary research of practical benefit to the New Zealand health sector; and secondly, by providing a gateway to the health sector that is of direct benefit to the student and health sector employers.

The Laboratory welcomes innovative scholarship research proposals from recipients from wide background across a broad spectrum of geohealth, environmental, and public health areas including (but not exclusively) the following:

- Neighbourhood built environments and health
  - Determinants of obesity
  - Alcohol related behaviours and harms
- Social environments and health
  - Social inequality and smoking
  - Crime and health
  - Social dimensions of cancer incidence and survival
- Physical environments and health
  - Air pollution and health
  - Environmental health indicators
- Health inequalities
- Hospital admissions and access to primary care
- Healthy, resilient populations and places
- Health service planning and use

Each Masters scholarship covers domestic tuition fees and provides a $15,000 living allowance. For PhD scholarships this covers tuition fees and provides a $30,000 living allowance. The GeoHealth Laboratory has also endeavoured to cover research costs associated with the student's research and, for example, is contributing towards the cost of attending conferences or other associated training.

4.2. Current Masters Students

Note: Appendix A shows a list of all former Master students with the title of their projects.

Kirsten Curry (commenced April 2015, completed August 2016) (GeoHealth scholarship)

Thesis title: An exploration of the effects of roads and traffic on mental health in Auckland, New Zealand

Jesse Wiki (commenced February 2016) (GeoHealth scholarship). Successfully converted to PhD student in August 2016 (see Section 4.3 below).

UC GEOHEALTH LABORATORY

4.3. Current PhD Students

Note: Appendix B shows a list of all former PhD students with the title of their projects.

Niamh Donnellan (commenced February 2012 and completed in December 2016) (GeoHealth scholarship)

Subject: A geospatial approach to understanding the influences of the built environment on active transport behaviours and health outcomes

Alison Watkins (commenced March 2013) (GeoHealth scholarship)

Subject: The social and spatial distribution of obesity in New Zealand: A spatial microsimulation approach

Jesse Wiki (commenced February 2016) (GeoHealth scholarship)

Subject: Understand the geographical distribution and spatial risk factors of obesity and T2DM in NZ and the implications this has for health policy and planning.

5. GeoHealth Laboratory Promotion

5.1. Conferences and other presentations

Presenting the research of the GeoHealth Laboratory is integral to raising the profile of the GeoHealth Laboratory, both domestically and internationally. Selected presentations are listed below.

- Beere P (2016) *Spatial Analysis and interRAI*. Presentation to the NZ Health and Ageing Research Group – Christchurch.
- Beere P (2016) *Geographic Distribution of New Zealand's interRAI Cohort*. University of Canterbury Geography Seminar Series.
- Beere P (2017) *Geographic Distribution of Loneliness in New Zealand's interRAI Cohort.* Global Acute Care Excellence Forum, Brisbane, Australia.
- GeoHealth Symposium/Open Day, 5.5.2016, Wellington. Members of the lab, or people related, presented research and prepared workshops.
    - o Workshop and discussion: "What value can geospatial science bring to the MoH?" Prof. Simon Kingham, Co-Director of GeoHealth Laboratory
    - o Research seminar: "An exploration of the effects of roads and traffic on mental health in Auckland, New Zealand" Kirsty Curry, GeoHealth laboratory, Masters of Science (completed in 2016)
    - o Research seminar: "A Geographic Analysis of the Built Environment, Obesity and Diabetes in New Zealand" Jesse Wiki, PhD candidate, GeoHealth laboratory
    - o "Measuring the built environment for health: walkability and accessibility" Dr. Angela Curl, Lecturer in Human Geography at University of Canterbury
    - o Workshop and discussion: "Tracking and tracing" led by Dr. Malcolm Campbell, Co-Director of GeoHealth Laboratory
    - o Workshop 1: Primary health care, led by Dr. Paul Beere, Postdoctoral fellow, GeoHealth Laboratory

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- o Workshop 2: Intelligently targeting specific population groups using geospatial analysis and tools, led by Dr Melanie Tomintz, Postdoctoral fellow, GeoHealth Laboratory

- Kingham S, Wiki J and Banwell K, 2016, Traffic volume, social interaction and community development. Conference presentation at 2Walk&Cycle 2016 moving toward healthy communities conference, Auckland, 6th-8th July 2016. Presentation.

- Tomintz 2017: Filling the gap of non-response smoking census data 2013. Report for Ministry of Health.

- Tomintz, M. and Campbell, M. (2016). *The advantage of New Zealand Census smoking data for spatial microsimulation modelling.* Conference presentation at the International Microsimulation Association (IMA) - European Meeting 2016, Budapest, Hungary.

- Tomintz (2017) '*Where are New Zealand's smokers? Filling the gaps of Census smoking data using spatial microsimulation algorithms.*' Conference presentation at the 6th World Congress of the International Microsimulation Association, Torino, Italy.

- Tomintz (2017) '*Geospatial analysis, GIS and tobacco research'*, presentation at the MoH, 20.7.2016.

- Watkins, A., Tomintz, M. and Campbell, M. *Complexities of ethnicity and deprivation: Challenges for constructing a spatial microsimulation model in a New Zealand Context* Presenter: M. Tomintz, Conference presentation at the International Microsimulation Association (IMA) European Meeting 2016, Budapest, Hungary.

- Watkins, Tomintz, Campbell (2017) '*Projecting future obesity rates in Aotearoa/New Zealand using Spatial Microsimulation'*. Conference presentation at the 6th World Congress of the International Microsimulation Association, Torino, Italy. Presenter: M. Tomintz

5.2.   Web page

A comprehensive set of web pages outlining the GeoHealth Laboratory activities are available and are regularly updated by GeoHealth staff and Paul Bealing (Department of Geography, Web Administrator). For a link to the Laboratory's web page, see www.geohealth.canterbury.ac.nz/. The site:

- outlines the aims and objectives for the Laboratory
- gives an overview of Laboratory activities
- provides details of the various GeoHealth research projects
- provides details of the available scholarships
- provides a list of recent staff publications
- provides an overview of all staff members and postgraduate students
- has regular news items

5.3.   Social media

The GeoHealth Laboratory uses social media to disseminate news and features. To view the Laboratory's Twitter feed, see www.twitter.com/GeoHealthLab.

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5.4. 3rd Annual Geospatial Symposium

On 5th May 2017 the Laboratory collaborated with the Ministry of Health in delivering an event entitled 'The extra dimension – location, 3rd Annual Geospatial Symposium: annual showcase of research'. The opening was done by Deb Struthers and a series of speakers from, or related to, the Laboratory presented to attendees from public sector organisations such as the Ministry for Social Development (MSD) and the Ministry of Justice to strengthen existing and build up new collaborations between the Ministry and the University. Two specific workshops were scheduled in the afternoon.

6. Plans for 2017-18

The GeoHealth Laboratory was evaluated and received another three years of funding. For the next three years, a new work model will be implemented and changes include the staff, as well as the collaboration between the MoH and the GHL. The Director and Deputy Director will also aim to further increase their network of contacts and raise awareness of the Laboratory particularly across the health sector, as well as all staff are encouraged to do.

Staff:

Directors: Prof. Simon Kingham is the Director of the Lab and Dr Malcolm Campbell will be the Deputy Director.

Research Manager: It is planned to implement this new position to strengthen the internal work environment and foster a stronger collaboration with the Ministry of Health and other related organisations. This position is important as there will be no senior advisor located anymore within the Ministry of Health. This new post is planned to be advertised in winter/autumn 2017 and filled as soon as possible after that.

Postdocs: Two postdoctoral research positions will continue with the Lab.

Scholarships: Some thesis scholarships will be available.

New work model:

The project for the next year are designed together with key persons from the MoH to meet and approach most significant health issues and problems, and support these with spatial data analysis and visualisation. All projects outlined in section 6.1 "Research" are scheduled for shorter time periods to encourage active communication and engagement with the MoH.

6.1. Research

For the time period 2017/18, six research projects were shortlisted between the MoH and the GHL and these projects are listed below:

Project One: How does service provision, service use and health outcomes differ between neighbourhoods with similar characteristics?

This project will inform other research projects relating to equitable access to services and will provide evidence and insights that contribute to the following New Zealand Health Strategy Actions:

- Action 6: Ensure the right services are delivered at the right location in an equitable and clinically and financially sustainable way

- Action 8: Increase the effort on prevention, early intervention, rehabilitation and wellbeing for people with long-term conditions. This includes addressing common risk factors.

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The project will consist of two phases:

1. A range of demographic, socioeconomic, and service access indicators will be used to assess the social and environmental characteristics and risk factors associated with long-term conditions across New Zealand. Analyses could utilise data from the Census, New Zealand Health Survey, health administration datasets and District Health Boards, with additional service location information likely to be provided by Service Commissioning (MoH). It is expected that geographical anomalies will be identified at the neighbourhood level to inform the second phase of the project.

2. Anomalies will be investigated further at a neighbourhood/local level (e.g. Census Area Unit) for selected case study areas, to investigate as to why neighbourhoods with seemingly similar characteristics differ in health outcomes. The output from each phase will include (but not be limited to) a summary in plain English documenting the methodology and key findings from each phase and sharing of the datasets used in the analysis.

Research Project Two – What is the geographic distribution of stroke patients, eligibility for rehabilitation and placement of rehabilitation services?

This project is intended to be the first relating to the geographic distribution of patients with long term conditions and will focus on stroke patients, their eligibility and placement of services. The project will provide evidence and insights that will aid the understanding of the provision of an equitable service to patients and will contribute to the following New Zealand Health Strategy Actions:

- Action 6: Ensure the right services are delivered at the right location in an equitable and clinically and financially sustainable way

- Action 8: Increase the effort on prevention, early intervention, rehabilitation and wellbeing for people with long-term conditions. This includes addressing common risk factors.

- Action 25: Increase New Zealand's national data quality and analytical capability to make the whole health system more transparent and provide useful information for designing and delivering effective services.

The project will look at the geography of where stoke patients live (data dependant), the areas where they reside as well as the location and accessibility of rehab services (i.e. where are they, how close are they to patients). In addition the project will explore the differences in this patient group (e.g. mobile phone use, internet, access to transport, income, distance from services) and their health outcomes. This project is likely to lead to further research projects relating to long term conditions.

Research Project Three – Spatial analysis of e-cigarette smoking and its impact on the population of New Zealand

This project aims to provide a spatial analysis of e-cigarette smoking and its impact on the population of New Zealand. The increase of e-cigarette usage is reported but more data collection about the health impacts of e-cigarettes, the impact of tobacco smoking cessation and uptake of e-cigarettes by non-smokers is needed. The project will include the identification of existing data sets from New Zealand and worldwide, to provide some insights into the areas likely to be most affected by e-cigarette consumption. The objectives of this study are to:

- Complete a systematic literature review of current state of the art on e-cigarette smoking and its impact on tobacco cessation, smoking uptake, etc.

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- Identify New Zealand (if available) and global statistics and datasets.

- Data processing and analysis.

- Reporting of findings.

The project will provide evidence and insights and contribute to the New Zealand Health Strategy Actions:

- Action 8: Increase the effort on prevention, early intervention, rehabilitation and wellbeing for people with long-term conditions. This includes addressing common risk factors.

- Action 25: Increase New Zealand's national data quality and analytical capability to make the whole health system more transparent and provide useful information for designing and delivering effective services.

And to the Smokefree 2025 target which will be achieved by: protecting children from exposure to tobacco marketing and promotion; reducing the supply of, and demand for tobacco; and, providing the best possible support for quitting.

Research Project Four – A spatial microsimulation model

The aim of this project is to use the previously built spatial microsimulation model to simulate useful scenarios and produce datasets and information that is not provided by the Census. Such scenarios will not only help to produce new local information about certain behaviour, and to model the impact of certain policy changes. The first scenario will be to simulate smokers according to the amount they smoke (hence to categorise them into heavy smokers) and enable the identification of areas where people are most likely to stop smoking when increasing the cigarette prices or implement an additional smoking cessation support – to provide a few examples.

The objectives of this study are to:

- Identify variables from the NZHS that can be relevant for modelling future scenarios

- Define and select most relevant scenarios together with Ministry of Health

- Prepare and model defined simulation scenarios

- Analyse spatial simulation results of outcomes

- Disseminate/Report findings

It is likely that this project will lead to other spatial microsimulation modelling. The project will provide evidence and insights and contribute to the New Zealand Health Strategy Actions:

- Action 6: Ensure the right services are delivered at the right location in an equitable and clinically and financially sustainable way.

- Action 8: Increase the effort on prevention, early intervention, rehabilitation and wellbeing for people with long-term conditions. This includes addressing common risk factors.

- Action 25: Increase New Zealand's national data quality and analytical capability to make the whole health system more transparent and provide useful information for designing and delivering effective services.

Research Project Five – Avoidable Hospitalization: Which populations are not getting the services they need

Health & Disability Intelligence   21   **Dept. of Geography**

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This project will explore where those (by age) with potentially avoidable need are located, their demographics and how potentially avoidable need (by condition) varies by DHB. The project will provide evidence and insights and contribute to the New Zealand Health Strategy Actions:

- Action 6: Ensure the right services are delivered at the right location in an equitable and clinically and financially sustainable way.

- Action 8: Increase the effort on prevention, early intervention, rehabilitation and wellbeing for people with long-term conditions. This includes addressing common risk factors.

And the Better Public Services Results Two Health Mums and Babies - by 2021, a 25% reduction in hospital admission rates for a selected group of avoidable conditions in children aged 0 - 12 years, with an interim target of 15% by 2019.

The project has two phases.

1. Which populations are not getting the services they need (ie potentially avoidable need). The research will cover a range of conditions deemed to be potentially avoidable including (but not limited to) dental, respiratory, pneumonia, asthma and wheeze, skin conditions and head injuries.

2. What is preventing people from using the services they need? This project will explore what is preventing people from using the health services they need. This may include amongst others location, access and transport.

Research Project Six – What are the obesogenic environments experienced by obese children?

This project will be defined once the Childhood Obesity Plan is refreshed in 2017/18 and will contribute to the three focus areas from the plan:

- Targeted interventions for those who are obese

- Increased support for those at risk of becoming obese

- Broad approaches to make healthier choices easier for all New Zealanders.

6.2. Scholarships

Scholarships will continue to be awarded to the most promising candidates with innovative research proposals.

6.3. Training

There are four undergraduate and four graduate GIS courses offered by the Department of Geography at University of Canterbury, and one undergraduate and one graduate course in Health Geography. In 2011, the Masters in GIS (MGIS) programme, primarily developed at the University of Canterbury, commenced. This included a newly developed *Geographic Information Systems (GIS) in Health* course which includes almost exclusive contributions by GeoHealth Laboratory staff. This course provides a unique forum for those working or interested in working in the health sector to learn GIS and how this is utilised in health research. This course includes students joining by videoconference from Wellington (Victoria University) and Auckland (AUT).

A new designed Master programme called "Masters of Geospatial Analysis for Public Health" is submitted for accreditation and planned to start in February 2018.

6.4. GeoHealth Laboratory office and equipment

GeoHealth Laboratory moves into new RSIC building

The physical location of the GeoHealth Lab will move to the RSIC (Research and Science Innovation Centre), which is planned to be finished by the end of 2017. The new lab will be of similar size to the current one and will be equipped with new office furniture and white board. The current computer equipment is transferred to the new office and the secured data workstation will be transferred by movers with a GHL staff member accompanying them. The move to the new building means a physical divide between the director and deputy director, but the walking distance is short and regular meetings are planned.

Transfer of NZHS data to GeoHealth Laboratory premises

In 2015-16 the GeoHealth Laboratory established a workstation on University of Canterbury premises to host information from the New Zealand Health Survey. This workstation has added levels of security in addition to the existing protocols governing data management in the GeoHealth Laboratory, with log on access restricted to the Directors and to the Postdoctoral Fellows employed. Additional has been undertaken by these staff, where applicable, in order to ensure confidentiality, data quality, and analysis are conducted in appropriate ways. The transfer has been sanctioned by legal teams at both the Ministry of Health and the University of Canterbury. The transfer of data will facilitate the undertaking of policy-relevant research in keeping with the aims of the ongoing relationship between both organisations, both at senior academic and postgraduate level (for example, the NZHS often underpins research undertaken in the 'Health and GIS' Masters course delivered by the University of Canterbury). To date, the NZHS 2014-15 has been supplied. The protocols set in place have facilitated efficient supply of data

6.5. Promotion through conferences and seminars

Below is a list of our planned conference attendance for 2017-18 to disseminate and present GeoHealth related research (***not*** all funded by the GeoHealth contract) and to socialize for possible future collaborations:

- Seminars in the Ministry of Health, Medical Schools and Geography Departments in New Zealand and at international events
- International Medical Geography Symposium, Angers, France, July 2017
- New Zealand Geospatial Research Conference, December 2017, Christchurch
- 4th Annual Geospatial Symposium at the Ministry of Health, around May 2017

Due to the new work model between the MoH and GHL, a strong focus is to present project results to selected people at the Ministry and later to a wider audience.

UC GEOHEALTH LABORATORY

Appendix A: Previous GeoHealth Laboratory Research Students

Masters Thesis students (in ascending order)

Catherine Tisch (completed September 2006) (GeoHealth scholarship)
Title: Has mortality become geographically polarised in New Zealand? A case study: 1981-2000.
On completion of her Masters Catherine worked at the Institute of Environmental Science and Research (ESR) as a Health Information Analyst in the Population and Environmental Health team, then as a Research Associate with GeoHealth, then joined a research group in GeoSciences at the University of Edinburgh.

Katrina McPherson (completed December 2006) (GeoHealth scholarship)
Title: Food insecurity and the food bank industry: A geographical analysis of food bank use in Christchurch.
On completion of her Masters Katrina joined the Christchurch City Council as a Research Assistant.

Erin Holmes (completed March 2007) (GeoHealth scholarship)
Title: Mandatory disease notification and under-ascertainment: A geographical perspective.
On completion of her Masters Erin joined the Ministry of Health as a full time Research Analyst and then as a Senior Advisor for the National Health Committee.

Esther Rhind (completed June 2007) (GeoHealth scholarship)
Title: Investigating the spatial distribution of campylobacteriosis in New Zealand.
Esther completed a PhD at the University of Norwich, UK and then joined a research group in GeoSciences at the University of Edinburgh.

Paul Moth (completed July 2008) (GeoHealth scholarship)
Title: Examining the environmental justice of sea-level rise and storm tides.
Paul completed a four month internship with the Ministry of Health and then returned to the US to a teaching job at a High School.

Michael Brown (completed February 2009) (funded by FRST)
Title: The health effects of PM10 air pollution in Reefton, South Island, New Zealand.
Michael worked for Watercare Services in Auckland as an Environmental Analyst.

Anjeela Kumar (completed June 2010) (GeoHealth scholarship)
Title: The effect of the neighbourhood built environment on obesity in Christchurch.
Anjeela got a job working at the Christchurch School of Medicine.

Sam Valentine (completed May 2011) (GeoHealth scholarship)
Title: Public health service rationing for elective surgery in New Zealand, 2004-2007.
Sam got job working for the Appian Group in Sydney.

Chris Bowie (completed May 2011) (GeoHealth scholarship)
Title: Socioeconomic inequalities in adolescent smoking behaviour and neighbourhood access to tobacco products.
After working in the GeoHealth Lab Chris got a job OPUS International Consultants.

Matt Willoughby (completed May 2012) (GeoHealth scholarship)
Title: Neighbourhood level impact of crime on community health outcomes.
Matt got a post working for the Canterbury District Health Board.

Kim Reed (completed February 2013) (GeoHealth Scholarship)
Title: The spatial and temporal patterns of anxiety and chest pain resulting from the Canterbury earthquakes

Kim got a job working in Blenheim as a GIS professional.

Daniel Nutsford (completed February 2014) (GeoHealth scholarship)
Title: Natural urban environments and their influence on mental health: A New Zealand Case Study
Daniel spent time working in London as a GIS professional, then returned to NZ for a job for Interpret in Auckland.

Jayden MacRae (completed March 2014)
Title: Using a natural experiment to assess the effect of spatial barriers on health service utilization.
Jayden was CEO of Patients First in Wellington.

Nick Brunsdon (completed February 2015) (GeoHealth scholarship)
Title: Regional patterns in excess winter mortality and morbidity amongst the elderly in New Zealand
Nick worked as an Economic Analyst at Canterbury Development Corporation (CDC).

Andreas Wilson (completed August 2015) (GeoHealth scholarship)
Title: Measuring exposure to obesogenic environments among school children in New Zealand
Andreas got a post at Christchurch City Council.

Robert Poynter (completed April 2016) (funded by IBM)
Title: Assessing the influence of environment and socio-economics on spatial and temporal patterns of COPD hospitalisation in Christchurch: a GIS approach.
Rob worked as a GIS analyst on an HRC funded project.

Kirsten Curry (completed August 2016) (GeoHealth scholarship)
Title: An exploration of the effects of roads and traffic on mental health in Auckland, New Zealand.
Kirsty got a post working as an analyst for PwC New Zealand.

PhD students (in ascending order)

Jeff Wilson (completed 2006) (funded by University of Canterbury doctoral scholarship)
Title: Spatial variability of intra-urban particulate air pollution: epidemiological implications and applications.
After a postdoc post at Harvard, Jeff was on the academic staff at the University of Texas, Brownsville; then Environmental Science Professor and Dean at Huston Tillotson University (USA).

Laura Miller (completed 2008) (GeoHealth scholarship)
Title: Population mixing and the geographical epidemiology of childhood leukaemia and type 1 diabetes in New Zealand.
Laura went to work as a Spatial Analysis Research Officer with Child and Adolescent Community Health, Western Australian Department of Health.

Francis Ayuka (completed 2011) (GeoHealth scholarship)
Title: Examining place influence on alcohol-related behaviour and health outcomes New Zealand.
Francis went to work as a researcher in Nairobi, Kenya.

Daniel Hogg (completed 2016) (funded by CRCSI)
Title: Geographic variation in exposure to the 2010/11 Canterbury earthquake series and its implications on adverse mental health outcomes.
Daniel returned to Germany to a job in the geospatial industry.

Niamh Donnellan (completed 2016) (GeoHealth scholarship)
Title: A geospatial approach to measuring the built environment for active transport, physical activity and health outcomes.
Niamh got a post as Postdoctoral Research Fellow at the University of Auckland.