UC GEOHEALTH LABORATORY

Knock, knock, who's where: how location (and GIS and GPS) can help explain health …… and a lot of other things

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GeoHealth Laboratory and Dept of Geography,

University of Canterbury - Te Whare Wananga O Waitaha, Christchurch

University of Otago Christchurch Seminar Series

Monday August 7th 2017

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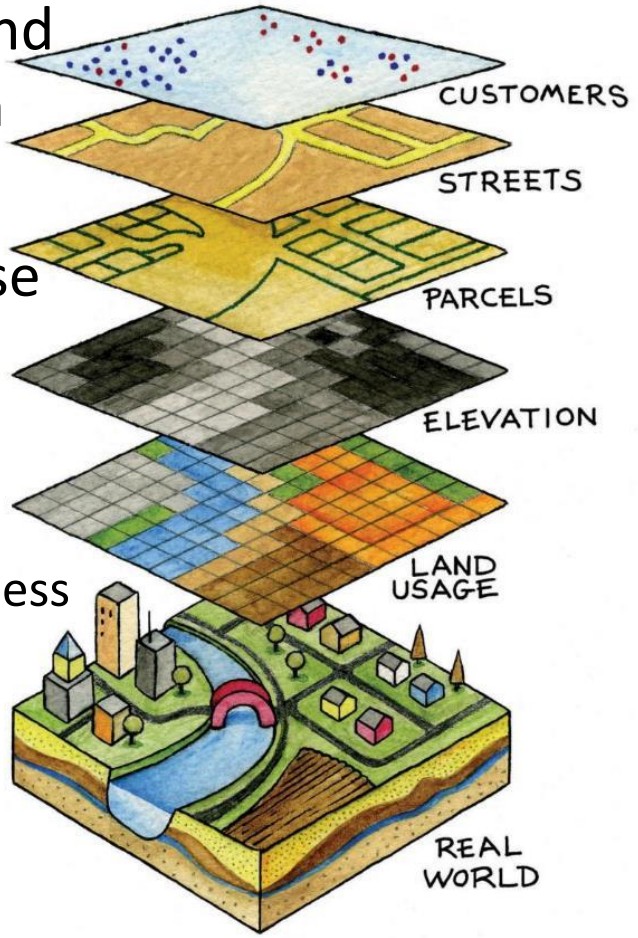
What is Health/Medical geography?

- Health geography is the application of geographical approaches to the study of health, disease, and health care
  - Site, situation, place, location, region - geography
  - distribution and dispersion of disease/illness/wellness and the supply and demand for healthcare resources

Geospatial Science and Geohealth?

- Geospatial science: a discipline that focuses on using information technology to understand people, places, and processes of the earth
- Geographic Information Systems (GIS): a technology that is used to view and analyse data from a geographic perspective

- Geohealth: Health + GIS
  - Determinants of disease and ill health & wellness
  - Health care provision



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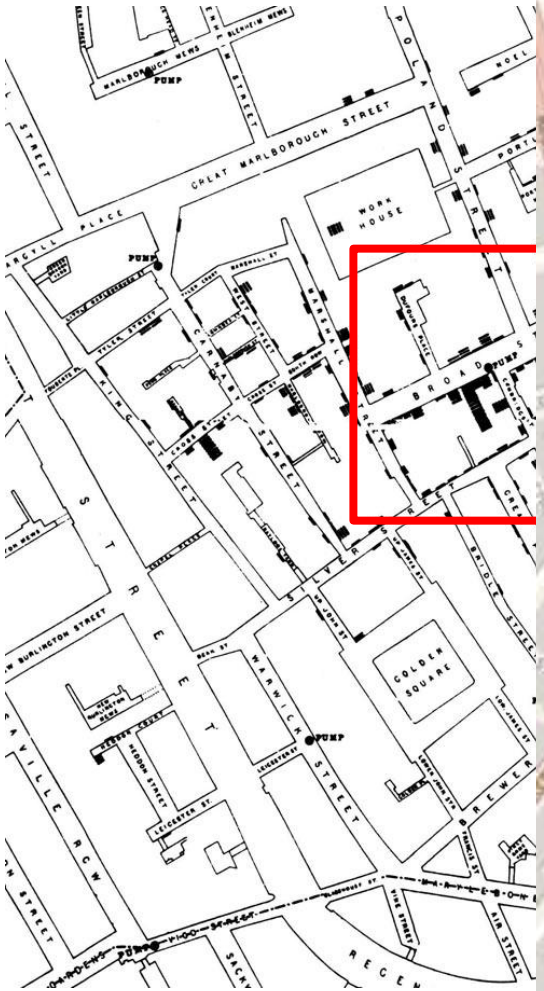
Data

- Big datasets
  - usually existing data
  - Surveys OK - but need to be spatially representative
- Geographically located
  - Points (best!), mesh blocks, or CAUs/domicile codes
- Information about determinants of health with geography
  - e.g. proximity to health service, SES, ethnicity, built environment, transport routes
  - often ‘created’ using GIS

Methods

- Tools
  - Visualisation (mapping etc)
  - Spatial analysis
  - Disease clustering
  - Modelling
  - Mobility and Disease Tracking

Mapping



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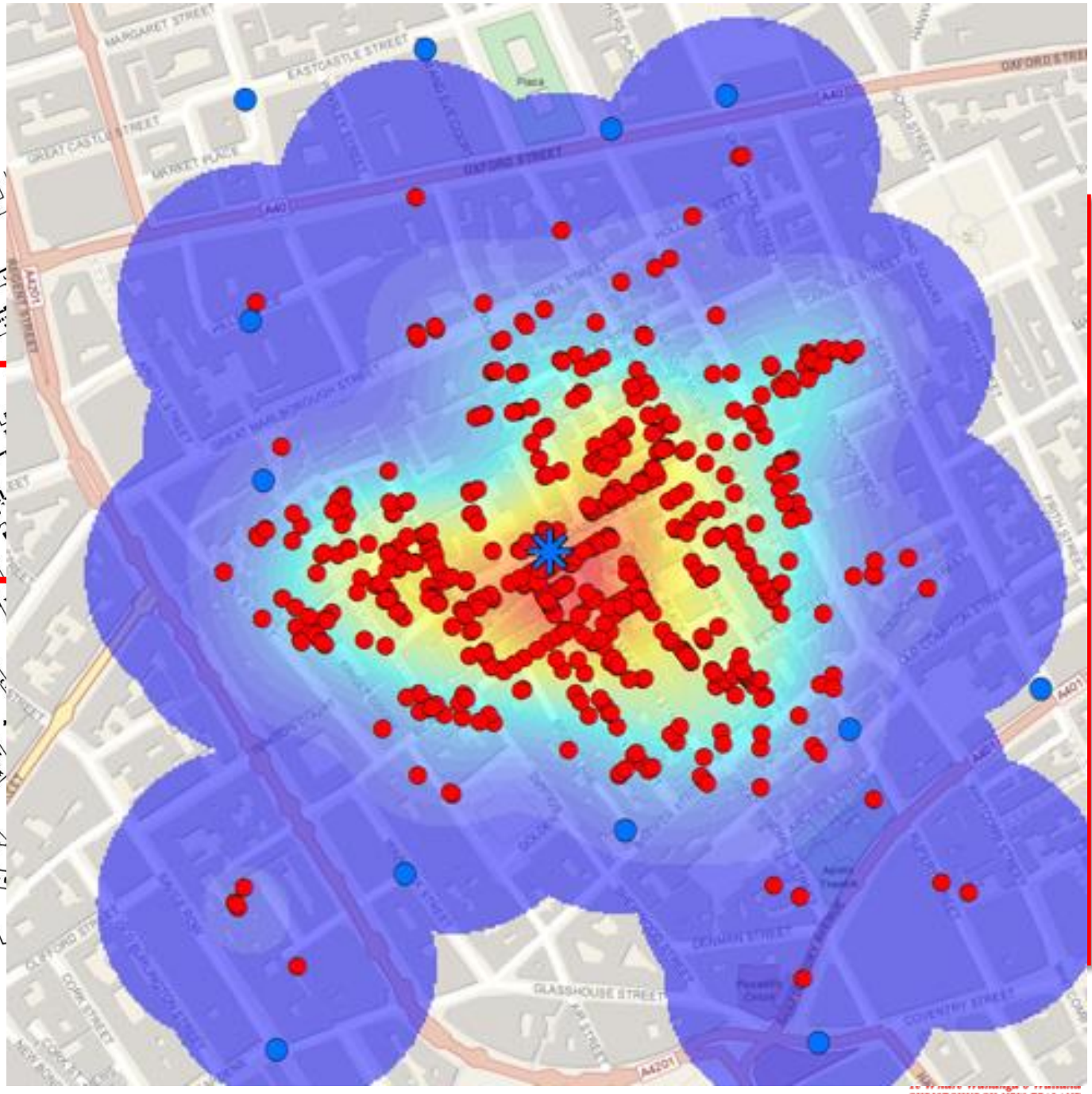
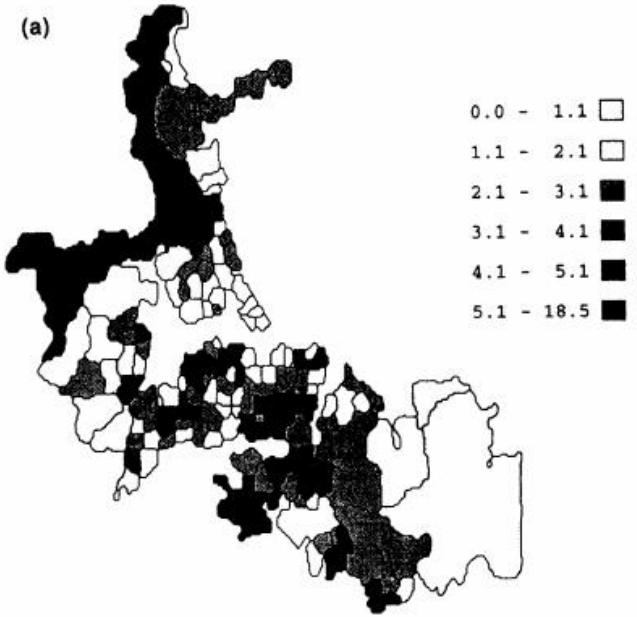


Mapping



Marshall RJ, 1991, Mapping disease and mortality rates using empirical Bayes estimators. Appl. Stat. 40, 283

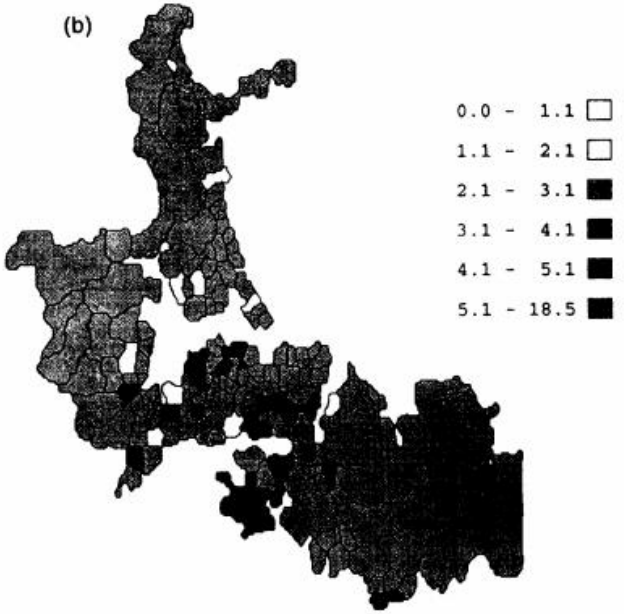


Fig. 5. (a) Child mortality in Auckland, New Zealand (1977 85), expressed as deaths per thousand children per year. (b) Empirical Bayes estimates of child mortality in Auckland.

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Interpretation

- Asking (and answer) questions
- Informing policy

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EXAMPLES

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Social Science & Medicine 179 (2017) 91–96

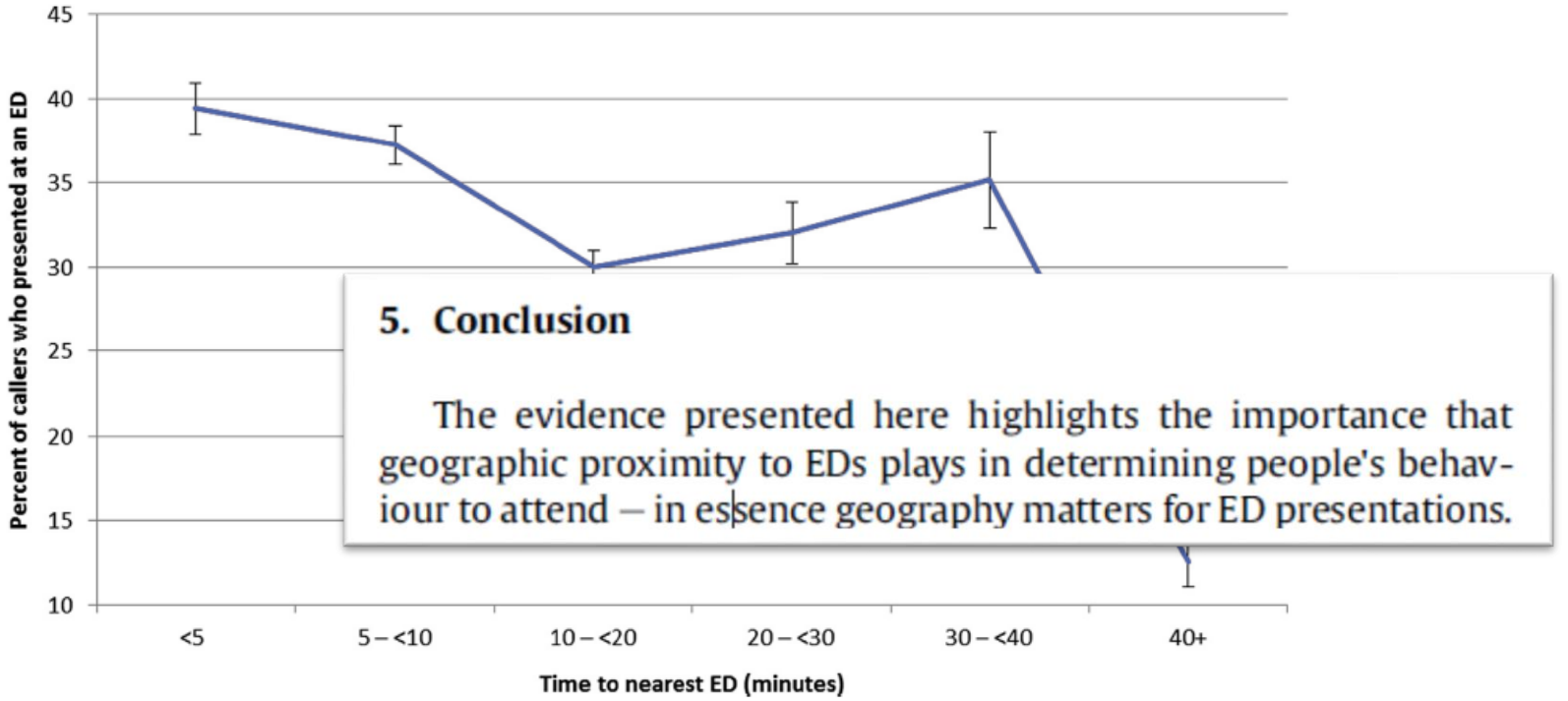
Contents lists available at ScienceDirect

Social Science & Medicine

journal homepage: www.elsevier.com/locate/socscimed

New Zealand Healthline call data used to measure the effect of travel time on the use of the emergency department

Edward Griffin [a, *], John P. McCarthy [b], Fiona Thomas [b], Simon Kingham [b]



5. Conclusion

The evidence presented here highlights the importance that geographic proximity to EDs plays in determining people's behaviour to attend – in essence geography matters for ED presentations.

Fig. 1. Compliant emergency presentations by drive time from nearest ED.

Available online at www.sciencedirect.com

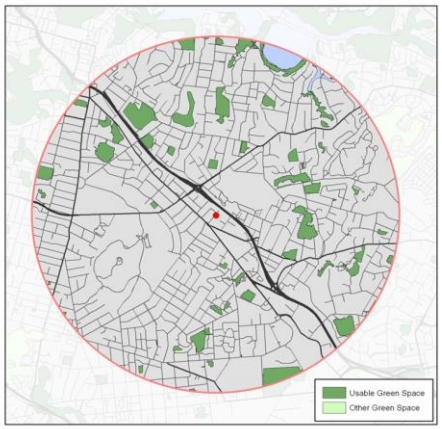
Public Health

journal homepage: www.elsevier.com/puhe

Original Research

An ecological study investigating the association between access to urban green space and mental health

D. Nutsford [a,*], A.L. Pearson [b], S. Kingham [a]



Conclusion: This study found that decreased distance to useable green space and increased proportion of green space within the larger neighbourhood were associated with decreased anxiety/mood disorder treatment counts in an urban environment. This suggests the benefits of green space on mental health may relate both to active participation in useable green spaces near to the home and observable green space in the neighbourhood environment.

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Health & Place 39 (2016) 70–78

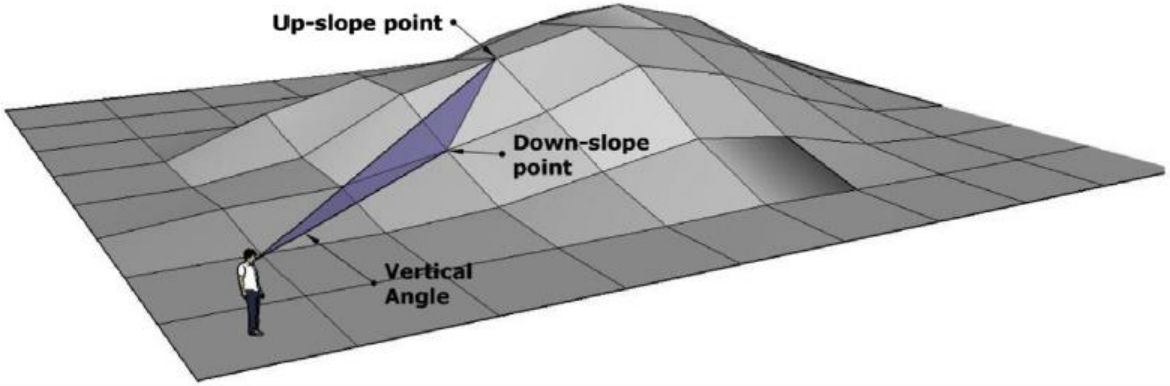
Contents lists available at ScienceDirect

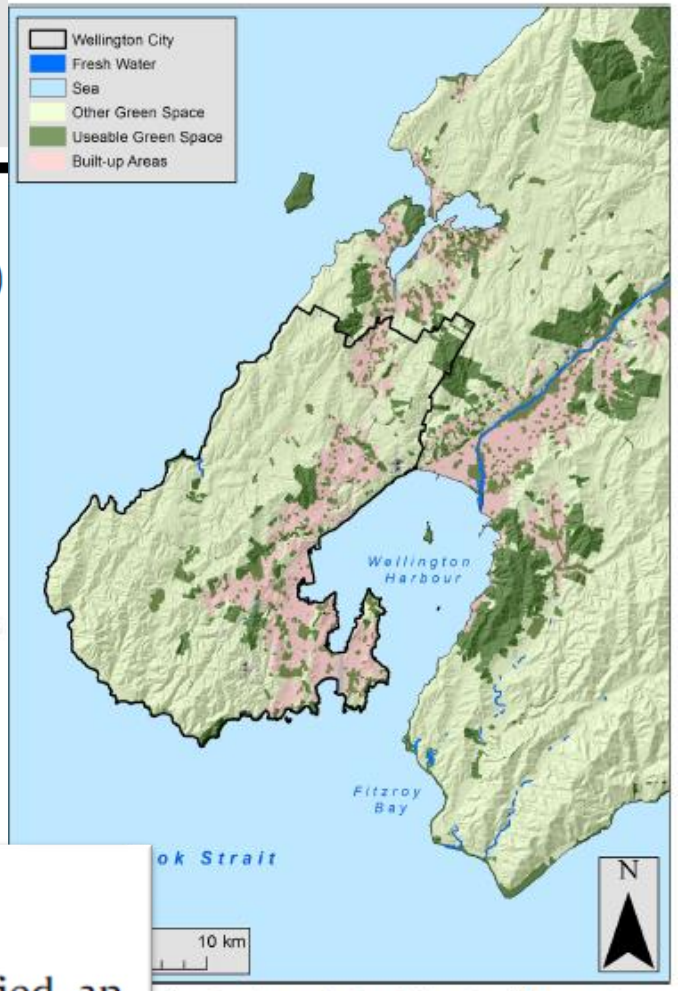
Health & Place

journal homepage: www.elsevier.com/locate/healthplace

Residential exposure to visible blue space (but not green space) associated with lower psychological distress in a capital city

Daniel Nutsford [a], Amber L. Pearson [b,c,*], Simon Kingham [a], Femke Reitsma [a]

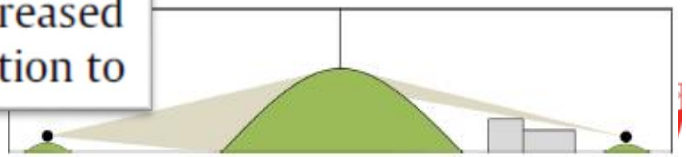




of natural environments throughout Wellington City and the greater region.

5. Conclusion

This study, in the capital city of New Zealand, identified an association between increased views of blue space and decreased psychological distress while adjusting for covariates. In addition to



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Pearson et al. BMC Public Health 2014, 14:553
http://www.biomedcentral.com/1471-2458/14/553

BMC Public Health

RESEARCH ARTICLE Open Access

Associations between neighbourhood environmental characteristics and obesity and related behaviours among adult New Zealanders

Amber L Pearson[1*], Graham Bentham[2], Peter Day[3] and Simon Kingham[3]

Table 4 Association between overweight, obesity, overweight+obesity and environmental factors adjusted for socio-demographic and other environmental factors

Characteristic		Category 1	Category 2			Category 3			Category 4			Category 5			
			OR	95% CI	p-value	OR	95% CI	p-value	OR	95% CI	p-value	OR	95% CI	p-value	p trend
Overweight															
Urban/rural category	Urban/rural	*Reference*	0.82	0.64,1.05	0.113	0.99	0.70,1.42	0.970	1.16	0.77,1.73	0.478				0.843
Area-level deprivation (NZDep)	NZdep	*Reference*	1.19	0.98,1.44	0.078	1.10	0.89,1.34	0.378	1.21	0.97,1.49	0.089	**1.34**	**1.05,1.72**	**0.018**	**0.034**
	Greenspace	*Reference*	**1.38**	**1.24,1.68**	**0.001**	1.14	0.93,1.39	0.215	**1.32**	**1.08,1.63**	**0.008**	**1.34**	**1.04,1.73**	**0.022**	**0.041**
	Foodshop	*Reference*	0.97	0.80,1.18	0.773	0.99	0.81,1.20	0.909	1.04	0.82,1.32	0.753	0.82	0.55,1.18	0.265	0.880
	Gym/pool	*Reference*	0.98	0.81,1.18	0.805	1.01	0.83,1.24	0.892	1.13	0.86,1.47	0.338	1.07	0.79,1.44	0.678	0.533
	Active travel	*Reference*	1.00	0.82,1.23	0.973	1.06	0.85,1.34	0.586	1.03	0.83,1.27	0.811	0.89	0.70,1.13	0.340	0.322
A															
A															
	Gym/pool	*Reference*	0.91	0.74,1.12	0.375	1.23	0.98,1.55	0.073	0.94	0.68,1.30	0.704	1.18	0.83,1.68	0.365	0.143
Accessibility of sports/leisure facilities	Active travel	*Reference*	1.15	0.90,1.48	0.269	1.16	0.88,1.54	0.291	1.10	0.84,1.46	0.485	0.90	0.67,1.21	0.497	0.314
Overweight+obesity															
Urban/rural category	Urban/rural	*Reference*	0.93	0.74,1.18	0.575	1.13	0.82,1.56	0.460	1.15	0.80,1.65	0.463				0.525
Area-level deprivation (NZDep)	NZdep	*Reference*	1.09	0.91,1.31	0.328	1.06	0.88,1.28	0.547	1.17	0.97,1.42	0.109	**1.43**	**1.14,1.78**	**0.002**	**0.004**
Percentage active transport to work	Greenspace	*Reference*	**1.23**	**1.03,1.47**	**0.023**	1.08	0.90,1.29	0.433	**1.34**	**1.11,1.61**	**0.002**	**1.39**	**1.10,1.75**	**0.006**	**0.005**
	Foodshop	*Reference*	0.88	0.74,1.04	0.128	0.94	0.79,1.11	0.437	0.92	0.74,1.14	0.444	0.74	0.53,1.03	0.079	0.320
	Gym/pool	*Reference*	0.96	0.81,1.14	0.675	1.11	0.93,1.33	0.247	1.07	0.83,1.37	0.598	1.11	0.84,1.48	0.455	0.217
	Active travel	*Reference*	1.09	0.89,1.32	0.401	1.12	0.90,1.39	0.313	1.10	0.89,1.36	0.379	0.91	0.73,1.15	0.428	0.315

Note: Categories: Urban/rural: 1 = Main urban area; 2 = Secondary urban area; 3= Minor urban area; and 4 = Rural area.
Environmental variables: quintiles (1 = best access, 5 = worst access); Deprivation (NZdep) (1= least deprived, 5= most deprived).
All bolded values are statistically significant at the 0.05 level.

Conclusion: Similar to findings from other international studies, these results highlight greenspace as an amenable environmental factor associated with obesity/overweight and also indicate the potential benefit of targeted health promotion in both urban and deprived areas in New Zealand.

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Social Science & Medicine 152 (2016) 18–26

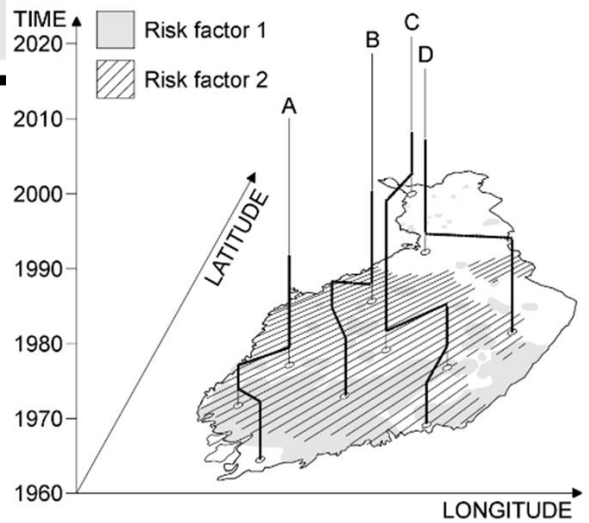
Contents lists available at ScienceDirect

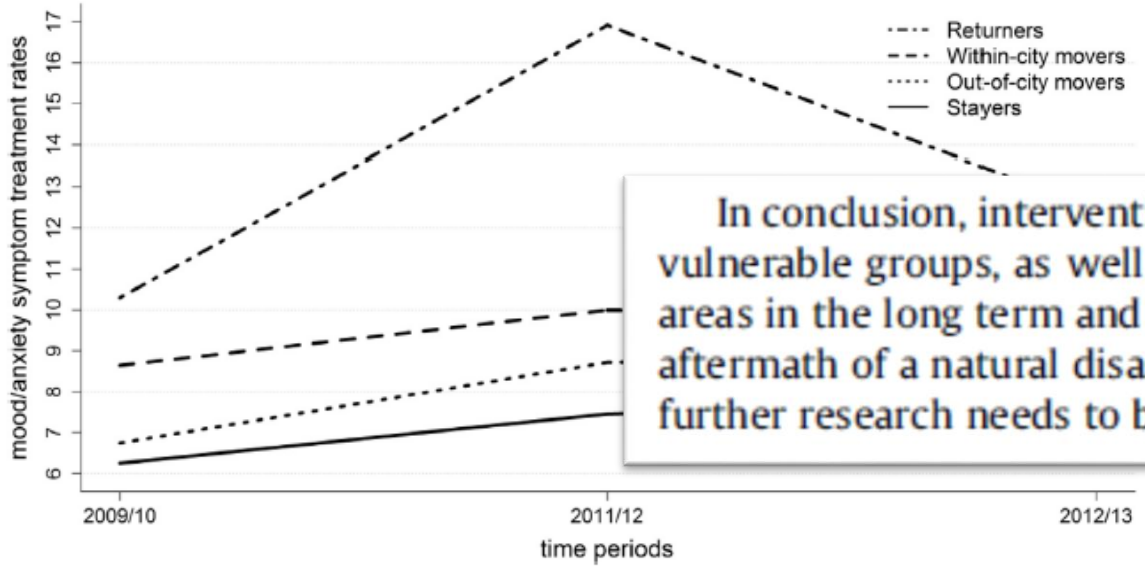
Social Science & Medicine

journal homepage: www.elsevier.com/locate/socscimed

The effects of relocation and level of affectedness on mood and anxiety symptom treatments after the 2011 Christchurch earthquake

Daniel Hogg [a, b, *], Simon Kingham [a, b], Thomas M. Wilson [c, d, e], Michael Ardagh [f, g]





In conclusion, intervention programs should target these highly vulnerable groups, as well as permanent relocatees from affected areas in the long term and temporary relocatees in the short-term aftermath of a natural disaster. As this study is the first of its kind, further research needs to be done.

Fig. 2. Mood or anxiety symptom treatment rates among Christchurch residents classified by mobility group in the pre-disaster year (2009/10) and the 1st (2011/12) and 2nd (2012/13) post-disaster year.

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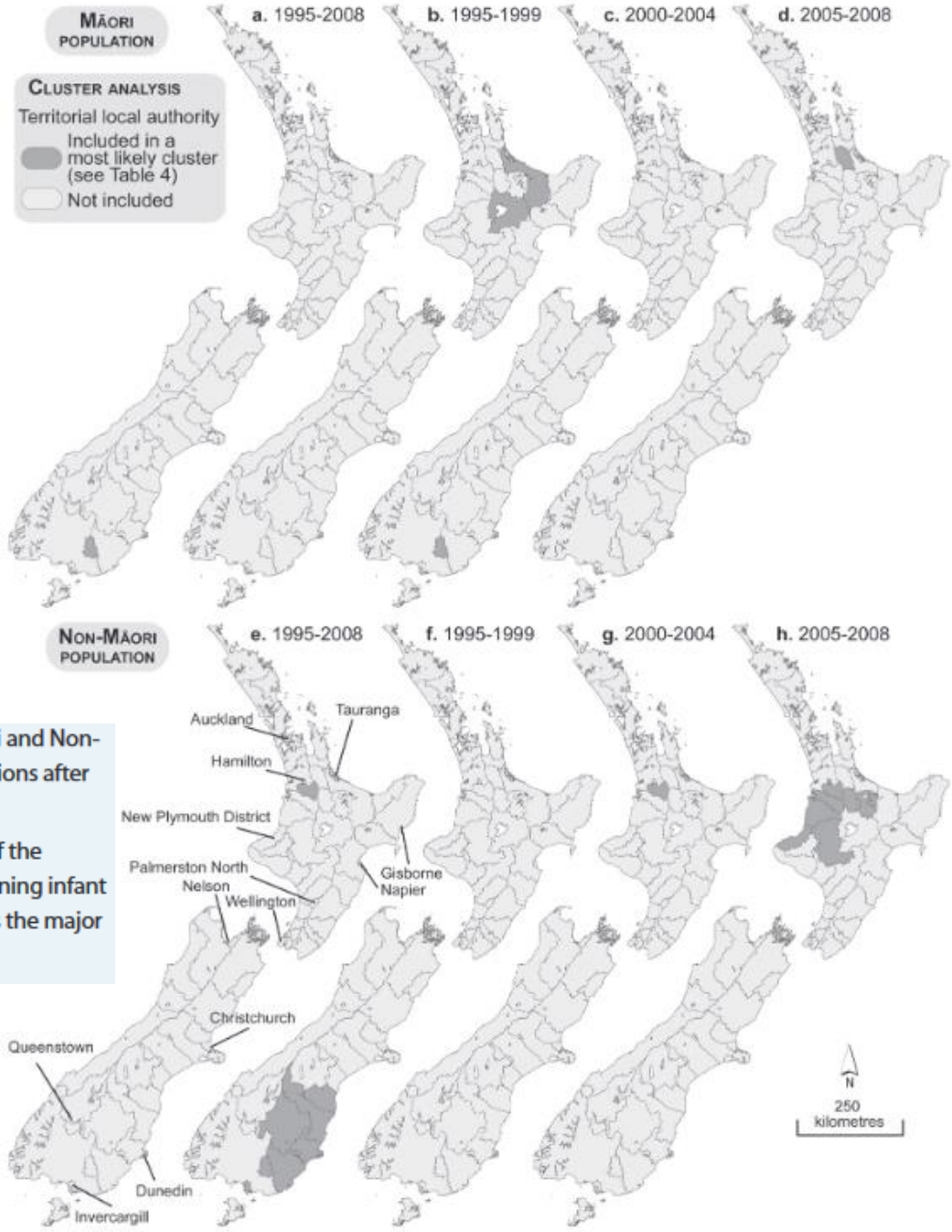
Geographic analysis of infant mortality in New Zealand, 1995–2008: an ethnicity perspective

Malcolm Campbell,[1] Philippe Apparicio,[2] Peter Day[1]

Conclusions: Infant mortality patterns are geographically similar for both Māori and Non-Māori. However, there are differences geographically between the two populations after accounting for deprivation.

Implications: Health services that can affect infant mortality should be aware of the geographical differences across NZ. Deprivation is an important factor in explaining infant mortality rates and policies that ameliorate its effects should be pursued, as it is the major determinant of the geographical pattern of infant mortality in NZ.

Figure 4: Purely spatial clusters of infant mortality incidence adjusted for area-level deprivation, 1995-2008.



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New Zealand Sociology Volume 28 Issue 3 2013

Variation in health and social equity in the spaces where we live: A review of previous literature from the GeoHealth Laboratory

Christopher Bowie, Paul Beere, Edward Griffin, Malcolm Campbell & Simon Kingham

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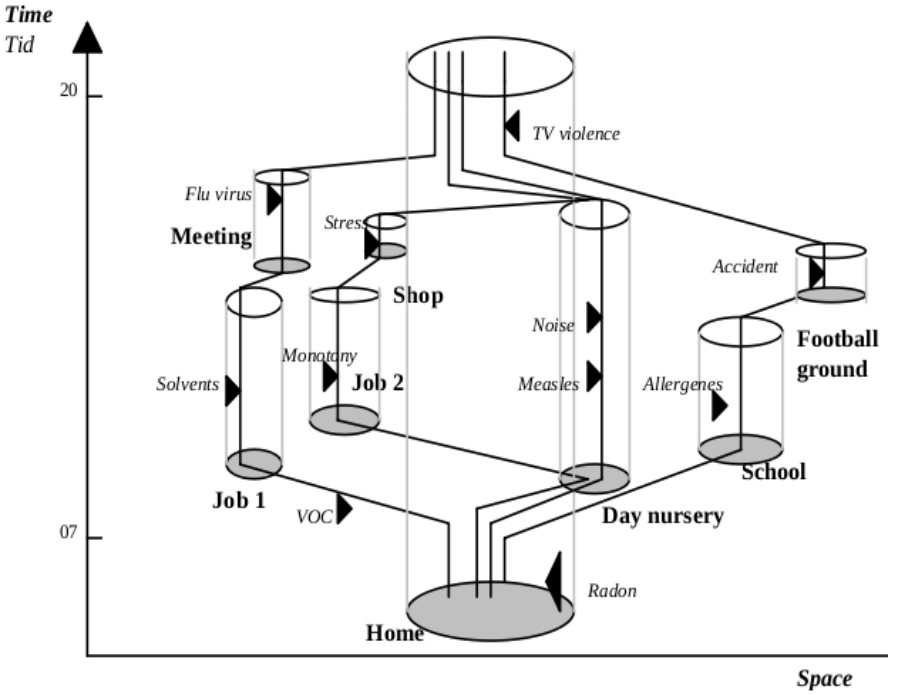
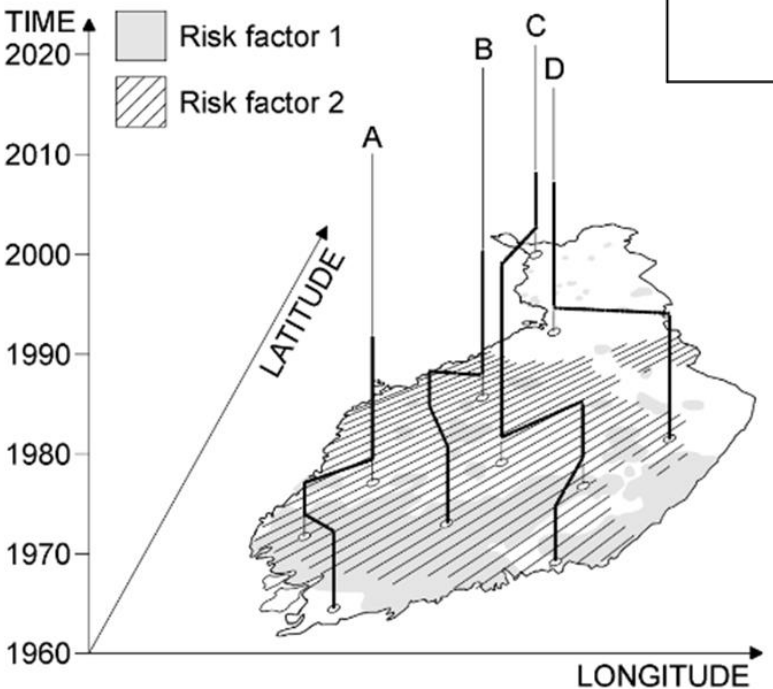
Mobile technologies: Tracking

- Tracking people
- Life course
- Spatio-temporal
  - space and time
- The exposome





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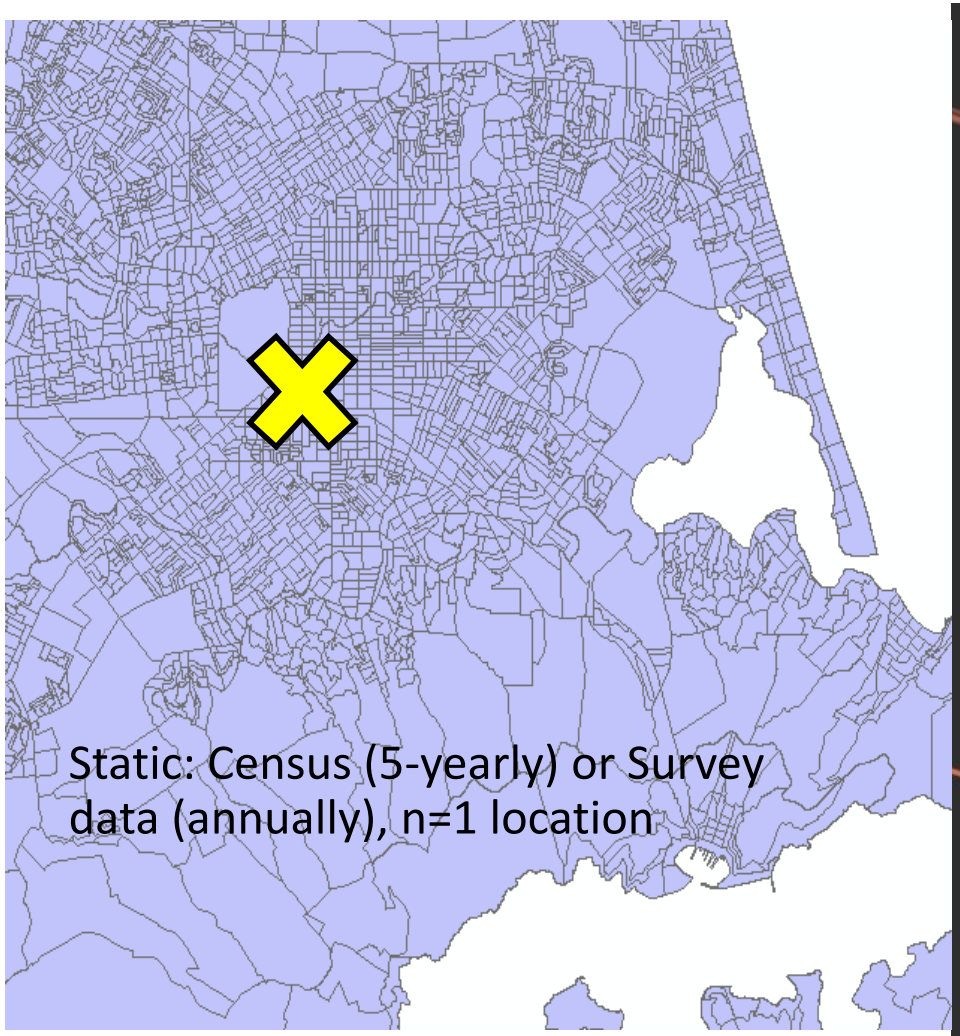
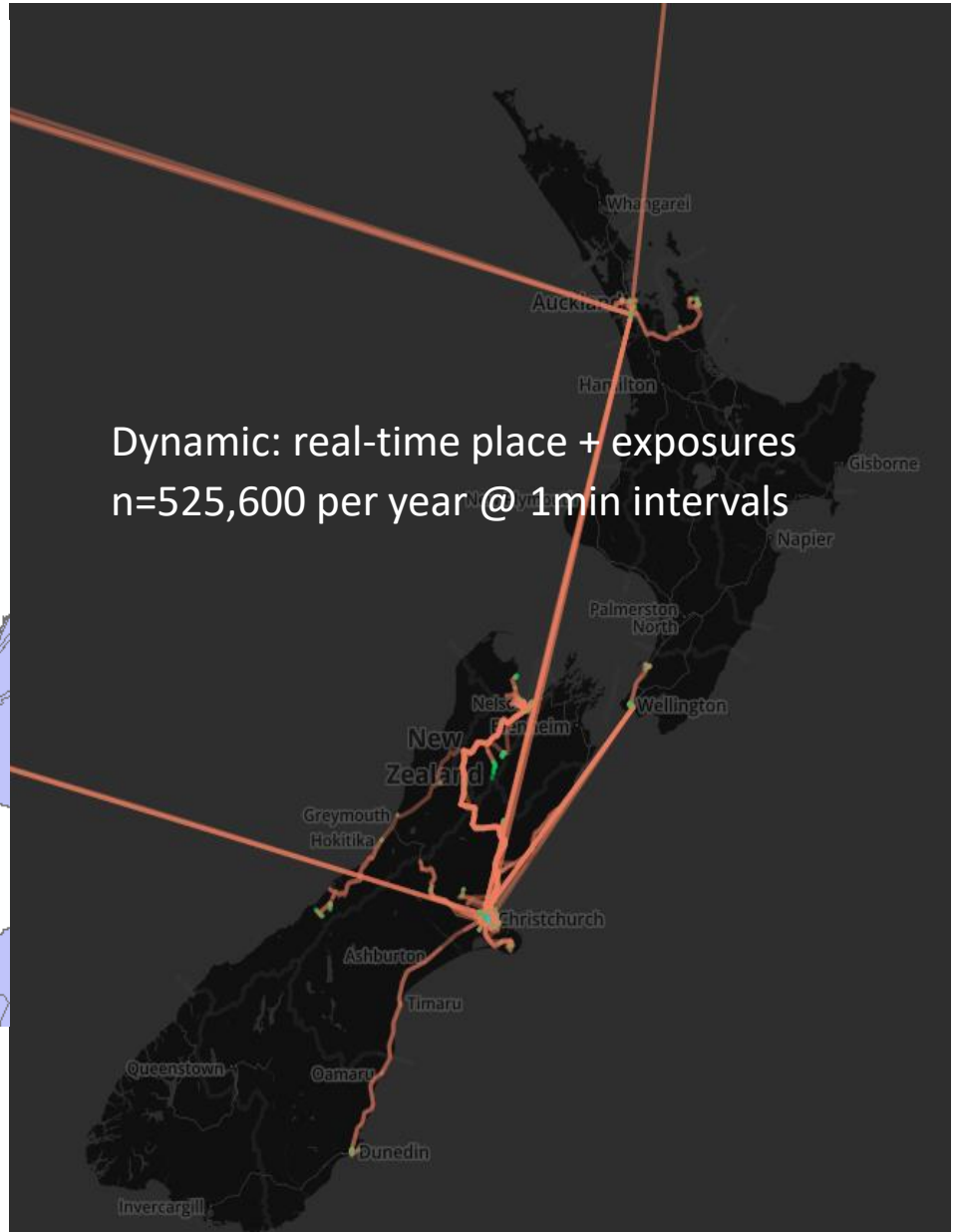
my ‘risk profile’ over a year or three





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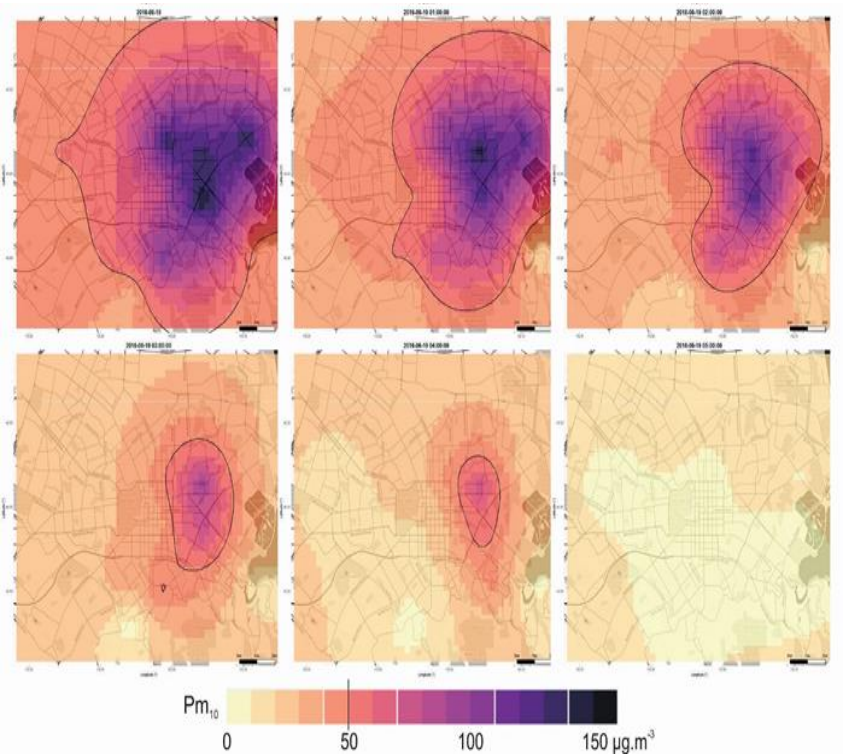
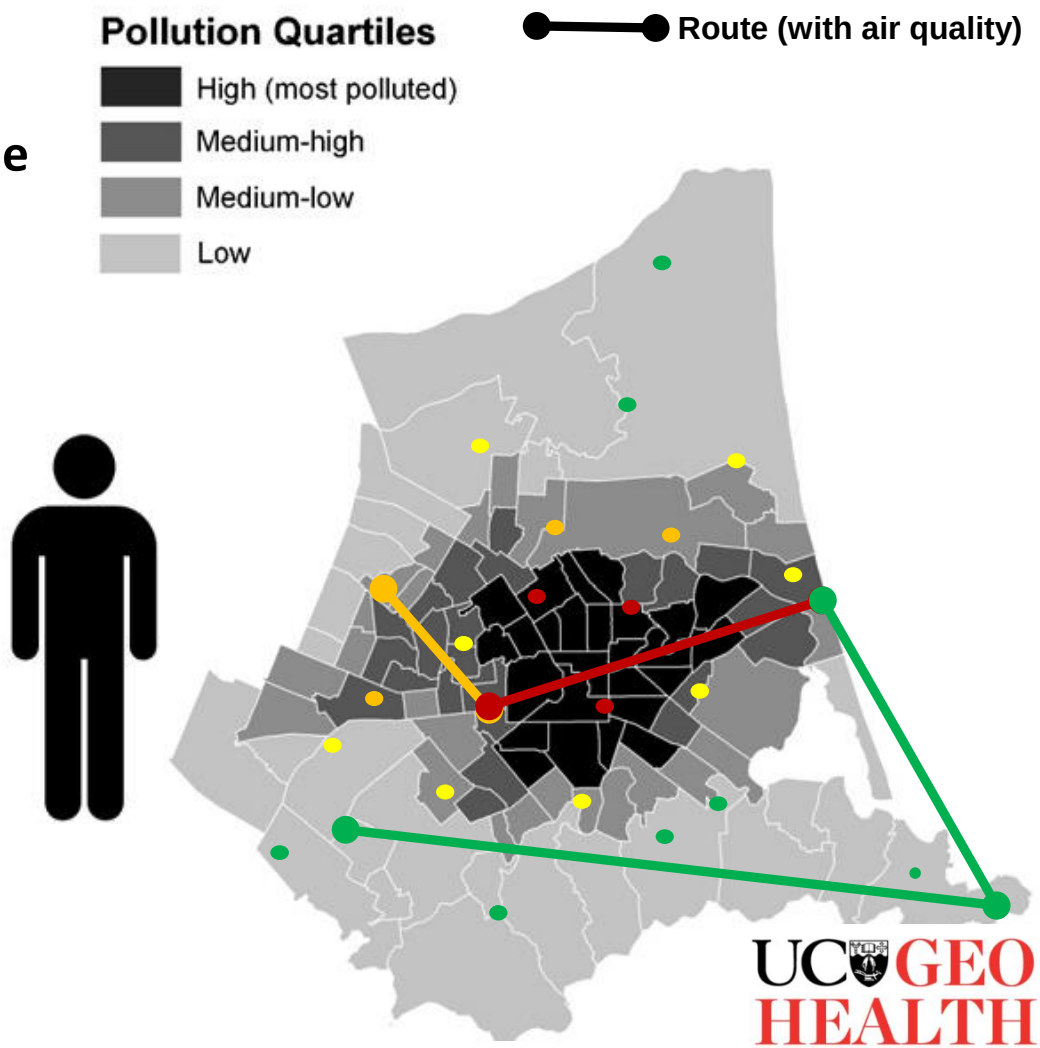
Real time 'risk': spatio-temporal dynamics

- Accurately assigning exposure (to individuals and populations)
- How do environmental conditions alter as one moves around the city?
- 'Person X' knows **when and where** pollution is higher **+ almost real time**

Dynamic (n=20-30 stations)



Static (e.g. LUR, 2 stations)



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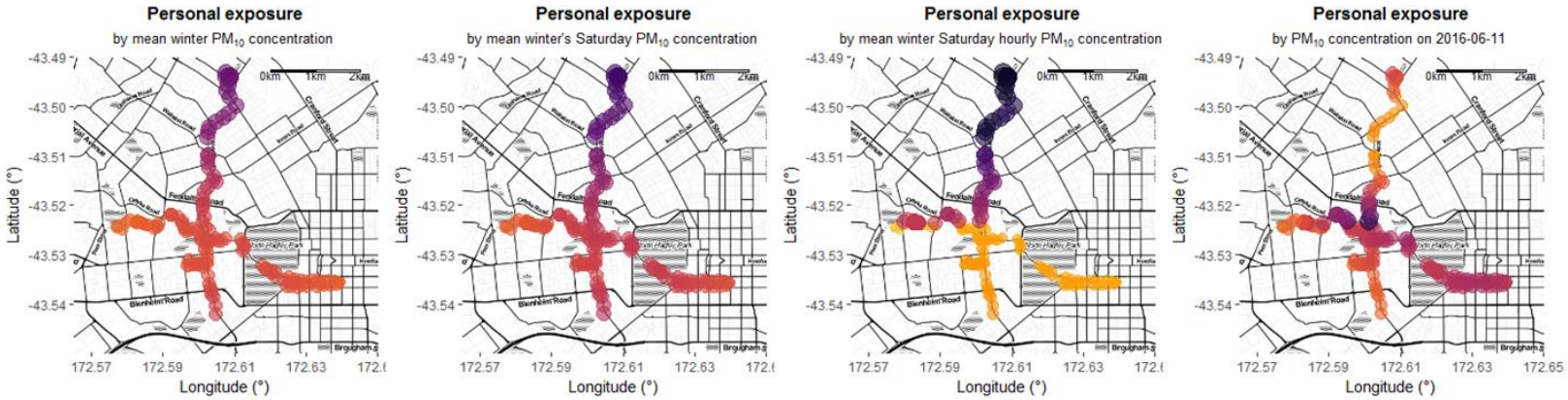

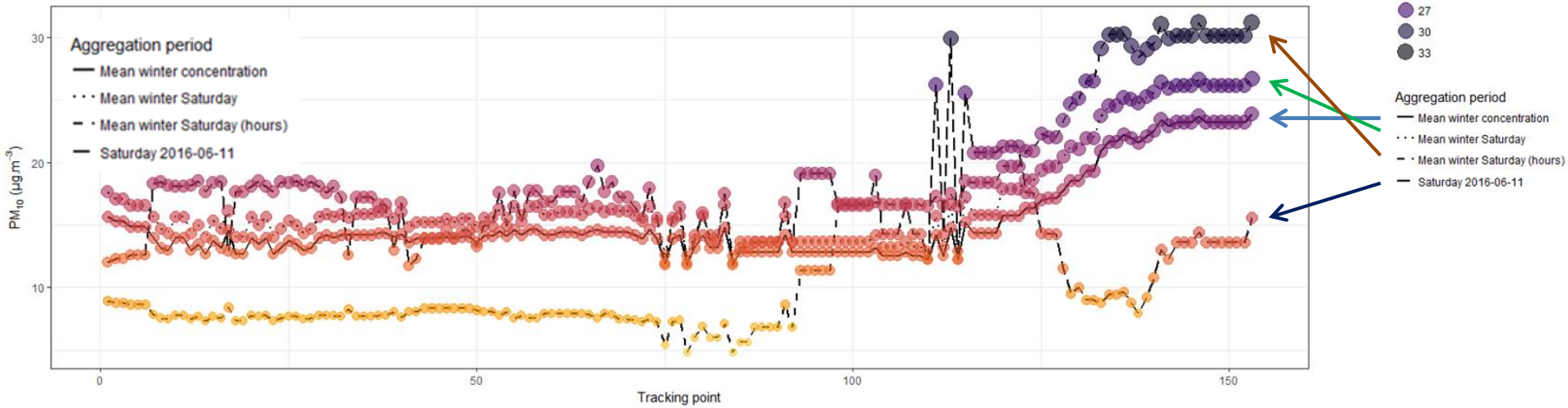

- How interpolation, averaging / method affect the result
- Winter (average), winter (daily), winter (hourly), winter (by minute)

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Possible applications

- Geographical variations and/or spatio-temporal changes in:
  - accessibility and equity of health care service
  - disease distribution
  - environmental/social determinants of health
  - response to treatment and survival rates

Precision medicine in cardiology

Elliott M. Antman & Joseph Loscalzo

Affiliations | Contributions | Corresponding author

Nature Reviews Cardiology **13**, 591–602 (2016) | doi:10.1038/nrcardio.2016.101
Published online 30 June 2016

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Abstract

Abstract · References · Author information

The cardiovascular research and clinical communities are ideally positioned to address the epidemic of noncommunicable causes of death, as well as advance our understanding of human health and disease, through the development and implementation of precision medicine. New tools will be needed for describing the cardiovascular health status of individuals and populations, including 'omic' data, exposome and social determinants of health, the microbiome, behaviours and motivations, patient-generated data, and the array of data in electronic medical records. Cardiovascular specialists can build on their experience and use precision medicine to facilitate discovery science and improve the efficiency of clinical research, with the goal of providing more precise information to improve the health of individuals and populations. Overcoming the barriers to implementing precision medicine will require addressing a range of technical and sociopolitical issues. Health care under precision medicine will become a more integrated, dynamic system, in which patients are no longer a passive entity on whom measurements are made, but instead are central stakeholders who contribute data and participate actively in shared decision-making. Many traditionally defined diseases have common mechanisms; therefore, elimination of a siloed approach to medicine will ultimately pave the path to the creation of a universal precision medicine environment.

Subject terms: Cardiology · Medical research · Personalized medicine · Preventive medicine

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Summary

- Geohealth
  - Big datasets
  - Geography
  - Spatial analysis (not just mapping)
- Place/geography is important
- Real potential to address health priorities

  … and impact policy