Geographical variations and trends in infant mortality in New-Zealand (1980-2008)

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Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

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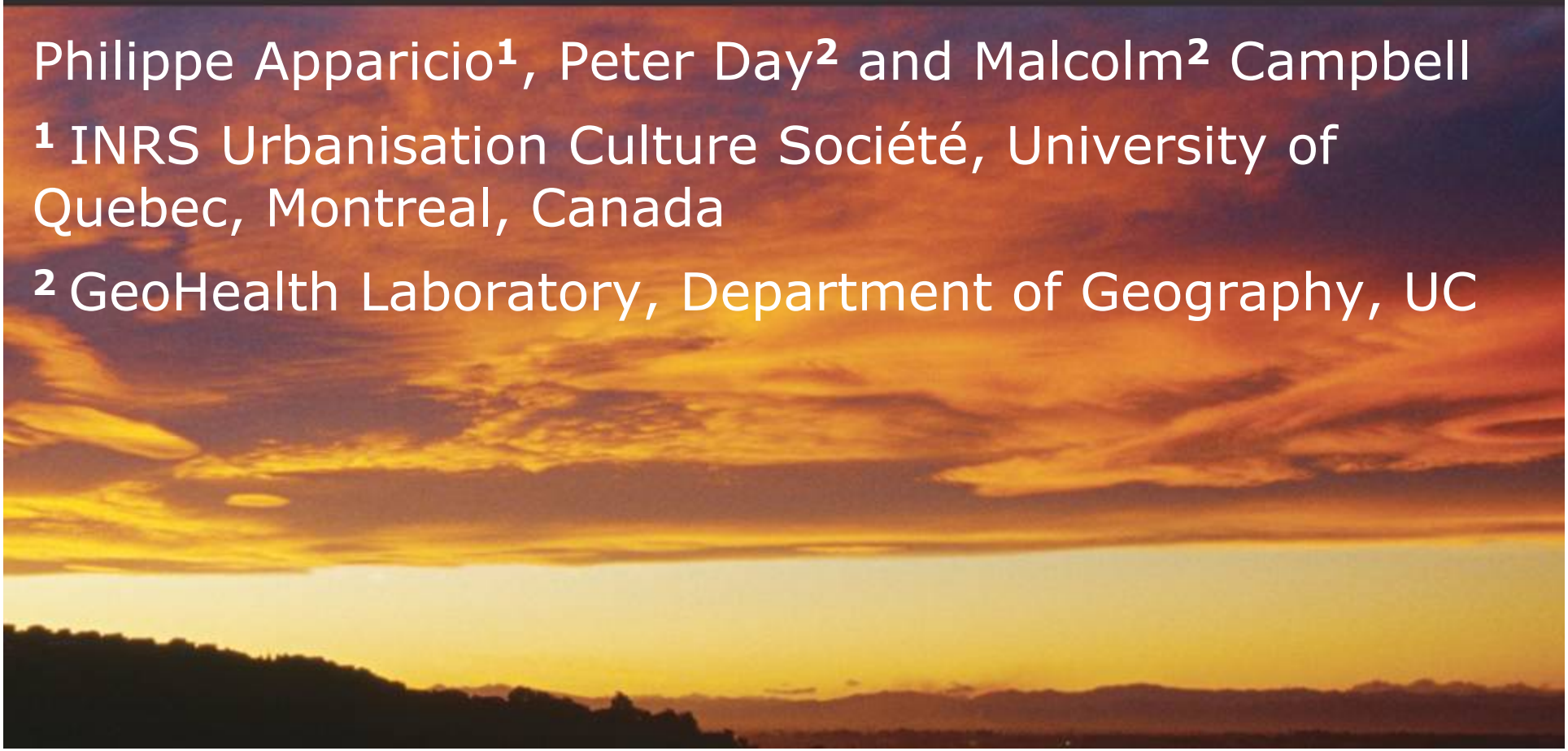

INTRODUCTION

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A large well-known range of biological and social factors associated with high infant mortality

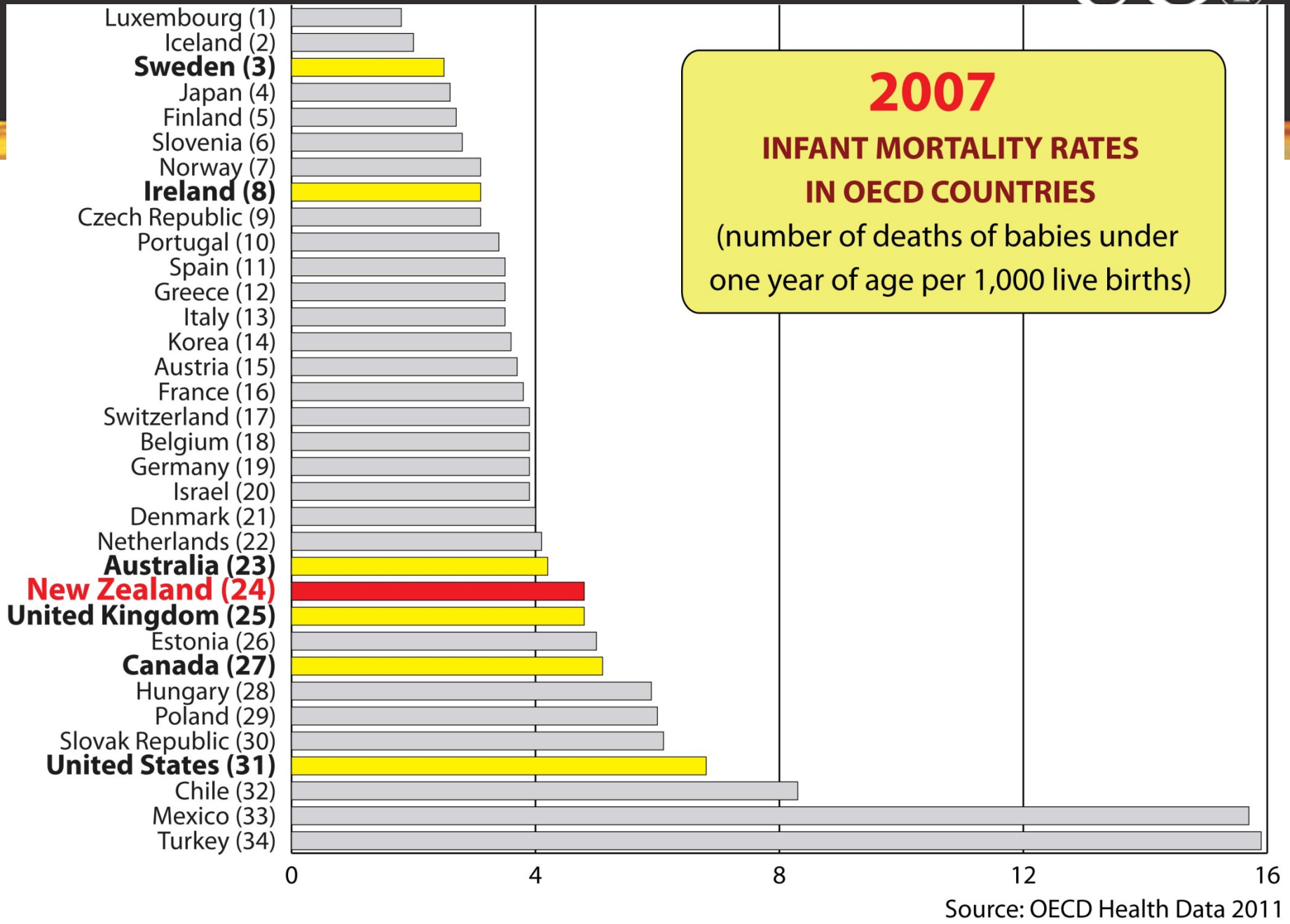
Biological factors – very low (under 1.5 kg) and low birthweight (under 2.5 kg) babies, preterm births, mother's age (under 20; over 40).

Social factors – Socio-economic position of the family, mother's country of birth, birth registered solely by the mother (see for example the report entitled *Infant and perinatal mortality in England and Wales by social and biological factors, 2010*).

The well-documented disparities in infant mortality rates among countries over the last four decades

Despite declines experienced over the last few decades, internationally New Zealand's infant death rate remains high, with a current ranking of twenty-fourth out of 34 OECD countries.

INTRODUCTION



RESEARCH OBJECTIVES

- **Main objective**

  Explore spatial-temporal variations of infant mortality in New Zealand at the Territorial Local Authority (TLA) level during the last three decades (1980-2008)

- **Specific objectives**
  - Objective I. Identify hot and cold spots of infant mortality cases in New Zealand for Māori and non-Māori populations
  - Objective II. Identify geographical trends in infant mortality for three populations (Total, Māori, non-Māori)
  - Objective III. Explore relationships with deprivation
  - Objective IV. Compare trends for Māori and non-Māori populations

LONGITUDINAL DATA

- Data: Infant mortality rates for three populations

- **Total population** (1980-2008)
  - 1,632,783 live births
  - 13,110 infant deaths (less one year old)
- **Māori population** (1995-2008)
  - 228,821 live births
  - 1,893 infant deaths (less one year old)
- **Non-Māori population** (1995-2008)
  - 580,652 live births
  - 2,821 infant deaths (less one year old)

No	TLA Name	1989	1990	1991	...	2007
1	Far North District	16.93	14.16	10.03	...	10.75
2	Whangarei District	14.67	12.36	9.77	...	4.99
3	Kaipara District	1.87	1.54	7.93	...	0.00
4	Rodney District	11.34	9.17	8.02	...	3.55
5	North Shore City	5.45	5.26	6.51	...	2.58
...	...	...	...	...	...	...
75	Invercargill City	12.52	10.45	9.94	6.11	5.31
	New Zealand	**12.00**	**11.00**	**9.89**	**4.62**	**4.21**

72 TLAs (Chatham Islands TLA and those in an 'Area outside Territorial Authority' were excluded)

- Smoothing process
  - Three years moving average
  - First and last year of the period were excluded

ORIGINAL VALUES

TLA_no	TLA_name	1980	1981	1982	1983	1984	1985
1	Far North District	12.7	10.2	16.4	10.1	11.1	9.5

average

SMOOTHED VALUES

1	Far North District	---	13.09	12.25	12.56	10.25	12.61

METHODS

OBJECTIVE I. Hot and cold spots identification

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Spatio-temporal clusters identification using

SaTScan with an elliptic spatial scan statistic

(Kulldorff 1997, 2006, 2010)

METHODS

OBJECTIVE II. Identifying geographical trends in infant mortality

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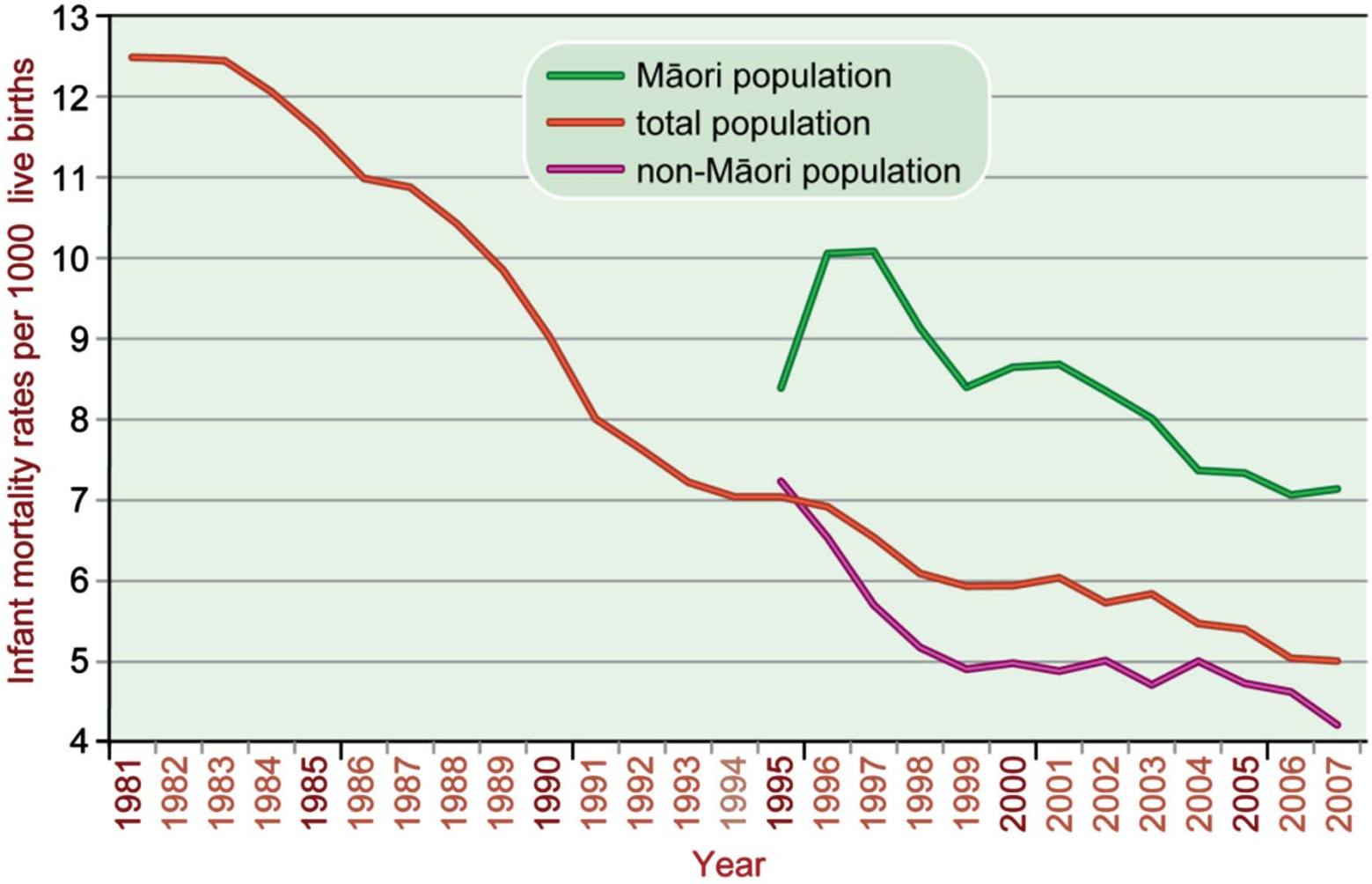
Method used: Latent Class Growth Modelling (LCGM)

Like any cluster method (such as K-Means or AHC), the goal is to group **observations** with similar values for ***n* variables** where:

- Observations = 72 TLAs
- Variables = Infant mortality rates
  - from 1981 to 2007 for the total population
  - from 1995 to 2007 Māori and non-Māori populations

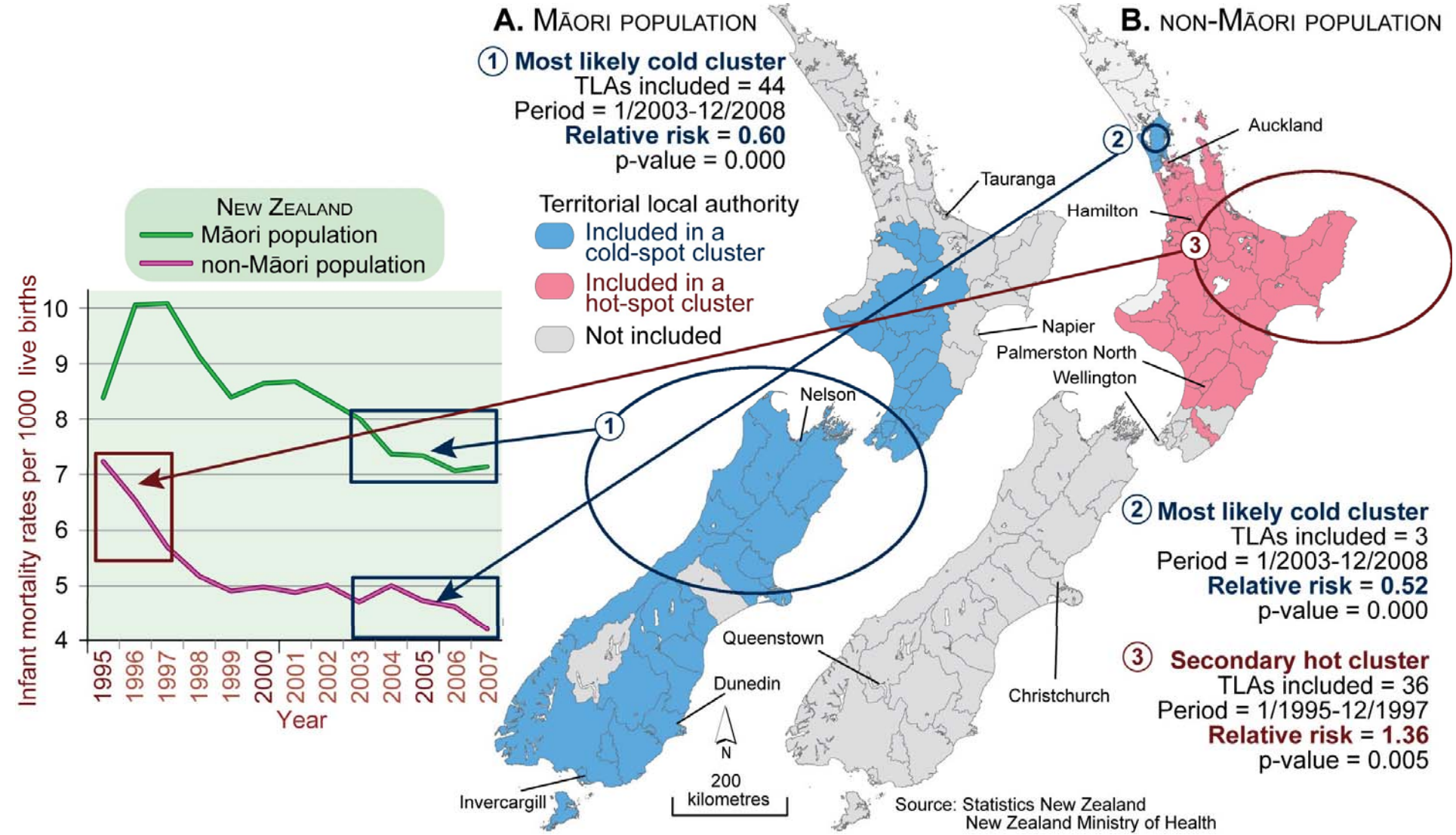
LCGM clustering	
Approaches to classification	Probability-based method of classification also producing information on misclassification of object into clusters.
Identification of number of optimal clusters	Various modelled-based diagnostics such as the BIC statistic and the posterior probabilities of group membership.
Types of variables and standardization	Continuous, categorical (nominal or ordinal), counts variables or any combination of these. Standardization of variables is not necessary.

RESULTS
Trends of infant mortality in New Zealand (1981-2007)

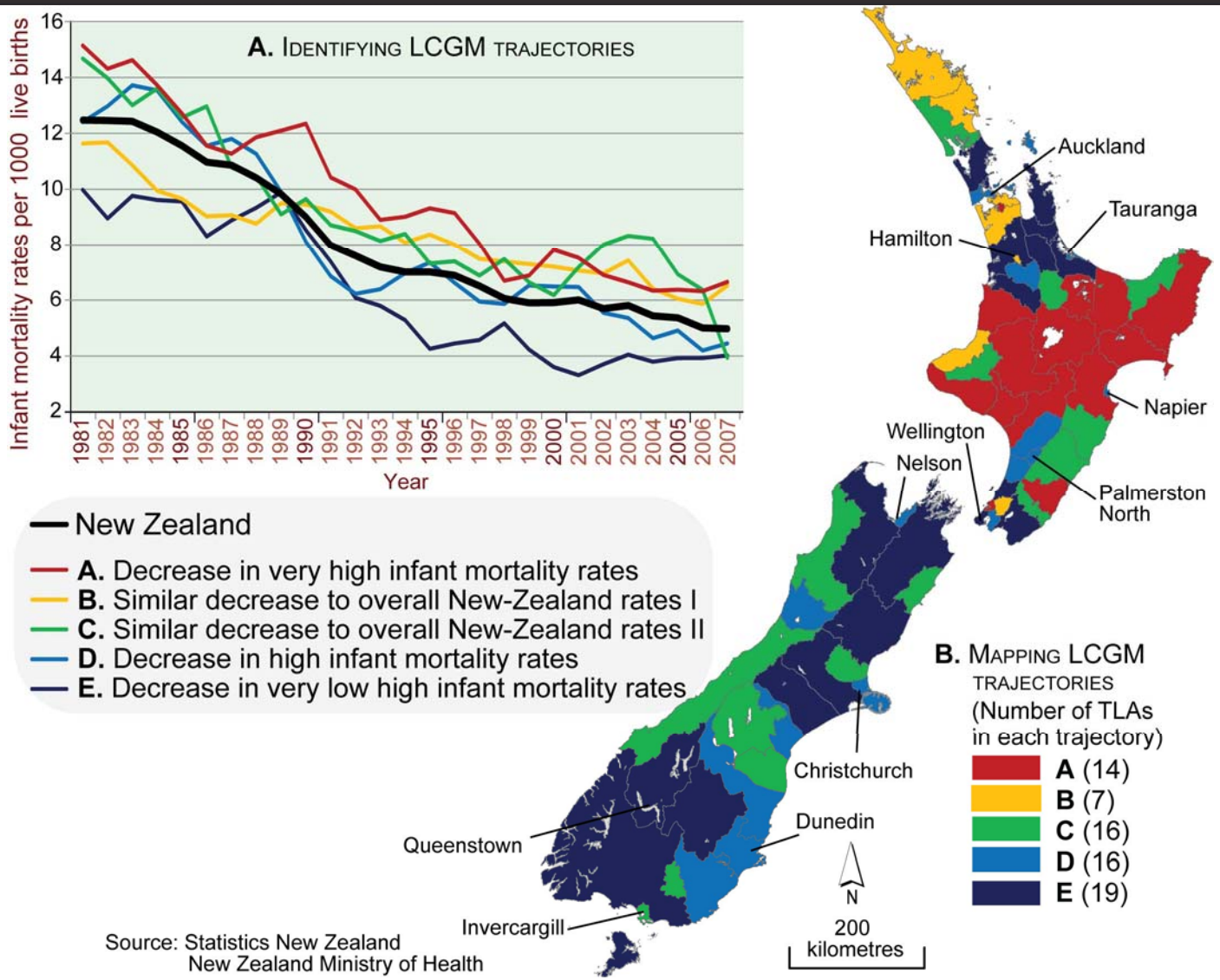


Source: New Zealand Ministry of Health

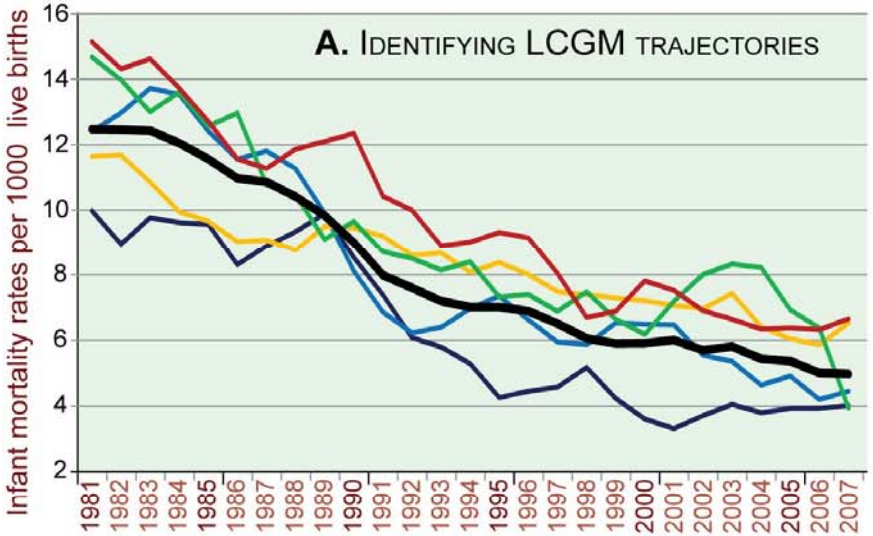
RESULTS: SaTScan™ analysis
i. Spatial temporal clusters: Māori and non-Māori populations



RESULTS: LCGM analysis
ii. Geographical trends in infant mortality (total population)



RESULTS: LCGM analysis
ii. Geographical trends in infant mortality

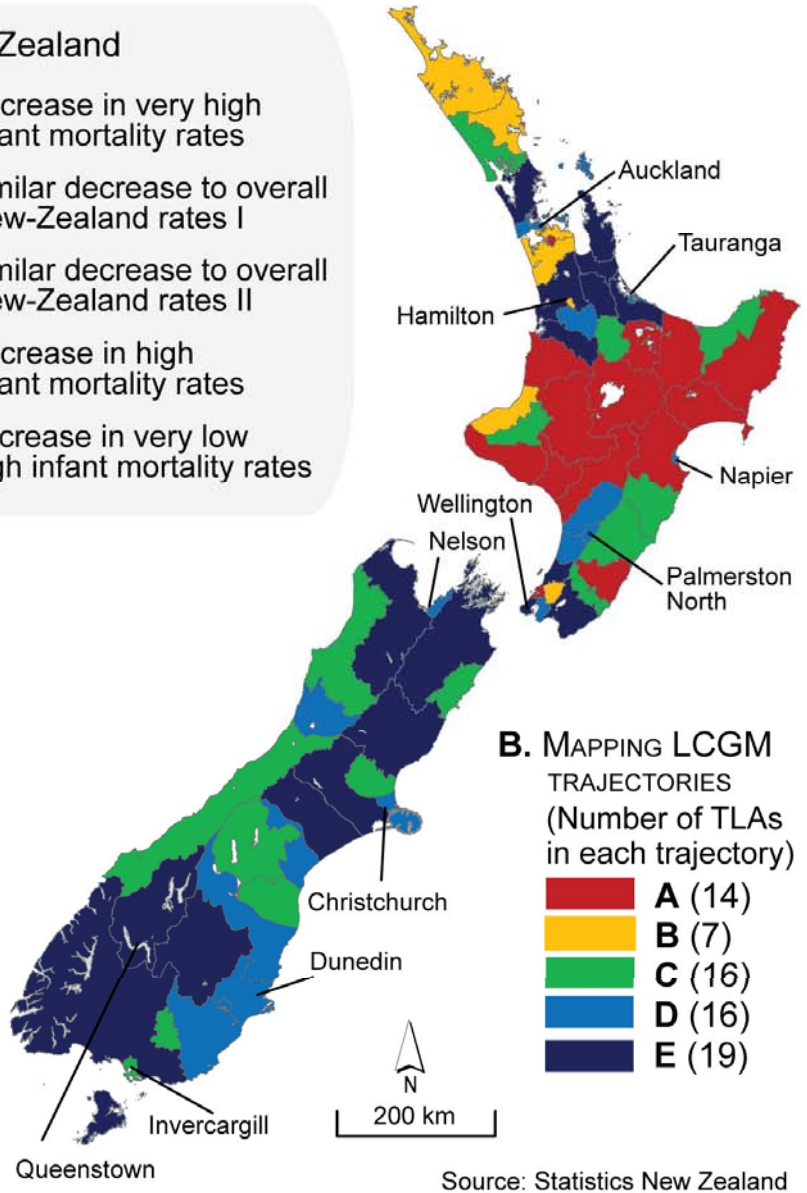


New Zealand
- **A.** Decrease in very high infant mortality rates
- **B.** Similar decrease to overall New-Zealand rates I
- **C.** Similar decrease to overall New-Zealand rates II
- **D.** Decrease in high infant mortality rates
- **E.** Decrease in very low high infant mortality rates

B. Trajectories and demographic characteristics

Year	Trajectories A	B	C	D	E	Anova R2 R2	Pr > F
	Population (%)						
1986	12.7	18.0	6.6	40.5	22.2	--	--
2006	11.8	18.8	5.9	40.5	23.0	--	--
	Population density (persons per km2)						
1986	8.8	45.2	4.5	49.2	7.7	0.098	0.137
2006	9.1	52.6	4.5	54.8	8.9	0.101	0.125
	Maori population (%)						
1996	29.8	20.4	18.1	10.6	10.5	0.332	<.0001
2006	30.2	19.1	17.8	10.8	10.1	0.343	<.0001
	Deprivation score*						
1991	1036	1015	1009	997	965	0.367	<.0001
1996	1040	1019	1012	992	966	0.304	<.0001
2001	1039	1028	1005	993	962	0.312	<.0001
2006	1039	1024	1005	994	960	0.334	<.0001

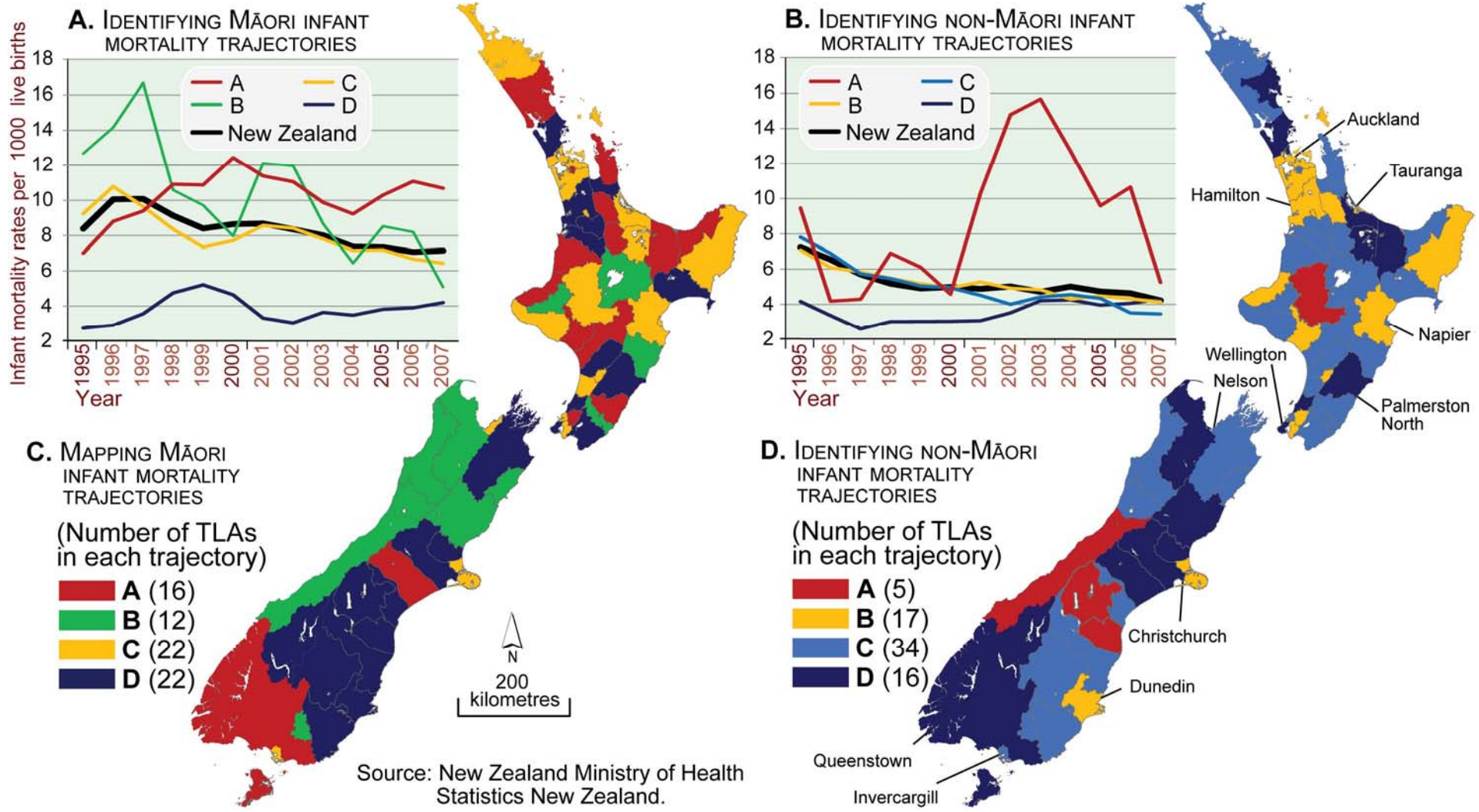
* high score = high deprivation



B. Mapping LCGM trajectories (Number of TLAs in each trajectory)
- **A** (14)
- **B** (7)
- **C** (16)
- **D** (16)
- **E** (19)

Source: Statistics New Zealand
New Zealand Ministry of Health.

RESULTS: LCGM analysis
Geographical trends in infant mortality (Māori and non- Māori populations)



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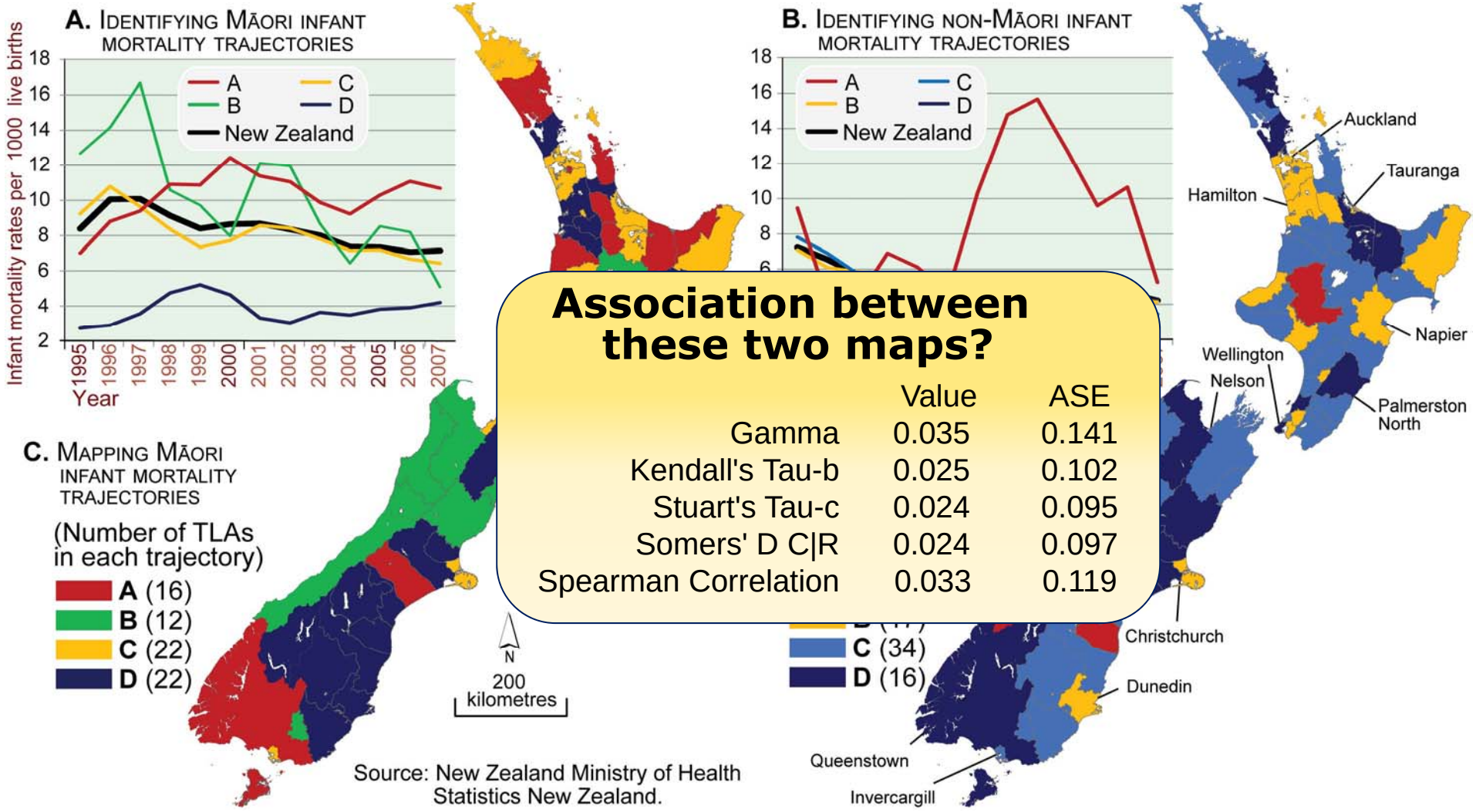

Association between these two maps?

	Value	ASE
Gamma	0.035	0.141
Kendall's Tau-b	0.025	0.102
Stuart's Tau-c	0.024	0.095
Somers' D C|R	0.024	0.097
Spearman Correlation	0.033	0.119

Concluding remarks

- As expected, there was a decline of infant mortality rates over the period, but…
  - Significant spatial variations and hot and cold spots
  - Different spots and trends for Māori and non-Māori populations
  - No significant association between trajectories of Māori and non-Māori infant mortality rates

- Do these findings have implications in terms of public health?
  - Identification of TLAs as possible sites for area-based interventions to tackle infant mortality in New Zealand according to target populations (Māori and non-Māori)