FUZZY SET QCA

A SET-THEORETIC APPROACH FOR UNDERSTANDING AND INVESTIGATING MAORI RESILIENCE THROUGH THE CHRISTCHURCH EARTHQUAKES

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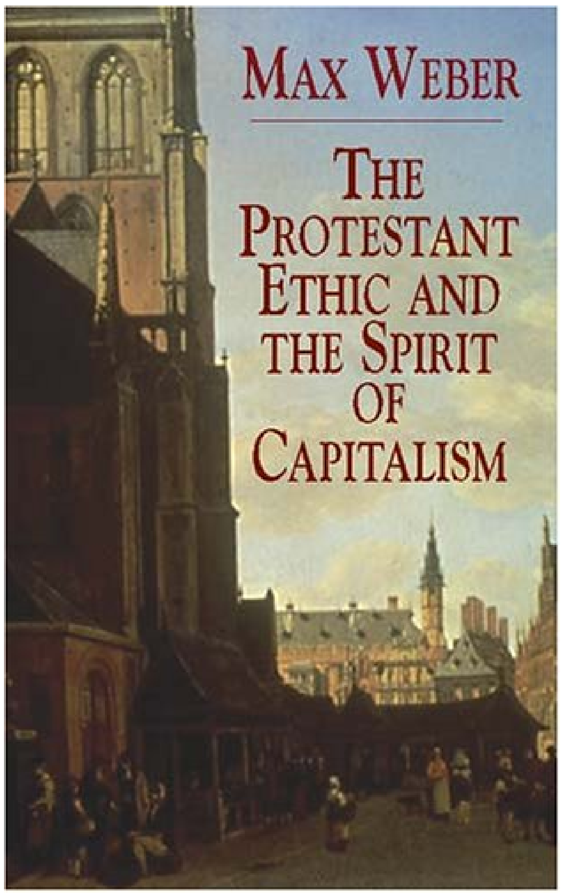
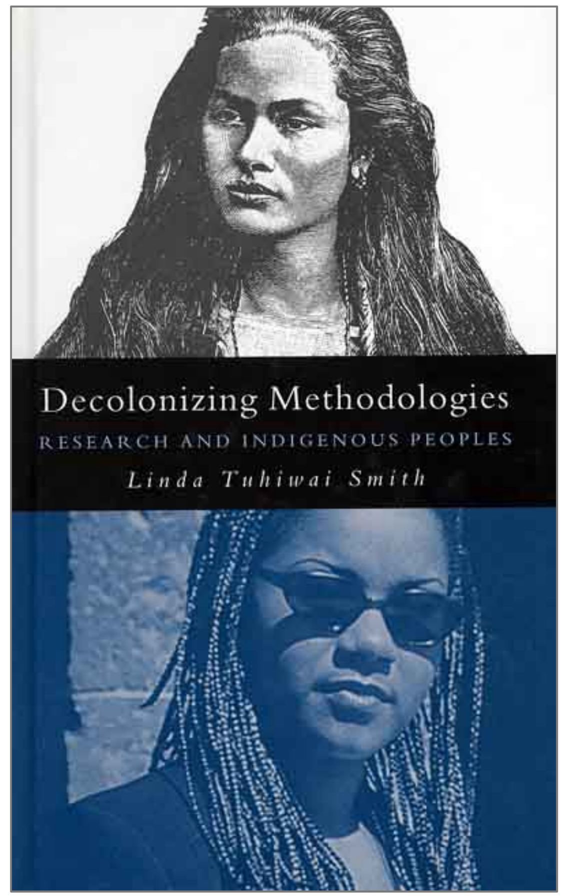
WHAT ARE SET-THEORETIC APPROACHES?

- **Social theory is often verbal and verbal formulations are largely set theoretic in nature**





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  - We can understand social phenomena as set relations
  - These set relations can be interpreted in terms of sufficiency and necessity

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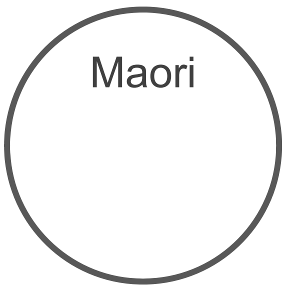

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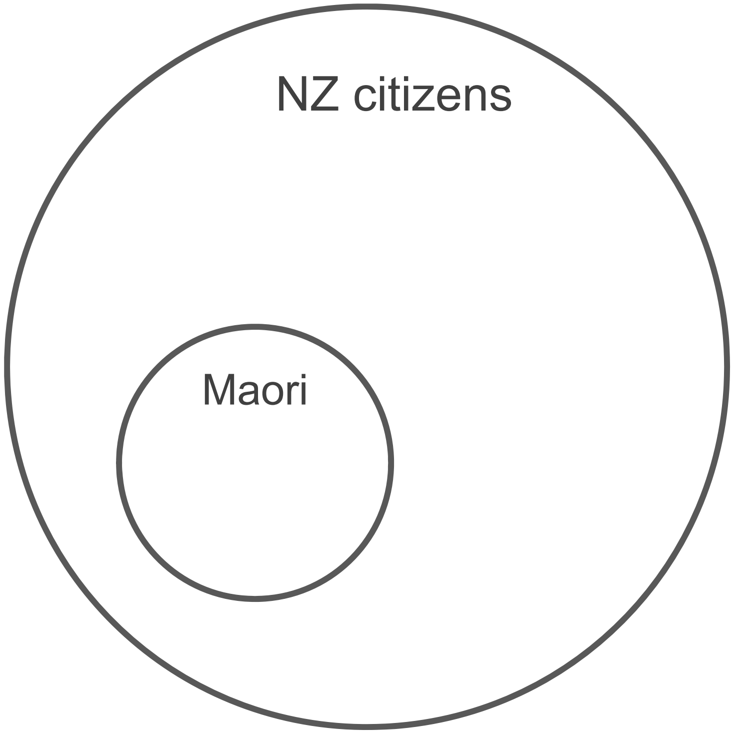

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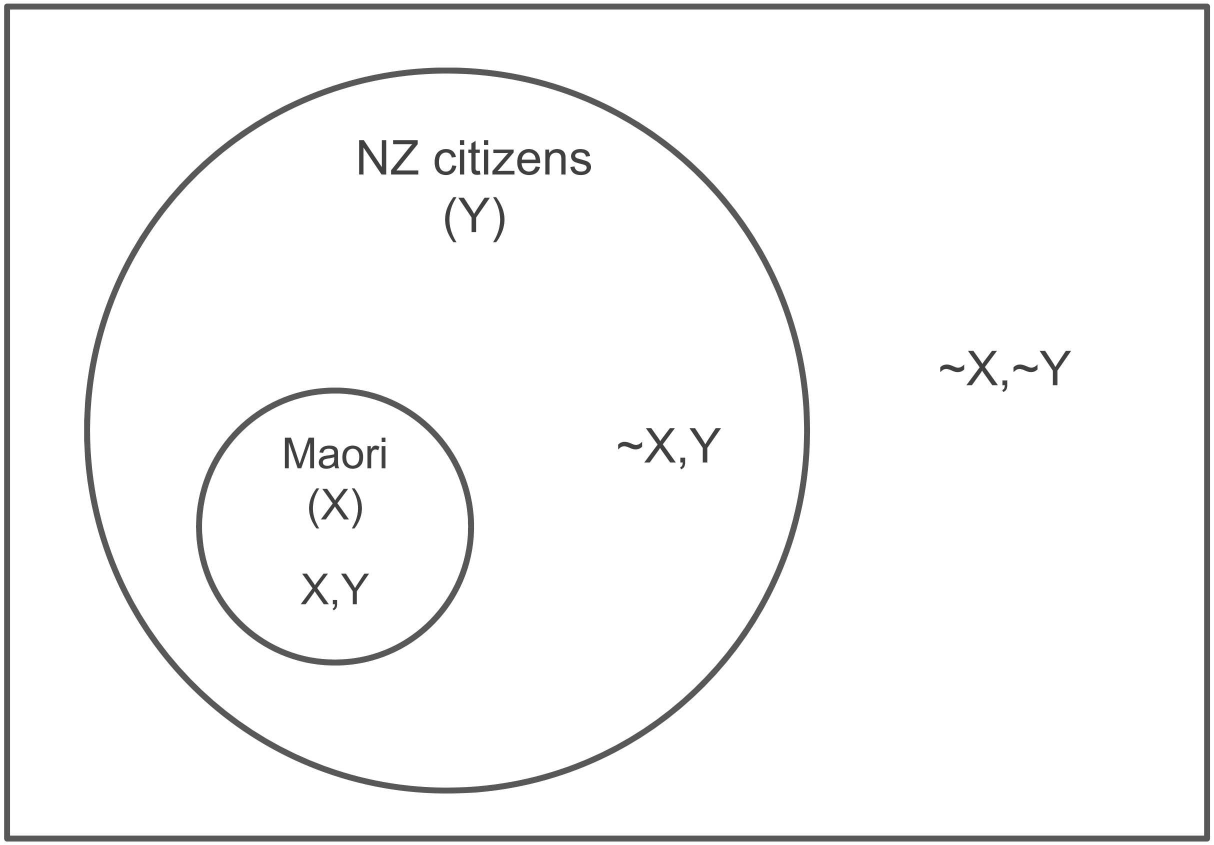

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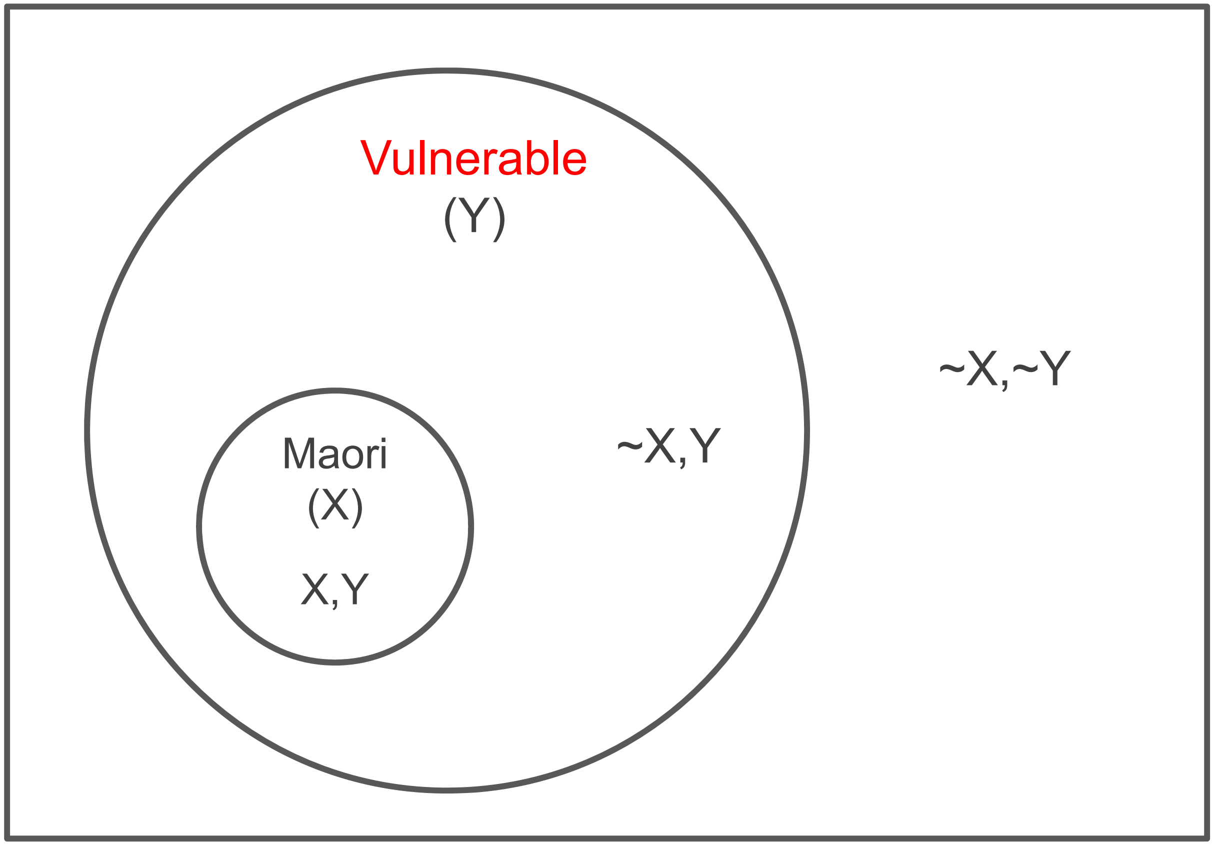

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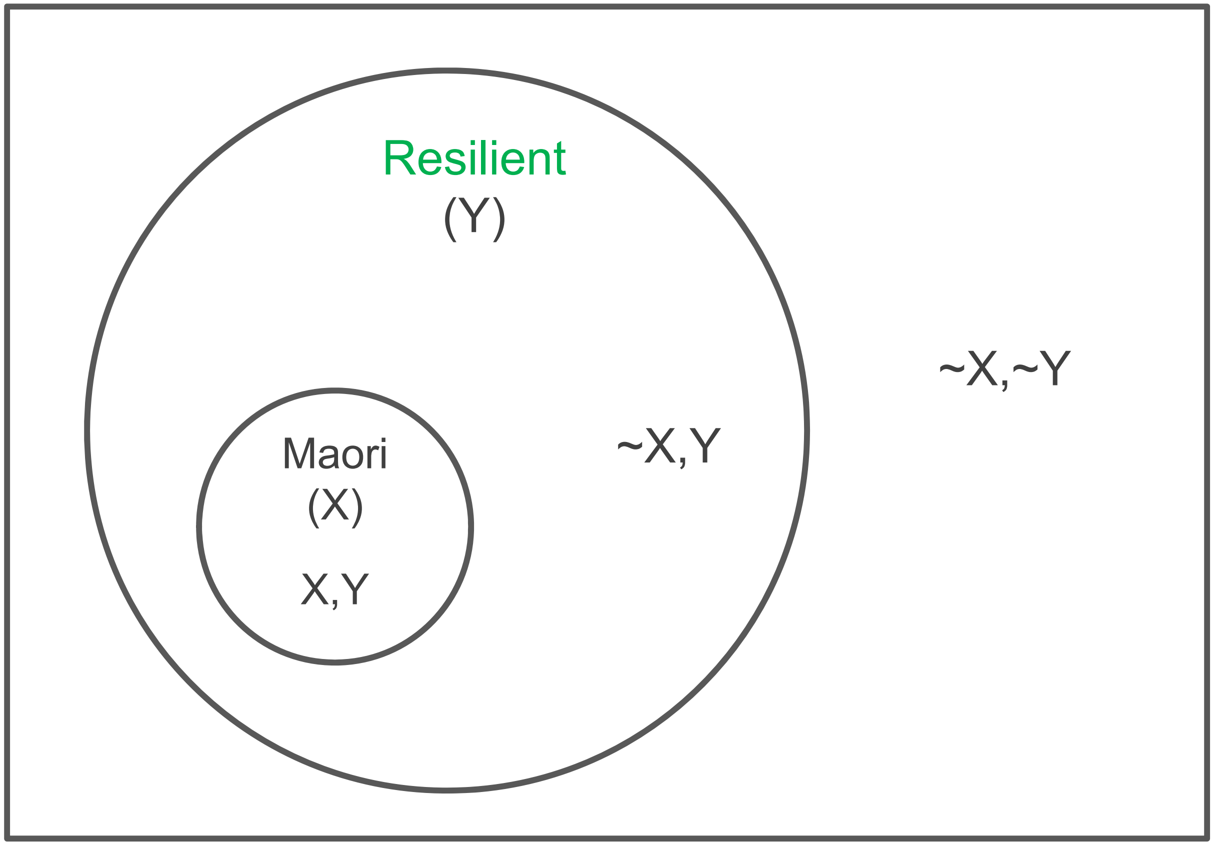


CAUSAL COMPLEXITY

In causal discourse, two terms dominate proceedings: ‘necessity’ and ‘sufficiency’

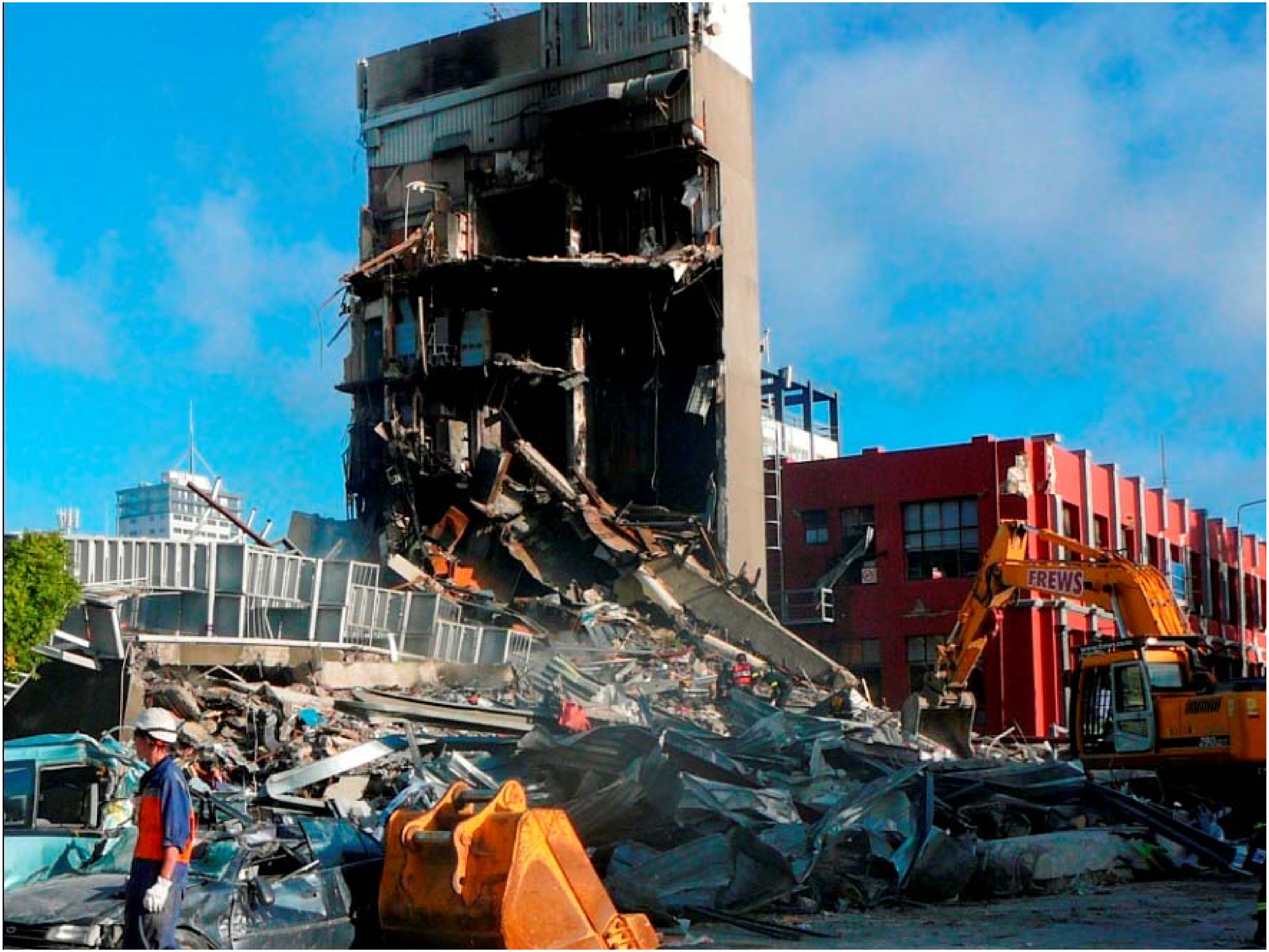
A cause is necessary if its presence is always required for a particular outcome.

A cause is sufficient if its presence by itself produces a particular outcome.

	Cause Absent	**Cause Present**
Outcome Present	**Cell 1** (Key cell for assessing necessity; must have no cases)	**Cell 2** cases
Outcome Absent	**Cell 3** not relevant	**Cell 4** (Key cell for assessing sufficiency, must have no cases)

Row for test of necessity

Column for test of sufficiency

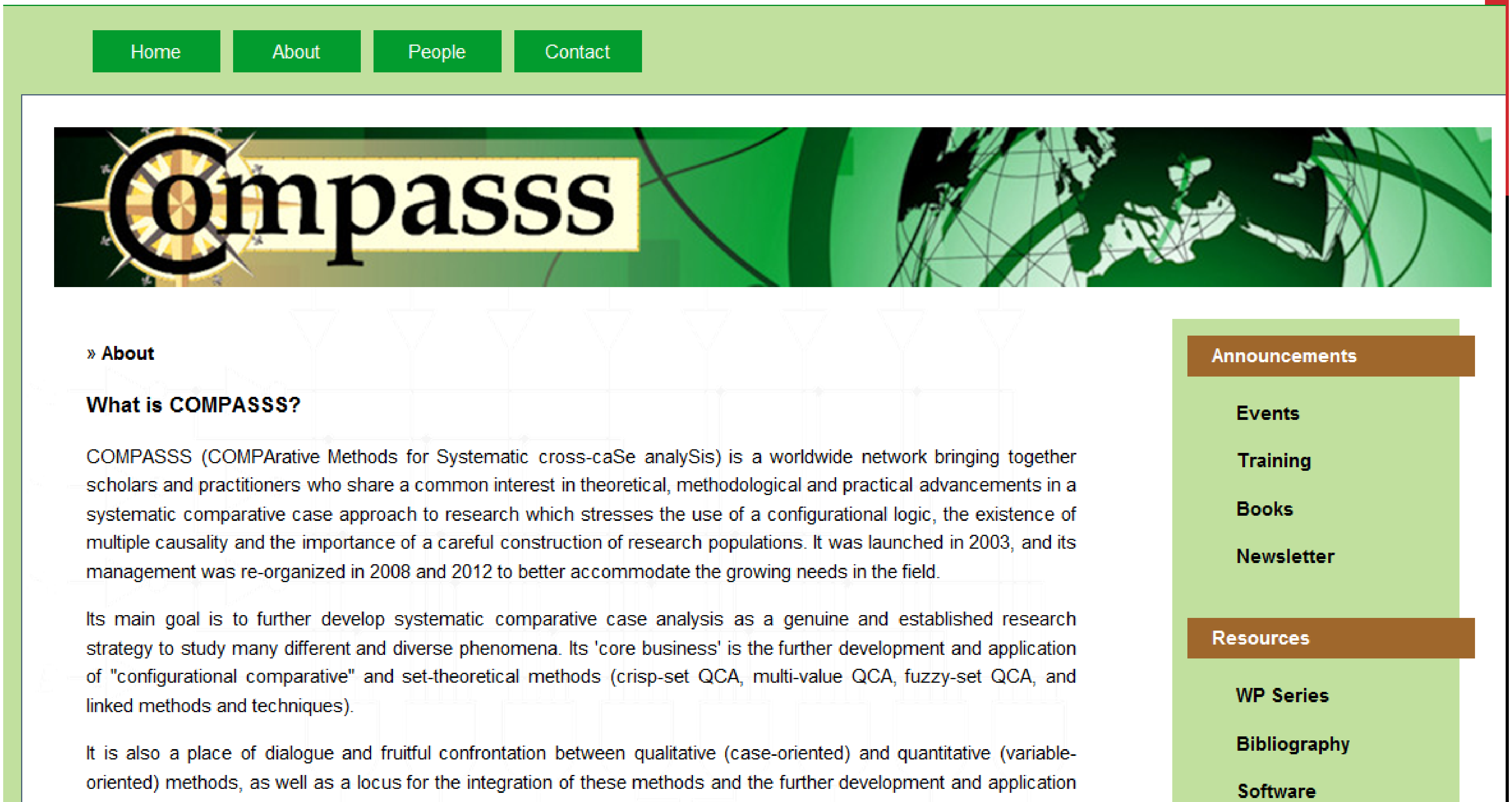

FREWS

IDENTIFYING NECESSARY CONDITIONS

	Good design	Bad design
Building collapses	Must be empty…	Cases
Building doesn’t collapse	Not ‘relevant’	

IDENTIFYING SUFFICIENT CONDITIONS

	Good design	**Bad design**
Building collapses		Cases
Building doesn’t collapse	Not ‘relevant’	Must be empty…



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What is COMPASSS?

COMPASSS (COMPArative Methods for Systematic cross-caSe analySis) is a worldwide network bringing together scholars and practitioners who share a common interest in theoretical, methodological and practical advancements in a systematic comparative case approach to research which stresses the use of a configurational logic, the existence of multiple causality and the importance of a careful construction of research populations. It was launched in 2003, and its management was re-organized in 2008 and 2012 to better accommodate the growing needs in the field.

Its main goal is to further develop systematic comparative case analysis as a genuine and established research strategy to study many different and diverse phenomena. Its 'core business' is the further development and application of "configurational comparative" and set-theoretical methods (crisp-set QCA, multi-value QCA, fuzzy-set QCA, and linked methods and techniques).

It is also a place of dialogue and fruitful confrontation between qualitative (case-oriented) and quantitative (variable-oriented) methods, as well as a locus for the integration of these methods and the further development and application

Announcements

- Events
- Training
- Books
- Newsletter

Resources

- WP Series
- Bibliography
- Software

http://www.compasss.org/index.htm

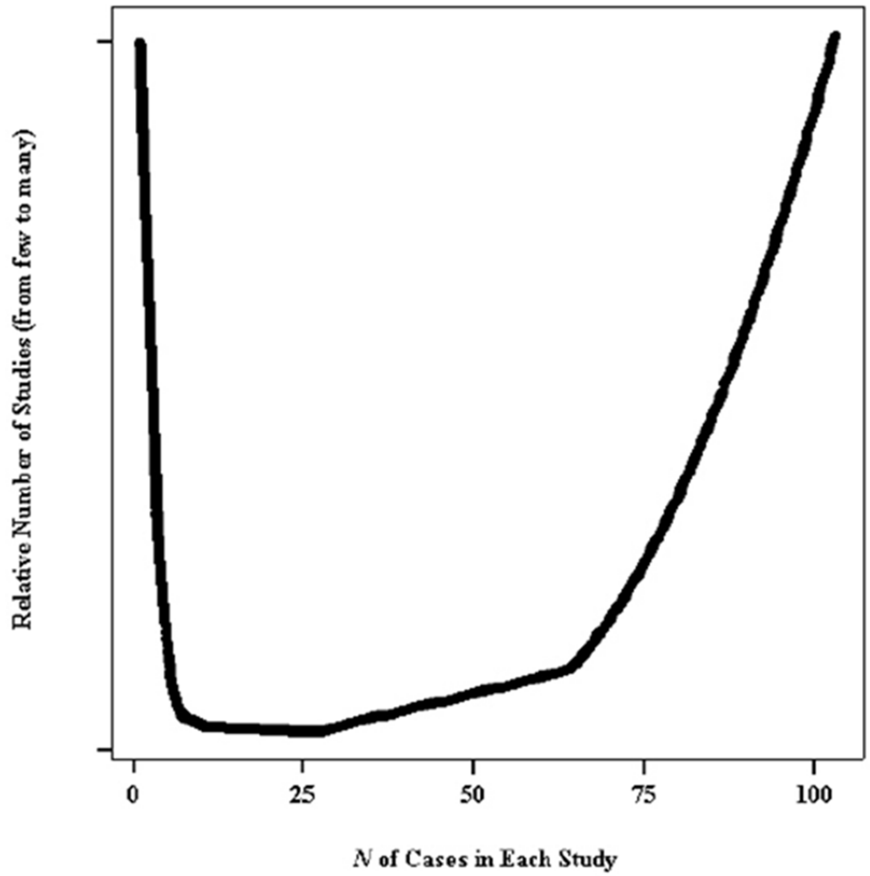
QUALITATIVE COMPARATIVE ANALYSIS (QCA)

- Designed by Charles Ragin.
- Case-oriented approach.
- Accepts causes will be configurational, i.e., comprised of several factors…
- …with more than one pathway to outcomes (equifinality)
- Enables systematic cross-case comparisons without ignoring complexity within cases.

QCA IS IDEAL FOR SMALL-TO-INTERMEDIATE-N RESEARCH DESIGNS:

QCA can be usefully applied to research designs involving small and intermediate-size *N*s (e.g., 5-50).

In this range, there are often too many cases for researchers to keep all the case knowledge “in their heads” but too few cases for most conventional statistical techniques.



OPERATIONALISING QCA …

The first stage begins with the dichotomous coding of selected variables that are then presented in a ‘data table’.

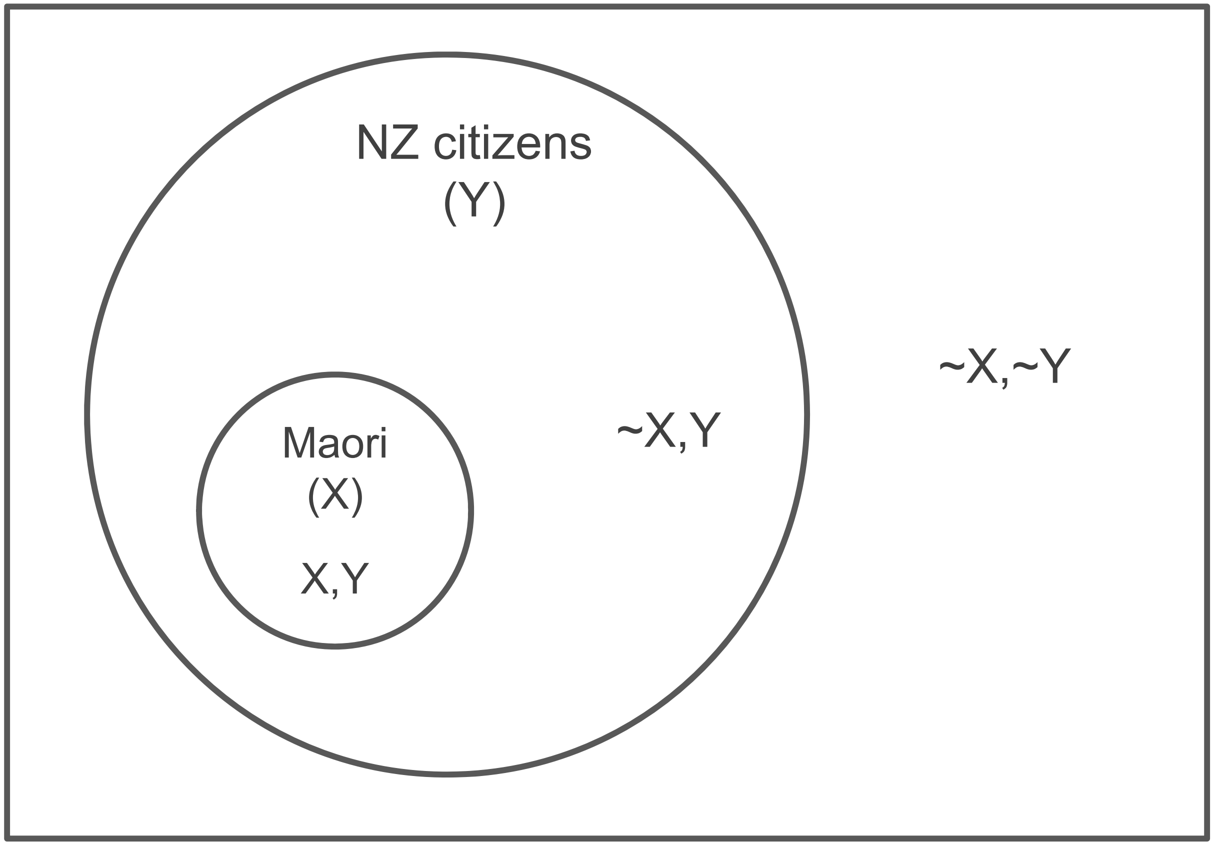
Case	Variable 1	Variable 2	Variable 3	**Outcome**
1	1	1	0	1
2	1	0	0	0
3	0	0	1	0
n	0	1	1	1

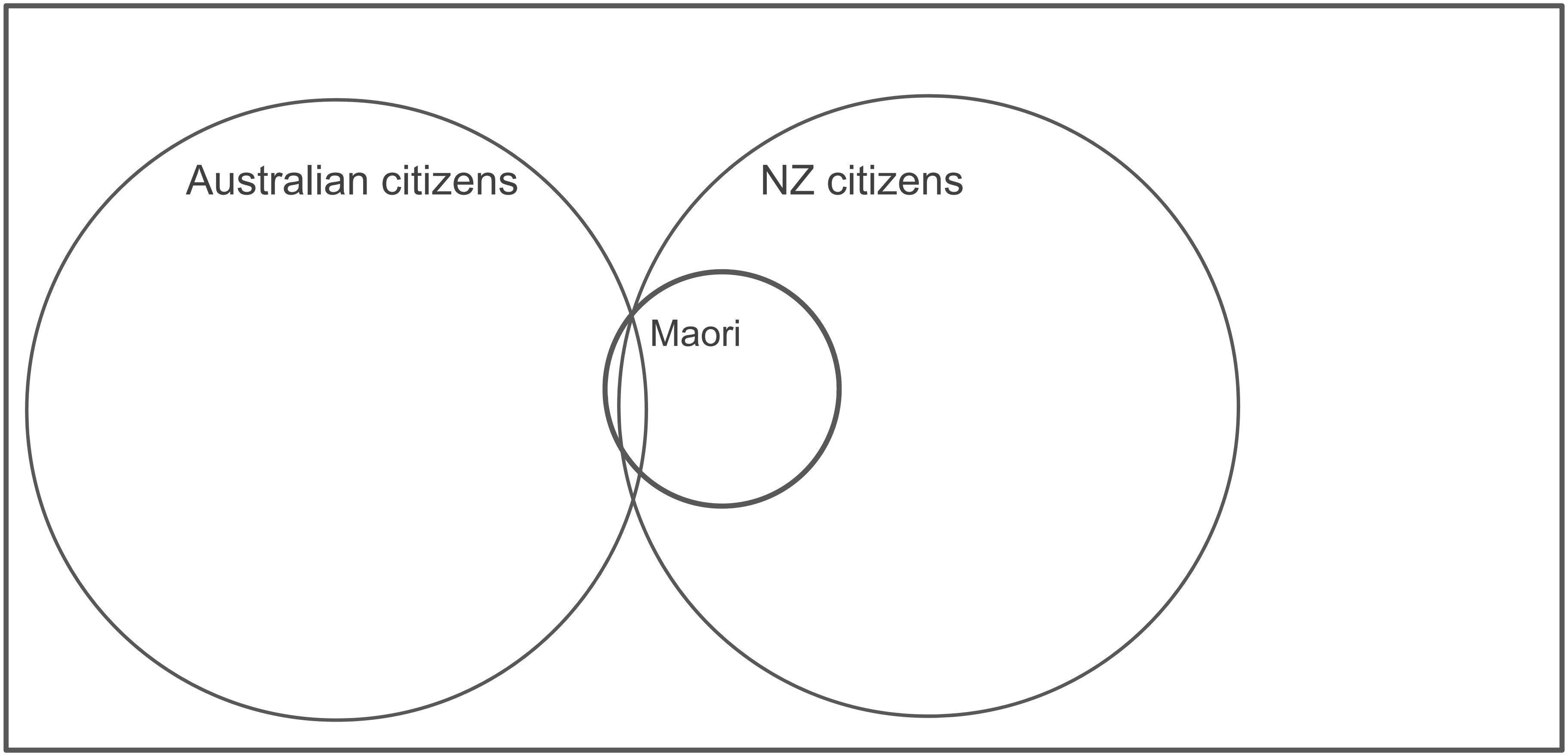
TRUTH TABLE…

Case	A	B	C	Outcome
1	A	B	c	S
2	A	b	C	s
3	a	B	C	s

ABc → S

BUT IS THE REAL WORLD SO CLEAR CUT?




Australian citizens
NZ citizens
Maori


THE GC

FUZZY-SET/QCA

Designed to capture two aspects of diversity:

- Differences in kind (as with QCA)
- Differences in *degree* (i.e., membership b/w 0 and 1)

…thus acknowledging <u>partial</u> membership in sets, a phenomenon readily observed in the real world.

LINCOLN RESEARCH PROJECTS

LURF (Internal Lincoln University funding)

- Quick grab of data = 10 interviews (Maori emergency workers, managers in CBD Feb 22)
- Detailed email survey (n=40; 21 Maori)

TPK

- Social and economic affects on Whānau

  10 + 10 interviews

Ngā Pae o te Māramatanga

- Maori mental health networks
  - Partnering with Te Awa o te Ora and Mental Health Education and Resource Centre (MHERC)

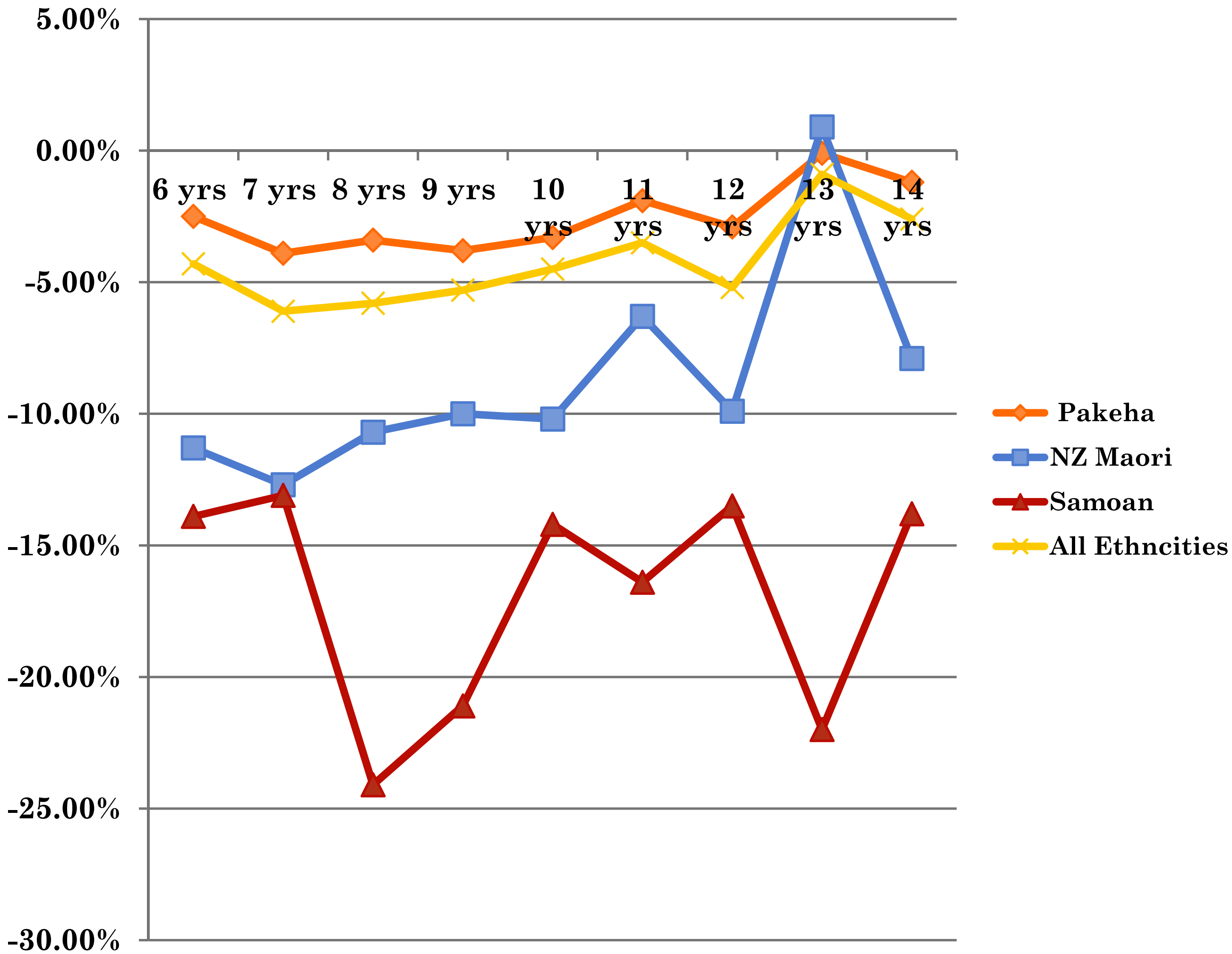
INTERVIEWS…

When I evacuated the office, my work colleague who was pregnant needed help... As I was walking past Joe's Garage, I could hear screaming in there. I helped this one lady out, I ended up carrying her. Both her legs were crushed.

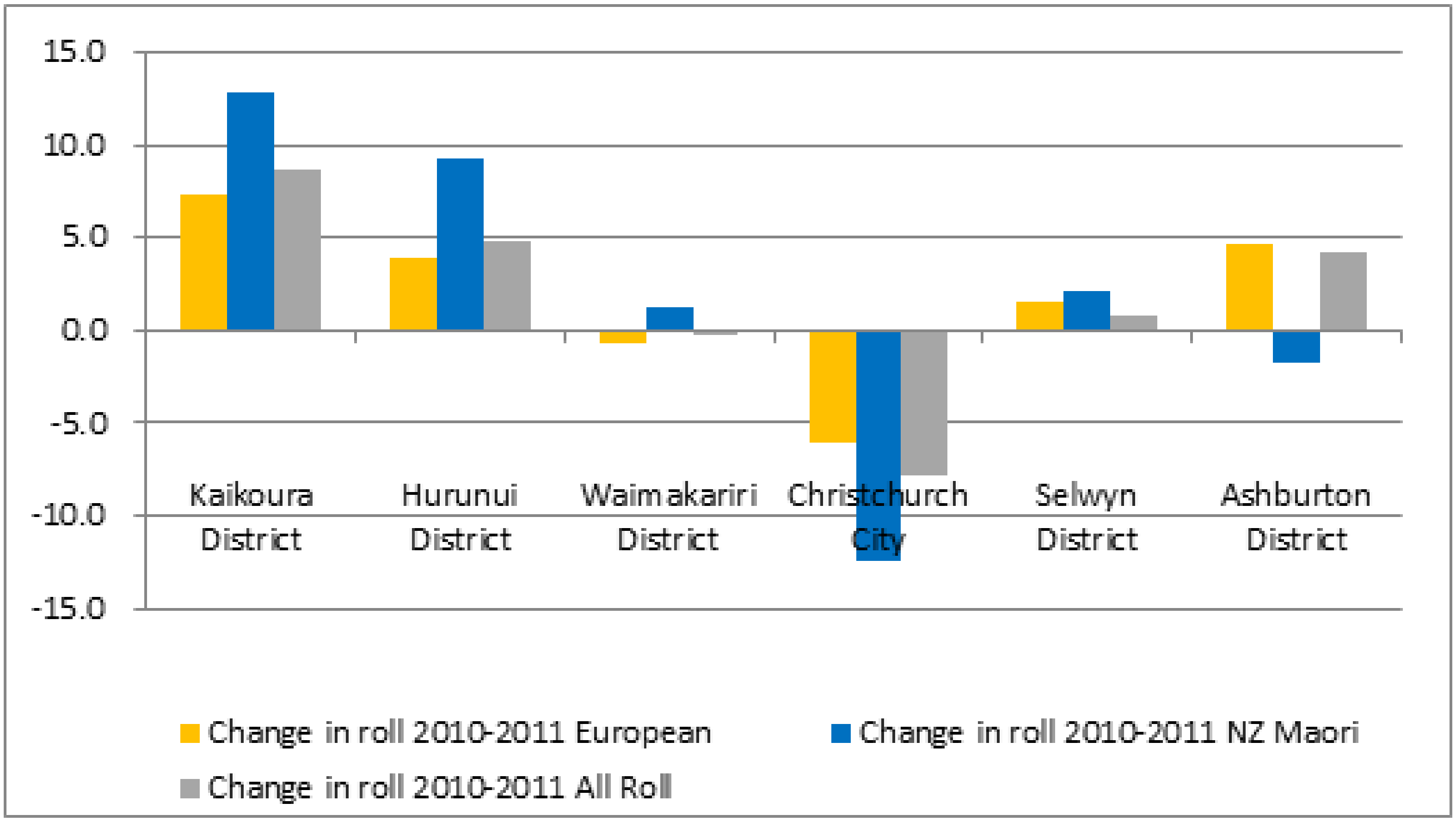
Me personally? Oh I didn't have time to be affected by the earthquake… on the day we were in the CBD ... I was more worried about my entire team dying in front of my eyes actually.

I wrapped her up and said a little prayer to myself. 'If this is it, please protect my girl.'

EST. CHRISTCHURCH NET MIGRATION YEAR BY AGE FOR SELECTED ETHNICITIES (JUNE 2011)

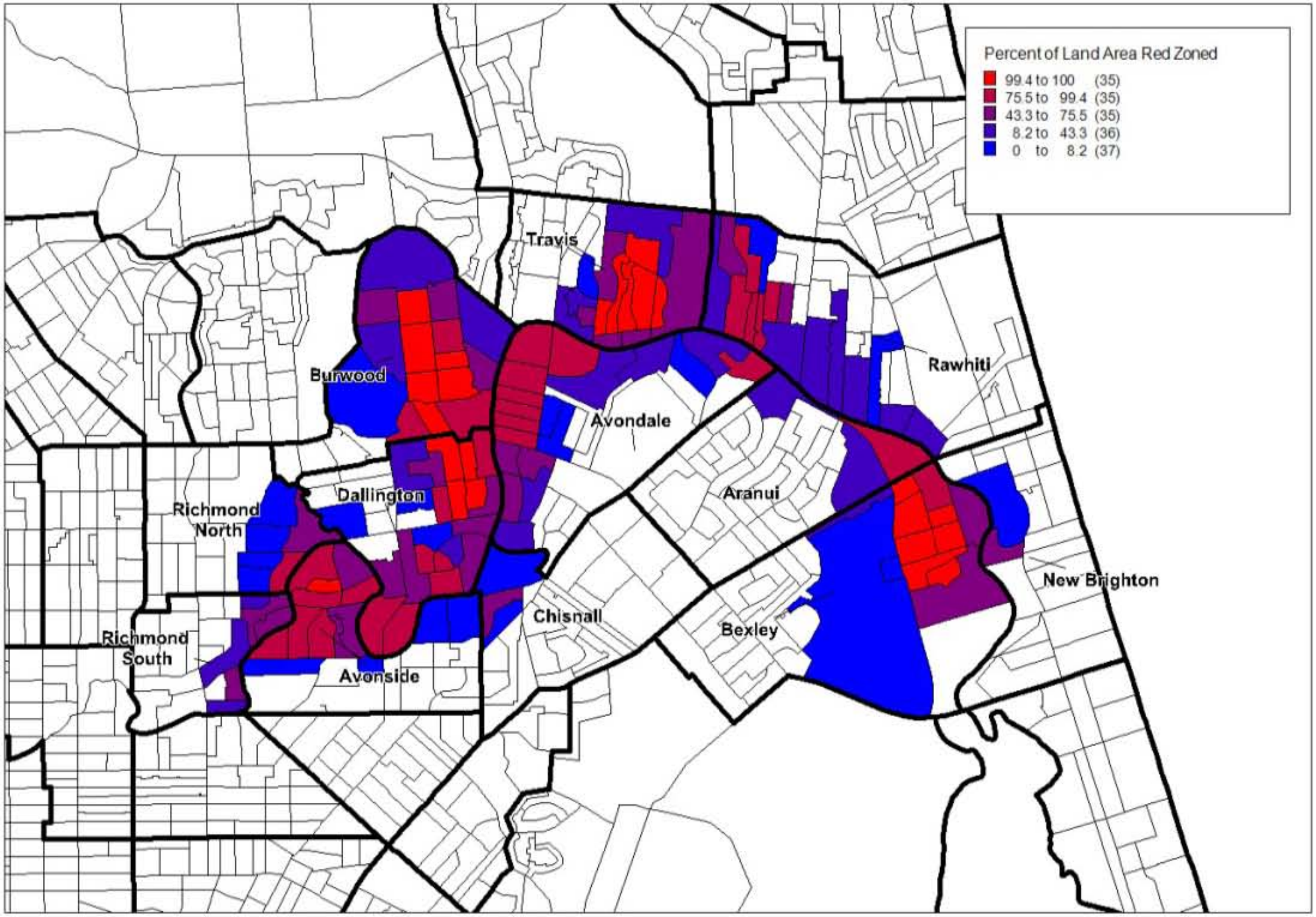


FAMILY AND EXODUS



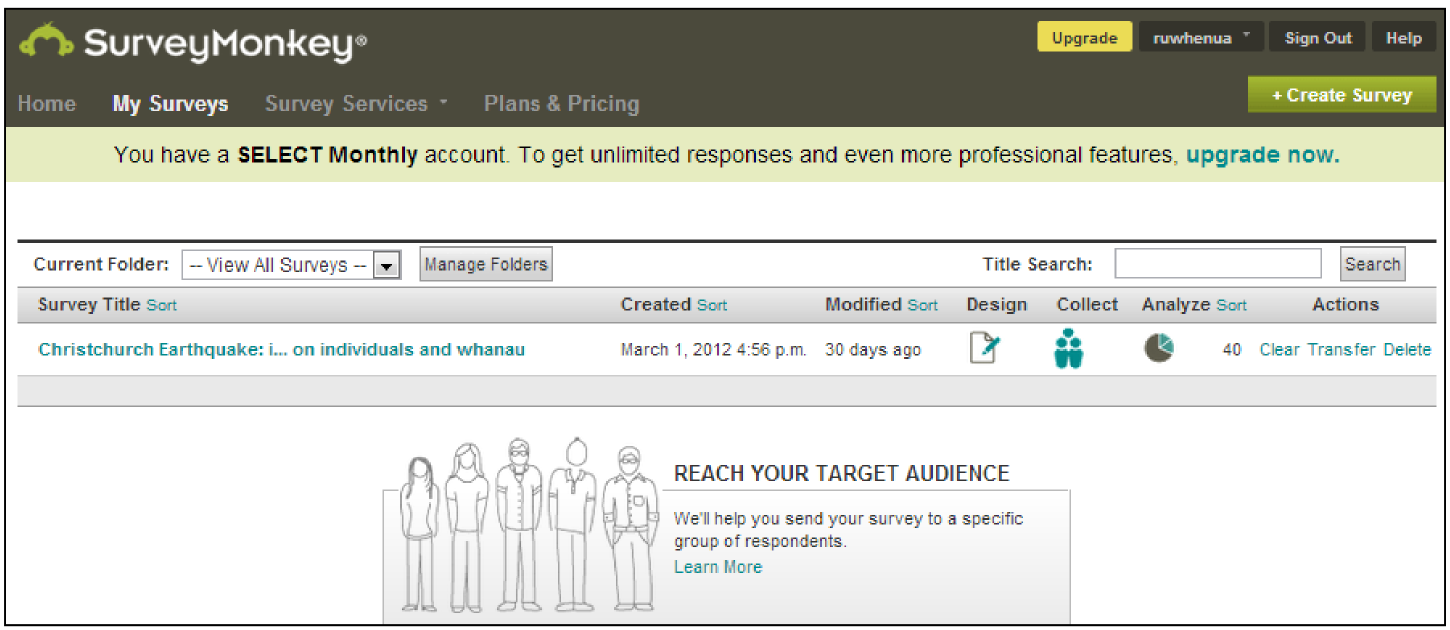
Source: Newell (2012).

NEIGHBOURHOODS



SURVEY

- **SurveyMonkey**
  - Sent to participants and through networks
  - Ridiculously long, but grabbed considerable detail
    - N = 40, 21 Maori



OVER 50 PATAI...

Q6 Edit Question ▼ Add Question Logic Move Copy Delete

6. How many of your neighbors did you know before the February 22nd earthquake?

- All of them
- Most of them
- About half of them
- A few of them
- None of them

Q8 Edit Question ▼ Add Question Logic Move Copy Delete

8. How many family/whānau members do you have in Christchurch?

- 0

Q11 Edit Question ▼ Add Question Logic Move Copy Delete

11. As a result of any of the earthquakes, have you: (You may choose more than one)

- Lost your job
- Lost hou
- Lost inc

Q10 Edit Question ▼ Move Copy Delete

10. If your housing was damaged, what are contents?

Q30 Edit Question ▼ Add Question Logic Move Copy Delete

30. What is your approximate total household income?

- less than 18,000
- 18,000 - 30,000
- 30,001 - 45,000
- 45,001 - 65,000
- 65,001 - 90,000
- 90,001 - 125,000
- 125,001 - 175,000
- Over 175,000

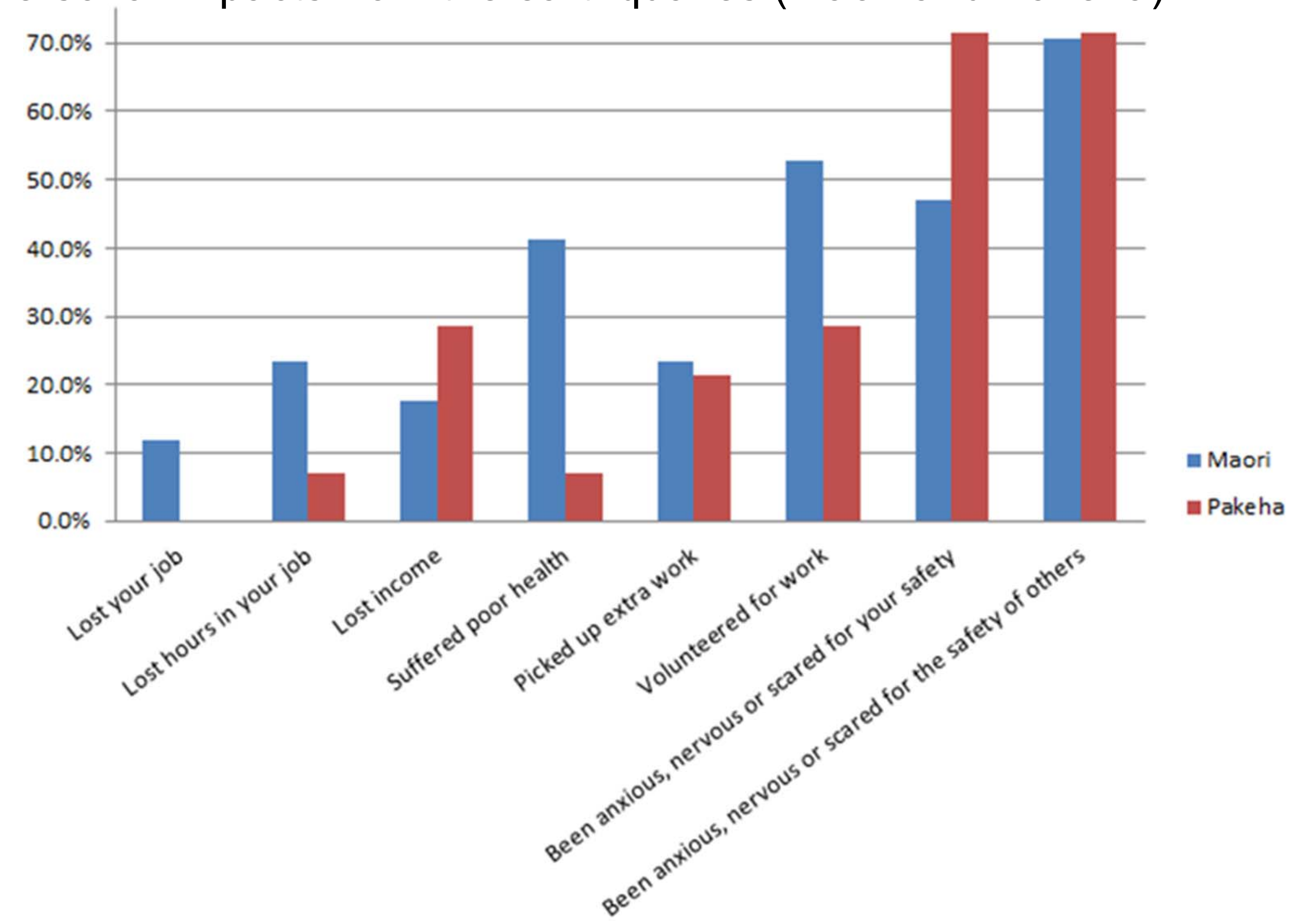
Q15 Edit Question ▼ Add Question Logic Move Copy Delete

15. How often do you visit marae?

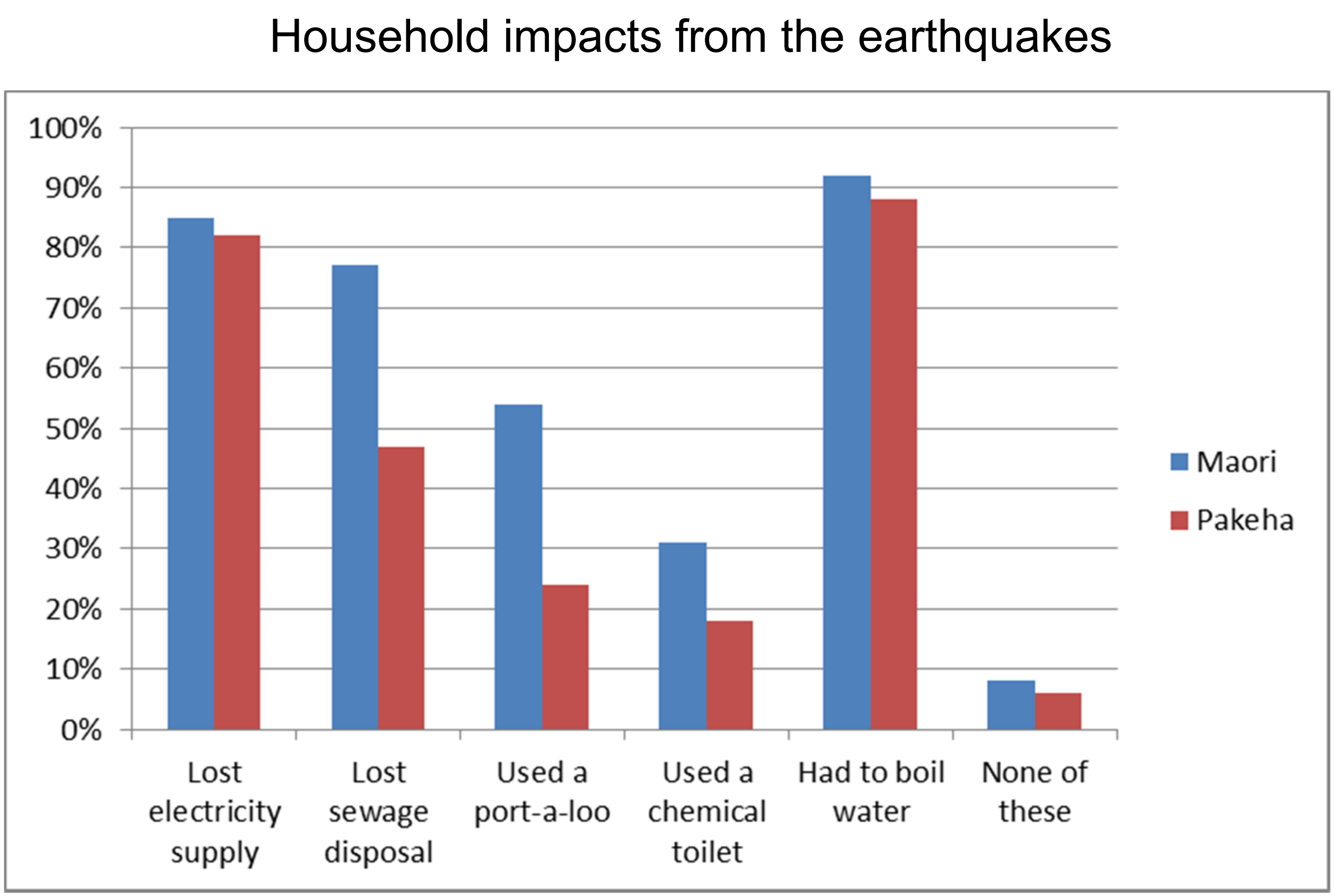
- Never
- Rarely
- Sometimes
- Frequently
- All the time

RESULTS…

Personal impacts from the earthquakes (Maori and Pakeha)



RESULTS…



Household impacts from the earthquakes
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Lost electricity supply
Lost sewage disposal
Used a port-a-loo
Used a chemical toilet
Had to boil water
None of these
Maori
Pakeha

WELLBEING PRE-QUAKE...

How would you describe your personal well-being in each of these four areas before the February 22nd, 2011, earthquake?

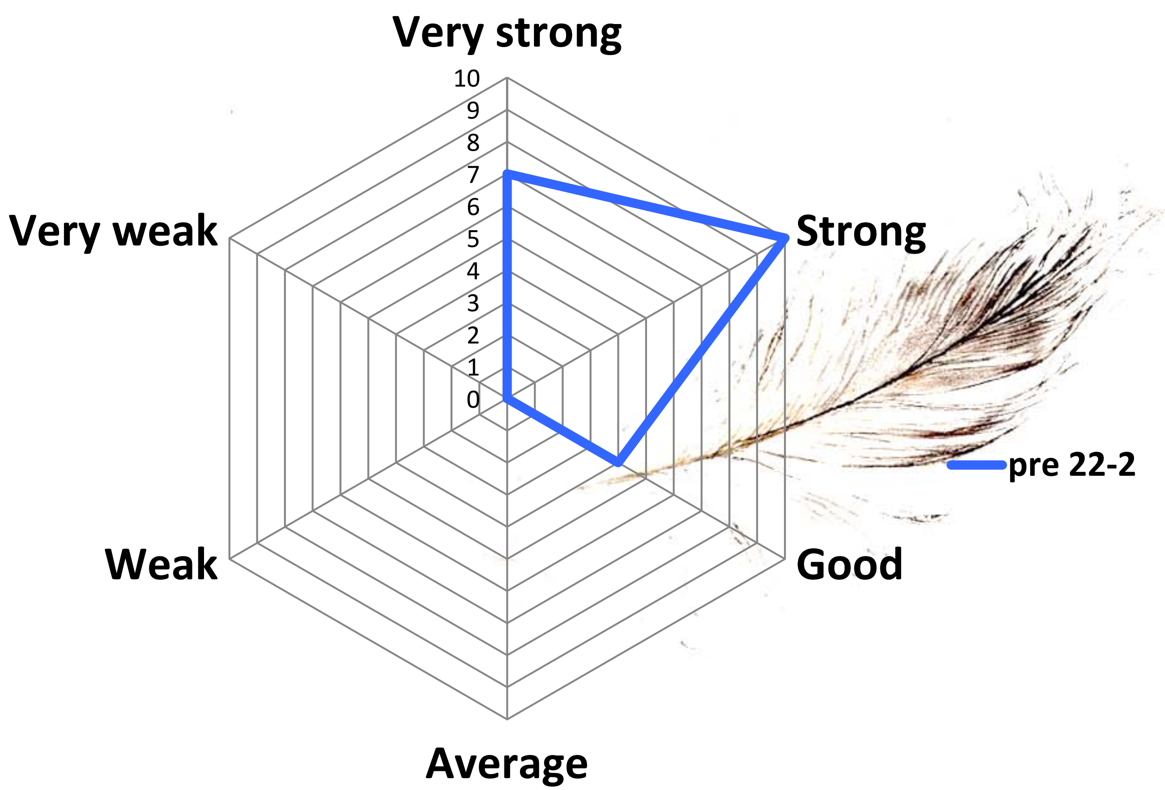
	Very strong	Strong	Good	Average	Weak	Very weak	Response Count
Overall economic well-being (for example, income, job, work hours, mortgage, benefit)	35.0% (7)	**45.0% (9)**	20.0% (4)	0.0% (0)	0.0% (0)	0.0% (0)	20
Overall social well-being (for example, sports, church, pub, parties, clubs)	25.0% (5)	**45.0% (9)**	15.0% (3)	5.0% (1)	10.0% (2)	0.0% (0)	20
Overall environmental well-being (for example, beach, fishing, gardening, walking)	25.0% (5)	**45.0% (9)**	15.0% (3)	10.0% (2)	5.0% (1)	0.0% (0)	20
Overall cultural well-being (for example, arts and crafts, kapahaka, museum, wananga, music)	**30.0% (6)**	25.0% (5)	**30.0% (6)**	15.0% (3)	0.0% (0)	0.0% (0)	20

WELLBEING POST QUAKE...

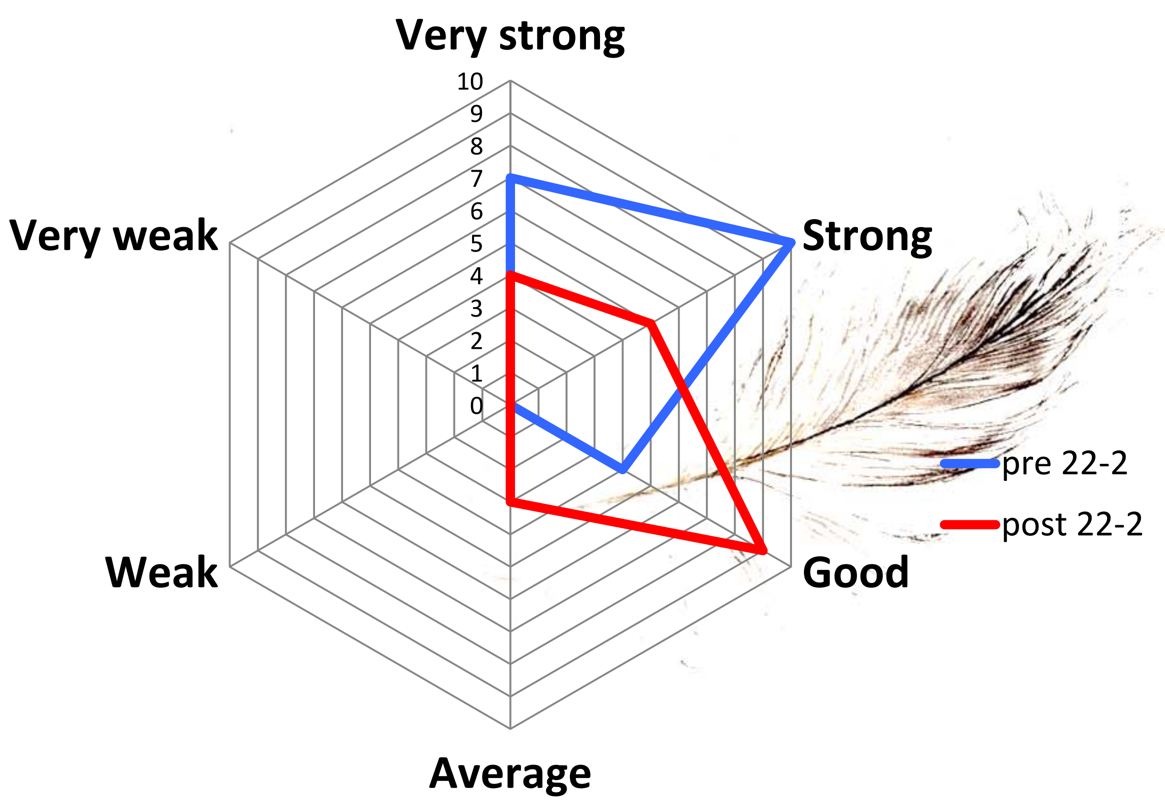
How would you describe your personal well-being now?

	Very strong	Strong	Good	Average	Weak	Very weak	Response Count
Overall economic well-being (for example, income, job, work hours, mortgage, benefit)	20.0% (4)	25.0% (5)	**40.0% (8)**	15.0% (3)	0.0% (0)	0.0% (0)	20
Overall social well-being (for example, sports, church, pub, parties, clubs)	10.0% (2)	20.0% (4)	20.0% (4)	**25.0% (5)**	20.0% (4)	5.0% (1)	20
Overall environmental well-being (for example, beach visits, fishing, gardening, walking)	10.0% (2)	**25.0% (5)**	**25.0% (5)**	20.0% (4)	15.0% (3)	5.0% (1)	20
Overall cultural well-being (for example, arts and crafts, kapahaka, museum, wananga)	10.0% (2)	15.0% (3)	25.0% (5)	**30.0% (6)**	15.0% (3)	5.0% (1)	20

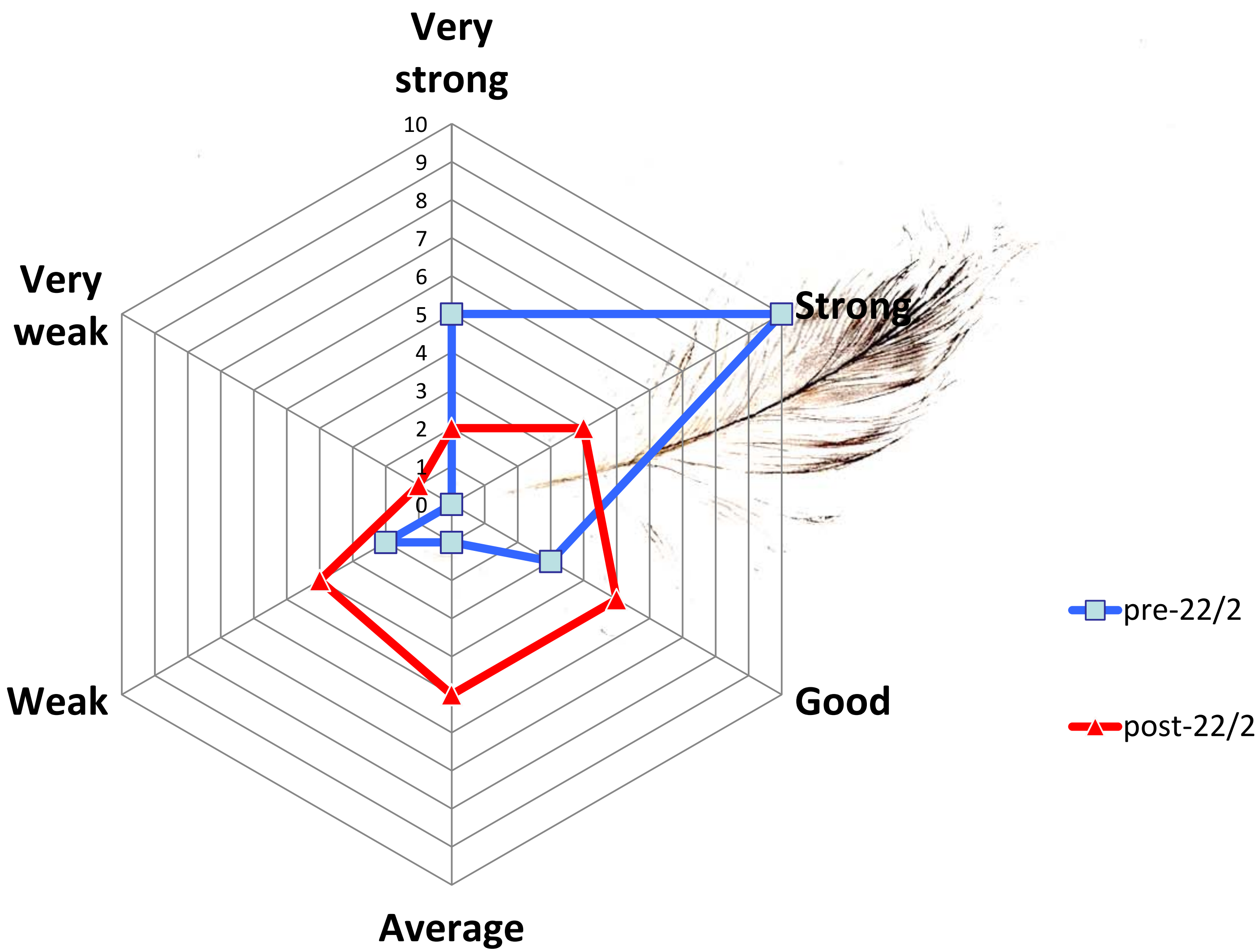
ECONOMIC WELLBEING



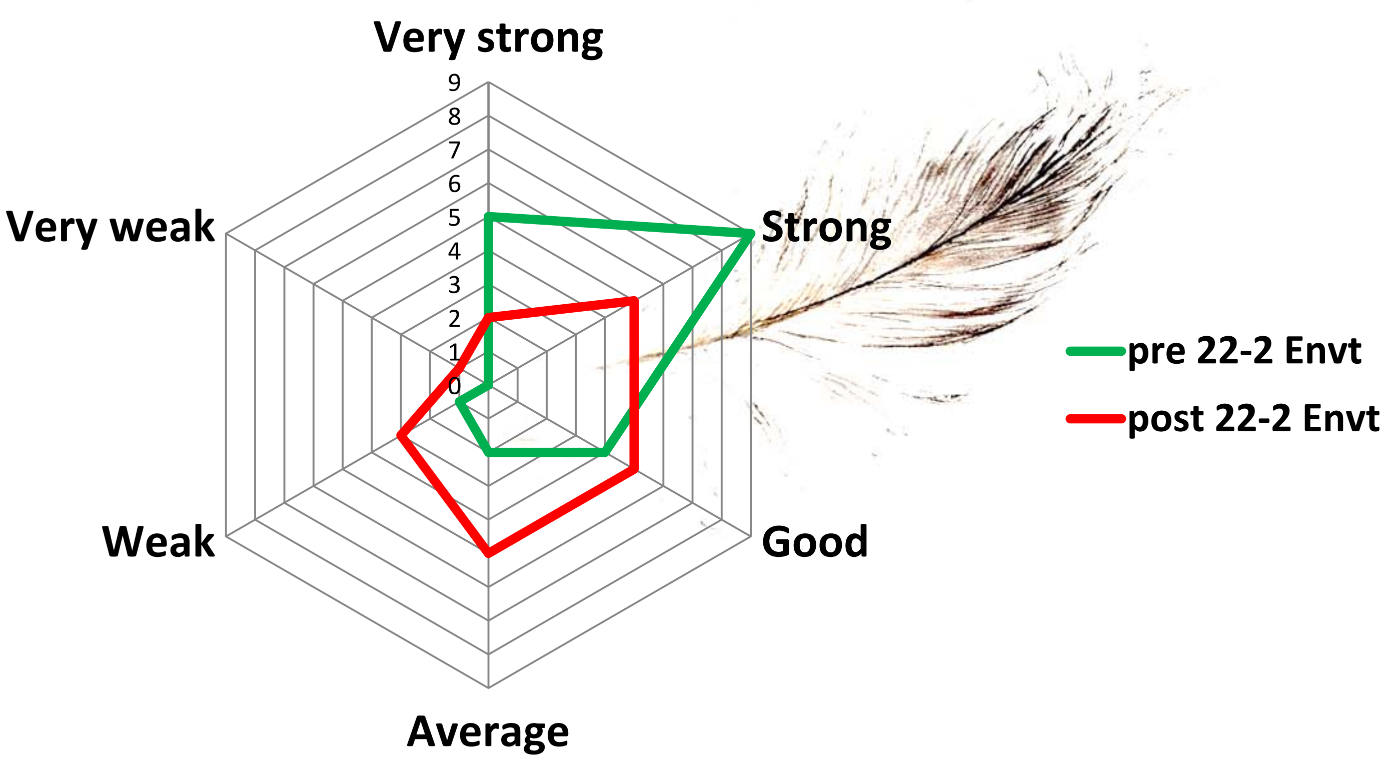
ECONOMIC WELLBEING



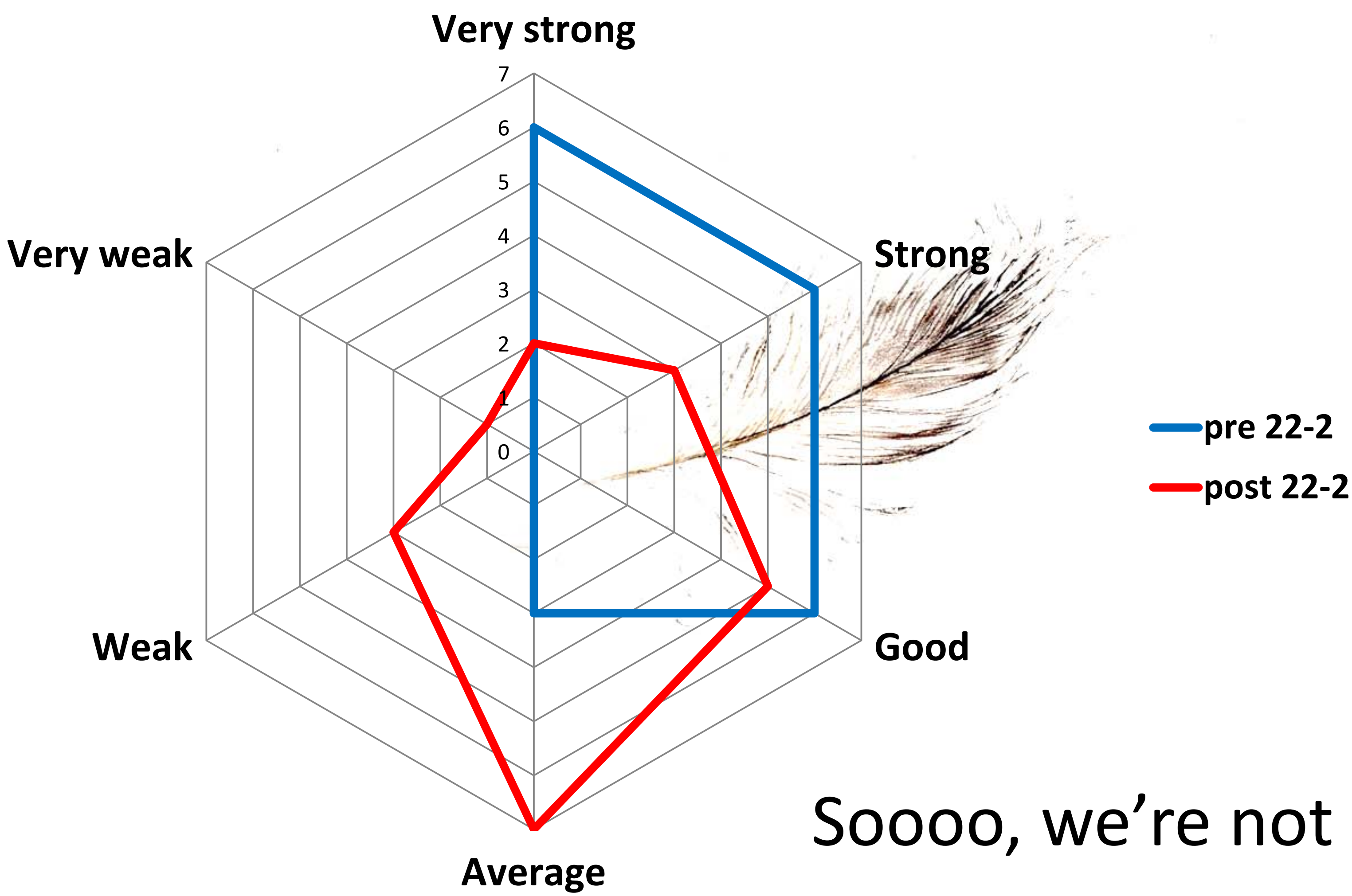
SOCIAL WELLBEING



ENVIRONMENTAL WELLBEING



CULTURAL WELLBEING



Soooo, we're not resilient?!

CAUSAL PATHWAYS TO MAORI RESILIENCE …

Construct sets

Informed by earlier research

Choose variables

Domains, property space

Taken from survey questions

Calibrate memberships…

CAUSAL PATHWAYS TO MAORI RESILIENCE …

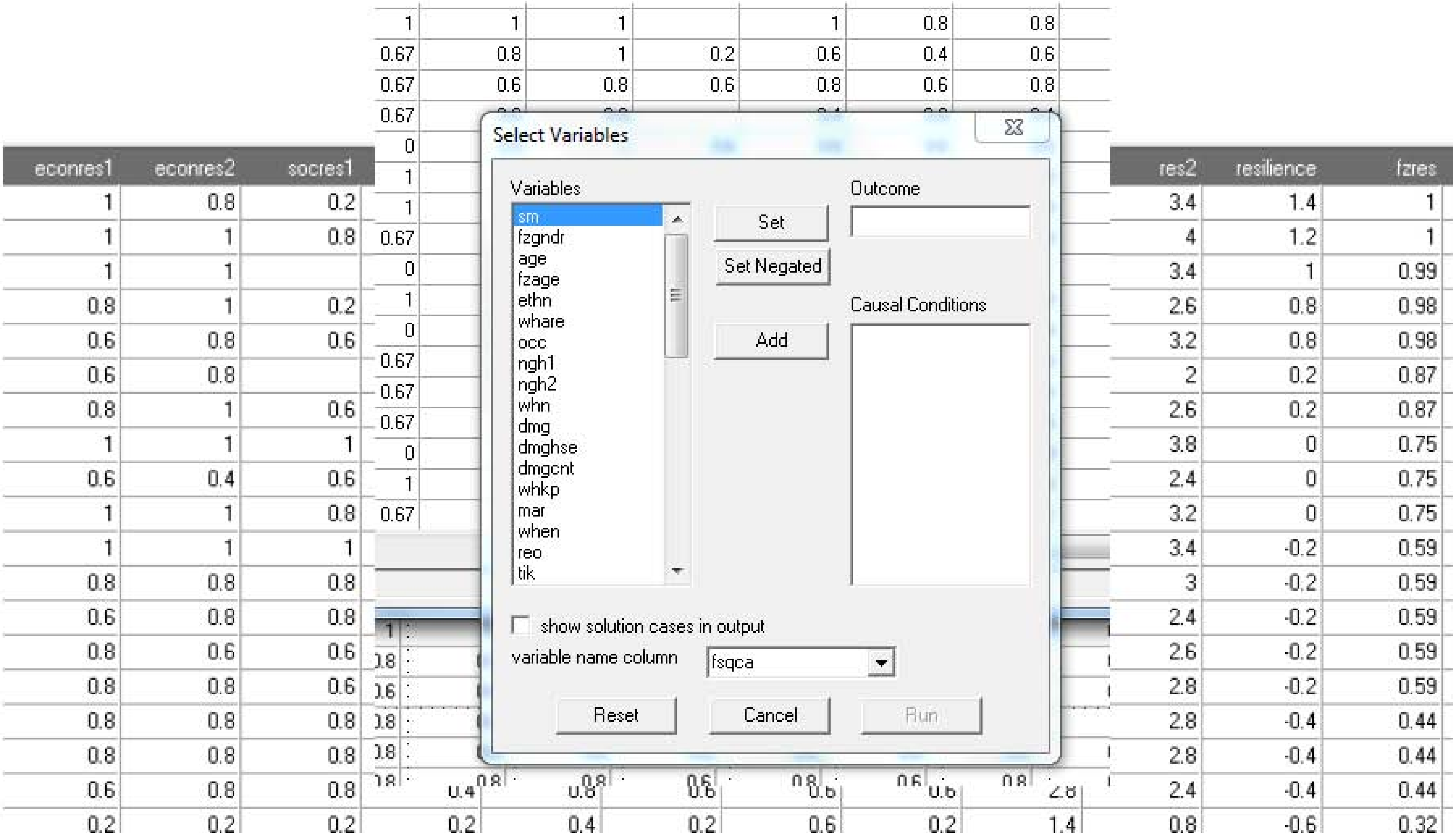
BB	BD	BG
Persincome	**Hseincome**	**Bdrm**
55,001 - 65,000	125,001 - 175,000	3
55,001 - 65,000	65,001 -	
55,001 - 65,000	Over 17	
less than 18,000	18,000 -	
Over 80,000	90,001 -	
less than 18,000	125,001	
Over 80,000	90,001 -	
Over 80,000	Over 17	
Over 80,000	65,001 -	
65,001 - 80,000	90,001 -	
23,001 - 28,000	Over 17	
35,001 - 45,000	90,001 -	
35,001 - 45,000	45,001 -	
45,001 - 55,000	65,001 -	
65,001 - 80,000	Over 17	
45,001 - 55,000	90,001 -	
less than 18,000	30,001 -	
Over 80,000	125,001 - 175,000	3
23,001 - 28,000	65,001 - 90,000	3
18,001 - 23,000	65,001 - 90,000	6
55,001 - 65,000	45,001 - 65,000	2
Over 80,000	125,001 - 175,000	3
less than 18,000	90,001 - 125,000	3

Household income	>$175,000	1.0
	$125,001 - $175,000	0.9
	$90,001 - $125,000	0.8
	$65,001 – $90,000	0.7
	$45,001 - $65,000	0.6
	$30,001 - $45,000	0.5
	$18,000 - $30,000	0.4
	<$18,000	0.3
Whānau contact	Daily	1.0
	Weekly	0.67
	Monthly	0.33
	Once or twice a year	0.17
	Never	0
Moved	Yes	1
	No	0

BB	BC	BD	BE
Persincome	**persinc**	**Hseincome**	**hseinc**
55,001 - 65,000	0.8	125,001 - 175,000	0.9
55,001 - 65,000	0.8	65,001 - 90,000	0.7
		Over 175,000	1
		18,000 - 30,000	0.4
		90,001 - 125,000	0.8
		125,001 - 175,000	0.9
		90,001 - 125,000	0.8
		Over 175,000	1
		65,001 - 90,000	0.7
		90,001 - 125,000	0.8
		Over 175,000	1
		90,001 - 125,000	0.8
		45,001 - 65,000	0.6
		65,001 - 90,000	0.7
		Over 175,000	1
		90,001 - 125,000	0.8
		30,001 - 45,000	0.5
		125,001 - 175,000	0.9
23,001 - 28,000	0.4	65,001 - 90,000	0.7
18,001 - 23,000	0.3	65,001 - 90,000	0.7
55,001 - 65,000	0.8	45,001 - 65,000	0.6
Over 80,000	1	125,001 - 175,000	0.9
less than 18,000	0.2	90,001 - 125,000	0.8
55,001 - 65,000	0.8	Over 175,000	1

CAUSAL PATHWAYS TO MAORI RESILIENCE …

EN	EO	EP	EQ	ER	ES	ET	EU	EV	EW	EX	EY	EZ	FA
Strong	**0.8**	**Very strong**	**1**	**Average**	**0.4**	**Average**	**0.4**	**Very weak**	**0**	**Very weak**	**0**	**Very weak**	0
				well2									
Weak	0.2	Weak	0.2	Good	0.6	Strong	0.8	Very strong	1	Very strong	1	Good	0.6
Strong	0.8	Good	0.6	Average	0.4	Very strong	1	Very strong	1	Very strong	1	Very strong	1
Weak	0.2	Average	0.4	Average	0.4	Very strong	1	Good	0.6	Good	0.6	Average	0.4
Good	0.6	Good	0.6	Good	0.6	Strong	0.8	Strong	0.8	Strong	0.8	Strong	0.8
Good	0.6	Good	0.6	Average	0.4	Very strong	1	Good	0.6	Good	0.6	Average	0.4
Very strong	1	Strong	0.8	Good	0.6	Very strong	1	Very strong	1	Strong	0.8	Good	0.6
Strong	0.8	Strong	0.8	Strong	0.8	Strong	0.8	Strong	0.8	Strong	0.8	Strong	0.8
Very strong	1	Good	0.6	Strong	0.8	Very strong	1	Strong	0.8	Strong	0.8	Strong	0.8
Very strong	1	Strong	0.8	Very strong	1	Very strong	1	Very strong	1	Strong	0.8	Very strong	1
Good	0.6	Average	0.4	Very strong	1	Good	0.6	Average	0.4	Good	0.6	Very strong	1
Very strong	1	Very strong	1	Good	0.6	Very strong	1	Strong	0.8	Very strong	1	Good	0.6
Very weak	0	Very weak	0	Weak	0.2	Strong	0.8	Very weak	0	Very weak	0	Very weak	0
Good	0.6	Strong	0.8	Strong	0.8	Strong	0.8	Strong	0.8	Good	0.6	Good	0.6
Strong	0.8	Strong	0.8	Average	0.4	Strong	0.8	Good	0.6	Average	0.4	Good	0.6
Strong	0.8	Strong	0.8	Strong	0.8	Strong	0.8	Average	0.4	Strong	0.8	Strong	0.8
Strong	0.8	Strong	0.8	Strong	0.8	Strong	0.8	Good	0.6	Good	0.6	Strong	0.8
Average	0.6	Strong	0.8	Average	0.4	Strong	0.8	Average	0.4	Average	0.4	Average	0.4
Strong	0.8	Strong	0.8	Good	0.6	Strong	0.8	Average	0.4	Good	0.6	Good	0.6
Good	0.6	Good	0.6	Good	0.6	Average	0.4	Average	0.4	Good	0.6	Good	0.6
Weak	0.2	Average	0.4	Good	0.6	Weak	0.2	Weak	0.2	Weak	0.4	Weak	0.2
Good		Good		Very strong		Good		Good		Good		Very strong	
Strong	0.8	Strong	0.8	Strong	0.8	Strong	0.8	Average	0.4	Strong	0.8	Average	0.4


econres1
econres2
socres1
res2
resilience
fzres
Select Variables
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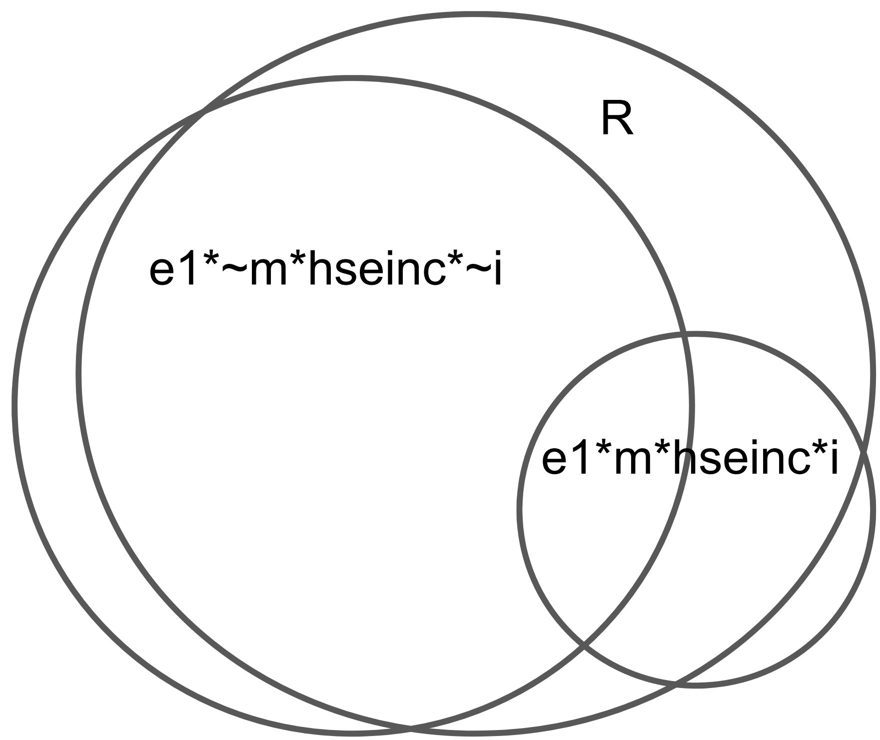
whare
occ
ngh1
ngh2
whn
dmg
dmghse
dmgcnt
whkp
mar
when
reo
tik
Set
Set Negated
Add
Outcome
Causal Conditions
show solution cases in output
variable name column
fsqca
Reset
Cancel
Run

CAUSAL PATHWAYS TO MAORI RESILIENCE ...

	raw coverage	unique coverage	consistency
econ1*~move*hseinc*~impacts	0.741344	0.741344	0.709552
econ1*move*hseinc*impacts	0.133401	0.133401	0.803681

solution coverage: 0.874745

solution consistency: 0.722456



CAUSAL PATHWAYS TO MAORI RESILIENCE …

In plain language: resilient individuals displayed…

1. No impacts, not moving, high household income, strong pre-quake economic wellbeing

2. Significant impacts, moving away, high household income, strong pre-quake economic wellbeing

PATHWAYS TO NON-RESILIENCE?

	raw coverage	unique coverage	consistency
impacts*~move	0.467800	0.121646	0.895548
~impacts*move	0.089445	0.071556	1.000000
~persinc	0.398032	0.051878	0.855769
~mcult*~cult1	0.275492	0.063506	0.708046

solution coverage: 0.702147

solution consistency: 0.813471

CONCLUSIONS

- **Resilience is yet to be demonstrated**
- **But that is to be expected!**
  - It is preceded by endurance…
- **Set theoretic methods are powerful tools in social research.**
- **fsQCA is a useful tool in understanding, investigating and *communicating* Maori resilience contexts.**