
Volunteering for nature generates behavioural spillovers, increases pro-environmental orientation and improves wellbeing: A field experiment

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Motivations

- Behaviour change is an important pillar of reducing environmental externalities, increasing social welfare
- Behavioural sciences and economics are providing increasing evidence and insight on achieving behaviour change
- Volunteering for nature is a behaviour that may have positive net private and social benefits
- Does it? And if so, why don't more people do it?
- Lack of theoretically motivated field experiment evidence

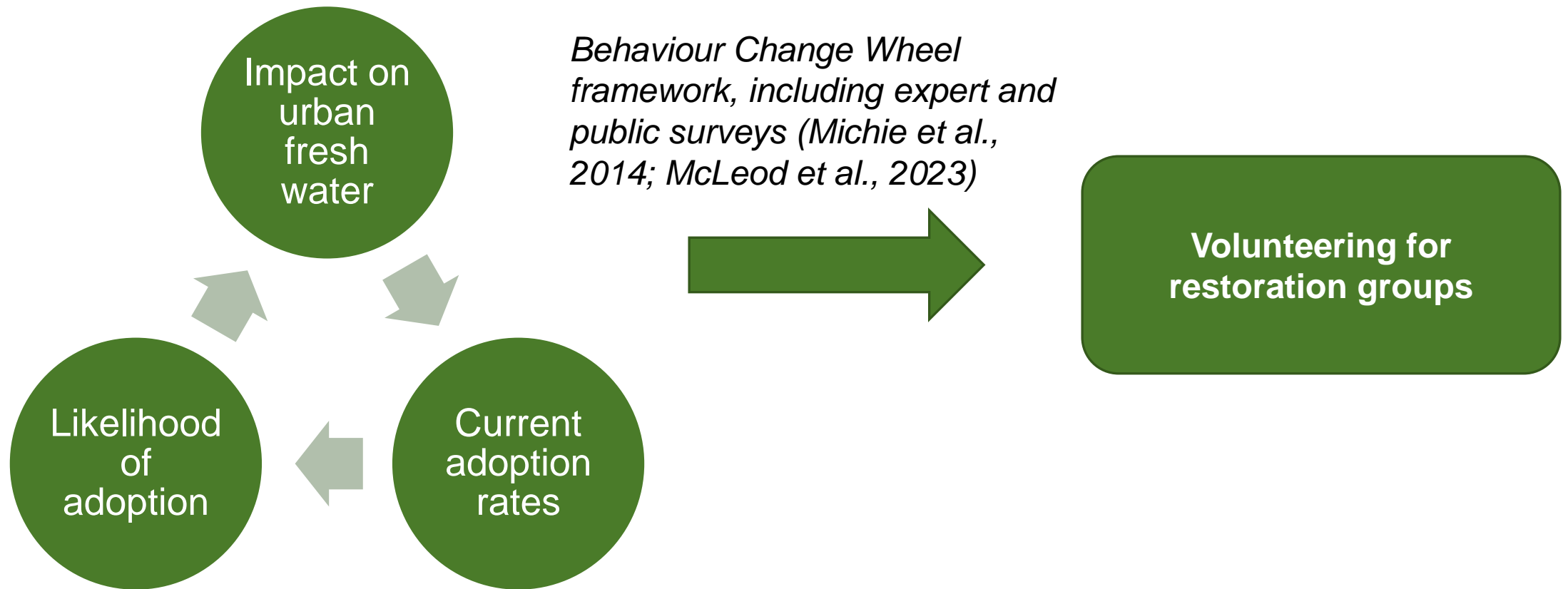
Biological Heritage National Science Challenge Research Team

- We sit within the Strategic Objective 2 (SO2) research team, made up of researchers from around the country with diverse backgrounds.
- Our inter-disciplinary team are:

Striving to empower New Zealanders to demand and enact environmental stewardship and kaitiakitanga (guardianship).

- The team has decided to focus on urban freshwater biodiversity stewardship behaviours (pro-environmental behaviours – PEBs).

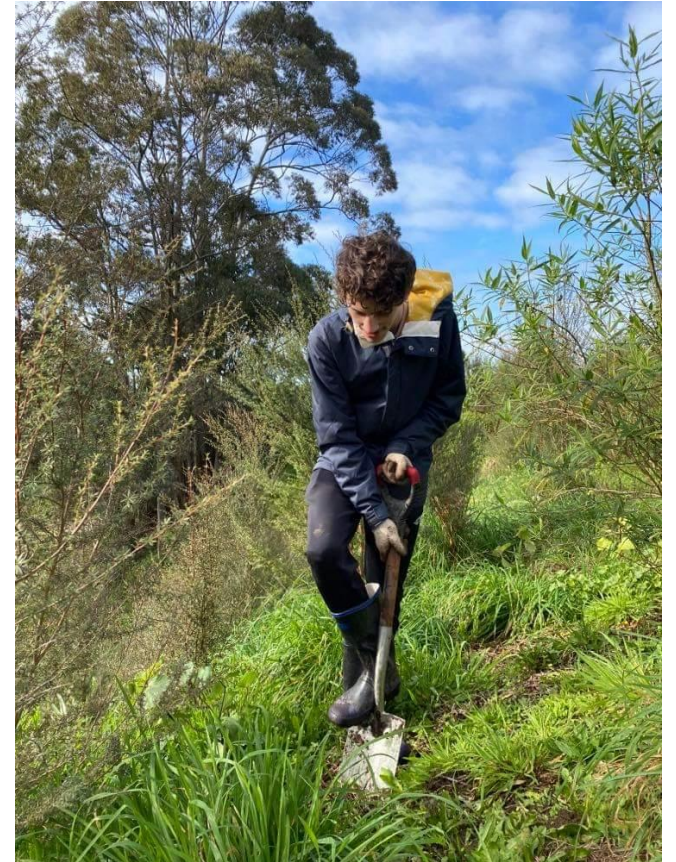
Why volunteering for restoration groups? - background work



This explicit selection process a point of difference to many other experimental studies (Al-Ubaydli et al., 2017, *JEP*; Grilli & Curtis, 2021, *RSER*).

Key Research Questions

- How effective are nudges and/or financial incentives for increasing volunteering for nature?
- (Mostly covered in another paper)
- Do first time volunteers keep volunteering?
 - Is this dependent on method of initial incenting?
 - What other benefits are there to volunteering?
 - Methodological challenge: how can we randomly assign people into *volunteering* vs control of *not volunteering*?



Our prior insights

Volunteering for nature has many private benefits evidenced in the literature, but past and present uptake is not widespread

Barriers to volunteering include:

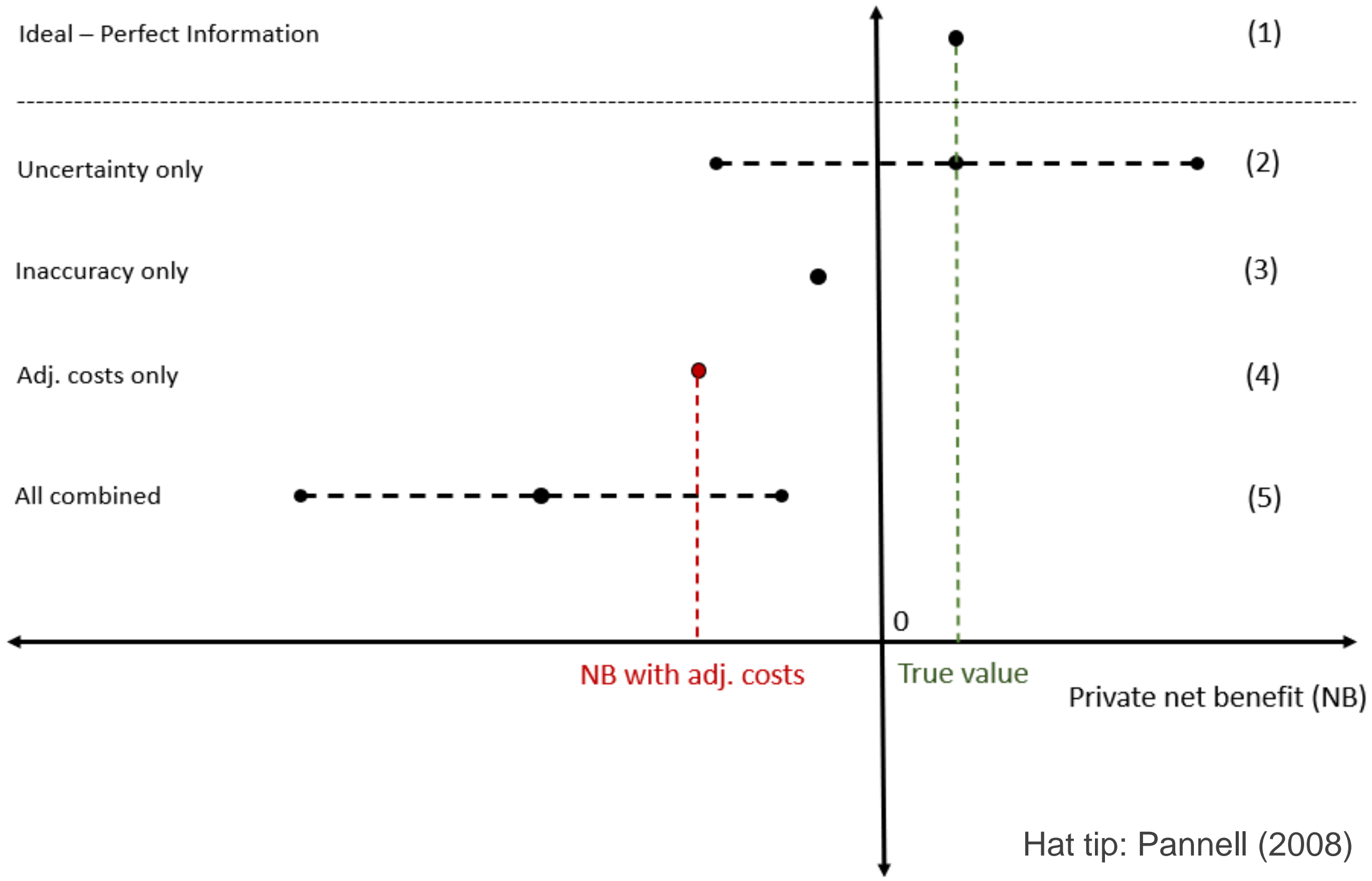
- Lack of information and awareness
- Not knowing other volunteers is a social barrier
- Work and time constraints
- Previous bad experiences volunteering

(McLeod et al., 2023 *working paper*, plus informal conversations with the sector)

Theoretical framework

- We look to the literature on experience goods to understand volunteering
- For a naive consumer, experience goods can have:
 - uncertainty regarding their benefits
 - high cost of sampling
- For a subset of non-volunteers, we posit they have net private benefits from volunteering, but do not due to:
 - Uncertainty
 - Inaccuracy
 - Upfront adjustment costs

Case: Naïve non-volunteer who would benefit from volunteering



Insights from theory

- Appropriately sized incentives and information may help create positive net benefits to try volunteering (for nature) for the first time
- We have theoretical reasons why we might expect a first time volunteering experience to lead to future volunteering
- It is important to try to mitigate motivational crowding out from incentives, and support crowding in if possible

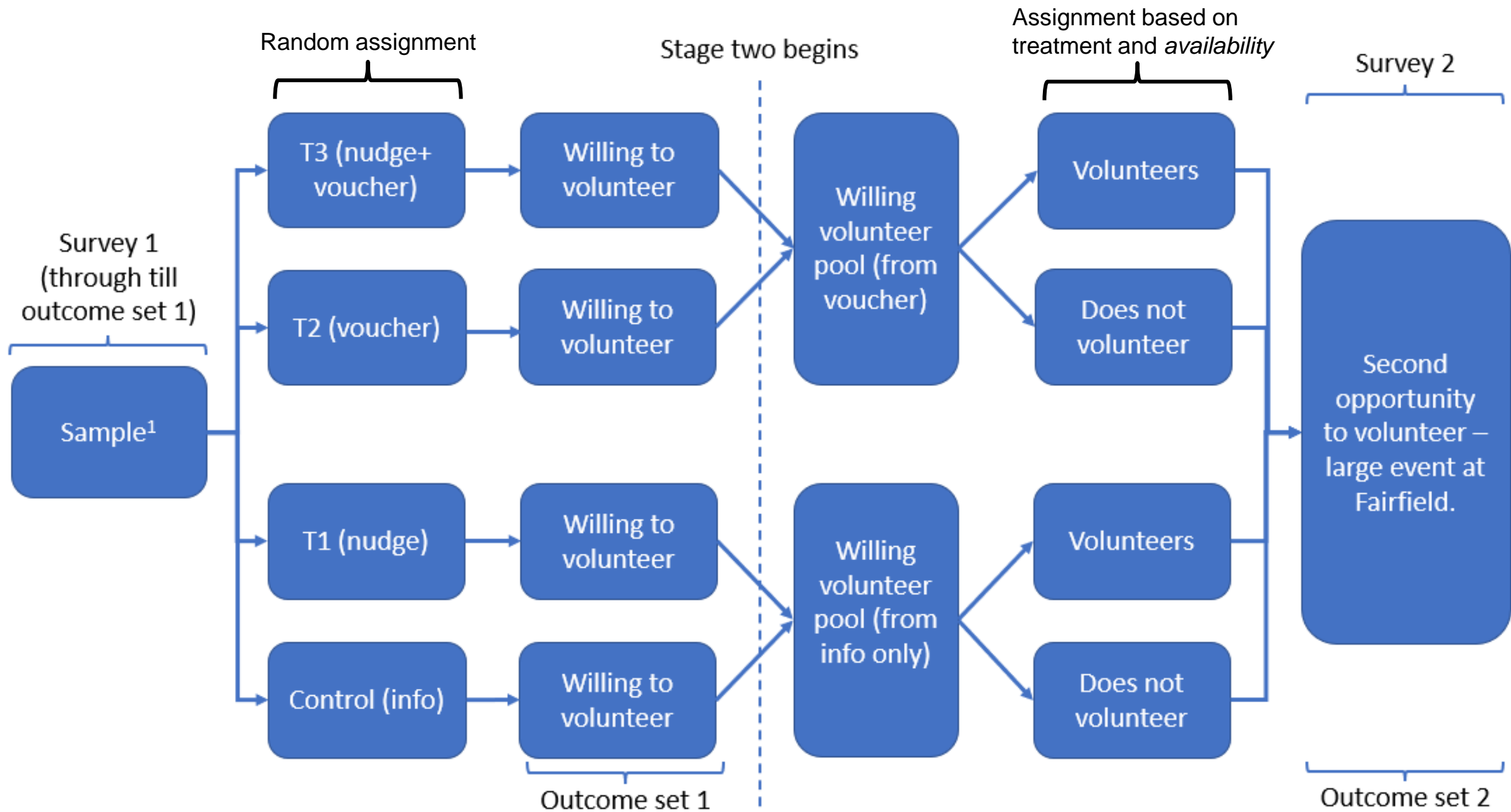
Fairfield Project - Kukutaaruhe



Experimental design



1. Online survey, recruited through social media for residents of Kirikiriroa | Hamilton, Aotearoa | New Zealand, January/February 2023.
2. Identified people not currently volunteering for nature, no recent volunteering, but willing
3. One person per household could take the survey, 18 and over
4. Gave the group an opportunity to **attend** a first time volunteering experience
5. Separate between those who volunteered and those who didn't, with a key determinant being **availability**
6. Follow up **attendance** at future events, follow up survey
7. We pre-registered



Control

We are looking for volunteers for a series of events with a community restoration group on the eastern side of Hamilton.

“Nudge”

We are looking for volunteers for a series of events with a community restoration group on the eastern side of Hamilton.

Participating in one of these events is a great way to give back to your community and the environment while having fun! It is also a good way to meet like-minded people. Studies show that volunteering increases overall wellbeing. You might also learn some new skills that you can apply at home or in your local neighbourhood to positively impact the environment.

Voucher

We are looking for volunteers for a series of events with a community restoration group on the eastern side of Hamilton.

*To recognise volunteers' time commitment and willingness to try something new, volunteers will receive a **one-off \$50 supermarket voucher** at the event.*

Events

- Four events February 2023 on weekday or weekend mornings
- Separated by voucher/non-voucher groups
- People could choose two activities to engage in – included potting, tracking, trapping, bamboo cutting, seed collection and gardening.
- Lunch was provided at the end.



Follow up events

All potential first time volunteers were informed about future events

We tracked attendance at:

- Working bee 18 March
- Fairfield Project's Garden Festival 25 March



SATURDAY, MARCH 18, 9-11:30AM

Kia ora koutou. We're back in the gully again this **Saturday, March 18, 9-11:30am**, and we'd love your help. It's very casual, and a great chance to meet like-minded folk from your community. Wear suitable footwear, and if you have one, please bring a cutting tool. We will meet at The Watershed (*see Google Maps*) at 9am.



Hypotheses

1. A first-time experience volunteering will lead to increases in future volunteering.
2. The effect size will be stronger for those who live near the community group where the event is held.
3. There is a difference in the treatment effect depending on if the volunteers came from a voucher group in stage one (direction unclear)
4. Volunteering will increase measures associated with wellbeing, environmental/social motivation

Results *preview*

1. A first-time experience volunteering will lead to increases in future volunteering. **SUPPORTED**
2. The effect size will be stronger for those who live near the community group where the event is held. **NOT SUPPORTED**
3. There is a difference in the treatment effect depending on if the volunteers came from a voucher group in stage one (direction unclear). **NOT SUPPORTED**
4. Volunteering will increase measures associated with wellbeing, environmental/social motivation. **SUPPORTED**

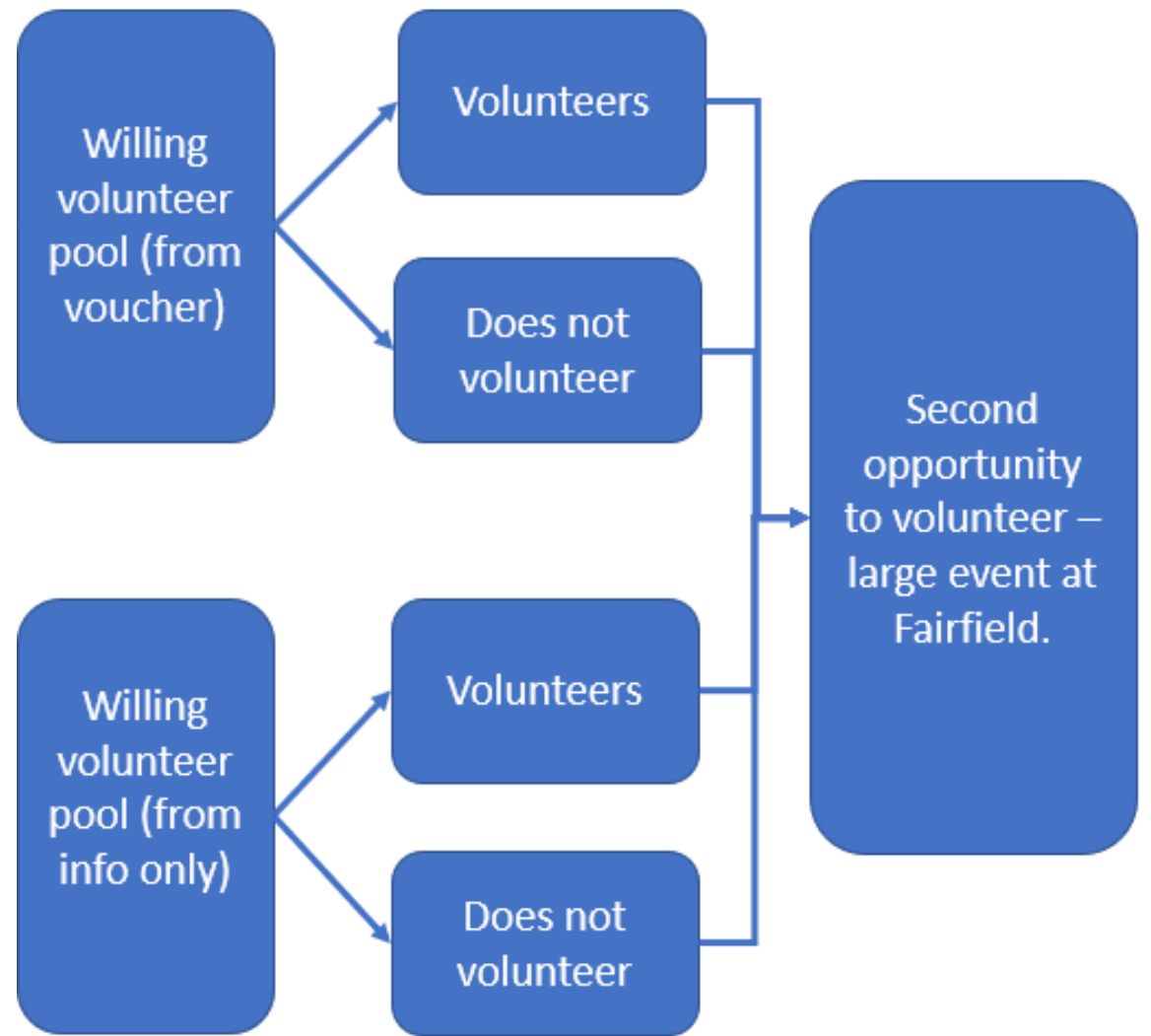
Empirical strategy

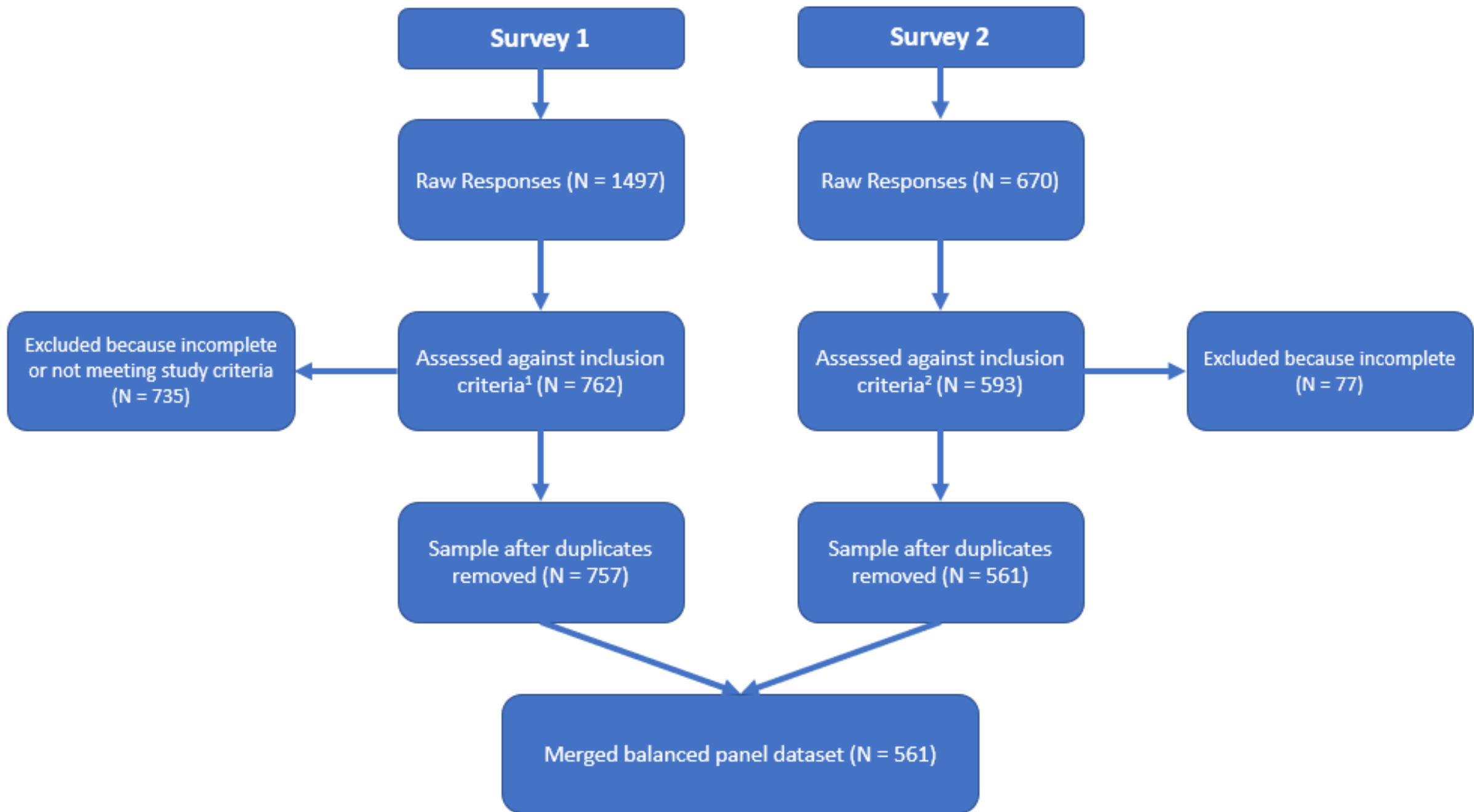
In survey 1:

1. Ask for **pre-commitment**: Are you willing to volunteer for 2 hours sometime in the next month? Yes -> assignment into willing volunteer pool
2. Ask for **availability**: When are you available to volunteer? Tick up to 28 dates in a calendar
3. Ask for **commitment**: Will you come to this event on this day?
4. Record **attendance** at the events

We test whether **stage 1 treatment** and **availability** predicts **attendance** among willing volunteers

We construct optimal balance weights for our analyses between volunteers (**stage 2 treated**) and non-volunteers (**stage 2 control**)





Variable	Full (N = 557)	
	Mean	Std. Dev.
Age	44	16
Māori and Pacific Ethnicity	20%	-
Bachelors or higher	60%	-
<i>Income (perceived)</i>		
Low income	24%	-
Middle income	64%	-
High income	13%	-
<i>Gender</i>		
Female	71%	-
Male	28%	-
Gender diverse	2%	-
<i>Employment status</i>		
Full time	47%	-
Student	7%	-
Retired	12%	-
Part time	16%	-
Other employment	17%	-
<i>Geographic location</i>		
Resides outside Hamilton City	16%	-
Resides near Fairfield	17%	-

Results from stage 1: No difference in treatment groups for *pre-commitment*

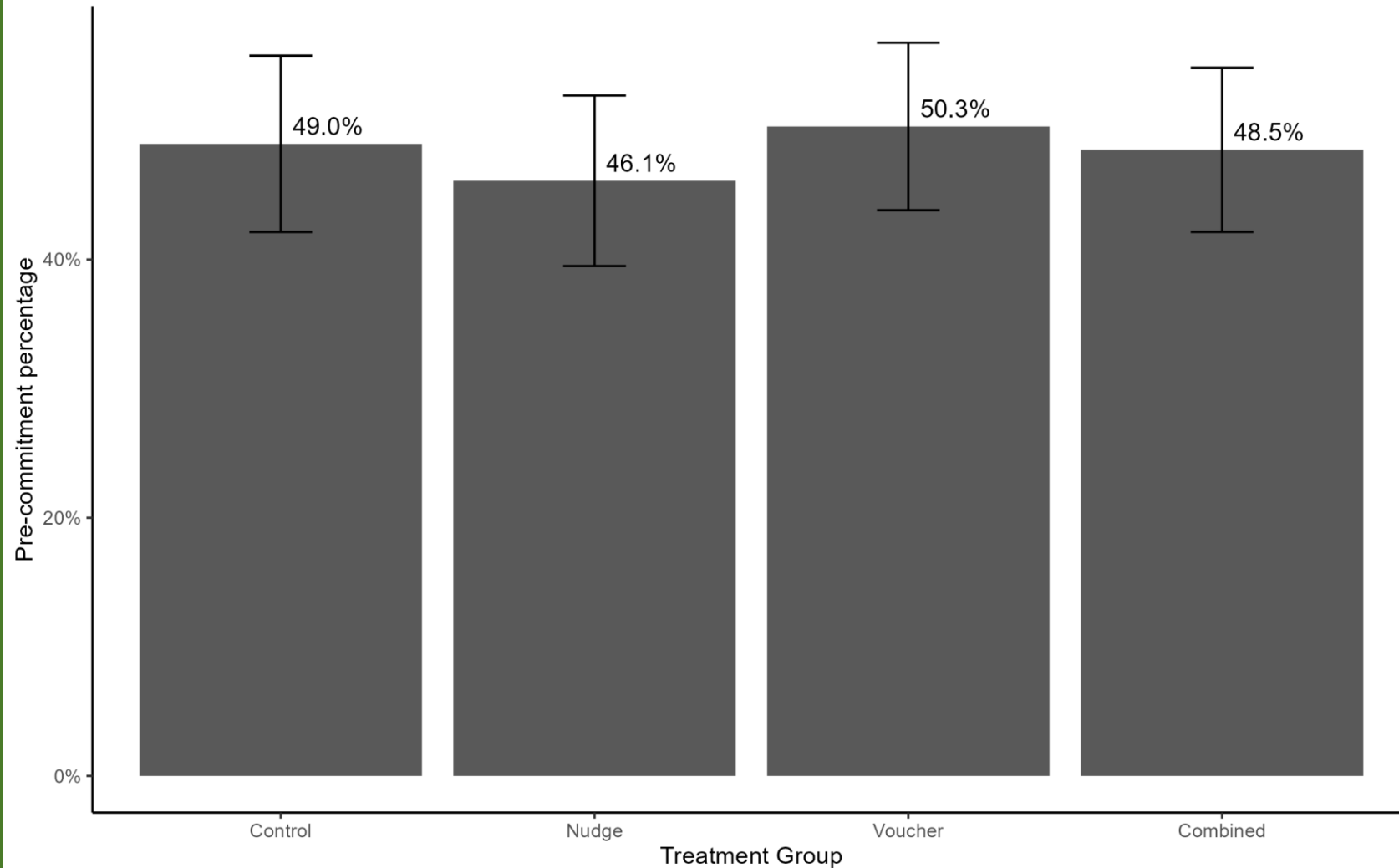
“Yes, I am willing to volunteer over the next month at a two hour event”.

Pre-commitment before they see specific dates and provide *availability*.

Error bars show 90% CIs.

$\chi^2 = 0.226$ (p-value = 0.317)

N=627



Results from stage 1: *Attendance at first event – voucher is effective*

Error bars show 90% CIs.

$\chi^2 = 8.721$ (p-value = 0.0016)

N=627

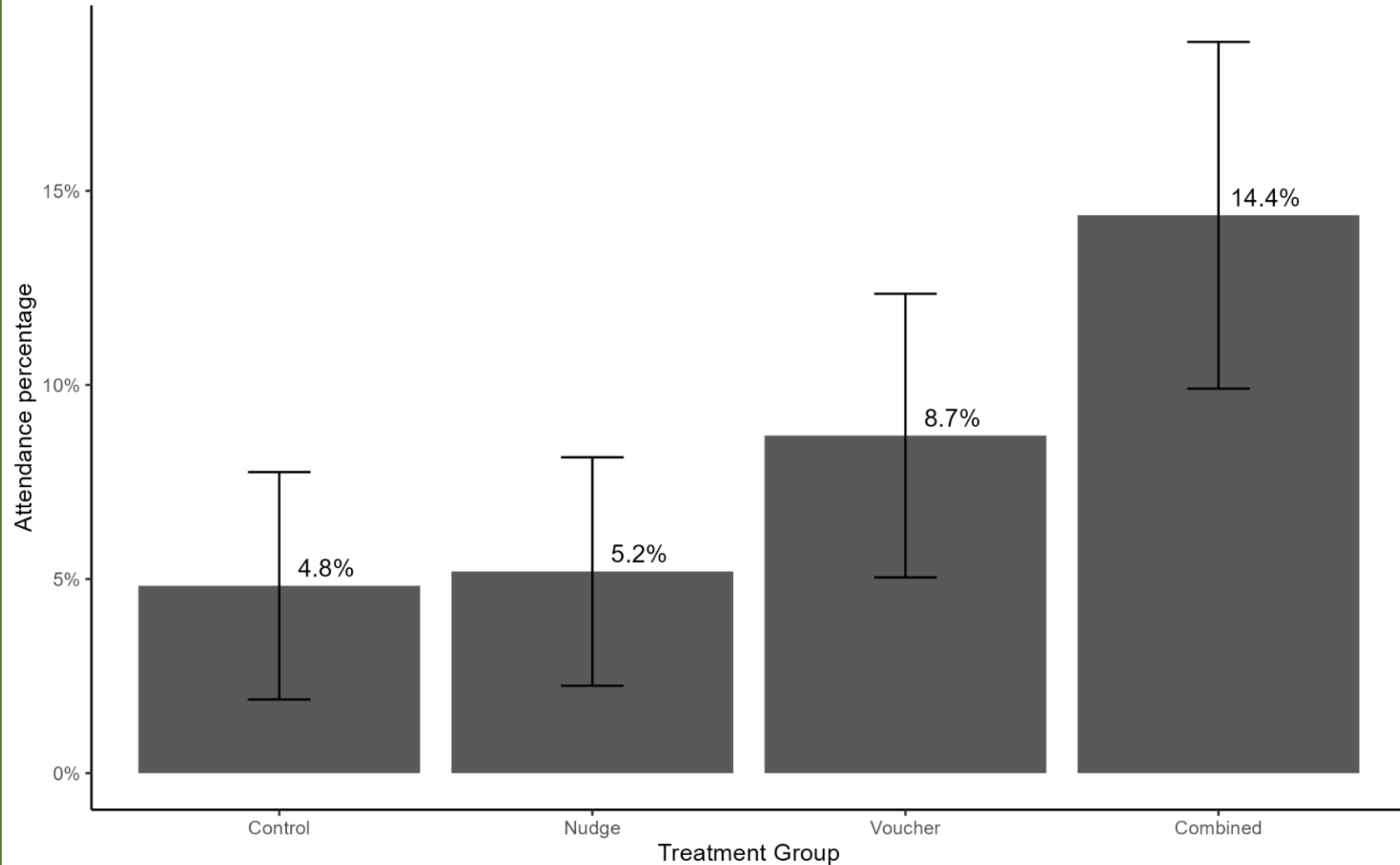


Table 4. Regression models predicting treatment assignment

	Dependent variable: Treatment (attendance at a volunteering event)			
	Full model		Voucher and availability only	
	LPM (1)	Logit (2)	LPM (3)	Logit (4)
Voucher	0.190 ^{***} (0.063)	0.187 ^{***} (0.063)	0.186 ^{***} (0.060)	0.193 ^{***} (0.065)
Days available	0.019 ^{***} (0.006)	0.018 ^{***} (0.005)	0.016 ^{***} (0.006)	0.014 ^{***} (0.005)
LOC index	-0.036 (0.043)	-0.037 (0.042)		
PEB index	0.001 (0.044)	0.004 (0.043)		
Who5 score	0.012 [*] (0.007)	0.013 [*] (0.007)		
Other volunteering	-0.023 (0.076)	-0.011 (0.076)		
Male	0.003 (0.083)	0.007 (0.074)		
Low income	-0.013 (0.085)	-0.022 (0.079)		
High income	-0.104 (0.108)	-0.130 (0.097)		

Maori/Pacific	-0.024 (0.075)	-0.020 (0.079)		
Full time	0.058 (0.096)	0.071 (0.097)		
Student	0.204 (0.132)	0.195 (0.125)		
Retired	0.119 (0.144)	0.106 (0.137)		
Part time	-0.162 (0.101)	-0.173 (0.128)		
Bachelors or higher	-0.019 (0.069)	-0.021 (0.068)		
Age	0.001 (0.003)	0.001 (0.003)		
Outside Hamilton City	-0.139* (0.083)	-0.152 (0.112)		
Near Fairfield	-0.085 (0.082)	-0.096 (0.094)		
Children dummy	-0.041 (0.071)	-0.052 (0.068)		
Model Constant	0.084 (0.327)	-2.411 (1.989)	0.086* (0.046)	-1.987 (2.084)
Observations	189	189	189	189

Balance weighting

- We have 51 volunteers (treatment) and 138 similar people who did not (control)
- These people all *pre-committed*
- The control differs from the volunteer treatment by stage 1 treatment and availability only
- For hypothesis testing, we construct optimal weights to maximize sample size, using voucher and availability, plus other covariates
- These optimisation weights are consistent estimators of true inverse probability weights (IPW) of being treated, eliminating selection bias (Wang & Zubizarreta, 2020).

Balance weighting optimisation

$$\max \frac{N}{\sum_{i=1}^N w_i} \text{ s.t. } \begin{cases} d \leq 0.1 \\ 0.5 < v < 2 \end{cases} \text{ for all } \mathbf{X}$$

where w are weights, \mathbf{X} is *availability, voucher treatment* and controls, and:

$$d = \frac{(\bar{x}_1 - \bar{x}_0)}{s_1}$$

where \bar{x}_1 is variable mean for treatment, subscript 0 is control, s_1 is std. dev., and:

$$v = \frac{s_1^2}{s_0^2}$$

where s_1^2 is the variance of covariate x in the treatment group and s_0^2 is the variance of covariate x in the control group.

Causal identification

$$ATE = E[Y_i | Z_i = T | w_i] - E[Y_i | Z_i = C | w_i]$$

which gives average treatment effect (ATE) for outcome Y , from treatment condition Z , given inverse probability weights w .

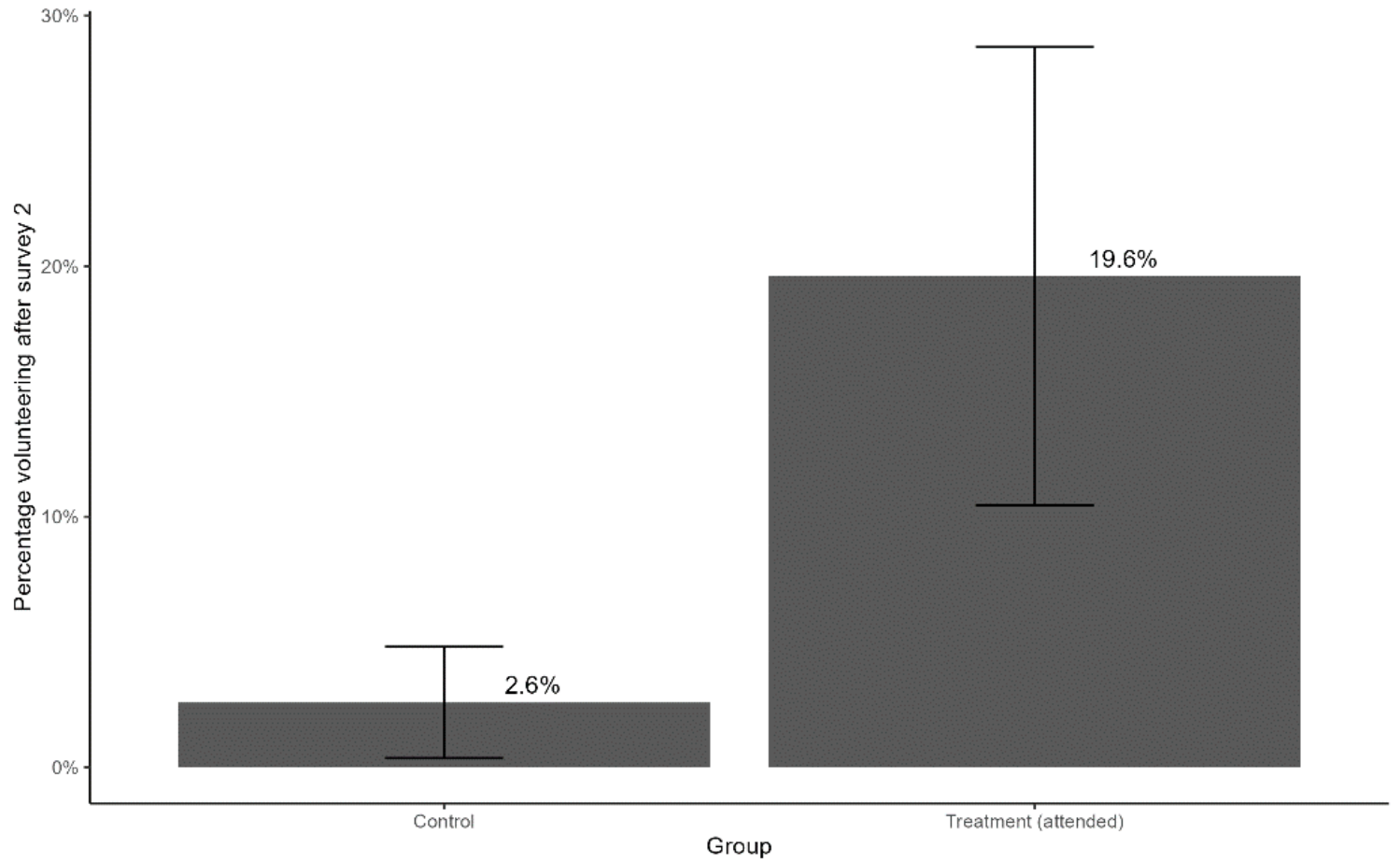
Thus, we assume:

$$Y_{0i}, Y_{1i} \perp Z_i | w_i \text{ where } w_i = W(\text{Availability}_i, \text{Voucher}_i, \mathbf{X}_i)$$

Volunteered again?

Control – non-volunteers

Treatment – volunteers



Weighted Chi-squared tests

<i>Future behaviour</i>	<i>Mean for group</i>		<i>Test output</i>	
	Control	Treatment	χ^2	p-value
Pre-commitment	78.9%	94.1%	5.035	0.0075***
Commitment	46.4%	66.7%	6.141	0.0065***
Attendance	2.6%	19.6%	8.721	<0.001 ***

Note: Treatment (volunteered) N = 51, Control effective N = 111

Linear probability models

	Future pre-commitment				
	(1)	(2)	(3)	(4)	(5)
Treatment	0.166*** (0.049)	0.152*** (0.050)	0.156*** (0.051)	0.210*** (0.058)	0.150*** (0.056)
Voucher			-0.024 (0.059)	-0.006 (0.076)	-0.025 (0.059)
Fairfield			0.025 (0.077)	0.026 (0.077)	0.014 (0.096)
Treatment*Voucher				-0.076 (0.089)	
Treatment*Fairfield					0.053 (0.104)
Intercept	0.775*** (0.036)	0.789*** (0.038)	0.800*** (0.052)	0.788*** (0.060)	0.802*** (0.054)
IPW Weights	NO	YES	YES	YES	YES
Observations	189	189	189	189	189
R ²	0.037	0.032	0.034	0.036	0.034
Adjusted R ²	0.032	0.027	0.018	0.015	0.013

Linear probability models

	Future attendance				
	(1)	(2)	(3)	(4)	(5)
Treatment	0.160*** (0.058)	0.170*** (0.058)	0.167*** (0.057)	0.091 (0.099)	0.187*** (0.063)
Voucher			-0.006 (0.035)	-0.032 (0.028)	-0.004 (0.035)
Fairfield			-0.068*** (0.022)	-0.070*** (0.023)	-0.031** (0.015)
Treatment*Voucher				0.108 (0.122)	
Treatment*Fairfield					-0.186*** (0.064)
Intercept	0.036** (0.016)	0.026** (0.013)	0.040 (0.028)	0.057** (0.025)	0.033 (0.028)
IPW Weights	NO	YES	YES	YES	YES
Observations	189	189	189	189	189
R ²	0.069	0.086	0.094	0.101	0.104
Adjusted R ²	0.064	0.081	0.079	0.082	0.084

Differences post-treatment

<i>Future behaviour</i>	<i>Wtd. mean for group</i>		<i>p-values from one-sided test</i>		
	Control	Treatment	Naïve	BKY adj. ¹⁴	BH adj.
EID index (1-7)	5.64	5.84	0.088*	0.048**	0.121
LOC index (1-7)	5.42	5.66	0.035**	0.047**	0.061*
Who5 score (0-25)	14.5	15.9	0.030 **	0.047**	0.061*
Willingness to vol. (restoration) (1-7)	5.44	6.14	<0.001***	<0.001***	<0.001***
Knowledge of restoration groups (1-7)	3.05	3.73	0.0015***	0.0048***	0.0058***
Perception of restoration groups (1-7)	5.62	6.39	<0.001***	<0.001***	<0.001***
Connection to nature (1-7)	5.86	5.82	0.374	0.120	0.412
Connection to community (1-7)	4.47	4.51	0.437	0.120	0.437
PEB index (1-7)	5.1	5.29	0.039**	0.047**	0.061*
Donation binary	58.5%	74.5%	0.023**	0.047**	0.061*
Donation value (\$)	28.4	31.1	0.187	0.076*	0.228

*Note: These are one-sided Mann-Whitney U non-parametric test results, except for the test of binary donation behaviour which uses a chi-squared proportion test ($\chi^2 = 3.99$). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.*

Differences post-treatment – pre-treatment lagged dependent variable models

<i>Future behaviour</i>	<i>Regression output</i>		<i>p-values from one-sided test</i>		
	AME	Std. error	Naïve	BKY adj. ¹⁵	BH adj.
EID index (1-7)	0.17	0.09	0.034**	0.026**	0.047**
LOC index (1-7)	0.27	0.10	0.003***	0.006***	0.009***
Who5 score (0-25)	1.11	0.56	0.025**	0.026**	0.039**
Willingness to vol. (restoration) (1-7)	0.17	0.10	<0.001***	<0.001***	<0.001***
Knowledge of restoration groups (1-7)	0.60	0.18	<0.001***	0.001***	0.002***
Perception of restoration groups (1-7)	0.77	0.16	<0.001***	<0.001***	<0.001***
Connection to nature (1-7)	0.02	0.14	0.432	0.069*	0.432
Connection to community (1-7)	0.12	0.16	0.233	0.061*	0.256
PEB index (1-7)	0.17	0.09	0.022**	0.026**	0.039**
Donation binary	0.13	0.06	0.018**	0.026**	0.039**
Donation value (\$)	\$3.66	\$3.49	0.148	0.058*	0.180

*Note: BM robust standard errors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.*

Results

1. A first-time experience volunteering will lead to increases in future volunteering. **SUPPORTED**
2. The effect size will be stronger for those who live near the community group where the event is held. **NOT SUPPORTED**
3. There is a difference in the treatment effect depending on if the volunteers came from a voucher group in stage one (direction unclear). **NOT SUPPORTED**
4. Volunteering will increase measures associated with wellbeing, environmental/social motivation. **SUPPORTED**

Conclusion

- We construct a credible control group to test for positive behavioural spillovers, increased pro-environmental orientation and private benefits of nature volunteering
- We find convincing support for hypotheses 1 and 4
- A voucher incentive for first time volunteers increases attendance, but does not crowd out intrinsic motivation
- These findings support our initial theory that nature volunteering is an experience good, with an untapped market of naïve non-volunteers