


# *'Reducio':* The Magical Potential of New Technologies to Deliver and Evaluate Nutrition Interventions

THE NATIONAL INSTITUTE FOR HEALTH INNOVATION
THE UNIVERSITY OF AUCKLAND
Te Whare Wananga o Tamaki Makaurau

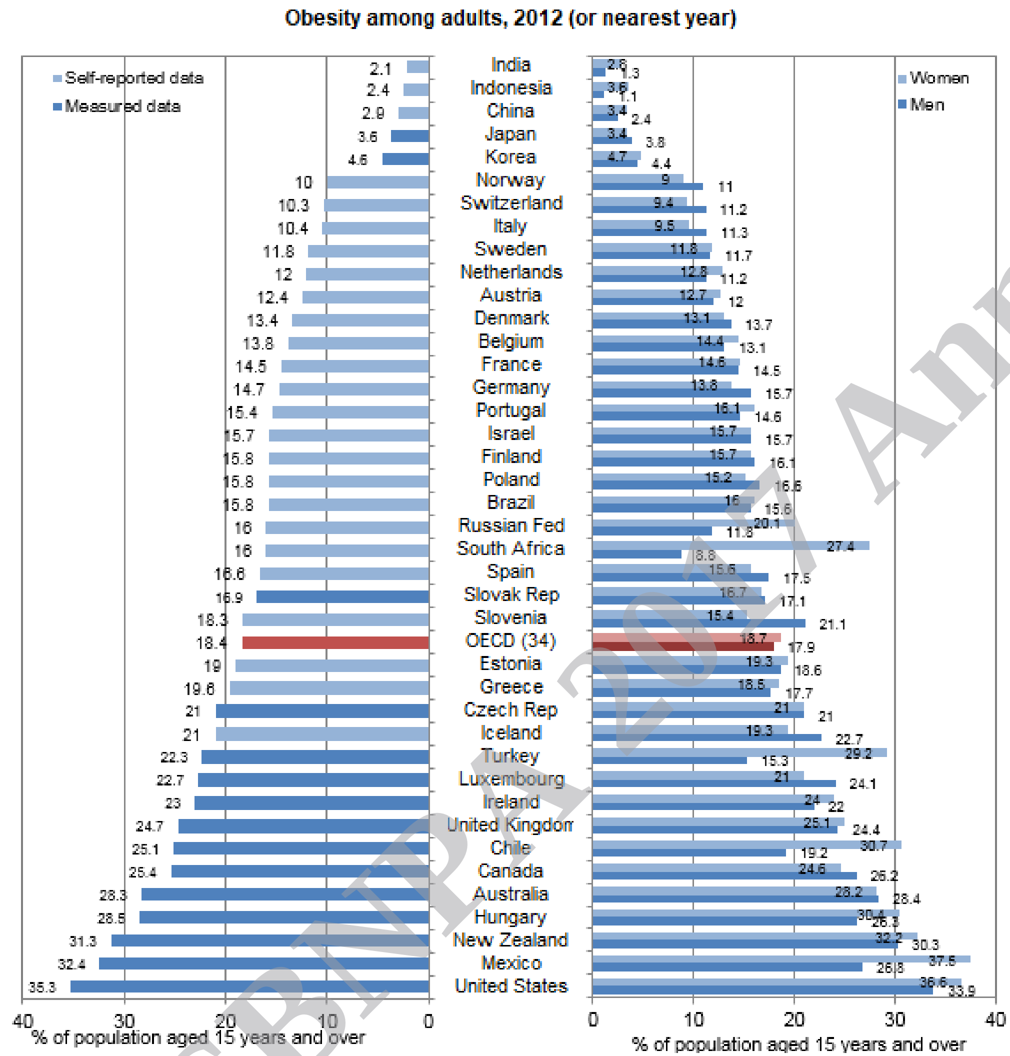
# My talk today

1. Scanner sales data
    a) Monitoring trends in population diets over time
    b) Evaluating natural experiments/new policies
2. Smartphone apps
    a) Undertaking a labelling RCT
    b) Co-designing an mHealth tool with communities
3. Wearable cameras
    a) Improving dietary assessment
    b) Measuring children's exposure to food marketing
4. Virtual supermarket
    a) Experiments
    b) Education tool

# New Zealand?

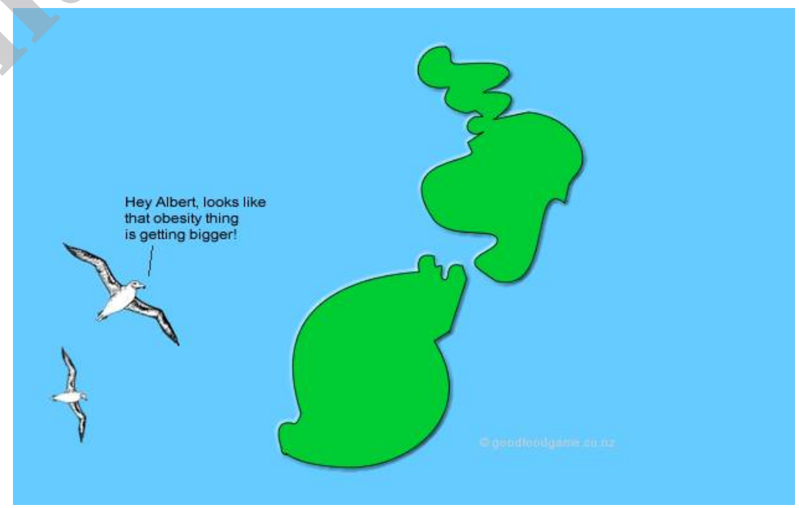
WHAT EACH COUNTRY LEADS THE WORLD IN
PERSONAL SPACE
MAPLE SYRUP AND ASTEROID IMPACTS
NOBEL LAUREATES AND GETTING KILLED BY LAWNMOWERS
RASPBERRIES AND NUCLEAR WARHEADS
URANIUM
VELOCIRAPTOR BONES
CO2 EMISSIONS AND RENEWABLE ENERGY
ROBOTS
APRICOTS
OPIUM
MOVIES
OIL
HEAT
MAKING BABIES
YAMS
RAIN
FIFA WORLD CUP TITLES
STAYING MARRIED
EXPORTING SOCCER PLAYERS
CAVES
VOLCANOES
DEADLY ANIMALS AND MELANOMA
DEADLY SHARK ATTACKS
SHEEP AND RUGBY
PIRATES
OSTRICHES
PYGMY CHIMPANZEES
INFLATION

# NZ also world leader in obesity



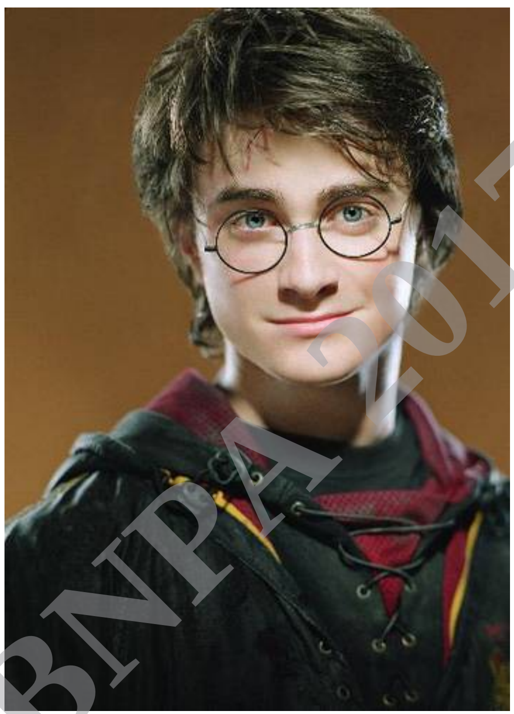

*Source: OECD (2014), OECD Health Statistics 2014, forthcoming. http://www.oecd.org/health/healthdata.*

Note: The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The

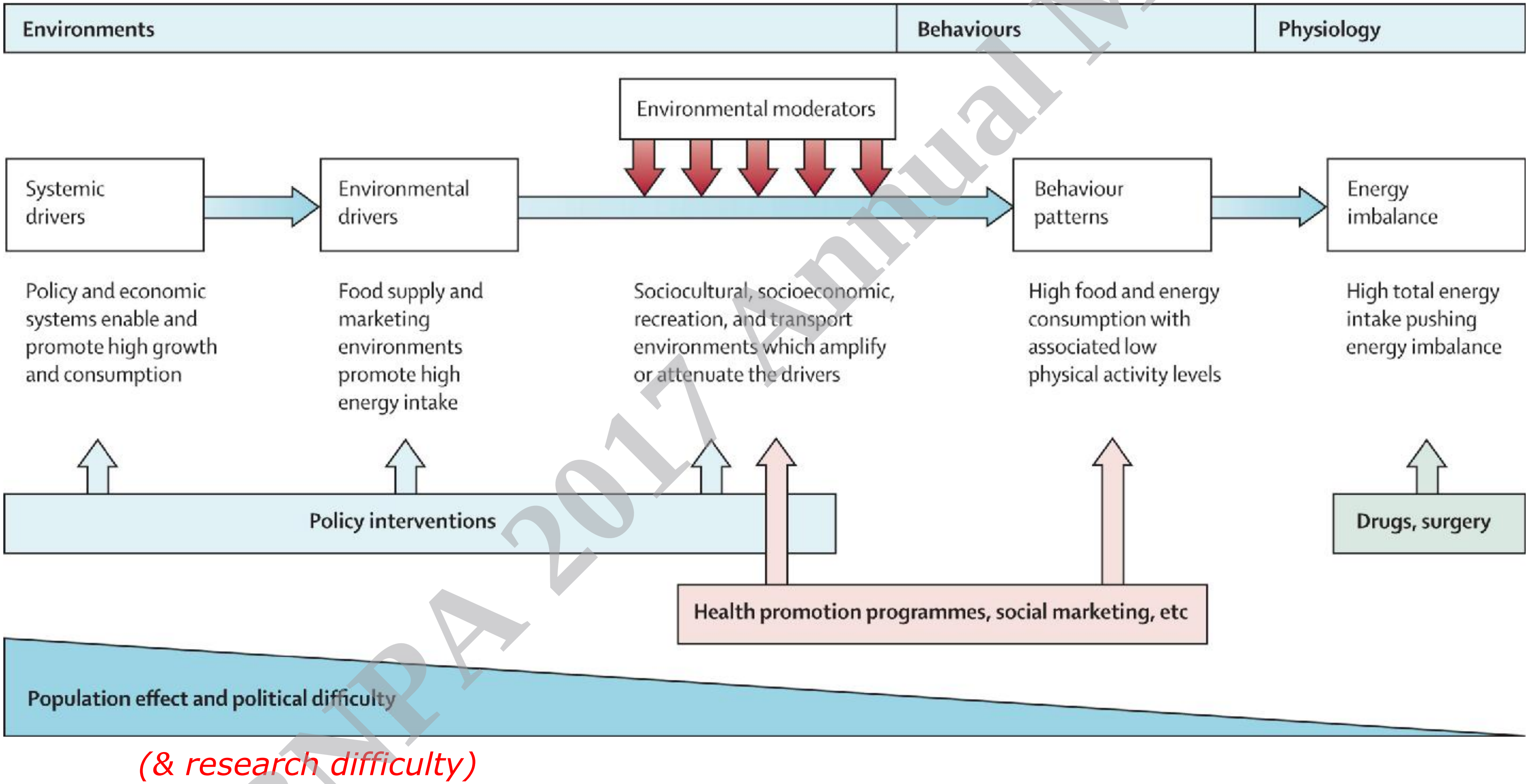


‘Reducio’

Makes an enlarged object smaller



# Obesity: shaped by global drivers & local environments




Swinburn et al, *Lancet* 2011

# Food policy research challenges

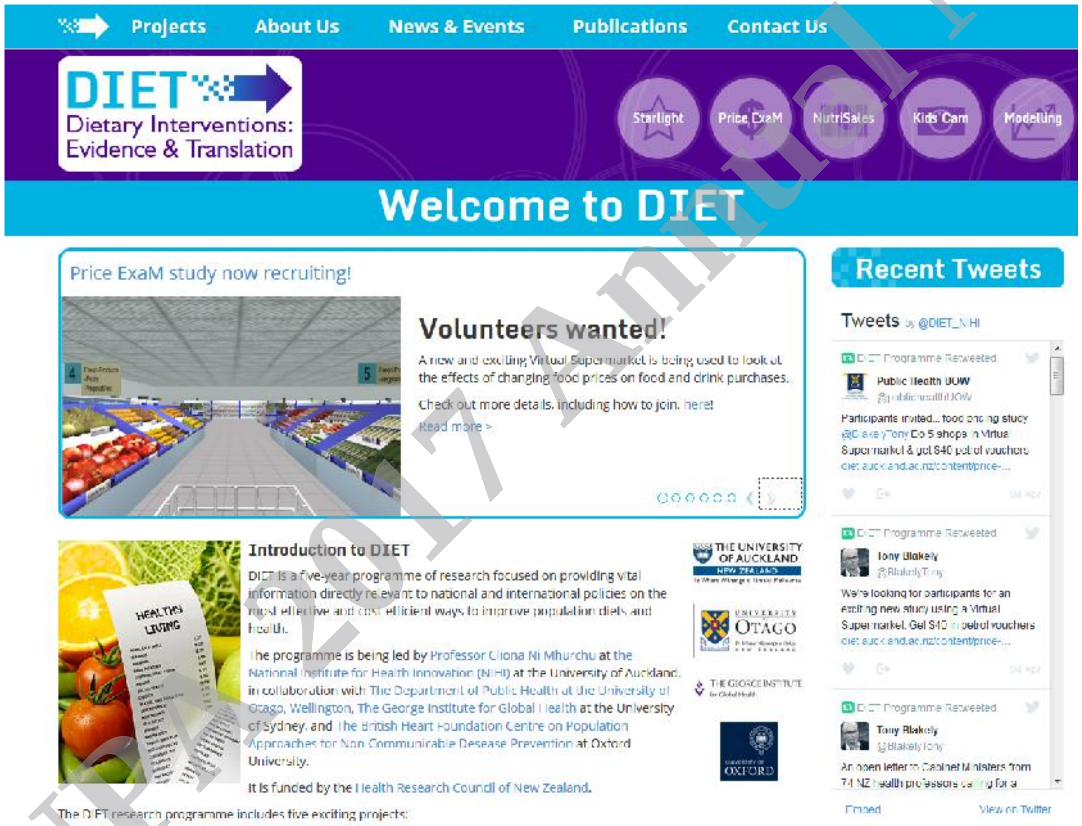
*Any sufficiently advanced technology is indistinguishable from magic*

*Arthur C. Clark*

# Our food policy research

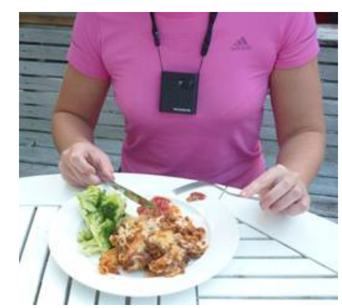
**Nutrition labelling**

**Food taxes & subsidies**




**Food composition & reformulation**

**Food marketing to kids**



www.diet.auckland.ac.nz

# Scanner Sales Data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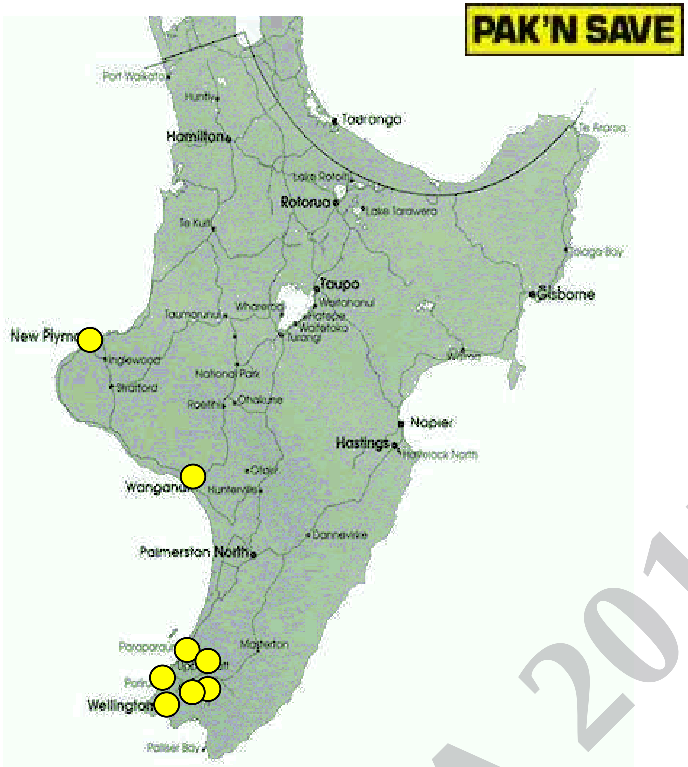
# SHOP RCT 2006-2009






**1,104 trial participants**
**8 supermarkets**
**15 months scanner sales data**
**55 supermarket shops per participant**

Ni Mhurchu et al, *Am J Clin Nutr* 2010

# Nutritrack

**4 supermarket chains**

**20 fast food chains**

**Database of NZ packaged and fast foods**

- Nutritional composition
- Pack/serve size
- Labelling and claims
- Ingredients
- Photographs

| | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|
| Supermarket foods | 6,020 | 8,440 | 13,406 | 14,191 | 14,436 | 15,370 |
| Fast foods | 608 | 2,310 | 2,940 | 2,945 | 3,055 | 3,589 |
| Annual total | 6,628 | 10,750 | 16,346 | 17,136 | 17,491 | 18,959 |
| Total products in database | 6,628 | 17,378 | 33,724 | 50,860 | 68,351 | 87,310 |

# Monitoring the food supply

*Nutrients* 2015, *7*, 4054-4067; doi:10.3390/nu7064054

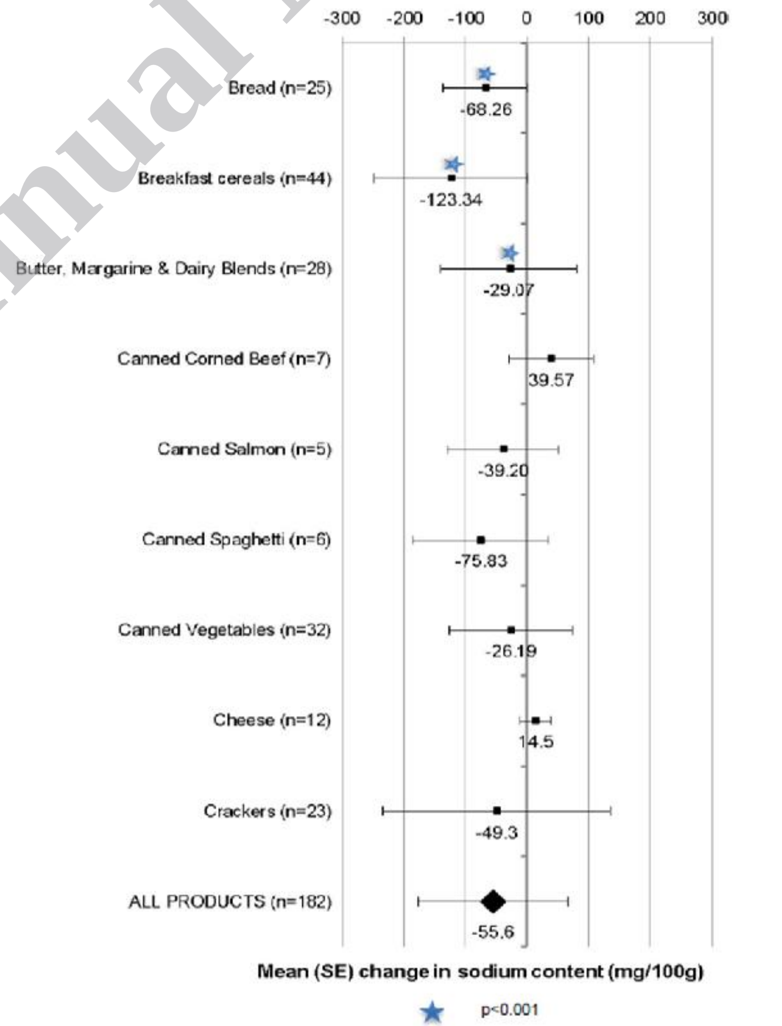
OPEN ACCESS
***nutrients***
ISSN 2072-6643
www.mdpi.com/journal/nutrients

*Article*

**Changes in the Sodium Content of New Zealand Processed Foods: 2003–2013**

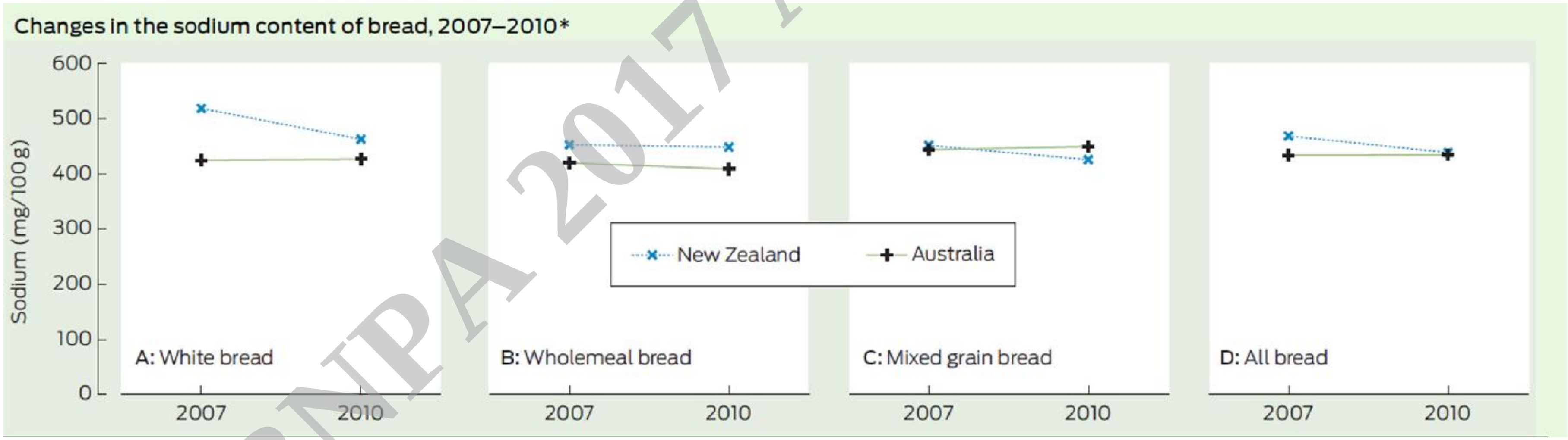
**David Monro [1], Cliona Ni Mhurchu [2], Yannan Jiang [2], Delvina Gorton [1] and Helen Eyles [2,3,*]**


**Figure 1: Mean difference in the sodium content of key processed food products available for sale in both 2003 and 2013 (n=182)**



# Effects of voluntary programmes

## Changes in the sodium content of bread in Australia and New Zealand between 2007 and 2010: implications for policy




Dunford et al, *Med J Aust* 2011

# Integrating sales data: NutriSales

- Nielsen Homescan
- Household consumer panel (n~2,500), representative of NZ population
  - Scan all grocery items taken into the home
  - Geographically, demographically representative
  - Weighted data represent 75% of annual national grocery sales
  - 2 million rows of data
  - >29,000 unique food and non-alcoholic beverage products per year


nielsen Homescan®

# NZ salt reduction model

Achieving the WHO sodium target: estimation of reductions required in the sodium content of packaged foods and other sources of dietary sodium[1–3]

Helen Eyles,[4,5]* Emma Shields,[4] Jacqui Webster,[6] and Cliona Ni Mhurchu[4]

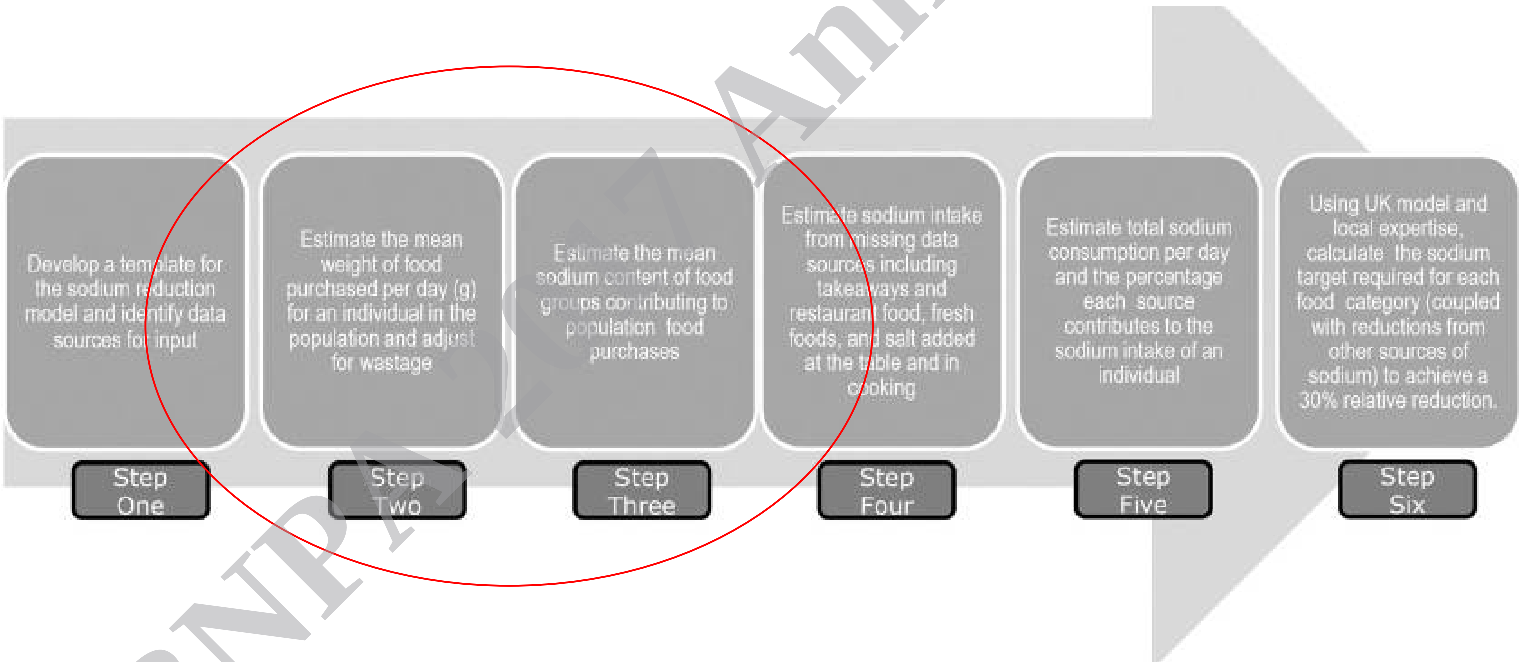
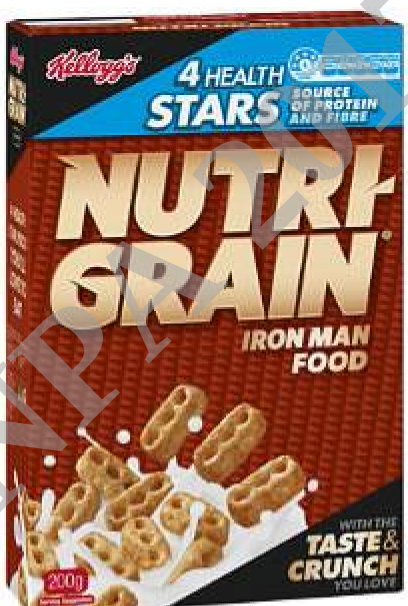



**FIGURE 1** The 6-step process used to develop the sodium reduction model.

Eyles et al, *Am J Clin Nutr* 2016

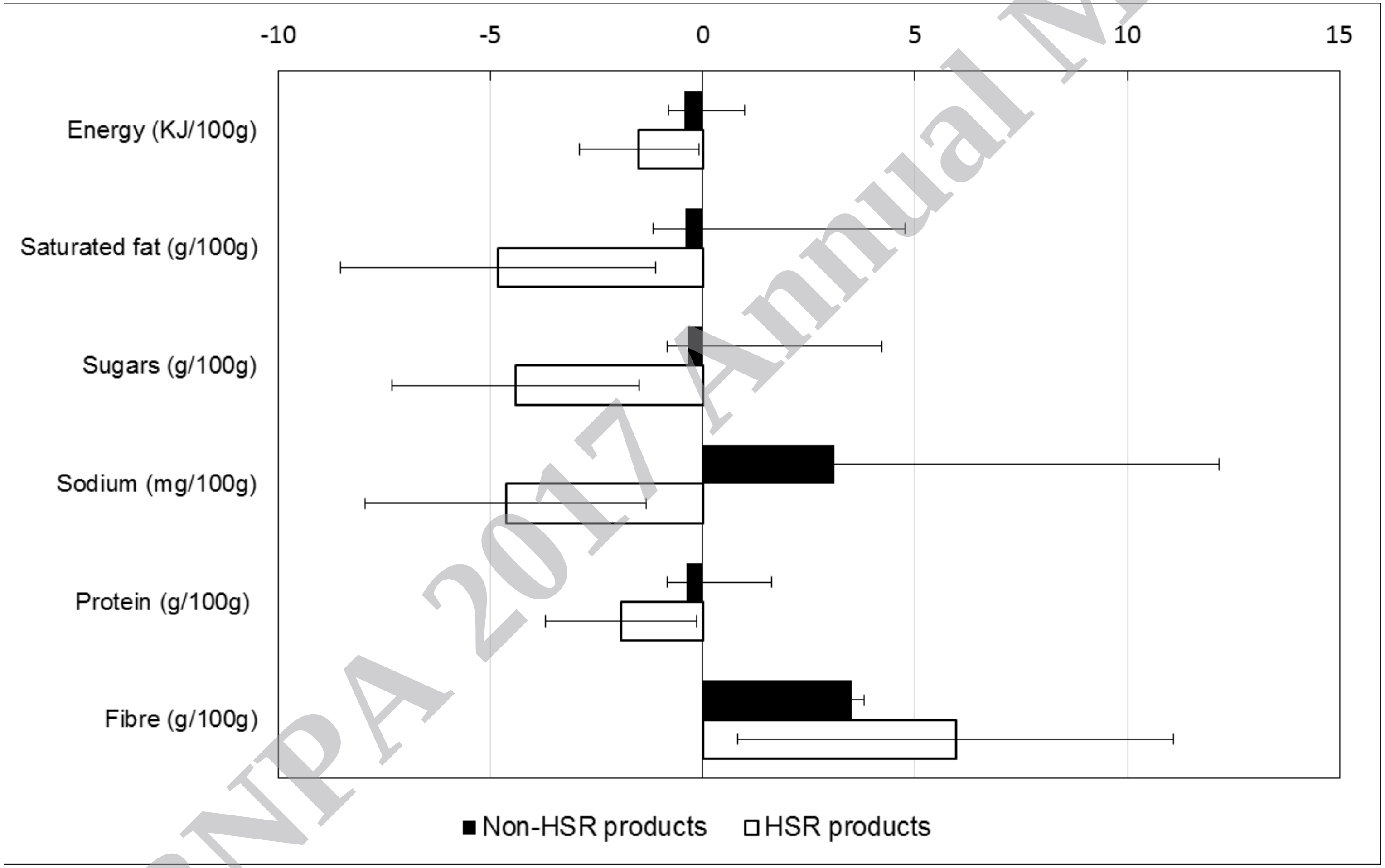
# Effects of labels on reformulation







# Reformulation of labelled (HSR) *vs* non-labelled (non-HSR), 2014-16




*Estimates weighted by household purchase volumes*

# Other examples

Effect of a price discount and consumer education strategy on food and beverage purchases in remote Indigenous Australia: a stepped-wedge randomised controlled trial

Julie Brimblecombe, Megan Ferguson, Mark D Chatfield, Selma C Liberato, Anthony Gunther, Kylie Ball, Marj Moodie, Edward Miles, Anne Magnus, Cliona Ni Mhurchu, Amanda Jane Leach, Ross Bailie, on behalf of the SHOP@RIC research collaborative

Influence of price discounts and skill-building strategies on purchase and consumption of healthy food and beverages: outcomes of the Supermarket Healthy Eating for Life randomized controlled trial[1–3]

Kylie Ball, Sarah A McNaughton, Ha ND Le, Lisa Gold, Cliona Ni Mhurchu, Gavin Abbott, Christina Pollard, and David Crawford

Beverage purchases from stores in Mexico under the excise tax on sugar sweetened beverages: observational study

M Arantxa Colchero,[1] Barry M Popkin,[2] Juan A Rivera,[3] Shu Wen Ng[2]

By Lindsey Smith Taillie, Shu Wen Ng, and Barry M. Popkin

Gains Made By Walmart's Healthier Food Initiative Mirror Preexisting Trends

# Smartphone Apps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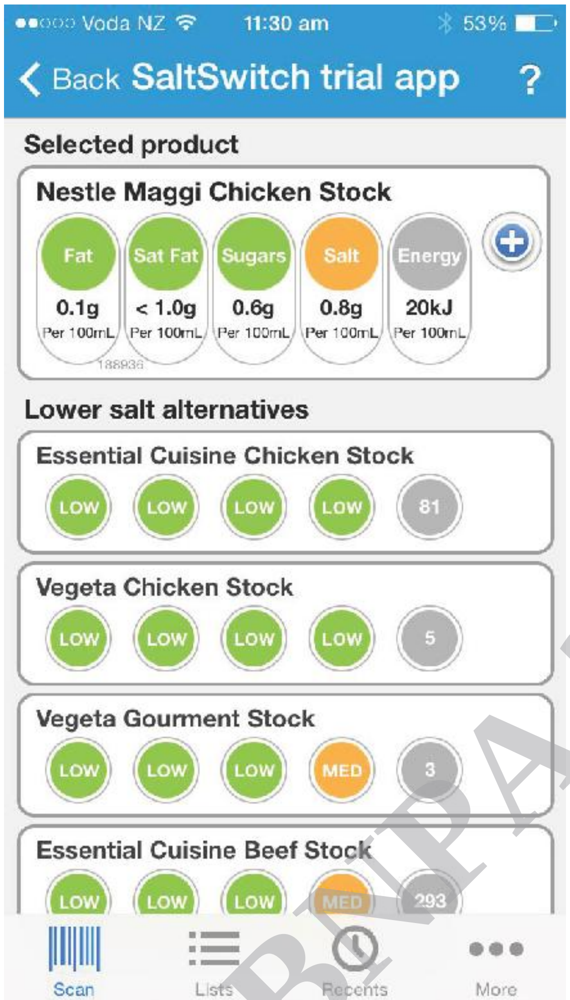
# FoodSwitch app


THE GEORGE INSTITUTE
for Global Health

# SaltSwitch RCT




Significant reduction in household purchases of salt (mean difference 0.30 (-0.58 to -0.03) g/MJ), equivalent to reduction of ~0.7 g salt per person per day over 4-week intervention

Eyles et al, *Eur J Prev Cardiol* In press

# Effects of nutrition labels on consumer food purchases

# Research questions

1) What effects do interpretive nutrition labels have on the average healthiness (FSANZ nutrient profile score) of consumer packaged food purchases?

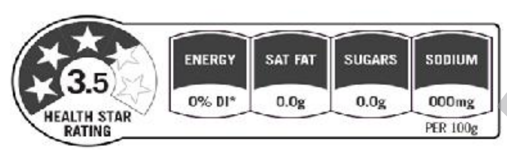
2) What effects do interpretive nutrition labels have on nutrients purchased (energy, sugar, sodium, saturated fat), food expenditure, and self-reported label usefulness and nutrition knowledge?

# Study design

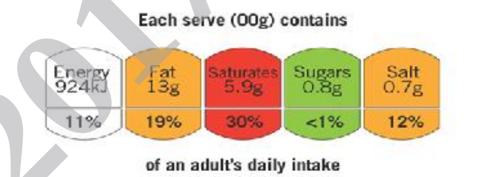
Registration and 1-week run-in

Randomisation

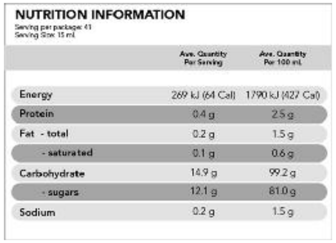
**HSR**




**TLL**

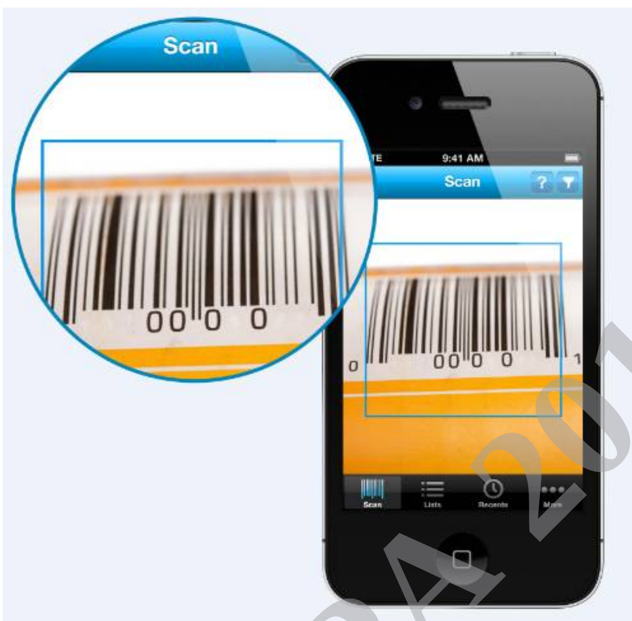


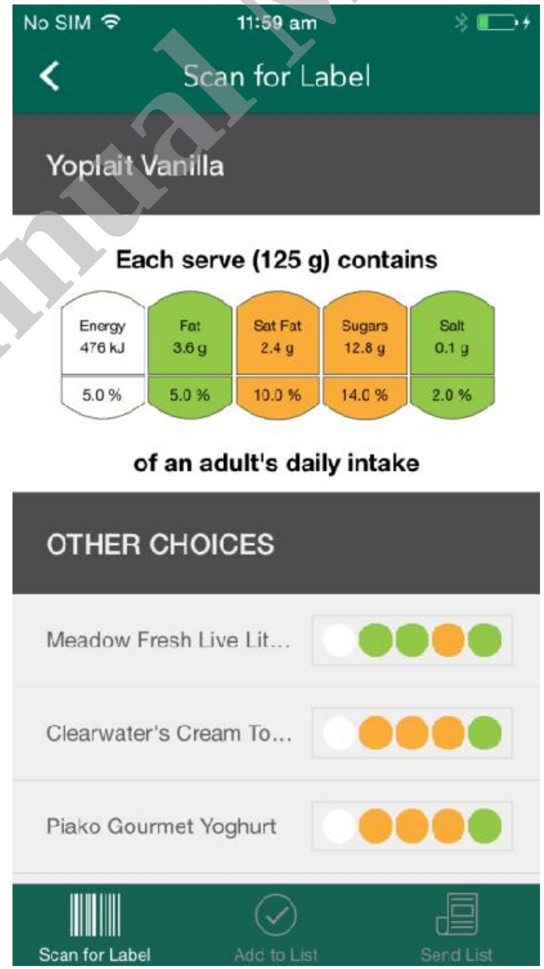

**NIP**



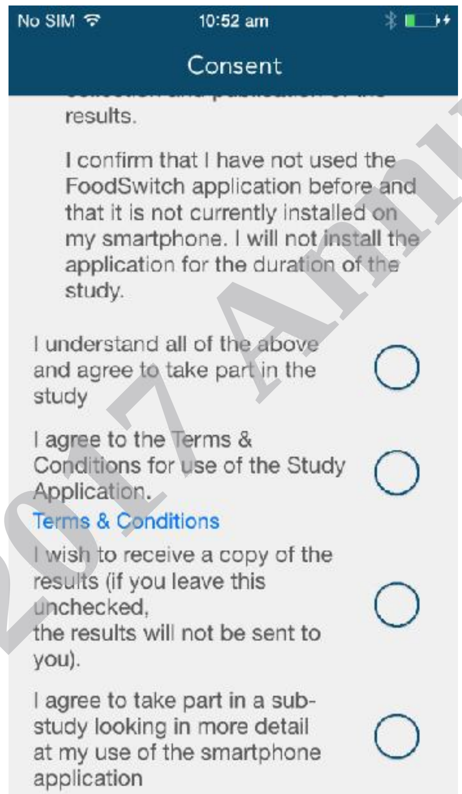

1-month follow-up of all packaged food purchases

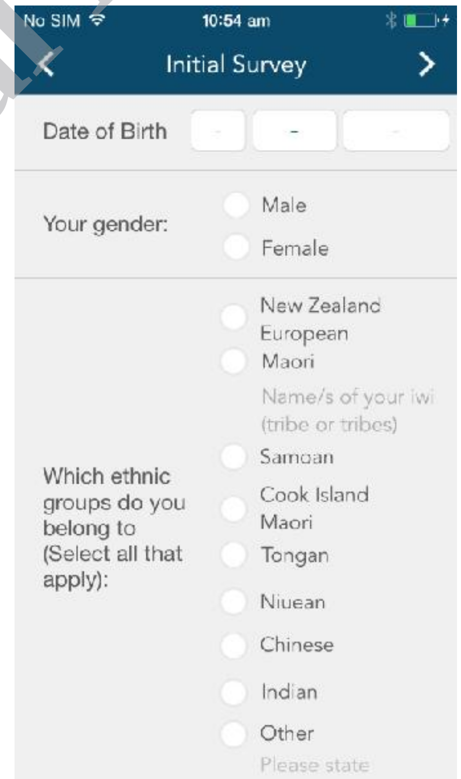
# Intervention delivery



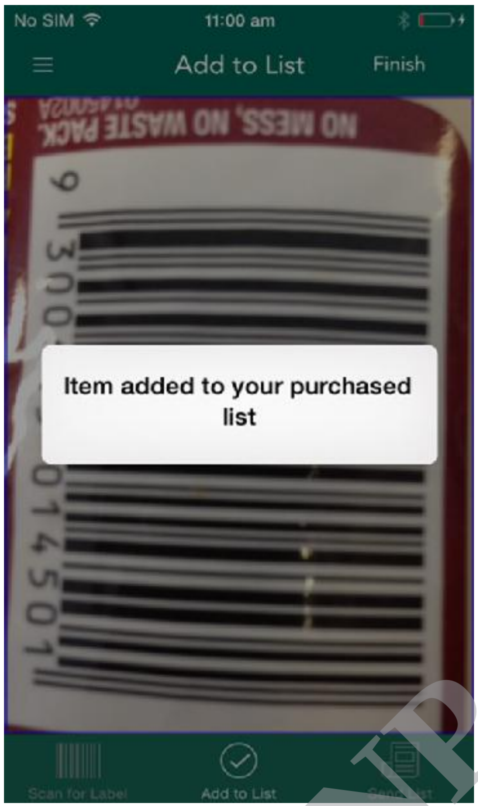
# Consent & baseline data collection


Volkova et al, *JMIR mHealth uHealth* 2016

# Food purchasing data collection






Volkova et al, *JMIR mHealth uHealth* 2016

# Flow chart

Registered ($n$=2448)

Excluded ($n$=1035 )

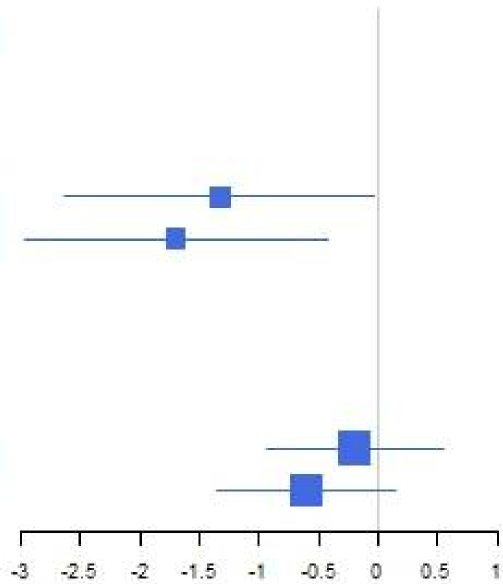
Randomised ($n$=1413)

| **HSR** | **TLL** | **NIP** |
|---|---|---|
| ($n$=471) | ($n$=472) | ($n$=470) |
| Analysed ($n$=443) | Analysed ($n$=459) | Analysed ($n$=455) |

280,000 packaged food & beverage purchases recorded

# Healthiness of food purchases

| | Difference | Lower 95%CI | Upper 95%CI |
|---|---|---|---|
| Frequent label users (n=423) | | | |
| TLL v NIP | -1.33 | -2.63 | -0.04 |
| HSR v NIP | -1.70 | -2.97 | -0.43 |
| All participants (N=1,357) | | | |
| TLL v NIP | -0.20 | -0.94 | 0.54 |
| HSR v NIP | -0.60 | -1.35 | 0.15 |




Ni Mhurchu et al, *Am J Clin Nutr* 2017

# Co-design of mHealth tool for diabetes and obesity prevention

OR
OL@

# Community/academic partnership

TOI TANGATA

South Waikato
Pacific Islands Community Services Trust

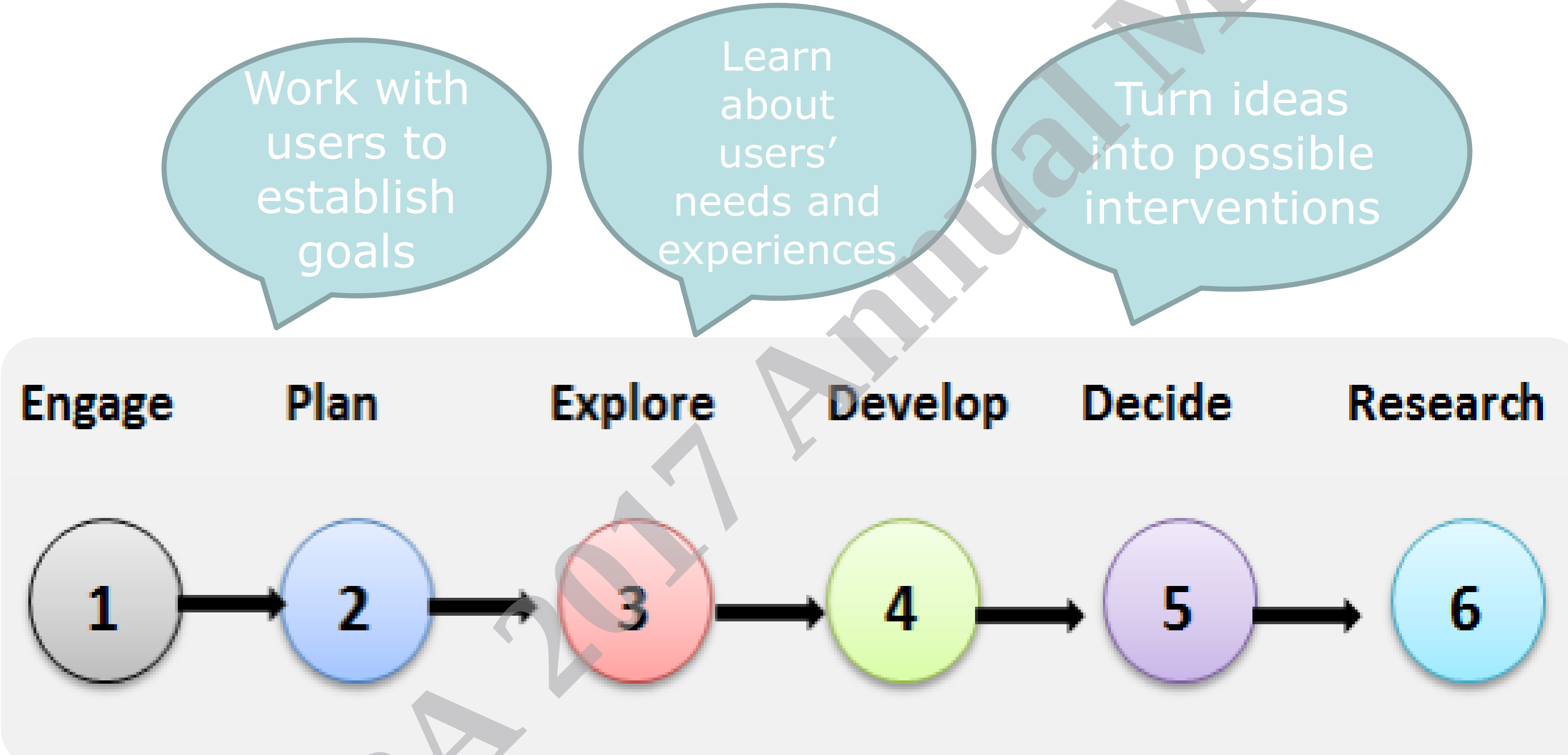
the fono
HEALTH & SOCIAL SERVICES

NIHI
The National Institute for Health Innovation

UNIVERSITY of OTAGO
Te Whare Wānanga o Otāgo
NEW ZEALAND

MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

# Co-design theory

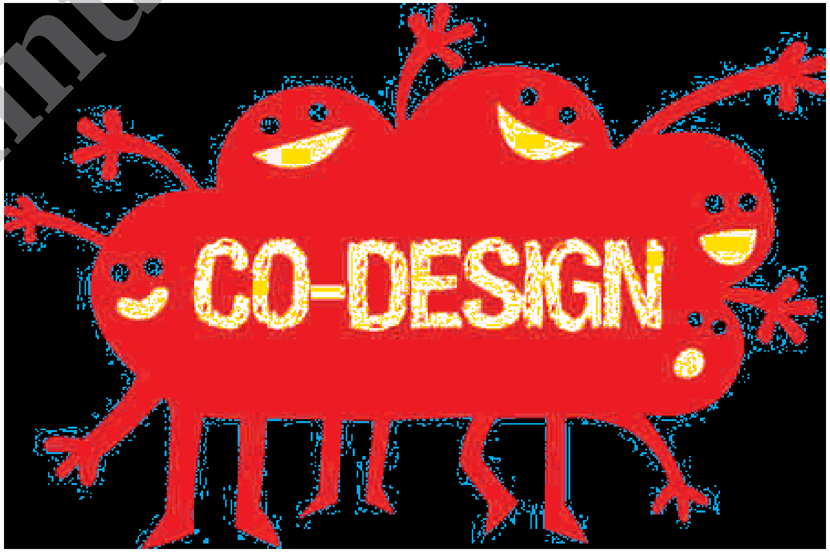


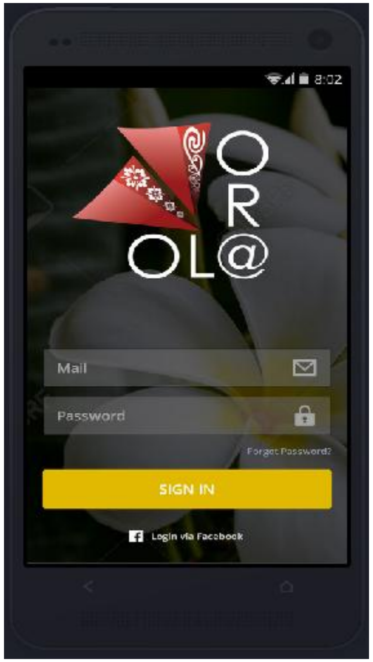

Boyd H et al, *NZ Med J* 2012

# Co-design in practice

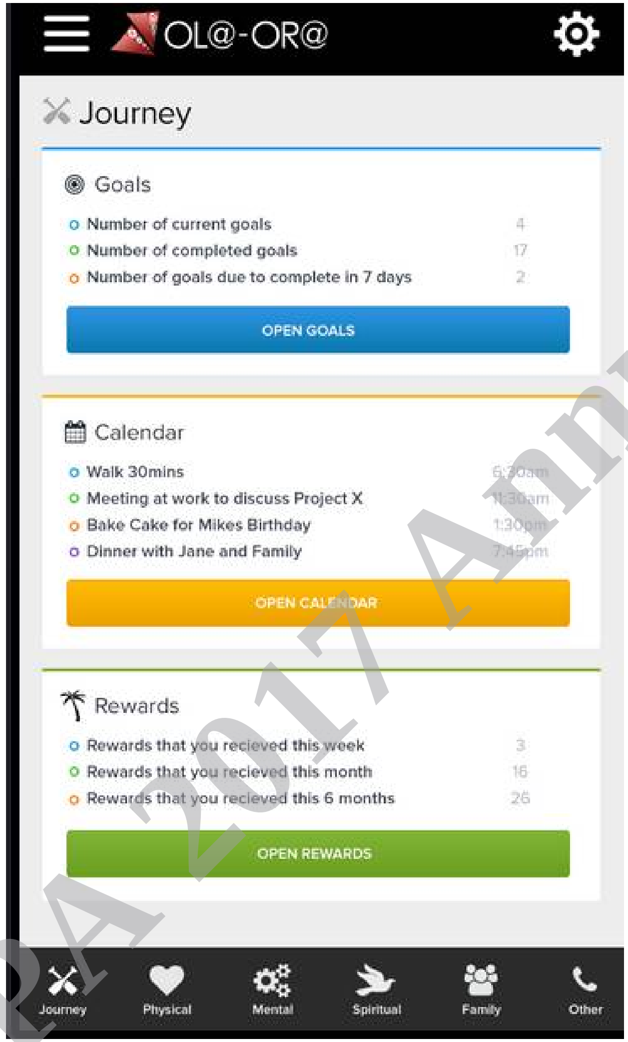
# OL@-OR@ features

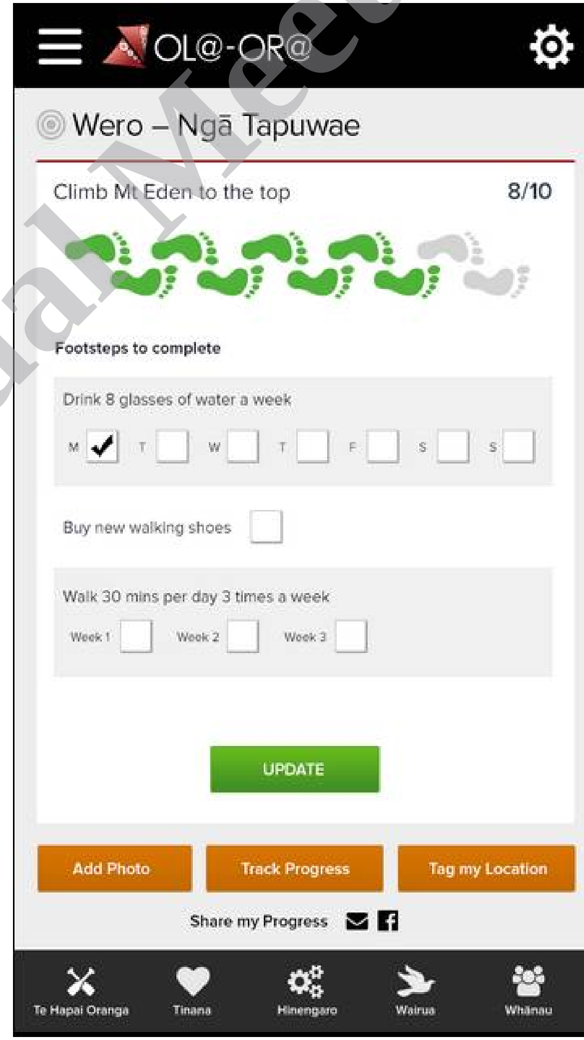
- **General**
  - Customizable content
  - Linkage with social media platforms
  - Share info with friends/family
  - Add and share recipes
  - Activity planner & calendar
  - Healthy tips (SMS or app notifications)
  - Achievement badges
  - Goal tracker
- **Unique**
  - Holistic model of wellbeing
  - Relationships and connectedness - group challenges, community/family goals
  - Indigenous knowledge
  - Use of ancestry and traditions to engage users
  - Culturally relevant healthy food information




8:02
O R OL@
Mail
Password
Forgot Password?
SIGN IN
Login via Facebook


8:02
O R OL@
Mail
Password
Forgot Password?
SIGN IN
Login via Facebook


OL@-OR@
Journey
Goals
Number of current goals 4
Number of completed goals 17
Number of goals due to complete in 7 days 2
OPEN GOALS
Calendar
Walk 30mins 6:30am
Meeting at work to discuss Project X 11:30am
Bake Cake for Mikes Birthday 1:30pm
Dinner with Jane and Family 7:45pm
OPEN CALENDAR
Rewards
Rewards that you recieved this week 3
Rewards that you recieved this month 16
Rewards that you recieved this 6 months 26
OPEN REWARDS
Journey
Physical
Mental
Spiritual
Family
Other


OL@-OR@
Wero – Ngā Tapuwae
Climb Mt Eden to the top
8/10
Footsteps to complete
Drink 8 glasses of water a week
M T W T F S S
Buy new walking shoes
Walk 30 mins per day 3 times a week
Week 1 Week 2 Week 3
UPDATE
Add Photo
Track Progress
Tag my Location
Share my Progress
Te Hapai Oranga
Tinana
Hinengaro
Wairua
Whānau

# Wearable cameras

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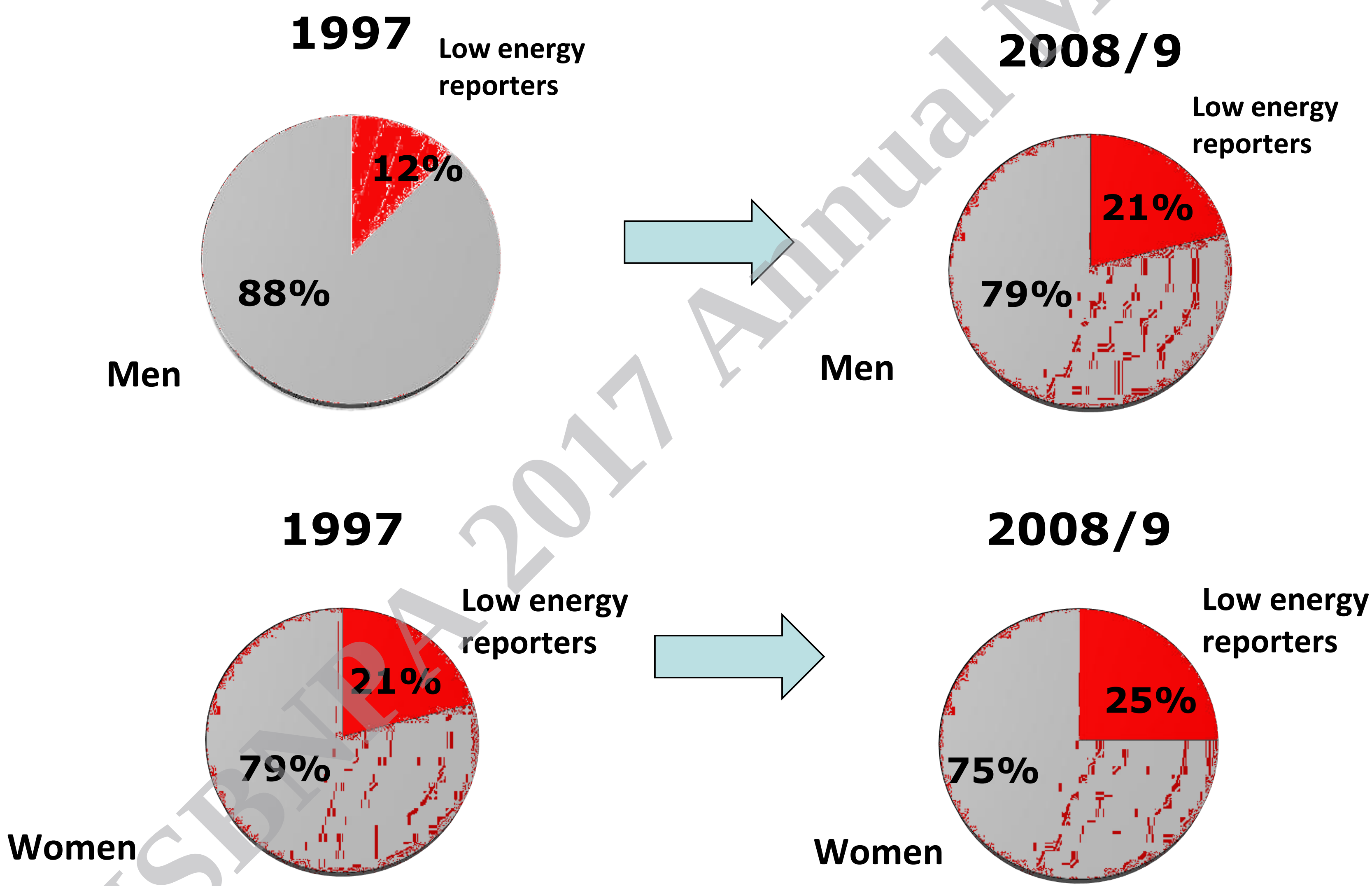
## Under-reporting remains a key limitation of self-reported dietary intake: an analysis of the 2008/09 New Zealand Adult Nutrition Survey

L Gemming[1], Y Jiang[1], B Swinburn[2], J Utter[2] and C Ni Mhurchu[1]



# Image-assisted dietary assessment

# Wearable cameras reduce dietary underreporting

- 40 healthy volunteers, Auckland, NZ
  - Wore SenseCam for 4 days over a 15-day period
  - Completed interviewer-administered 24hr recall on day 3, 9, 14
  - Viewed SenseCam images and provided additional information

- Viewing SenseCam images reduced energy under-reporting by 8% in men & 6% in women compared with 24h recall alone ($p<0.001$)
- Mainly due to reporting of 265 additional (forgotten/omitted) foods across a range of food groups

Gemming et al, *Brit J Nutr* 2015

# Social & environmental context

**Contexts assessed**

| Location | Environment | Physical Position | Social Interaction | Media Screens |
|---|---|---|---|---|
| At home | Indoor | Sitting at table | Social interaction | Television |
| Occupation | Outdoor | Sitting on sofa | Social – no interaction | Computer |
| Restaurant/Bar/Café | In vehicle | Sitting at desk | Not social | Handheld device |
| Other | Mixed | Standing/Active | | Multiple devices |
| | | Other | | No screen |

Gemming et al, *Appetite* 2015

# Measuring children's exposure to food marketing

Kids'Cam

# Research questions

1. What is the frequency and duration of children's exposure to food and beverage marketing?
2. Are there differences by setting, ethnicity and socioeconomic position?

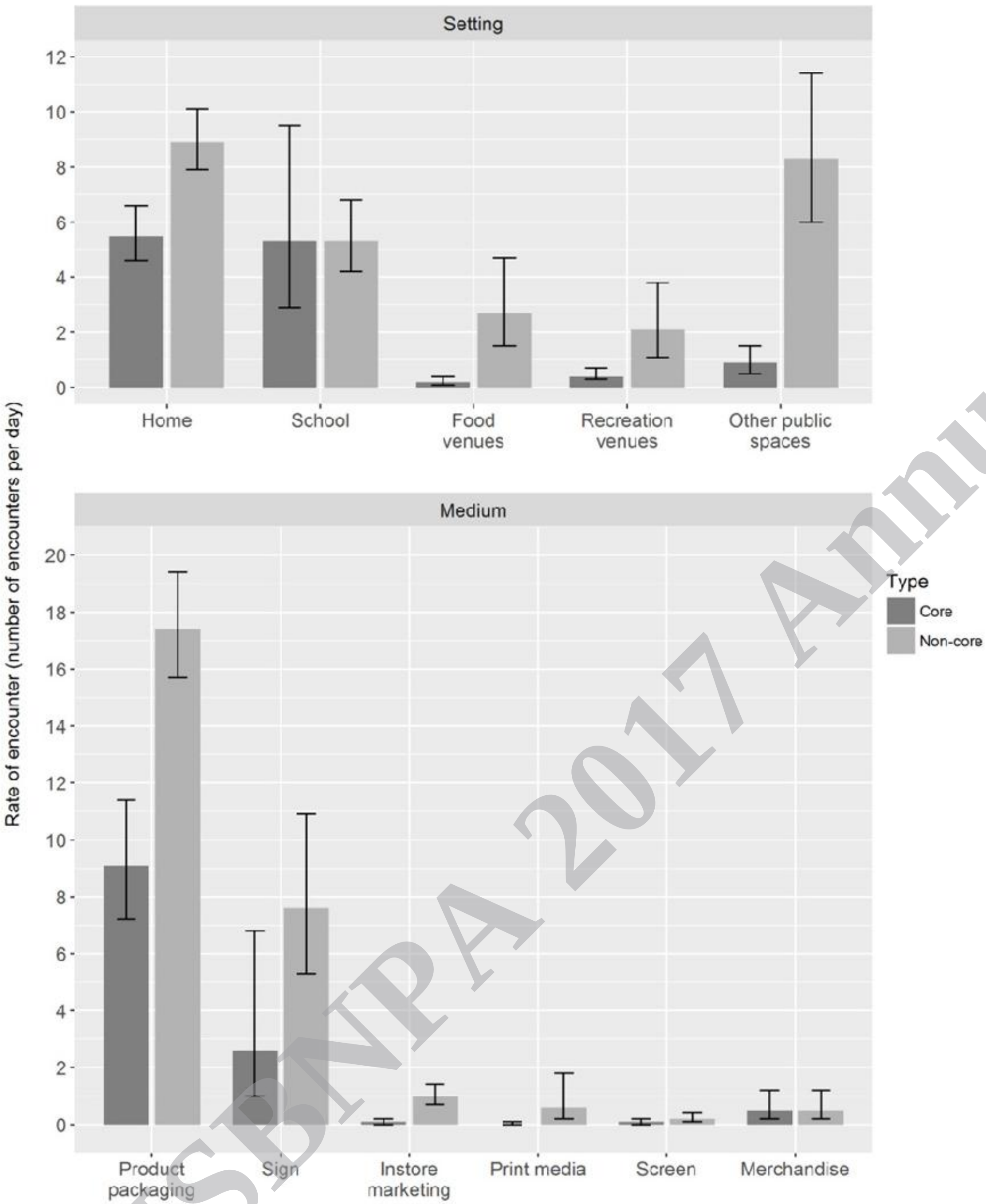
# Methods

- 168 NZ children aged 11-13 years
- Data collection July 2014 – June 2015
- Wore automated cameras and GPS devices for 4 days (2 weekdays & 2 weekend days)
- Cameras captured images automatically every 7 seconds (~1.5 million images collected)
- All foods and beverages in images coded as core or non-core (WHO nutrient profiling system) by setting, marketing medium, product category

Signal et al, *Am J Prev Med* 2017


500ml
2 FOR
5.50
Coke
2.25L.
2 FOR $6.


Weet-Bix




NZ children exposed to junk food marketing mean of 27.3 times a day; >twice their exposure to core food marketing (12.3/day)

Sugary drinks, fast food, confectionary and snack foods were most commonly encountered junk foods

Most junk food exposures occurred at home (33%), in public spaces (30%) and at school (19%)

# Kids'Cam data also being used to measure kids' exposure to:

- Alcohol
- Smoking & smoke-free promotions
- Gambling & Lotto signage
- Greenspace
- Active transport
- Housing quality etc.

# Virtual Supermarket

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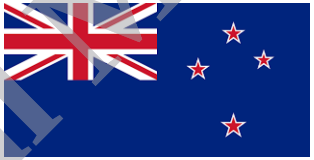
# Virtual Supermarkets




SURF SARA

# Experiments in the Virtual Supermarket

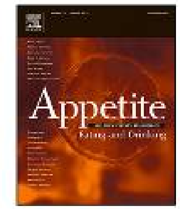


Appetite 78C (2014) 32–39

Contents lists available at ScienceDirect

Appetite

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




ELSEVIER

Research report

## Effects of a price increase on purchases of sugar sweetened beverages. Results from a randomized controlled trial[☆]

Wilma Elzeline Waterlander [a,b,*], Cliona Ni Mhurchu [b], Ingrid H.M. Steenhuis [a]

[a] Department of Health Sciences and the EMGO Institute for Health and Care Research, Faculty of Earth and Life Sciences, VU University Amsterdam, De Boelelaan 1085, 1081 HV Amsterdam, The Netherlands

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CrossMark

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Virtual supermarket
Nutrition
Pricing strategies

ABSTRACT

Sugar sweetened beverage (SSB) taxes are receiving increased political interest. However, there have been no experimental studies of the effects of price increases on SSBs or the effects on close substitutes such as diet drinks, alcohol or sugary snacks. Therefore, the aim of this study was to examine the effects of a price increase on SSBs on beverage and snack purchases using a randomized controlled design within a three-dimensional web-based supermarket. The trial contained two conditions: experimental condition with a 19% tax on SSBs (to reflect an increase in Dutch value added tax from 6% to 19%); and a control condition with regular prices. $N = 102$ participants were randomized and purchased groceries on a single occasion at a three-dimensional Virtual Supermarket. Data were analysed using independent t-tests and regression analysis. Results showed that participants in the price increase condition purchased significantly less SSBs than the control group ($B = -.90$; 95% CI = −1.70 to −.10 L per household per week). There were no significant effects on purchases in other beverage or snack food categories. This means that the higher VAT rate was effective in reducing SSB purchases and had no negative side-effects.

# Work to date

- 7 Virtual Supermarket experiments
  - Pricing, labelling, placement etc.
- High internal validity, independent of food manufacturers and retailers, adaptable, easy recruitment
- 4 regional variants
  - Netherlands, NZ, UK, Australia
- Testing impact of sound, smell, décor etc.

# How real is Virtual Reality?

JOURNAL OF MEDICAL INTERNET RESEARCH Waterlander et al

Original Paper

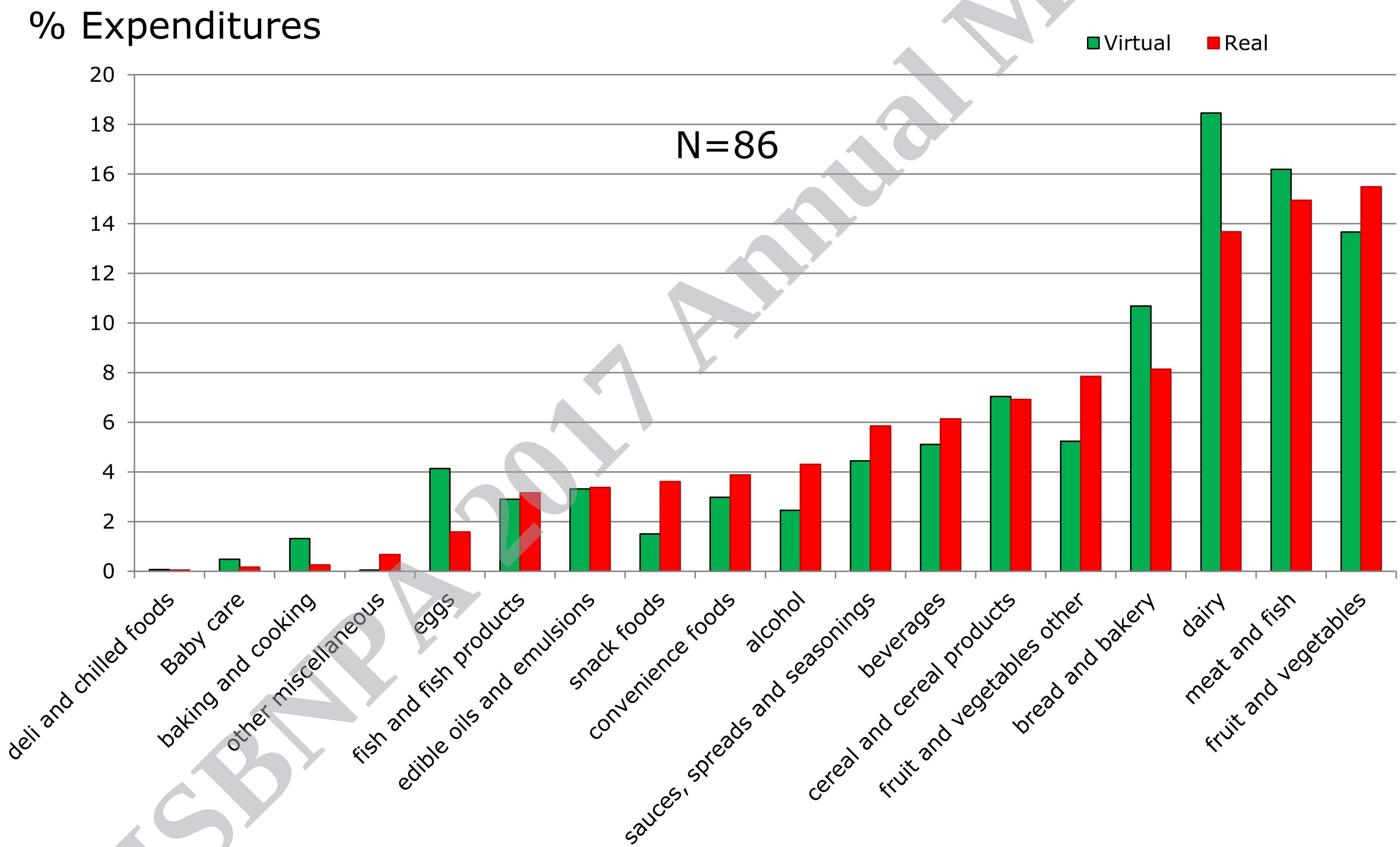
## Using a 3D Virtual Supermarket to Measure Food Purchase Behavior: A Validation Study

Wilma Elzeline Waterlander[1], BSc, MSc, PhD; Yannan Jiang[1], BSc, MSc, PhD; Ingrid Hendrika Margaretha Steenhuis[2], MSc, PhD; Cliona Ni Mhurchu[1], BSc (Hons), PhD

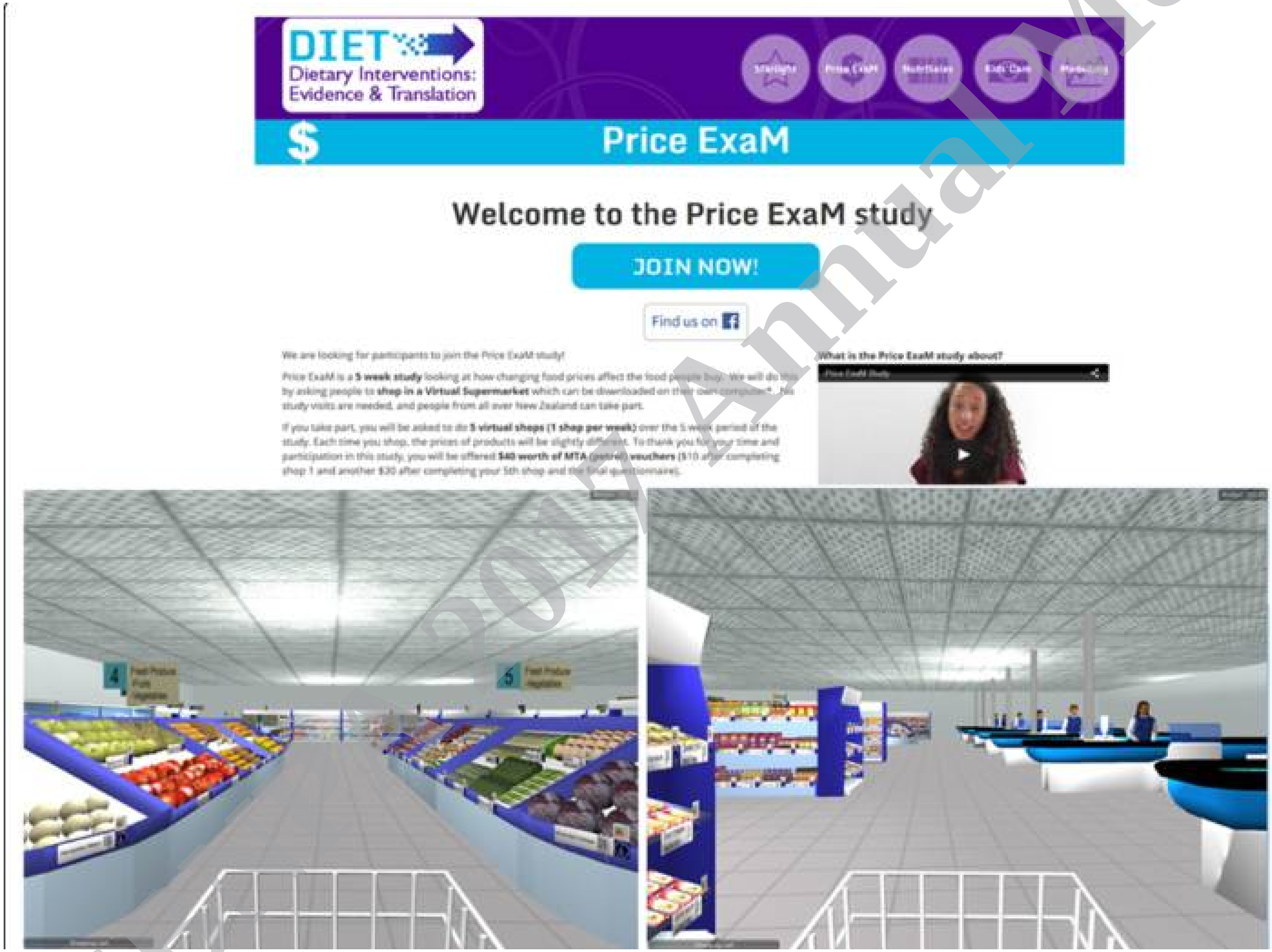
[1]National Institute for Health Innovation, School of Population Health, University of Auckland, Auckland, New Zealand

[2]Department of Health Sciences and the EMGO Institute for Health and Care Research, Faculty of Earth and Life Sciences, VU University Amsterdam, Amsterdam, Netherlands


# How real is Virtual Reality?



# Improving food price elasticity estimates




Waterlander et al, *BMC Public Health* 2016

# Price ExAM study methods

## 5 tax/subsidies:

- SSB tax
- F&V subsidy
- Saturated fat tax
- Sugar tax
- Salt tax

## 1,132 participants
## 4,259 shops
## completed

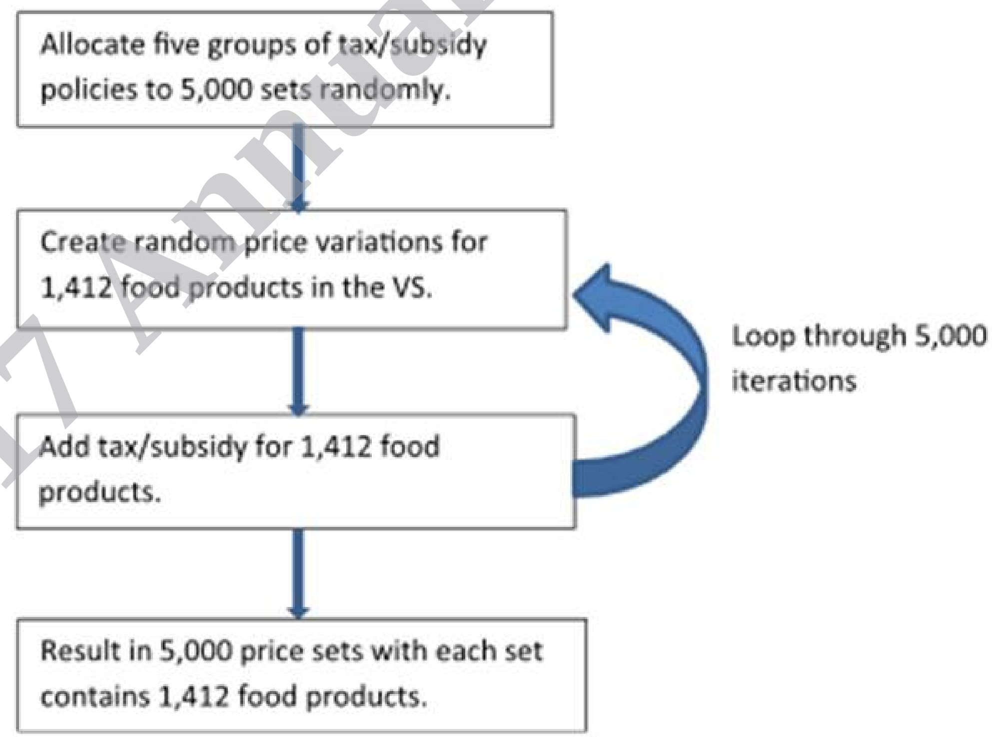



**Fig. 1** Procedure to generate 5,000 price sets for the Virtual Supermarket

Waterlander et al, *BMC Public Health* 2016 nz nutrition FOUNDATION

LIGGINS INSTITUTE
THE UNIVERSITY OF AUCKLAND NEW ZEALAND
Te Whare Wānanga o Tāmaki Makaurau

SLR 2a

## Lunches: School Lunches



The table below contains pictures of lunches for a teacher and her Year 11 students at *Carbo High School*.

What do you think about each of the lunches? Make sure you think about the person's activities during the afternoon!

Use the Virtual Supermarket and the traffic lights to look for foods that could be healthier options for these lunches.

| Scenario | Lunch | What do you think about the… How can they have healthier… |
|---|---|---|
| Mrs Potter is a teacher taking classes from 12 noon to 3.30 pm |  | |
| Jenny is a student with diabetes |  | |
| Josh is a student with a 3 hour Biology exam in the afternoon |  | |
| Blake is a student playing rugby after lunch |  | |


SLR 2c

## Lunches: Planning for the Family



Design and prepare lunches for your family for an entire week.

Use the virtual supermarket to find food items and ingredients to design the lunches.

Do you think you should include the following food items in your lunch plan?

beetroot (canned), carrots, celery, cucumber, red peppers

a, chicken, eggs, ham, baked beans

a, pear, kiwifruit

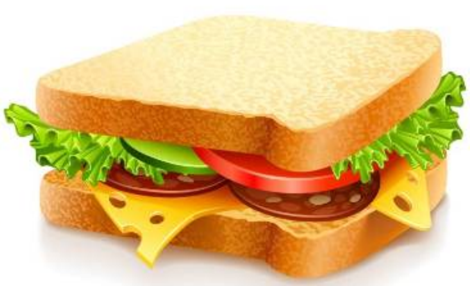
**te:** pita bread, panini, wraps, crackers, pasta

ney, peanut butter, cream cheese, hummus

m, you could make the lunches for your family!

Take photos of your prepared lunches, post and share the pictures with friends through the LENScience online forum:

[http://lenscience.ac.nz/community-groups/my-food-my-future](http://lenscience.ac.nz/community-groups/my-food-my-future)



# Final words from a FoodSwitch user

Finally my smart phone, that has introduced me to a thousand things I didn't know I needed, has something useful and important to do!!!!!

Imagine if people in supermarkets up and down the country were seen to be regularly using this tool how much influence that would have on food manufacturers, government regulators and politicians.

Let all those consumers who care about what they eat but have difficulty using the existing food labelling effectively get out there and show those groups what we really want.

Consumer Magazine, Aug 2014


Now that's magic!

# Research teams and funders

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# Thank you

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