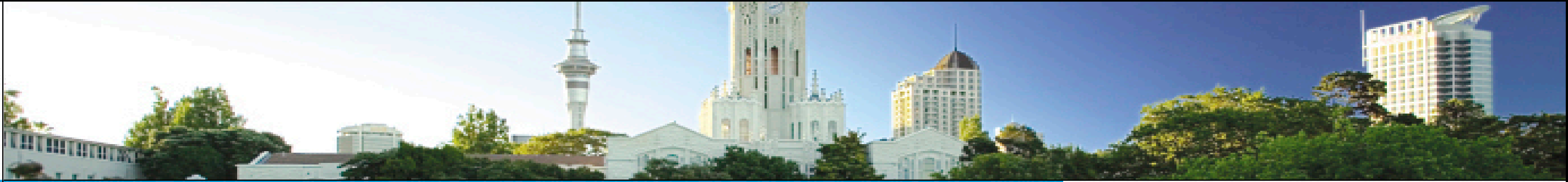


New Zealand

The University of Auckland

A Shiny new app for policy makers: Using simulation to test which factors most improve child well-being

Barry Milne and COMPASS team

COMPASS RESEARCH CENTRE
FACULTY OF ARTS
THE UNIVERSITY OF AUCKLAND
Whare Wānanga o Tāmaki Makaurau

COMPASS Seminar Series
17 March 2017

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HIKINA WHAKATUTUKI

Outline

COMPASS RESEARCH CENTRE
FACULTY OF ARTS
THE UNIVERSITY OF AUCKLAND
Whare Wānanga o Tāmaki Makaurau

- Background
  - Knowledge translation
  - Knowledge Lab of the early life-course
    - Model development
- What is microsimulation?
  - A simple example
- A Shiny app for policy
  - Demonstration
  - Policy scenarios: Obesity, Education, Mental health

Background
- Knowledge translation

COMPASS RESEARCH CENTRE
FACULTY OF ARTS
THE UNIVERSITY OF AUCKLAND
Whare Wānanga o Tāmaki Makaurau

- Knowledge translation: How to do?
  - ‘Push system’
    Researchers create knowledge; policy makers use it (or not)
  - ‘Pull system’
    Policy makers seek out or request information to fit their purpose
  - Emphasises divide between researches and policy makers, across which knowledge is pushed and pulled
    - Knowledge brokers may be employed to ‘translate’
  - Co-production of knowledge through policy-research partnerships
    - Shown to improve knowledge translation

Background
- Goal

COMPASS RESEARCH CENTRE
FACULTY OF ARTS
THE UNIVERSITY OF AUCKLAND
Whare Wānanga o Tāmaki Makaurau

- Our goal:
  - Collaborate with policy makers to produce a policy tool in which knowledge is embedded, but which can be interrogated by policy makers, and can be updated as per the needs of policy makers

- Knowledge Laboratory of the early life course
  - Identify key determinants of child and adolescent outcomes (to age 21)
  - Integrate estimates from systematic reviews/meta analyses into working microsimulation model of early life course (built upon earlier MELC model)
  - Make available for use by policy makers (and others) as a 'knowledge laboratory' to test policy scenarios
  - Web deployment to aid uptake (https://compassnz.shinyapps.io/knowlabshiny)

Knowledge Lab
- End user engagement

COMPASS RESEARCH CENTRE
FACULTY OF ARTS
THE UNIVERSITY OF AUCKLAND
Whare Wānanga o Tāmaki Makaurau

- Important role of policy reference "End User" group
  - Use their expertise to determine what they'd like modelled policy-relevant scenarios
- Seven agencies involved
  - Health
  - Education
  - Social Development
  - Justice
  - Te Puni Kōkiri
  - Children's Commission
  - SuPERU

Knowledge Lab
- Outcomes

COMPASS RESEARCH CENTRE
FACULTY OF ARTS
THE UNIVERSITY OF AUCKLAND
Whare Wānanga o Tāmaki Makaurau

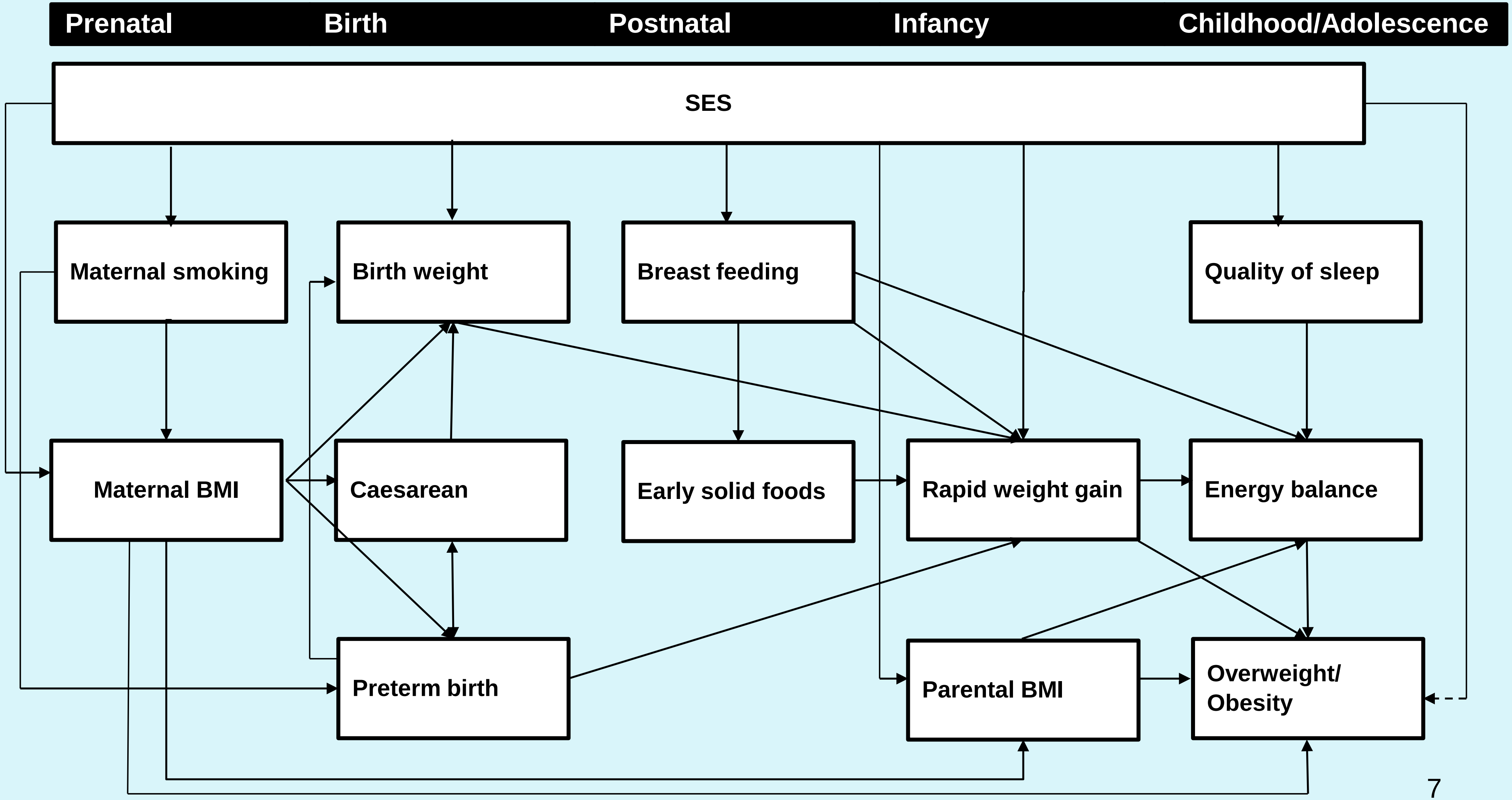
- Focus on three outcomes
  - Obesity
  - Education
  - Mental Health

- For each outcome
  - Determine conceptual framework
  - Get NZ prevalences and inter-relations for each predictor in the conceptual framework
  - Get meta-analytic estimates for each path in the conceptual framework
  - Build (upon) a computer simulation model to quantify the underlying determinants of obesity, education and mental health

Obesity
- Conceptual framework

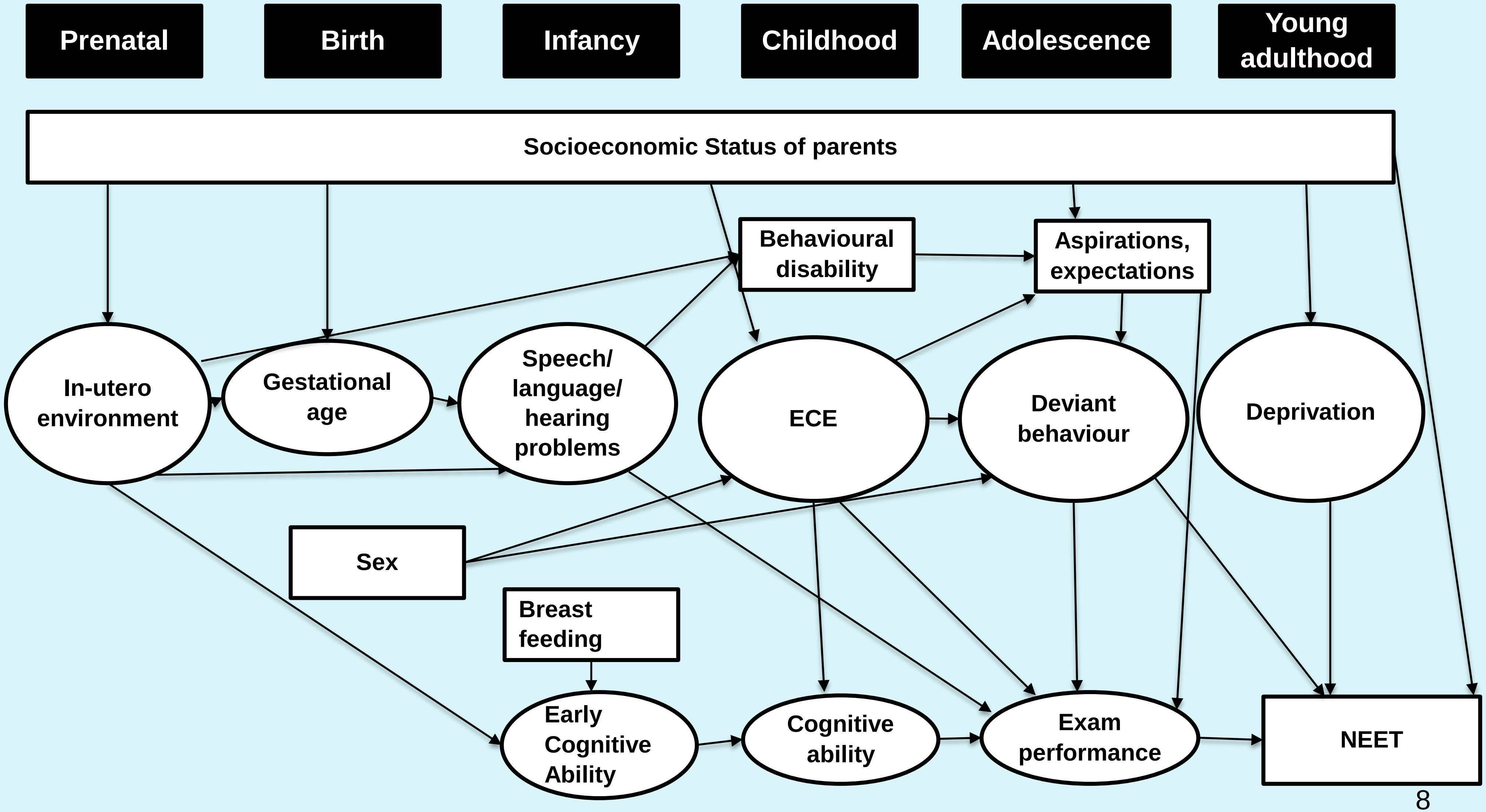
COMPASS RESEARCH CENTRE
FACULTY OF ARTS
THE UNIVERSITY OF AUCKLAND
Whare Wānanga o Tāmaki Makaurau

The University of Auckland New Zealand



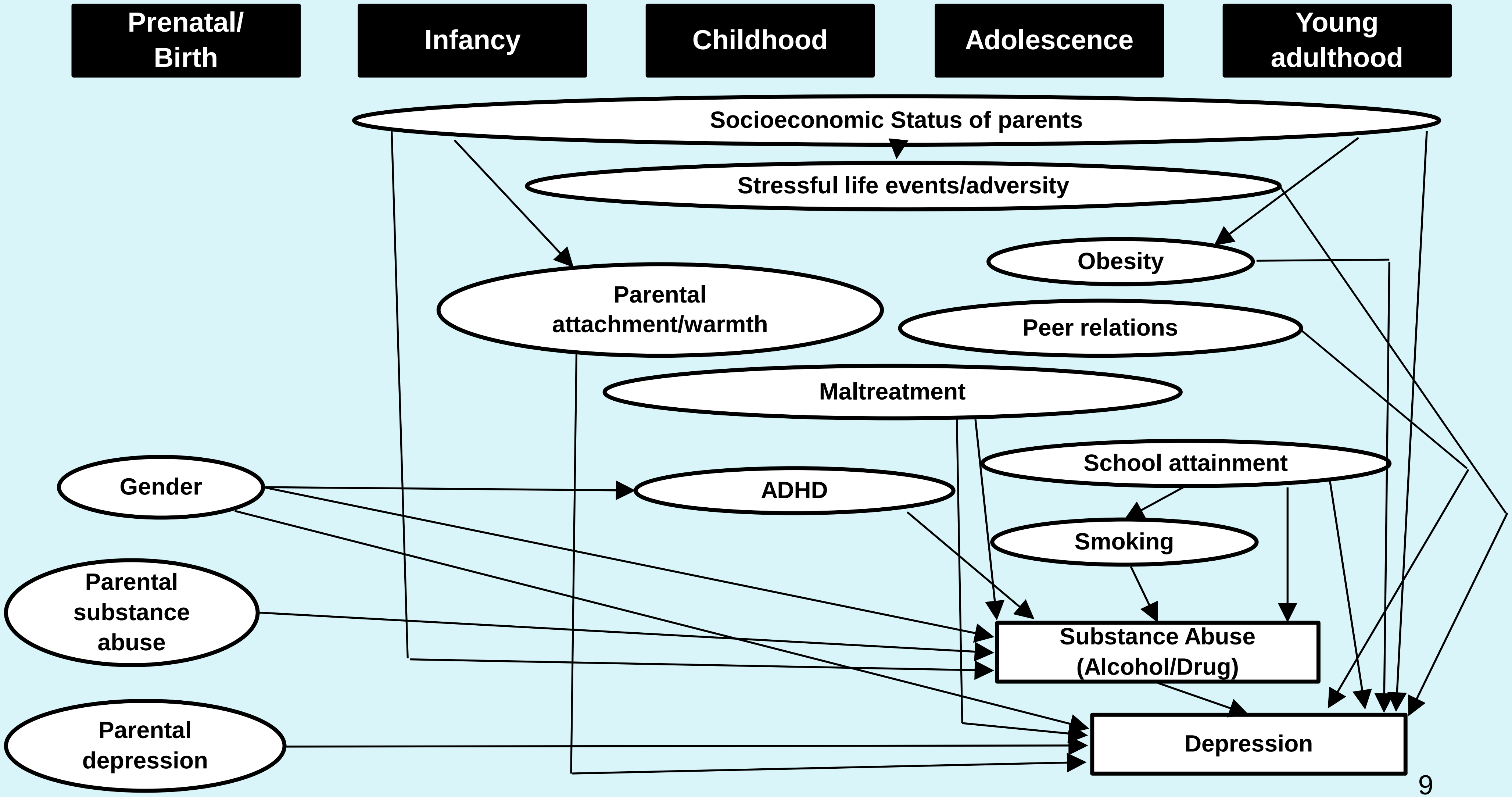
Education
- Conceptual framework

COMPASS RESEARCH CENTRE
FACULTY OF ARTS
THE UNIVERSITY OF AUCKLAND
Whare Wānanga o Tāmaki Makaurau



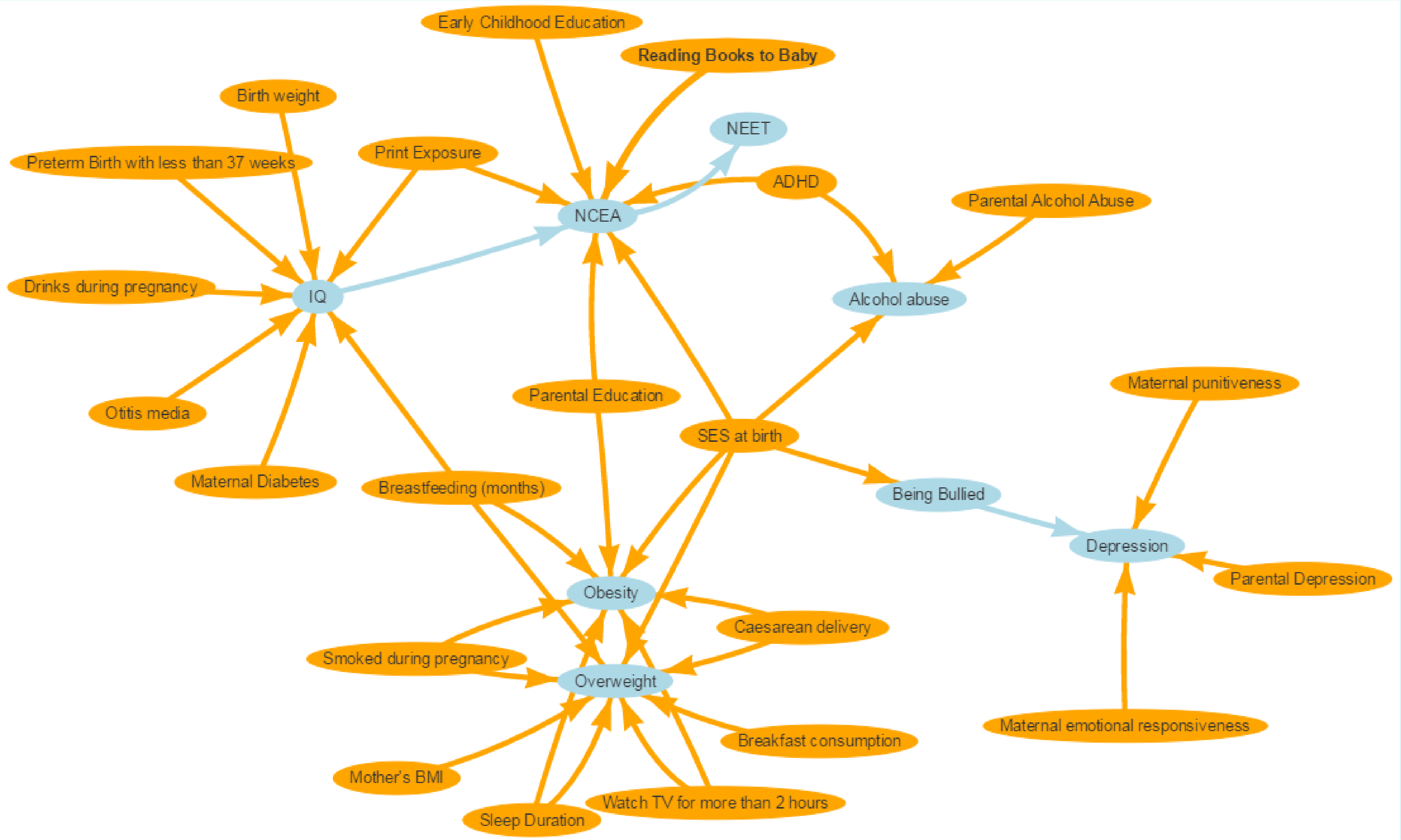
Mental health
- Conceptual framework

COMPASS RESEARCH CENTRE
FACULTY OF ARTS
THE UNIVERSITY OF AUCKLAND
Whare Wānanga o Tāmaki Makaurau



Knowledge Lab
- Conceptual framework(s)

COMPASS RESEARCH CENTRE
FACULTY OF ARTS
THE UNIVERSITY OF AUCKLAND
Whare Wānanga o Tāmaki Makaurau



The University of Auckland New Zealand

Literature comparing effect sizes for Māori vs non-Māori

COMPASS RESEARCH CENTRE
FACULTY OF ARTS
THE UNIVERSITY OF AUCKLAND
Whare Wānanga o Tāmaki Makaurau

- Getting meta-analytic estimates from literature all very well
  - …But will they accurately represent estimates for Māori? (or Pacific, etc…)
- Searched the literature for papers looking at health, education, psychosocial functioning for Māori youth, and found..
  - Most in health area, e.g. smoking (n=49), asthma (n=30)
- Few papers looked at risk factors (n=68; 10%)
  - Largely found in the smoking literature (n=14; 20%)
  - 38/68 reported whether magnitude of risk factor estimates differed for Māori vs non-Māori

Literature comparing effect sizes for Māori vs non-Māori

COMPASS RESEARCH CENTRE
FACULTY OF ARTS
THE UNIVERSITY OF AUCKLAND
Whare Wānanga o Tāmaki Makaurau

- 103 interactions reported (from the 38 papers)
- 63 reported that associations differed between Māori and non-Māori
  - Involving obesity (deprivation, rurality) – accounted for
  - Involving depression (family dysfunction) – not included
  - Involving alcohol (proximity to outlets) – not included
- 40 reported that associations did not differ between Māori and non-Māori

What is Microsimulation?

- Simulates plausible data for micro-level units (i.e., people, businesses, …)
- It (typically) uses empirical data as a basis to simulate real or alternative worlds, and their futures
- It enables experimentation in a virtual lab

Microsimulation: A virtual world

- Start with a real (or realistic synthetic) sample of people
- Apply statistically-derived rules to reproduce patterns via a stochastic process
- In so doing, create a virtual world (our simulation model)
- Predict what might happen if conditions were to change (i.e., by altering parameters)

A simple worked example (made up)

COMPASS RESEARCH CENTRE
FACULTY OF ARTS
THE UNIVERSITY OF AUCKLAND
Whare Wānanga o Tāmaki Makaurau

- Suppose every child born has the same probability of attending early childhood education (ECE)
- p = 0.50 ← **transition probability**

- And that those who **do attend** have the probability of leaving school with qualifications (SCQUAL):
- p = 0.80 ← **transition probability**

- And that those who **don’t attend** have the probability of leaving school with qualifications:
- p = 0.50 ← **transition probability**

A simple worked example

- Simulation is a **stochastic** process, so you get different results each time
  - On each simulation run, different units may be simulated as
    (i) attended ECE
    (ii) left school with qualifications

Imagine 2 individuals

	Run1				Run2			
	p(ECE)	**ECE?**	**p(ScQ)**	**ScQ?**	**p(ECE)**	**ECE?**	**p(ScQ)**	**ScQ?**
Abby	0.5	Yes	0.8	Yes	0.5	No	0.5	No
Brian	0.5	No	0.5	No	0.5	No	0.5	Yes

A simple worked example

COMPASS RESEARCH CENTRE
FACULTY OF ARTS
THE UNIVERSITY OF AUCKLAND
Whare Wānanga o Tāmaki Makaurau

- Simulation is a **stochastic** process, so you get different results each time
  - On each simulation run, different units may be simulated as
    (i) attended ECE
    (ii) left school with qualifications

- Best to take a number of runs and average…

- For 5 runs & 20 units
- Av=10.2/20 attended ECE
- Av=13.2/20 left school with qualifications

A simple worked example

COMPASS RESEARCH CENTRE
FACULTY OF ARTS
THE UNIVERSITY OF AUCKLAND
Whare Wānanga o Tāmaki Makaurau

- Suppose an intervention is suspected to increase the probability of children attending ECE to
- p = 0.80

- But the probability of leaving school with qualifications remains the same (p=0.80 for attenders; p=0.50 for non-attenders)

- What would happen??

A simple worked example

COMPASS RESEARCH CENTRE
FACULTY OF ARTS
THE UNIVERSITY OF AUCKLAND
Whare Wānanga o Tāmaki Makaurau

- For 5 runs & 20 units,
- Av=16/20 attended ECE
- Av=14.8/20 left school with qualifications, an increase from 13.2/20 (8% increase)

- A very simple model for which simulation probably not needed… …But if lots of factors affect ECE attendance, and its association with school qualifications (through potentially multiple pathways)

Microsimulation can capture this in one model, and allows counterfactuals to be tested

The University of Auckland New Zealand

SHINY
- Data visualisation using R

COMPASS RESEARCH CENTRE
FACULTY OF ARTS
THE UNIVERSITY OF AUCKLAND
Whare Wānanga o Tāmaki Makaurau

The University of Auckland New Zealand

Secure | https://shinyapps.stats.govt.nz/tkpie/

Apps | Faculty of Arts - The U | New Tab | Home - Baxters Cater | otago webmail | Family Centre - Areas

Iwi cultural well-being from Te Kupenga 2013

- English
- Te reo

Select region / rohe

...

Select iwi

Kāti Māmoe

Select measure

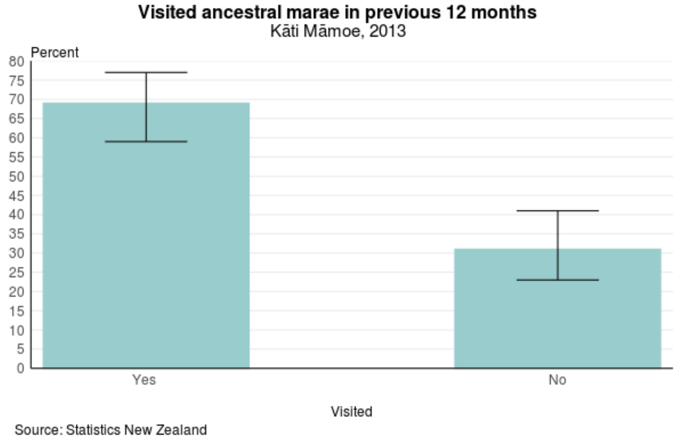
Visited ancestral marae in previous 12 months

Compare to estimate for Total Māori?

- No, just look at this iwi
- Yes

Download tables and graphs

Graph | Table



Explanatory notes

The estimates for the Total Māori population are for the usually resident Māori population of New Zealand, living in occupied private dwellings on 2013 Census night, aged 15 years and over, and who identified themselves as having Māori ethnicity or Māori descent.

The estimates for the Kāti Māmoe population are for the usually resident Māori population of New Zealand, living in occupied private dwellings on 2013 Census night, aged 15 years and over, who identified themselves as having Māori descent and who gave Kāti Māmoe as their iwi or one of several iwi.

The confidence intervals give the range in which we are 95 percent confident that the true population value falls.

We produced Kāti Māmoe estimates using small domain estimation. See Iwi estimates using Small Domain Estimation for technical details.

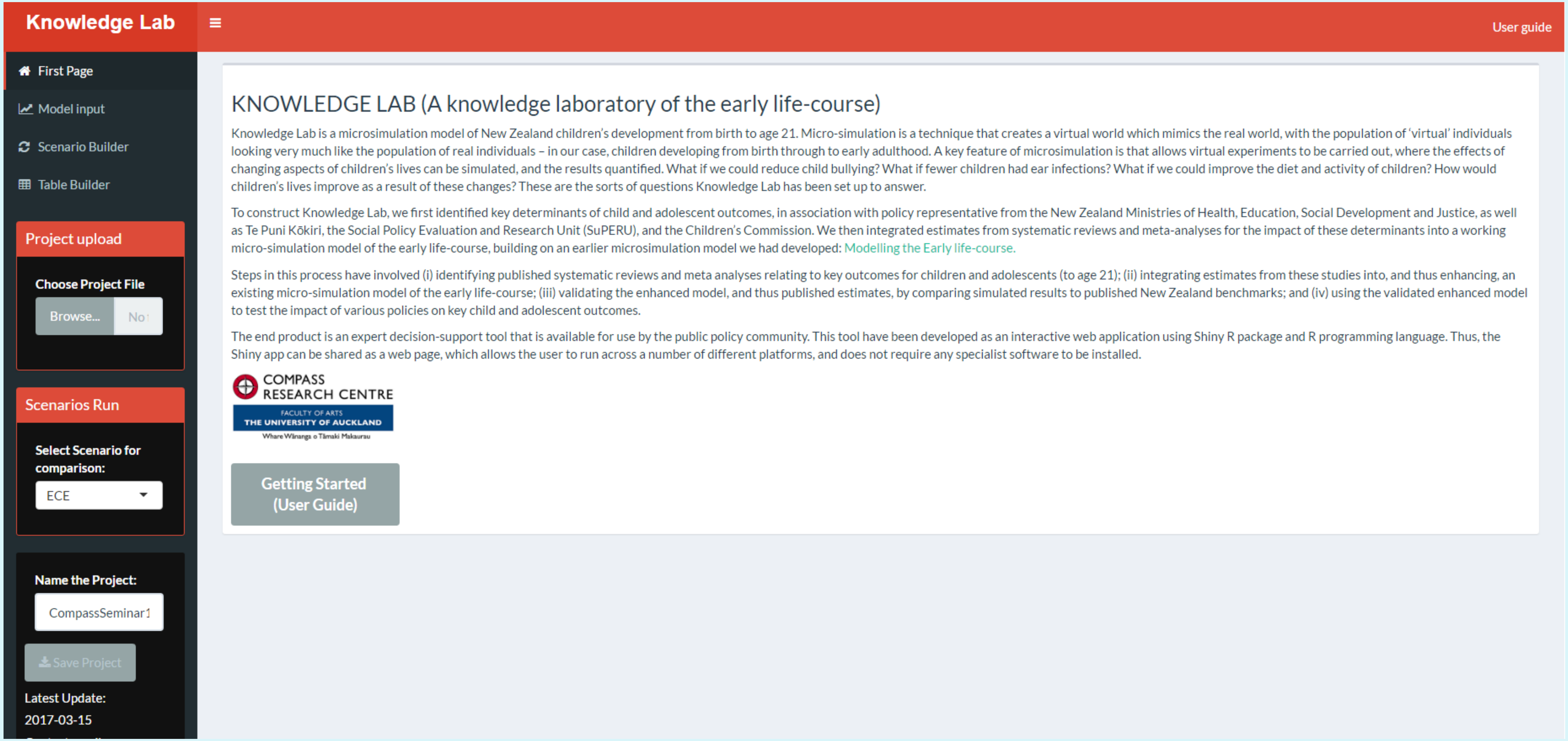
Feedback

You can provide feedback here.

Your feedback will help us develop and refine this tool - in order to better meet the needs of our customers.

Demonstration
- First Page

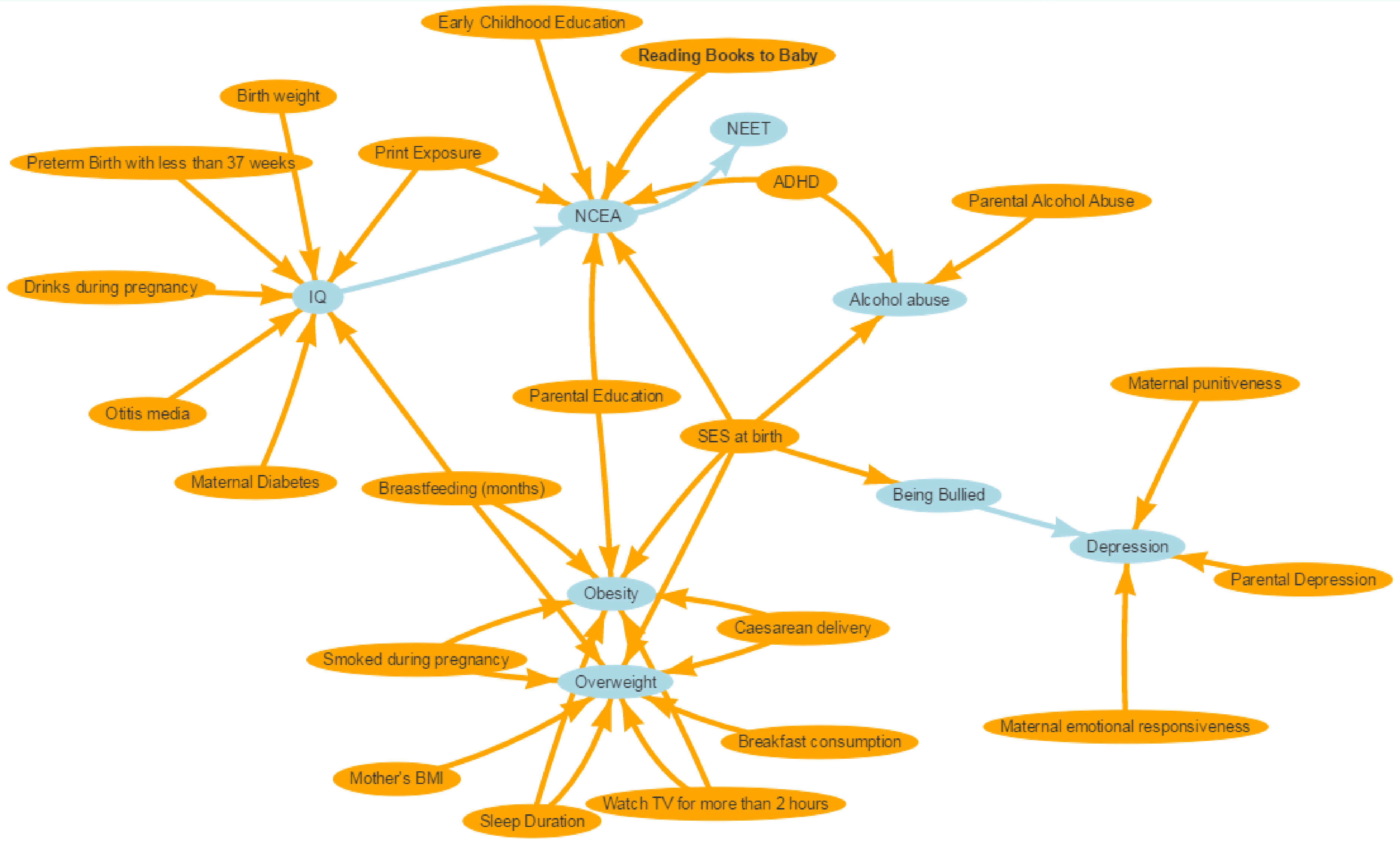
COMPASS RESEARCH CENTRE
FACULTY OF ARTS
THE UNIVERSITY OF AUCKLAND
Whare Wānanga o Tāmaki Makaurau



The University of Auckland New Zealand

Demonstration
- Model inputs

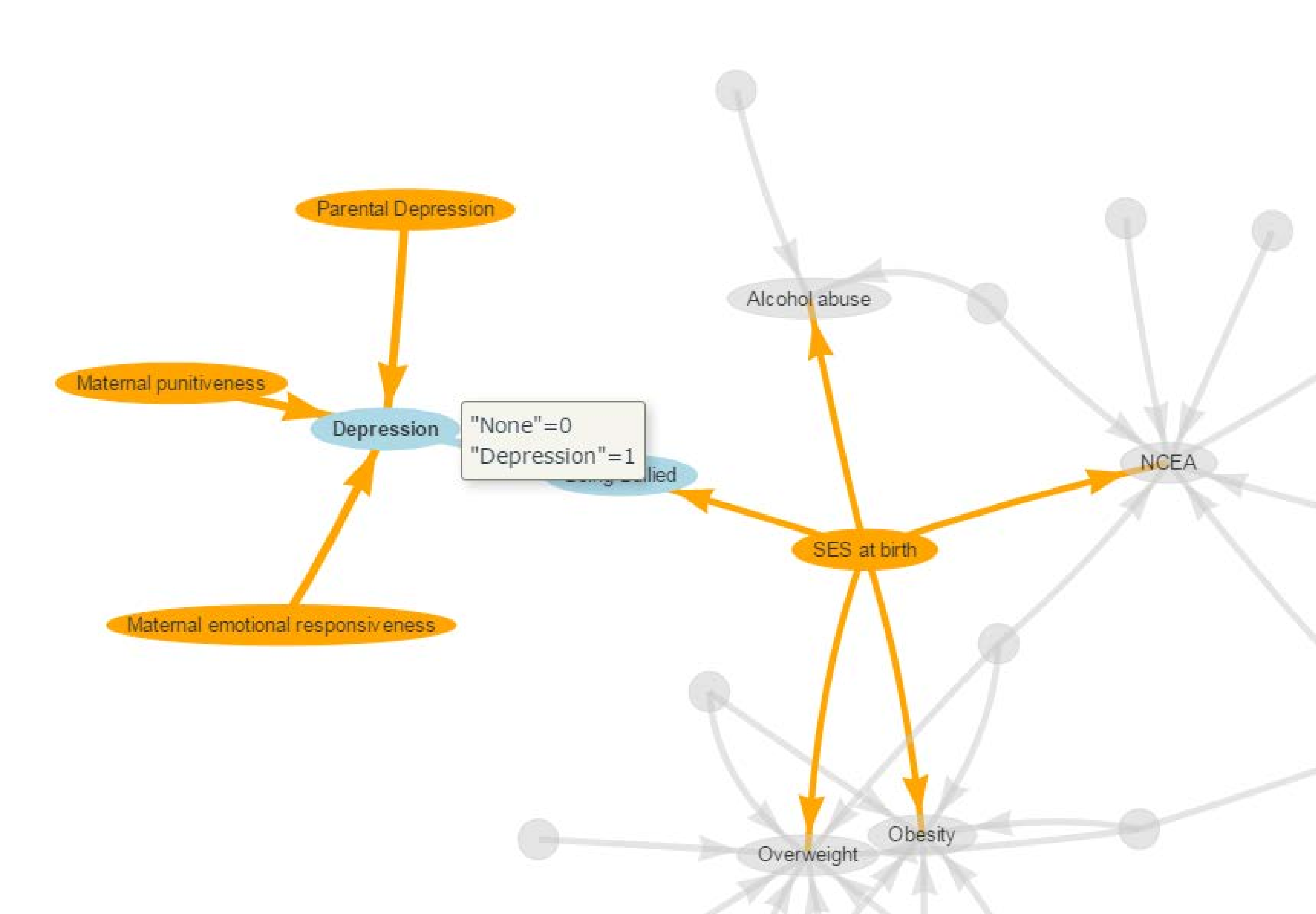
COMPASS RESEARCH CENTRE
FACULTY OF ARTS
THE UNIVERSITY OF AUCKLAND
Whare Wānanga o Tāmaki Makaurau



The University of Auckland New Zealand

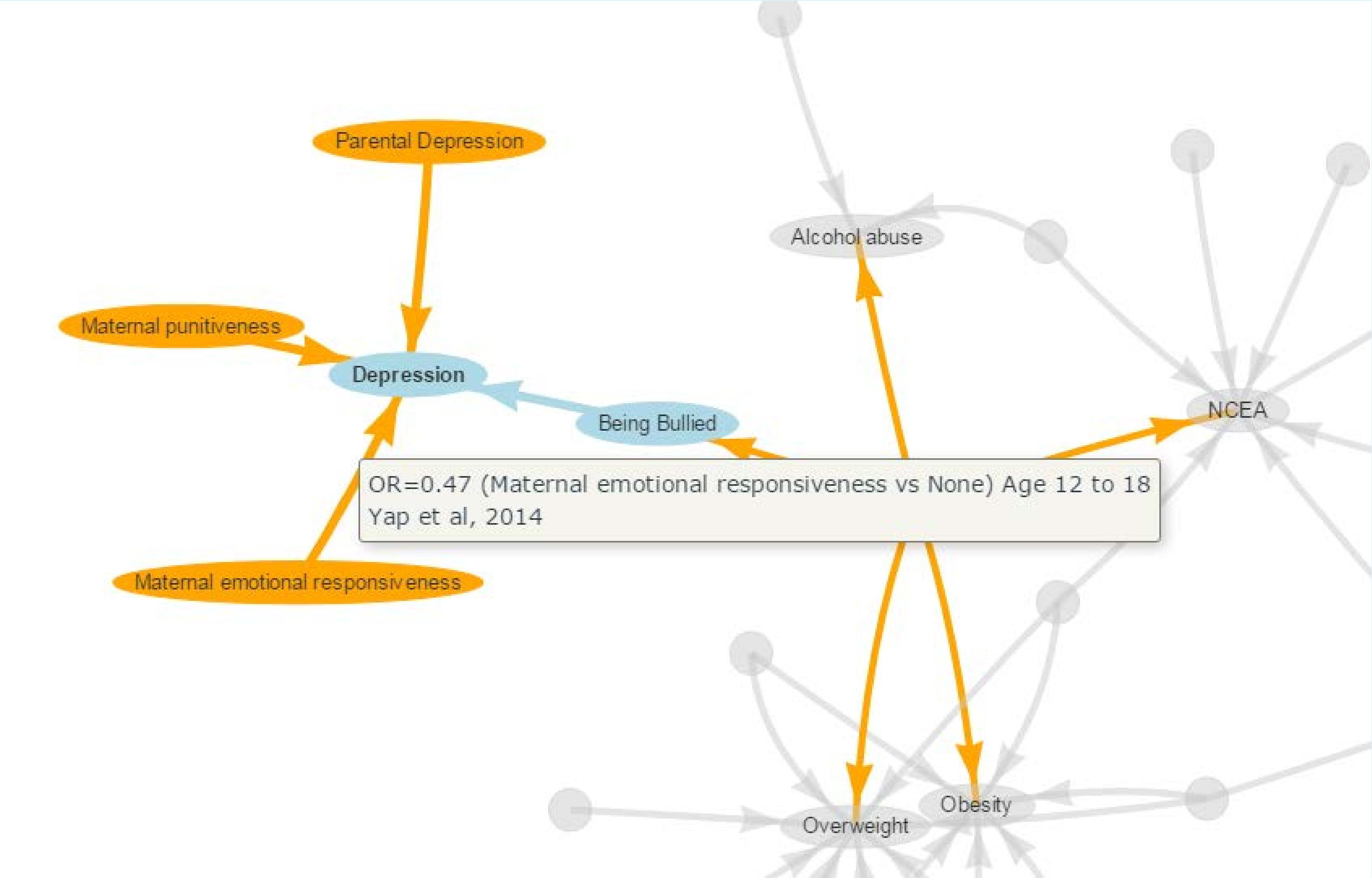
Demonstration
- Model inputs

COMPASS RESEARCH CENTRE
FACULTY OF ARTS
THE UNIVERSITY OF AUCKLAND
Whare Wānanga o Tāmaki Makaurau



Demonstration
- Model inputs

COMPASS RESEARCH CENTRE
FACULTY OF ARTS
THE UNIVERSITY OF AUCKLAND
Whare Wānanga o Tāmaki Makaurau



The University of Auckland New Zealand

Demonstration
- Model inputs

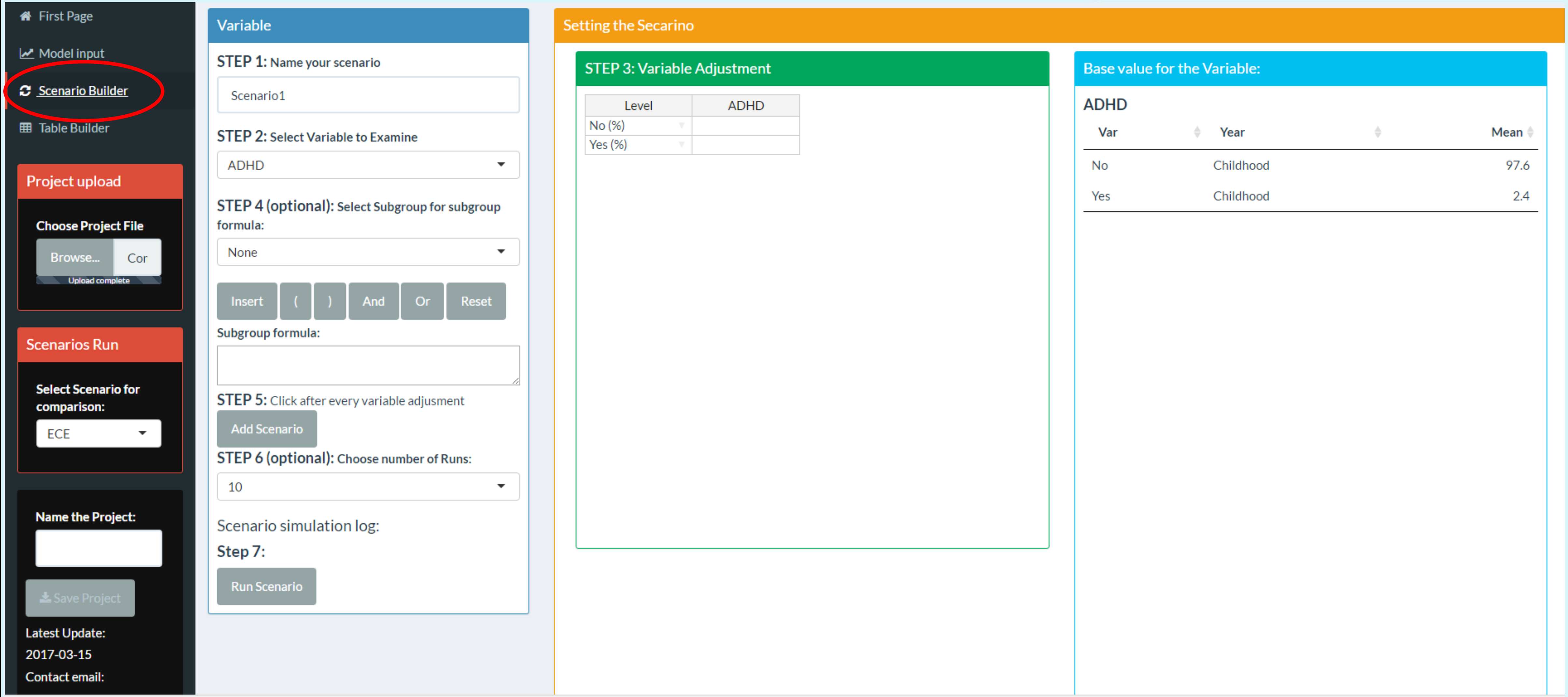
COMPASS RESEARCH CENTRE
FACULTY OF ARTS
THE UNIVERSITY OF AUCKLAND
Whare Wānanga o Tāmaki Makaurau

The University of Auckland
New Zealand

Demonstration
- Scenario builder

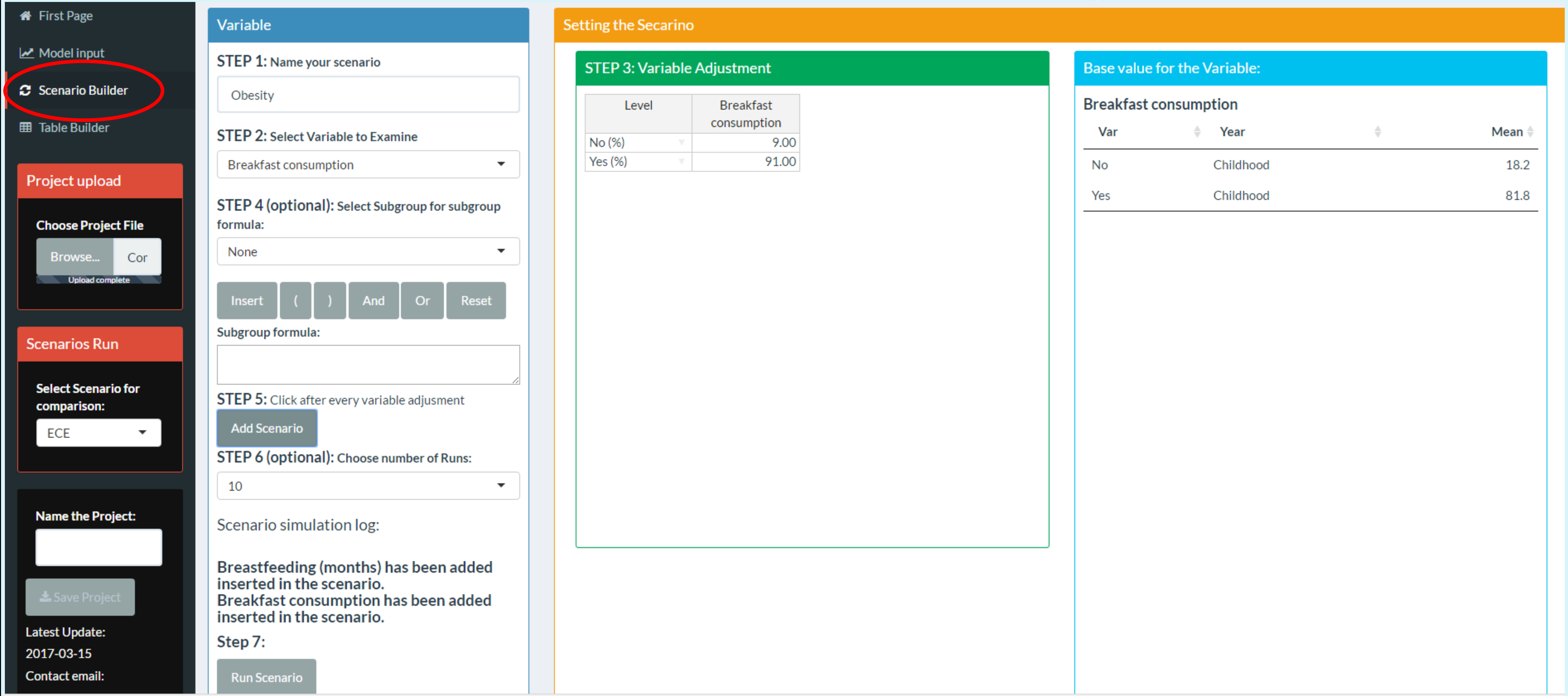
COMPASS RESEARCH CENTRE
FACULTY OF ARTS
THE UNIVERSITY OF AUCKLAND
Whare Wānanga o Tāmaki Makaurau

The University of Auckland New Zealand



Demonstration
- Scenario builder

COMPASS RESEARCH CENTRE
FACULTY OF ARTS
THE UNIVERSITY OF AUCKLAND
Whare Wānanga o Tāmaki Makaurau

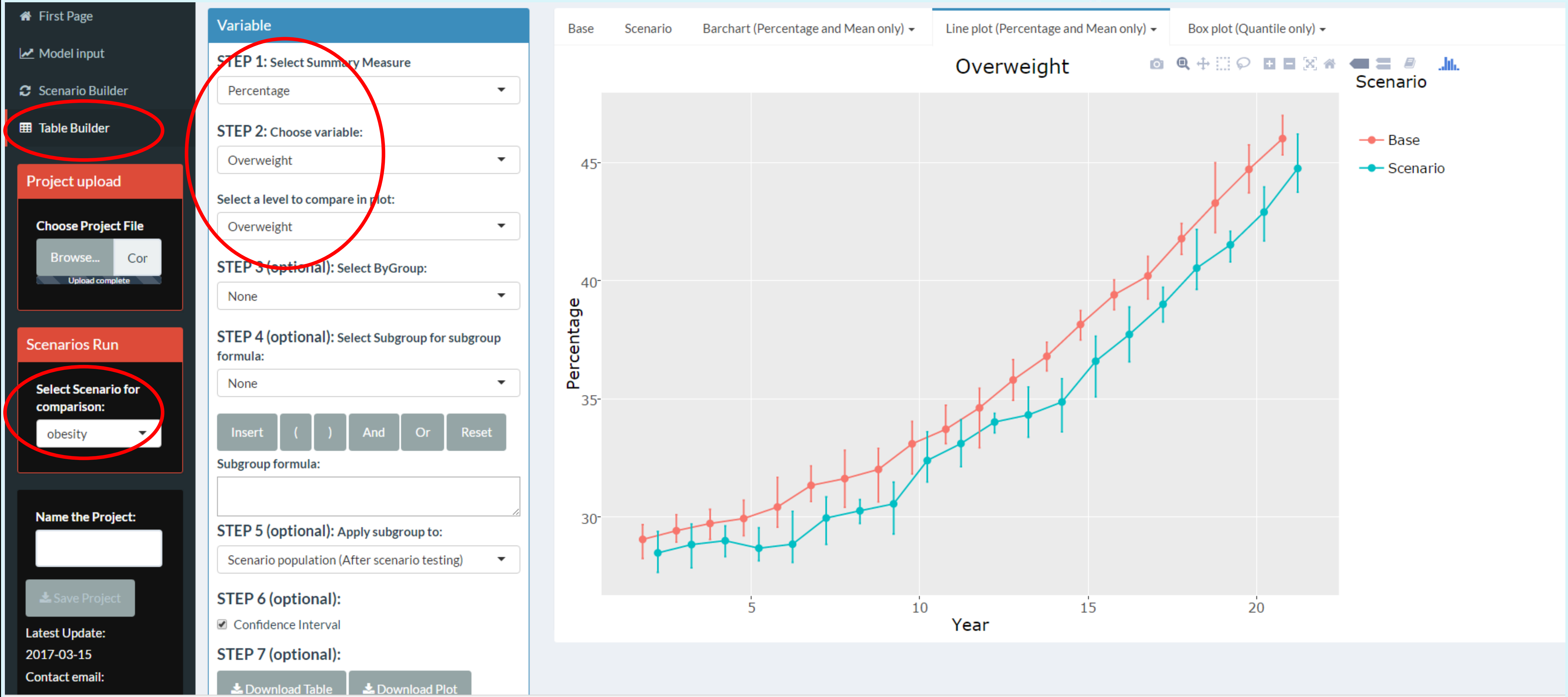


The University of Auckland New Zealand

Demonstration
- Table builder

COMPASS RESEARCH CENTRE
FACULTY OF ARTS
THE UNIVERSITY OF AUCKLAND
Whare Wānanga o Tāmaki Makaurau

The University of Auckland New Zealand



THANK YOU!!

COMPASS RESEARCH CENTRE
FACULTY OF ARTS
THE UNIVERSITY OF AUCKLAND
Whare Wānanga o Tāmaki Makaurau

https://compassnz.shinyapps.io/knowlabshiny