Outline

- **Background**
  - MEL-C project
    - Insights
    - Observations

- **Knowledge Lab project**
  - Plan
  - Progress
  - Issues
  - Next Steps
Modelling the Early Life-course (MEL-C)

1. Goals … what did we do?
   - Developed a software application as a decision-support tool for policy-making

2. Rationale … why did we do it?
   - To improve policymakers’ ability to respond to issues concerning children and young people

3. Means … how did we do it?
   - By building a computer simulation model with data from existing longitudinal studies to quantify the underlying determinants of progress in the early life course
Child characteristics
- (age)
- gender
- ethnicity

Parental characteristics
- age at birth of child
- ethnicity
- education level

Socio-economic position
- SES at birth of child
- (single-parent status at birth)

Family/household characteristics
- e.g. single-parent status, number of children, household size

Employment
- e.g. parental employment, welfare dependence

Material circumstances
- e.g. housing: accommodation type, owned-rented, bedrooms number

Psychosocial factors
- e.g. family functioning: change of parents, change of residence

Behavioural factors
- e.g. parental smoking

Other factors
- e.g. perinatal factors

Health service use
- e.g. GP visits, hospital admissions, hospital outpatient attendances

Education
- e.g. reading ability

Social/Justice
- e.g. Conduct disorder
MEL-C - Modelling software

Scenario Builder

Select Subgroup Variable for your Scenario

Select Options: ≤ ≥ 7 8 9
None: < > 4 5 6
Subgroup Formula: = 0 1 2 3

Select Variable to Examine
Cigarettes smoked per day during pregnancy

Adjust Proportions for your Scenario

Cigarettes:
0 (%) 1-5 (%) 6-10 (%) 11-15 (%) 16-20 (%) 21+ (%)

Preview Base Simulation Results for the Current Subgroup

<table>
<thead>
<tr>
<th>Name</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>78.34</td>
</tr>
<tr>
<td>1-5</td>
<td>7.70</td>
</tr>
<tr>
<td>6-10</td>
<td>4.84</td>
</tr>
<tr>
<td>11-15</td>
<td>5.24</td>
</tr>
<tr>
<td>16-20</td>
<td>1.50</td>
</tr>
<tr>
<td>21+</td>
<td>2.32</td>
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</table>
MEL-C Modelling software

Scenario Builder

Select Subgroup Variable for your Scenario
- Child ethnicity
- Select Options
- Māori
- Subgroup Formula

Select Variable to Examine
- Cigarettes smoked per day during pregnancy

Adjust Proportions for your Scenario

<table>
<thead>
<tr>
<th>Cigarettes</th>
<th>0 (%)</th>
<th>1-5 (%)</th>
<th>6-10 (%)</th>
<th>11-15 (%)</th>
<th>16-20 (%)</th>
<th>21+ (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>78.30</td>
<td>7.80</td>
<td>4.80</td>
<td>5.20</td>
<td>1.50</td>
<td>2.40</td>
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</table>

Preview Base Simulation Results for the Current Subgroup

<table>
<thead>
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<th>Name</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
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<tr>
<td>1-5</td>
<td>15.04</td>
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<tr>
<td>6-10</td>
<td>10.75</td>
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<td>11-15</td>
<td>9.34</td>
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<tr>
<td>16-20</td>
<td>2.73</td>
</tr>
<tr>
<td>21+</td>
<td>4.01</td>
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</table>

Name your Scenario: smoking_in_pregnancy

Run Scenario

2 runs
MEL-C
- Insights

- Able to model early life-course very well

- Changing factors in children’s lives often had weak effects on child outcomes
  - Is that just the reality of policy impact?
  - Does it indicate that estimates based on observational analysis do not reflect causal effect of interventions?

- Policy relevance increased by increasing range of outcomes and factors

- Childhood factors have impacts into adulthood
Astute observation 1

There are many well-established estimates for factors that impact the lives of children, but these exist in isolation; micro-simulation offers a way to bring these together.

– John Lynch, Professor of Public Health, University of Adelaide

Astute observation 2

‘Best’ estimates are thought to be derived from systematic reviews/meta analyses, but it is difficult to test their validity.

– David Gough, Professor of Evidence Informed Policy and Practice, Institute of Education
Knowledge Laboratory
- Plan

- Identify key determinants of child and adolescent outcomes
- Integrate estimates from systematic reviews/meta analyses into working model of early life course
  - Developed from MEL-C; extended in breadth (more determinants and outcomes), and length (to age 18)
- Use as knowledge laboratory
  - Test the validity of ‘best’ estimates
  - Test policy scenarios using validated model
Knowledge Laboratory
- Plan

To extend MEL-C model to include estimates derived from systematic reviews/meta analyses

To do this we will:
- Determine important factors to model (in consultation with an end user advisory group)
- Conduct literature search for these factors
- Update conceptual framework to include these factors
- Update micro-simulation model
- Validate model
- Deploy model and test policy scenarios
End User Advisory Group (EUAG)

- Model is (ultimately) for policy makers, so we want to involve them in its development

Precedent for MEL-C

- 4 Government Ministries – Health, Education, Social Development, Justice
- Regular meetings to discuss progress & next steps
- Deployment of tool with these ministries

Augmented for Knowledge Lab

- 4 additional agencies: Te Puni Kōkiri, Families Commission, Children’s Commission, Pacific Islands Families Study
- Same format
## Determine important factors

<table>
<thead>
<tr>
<th>Alcohol and drug use</th>
<th>Ethnicity</th>
<th>Justice contacts</th>
<th>Physical activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambulatory Sensitive Hospitalisations</td>
<td>Family transitions – formation/disintegration</td>
<td>Lead Maternity Carer enrolment</td>
<td>School type (single sex/co-ed)</td>
</tr>
<tr>
<td>Asthma/respiratory health</td>
<td>Food in schools</td>
<td>Maltreatment</td>
<td>Smoking</td>
</tr>
<tr>
<td>Birth weight/gestational age</td>
<td>Health visits</td>
<td>Mental Health</td>
<td>Socioeconomic measures (income, deprivation, living standards)</td>
</tr>
<tr>
<td>Books in home</td>
<td>Home visiting</td>
<td>Nutrition</td>
<td>Suicide</td>
</tr>
<tr>
<td>Breastfeeding</td>
<td>Housing quality</td>
<td>Obesity</td>
<td>Teaching quality</td>
</tr>
<tr>
<td>Conduct disorder</td>
<td>Immunisation</td>
<td>Otitis Media</td>
<td>Transfer payments</td>
</tr>
<tr>
<td>Early Childcare education (amount, quality, type)</td>
<td>Injuries</td>
<td>Parental and intergenerational welfare dependence</td>
<td>Transition to employment</td>
</tr>
<tr>
<td>Early parenting</td>
<td>Involvement in Child Health groups (e.g., plunket)</td>
<td>Parental involvement in schools</td>
<td>Violence in families</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td>Parental mental health</td>
<td></td>
</tr>
</tbody>
</table>
Determine search strategy

First attempt
- ARTICLE TYPE: Systematic Review OR Meta Analysis
- PUBLICATION DATE: Last 5 years
- SPECIES: Human
- AGES: Birth-18; 19-24

Searched PubMed
# Knowledge Lab - Progress

<table>
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<th>Search terms</th>
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<td>Ambulatory sensitive hospitalizations</td>
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<td>x</td>
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<tr>
<td>Asthma</td>
<td>“asthma”</td>
<td>445</td>
<td>400</td>
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<tr>
<td>Birth weight/gestational age</td>
<td>“birth weight” or “gestational age”</td>
<td>673</td>
<td>644</td>
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<tr>
<td>Books in home</td>
<td>“books” or “literacy”</td>
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<tr>
<td>Breastfeeding</td>
<td>“breastfeeding”</td>
<td>305</td>
<td>232</td>
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<tr>
<td>Child health groups</td>
<td>“health group”</td>
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<td>19</td>
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<td>Drug abuse</td>
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<td>Early childhood education</td>
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<td>34</td>
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<td>Early parenting</td>
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<td>3</td>
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</table>
# Knowledge Lab - Progress

<table>
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<td>548</td>
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<td>Ethnicity</td>
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<td>Family transitions*</td>
<td>“parental separation” or “father absence” or “parental death” or “family transition” or “family formation” or “family disintegration”</td>
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<td>6</td>
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<td>Food in schools</td>
<td>“school” and (“food” or nutrition”)</td>
<td>301</td>
<td>40</td>
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<tr>
<td>Health visits</td>
<td>“health visit”</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Home visiting</td>
<td>“home visit”</td>
<td>27</td>
<td>8</td>
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<tr>
<td>Housing quality</td>
<td>“housing” or “overcrowding”</td>
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<td>17</td>
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<td>Immunisation</td>
<td>“immunisation” or “vaccination”</td>
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<td>301</td>
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<td>Injuries</td>
<td>“injury”</td>
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<td>973</td>
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<td>Justice contacts</td>
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<td>Lead maternity care</td>
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<tr>
<td>enrolment</td>
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<td></td>
<td></td>
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<td>Search</td>
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<td>-----------------------------------------------------------------------------</td>
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<tr>
<td>Mental health</td>
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<td>375</td>
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<td>Depression</td>
<td>“depression” or “depressive”</td>
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<td>Eating</td>
<td>“eating disorder” or “bulimia” or “anorexia”</td>
<td>103</td>
<td>36</td>
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<tr>
<td>Psychosis</td>
<td>“manic” or “mania” or “bipolar” or “psychosis” or “schizophrenia” or “schizophreniform” or “schizotypy”</td>
<td>297</td>
<td>153</td>
</tr>
<tr>
<td>Nutrition</td>
<td>“nutrition”</td>
<td>684</td>
<td>364</td>
</tr>
<tr>
<td>Obesity</td>
<td>“obesity”</td>
<td>679</td>
<td>325</td>
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<tr>
<td>Otitis media</td>
<td>“otitis media” or “hearing”</td>
<td>336</td>
<td>239</td>
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<tr>
<td>Parental involvement in schools</td>
<td>“parent” &amp; “schools” &amp; “involvement”; yielded some references but not along lines hoped for</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Search</td>
<td>Search terms</td>
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<td>Physical activity</td>
<td>“physical activity” or “exercise”</td>
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<td>Respiratory health</td>
<td>“respiratory”</td>
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<td>School type (single-sex/co-ed)</td>
<td>school &amp; (single-sex or co-educational)</td>
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<td>x</td>
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<td>Smoking</td>
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<td>113</td>
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<td>Socioeconomic measures</td>
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<td>648</td>
<td>303</td>
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<td>Suicide</td>
<td>“self harm” or “suicide”</td>
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<td>29</td>
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<td>Teacher quality</td>
<td>(teacher or teaching) &amp; quality</td>
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<td>x</td>
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<td>Transfer payments</td>
<td>“transfer payments”; a few different combinations</td>
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<td>Transitions to employment</td>
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<td>Violence in families</td>
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<td>Welfare dependence</td>
<td>“welfare” or “poverty”</td>
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<td>Total</td>
<td></td>
<td>12759</td>
<td>7768</td>
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Knowledge Lab - Progress

- A lot of refs!
A lot of refs! But that’s OK.

- Most are irrelevant (don’t investigate impact of risk factor X on outcome Y)
- Relatively quick to scour even this number of records to find potentially relevant papers
Knowledge Lab - Progress

- A lot of refs! But that’s OK.
  - Most are irrelevant (don’t investigate impact of risk factor X on outcome Y)
  - Relatively quick to scour even this number of records to find potentially relevant papers
- Just PubMed.
A lot of refs! But that’s OK.

- Most are irrelevant (don’t investigate impact of risk factor X on outcome Y)
- Relatively quick to scour even this number of records to find potentially relevant papers

Just PubMed. But that’s OK.

- Can search other databases to get extras (and papers retrieved will give list of databases to search)
A lot of refs! But that’s OK.

- Most are irrelevant (don’t investigate impact of risk factor X on outcome Y)
- Relatively quick to scour even this number of records to find potentially relevant papers

Just PubMed. But that’s OK.

- Can search other databases to get extras (and papers retrieved will give list of databases to search)

Keywords may miss target.
A lot of refs! But that’s OK.

- Most are irrelevant (don’t investigate impact of risk factor X on outcome Y)
- Relatively quick to scour even this number of records to find potentially relevant papers

Just PubMed. But that’s OK.

- Can search other databases to get extras (and papers retrieved will give list of databases to search)

Keywords may miss target. But that’s OK.

- Papers retrieved will list keywords they searched
Parenting factors

- Alcohol abuse
- Depression
- Low SES
- Mental health
- Insecure attachment
- Maltreatment
- Substance abuse
- Media exposure
- Conduct problems
- Parenting programs
- Early childhood education

ADHD

- Childhood asthma
- Conduct problems
- Parenting programs
- Early childhood education

Maltreatment

- Low SES
- Cannabis use
- Smoking initiation

Educational achievement

- Smoking initiation
- Early childhood education

Smoking in pregnancy

- Maternal depression
- Smoking in pregnancy

Low birth weight

- Maternal depression
- Drinking in pregnancy

Parenting programs

- Early childhood education
- Conduct problems

Drinking in pregnancy

- Maternal depression
- Smoking in pregnancy

Insecure attachment

- Mental health
- Maltreatment

Low SES

- Mental health
- Maltreatment

Mental health

- ADHD
- Childhood asthma
- Conduct problems
- Parenting programs
- Early childhood education

Substance abuse

- ADHD
- Childhood asthma
- Low SES
- Cannabis use

ADHD

- Childhood asthma
- Conduct problems
- Parenting programs
- Early childhood education

Educational achievement

- Smoking initiation
- Early childhood education

Smoking initiation

- Early childhood education
- Parenting programs

Early solids

- Parenting factors

Childhood obesity

- Parenting factors

Lower minimum drinking age

- Parenting factors

Paternal age

- Parenting factors

Maternal depression

- Parenting factors

Smoking in pregnancy

- Parenting factors

Drinking in pregnancy

- Parenting factors

Childhood asthma

- Conduct problems
- Parenting programs
- Early childhood education

Cannabis use

- Conduct problems
- Parenting programs
- Early childhood education

Educational achievement

- Smoking initiation
- Early childhood education

Smoking initiation

- Early childhood education
- Parenting programs

Conduct problems

- Parenting programs
- Early childhood education

Parenting programs

- Early childhood education
- Conduct problems

Early childhood education

- Parenting programs
- Conduct problems

Conduct problems

- Parenting programs
- Early childhood education

Parenting programs

- Early childhood education
- Conduct problems

Early childhood education

- Parenting programs
- Conduct problems
Knowledge Lab - Conceptual framework

- Early solids
  - Childhood obesity
- Parenting factors
  - Lower minimum drinking age
  - Insecure attachment
  - Maternal depression
  - Drinking in pregnancy
- Low birth weight
  - Paternal age
- Alcohol abuse
- ADHD
- Substance abuse
- Depression
- Childhood asthma
- Conduct problems
- Media exposure
- Low SES
- Parenting programs
- Cannabis use
- Early childhood education
- Educational achievement
- Smoking initiation
- Smoking in pregnancy
- Maternal depression
- Smoking in pregnancy
- Childhood asthma
- Conduct problems
Knowledge Lab - Issues

- International studies (not surprisingly) so relevance to NZ unclear …
  - But can be tested
- Very few have looked specifically at Māori and Pacific groups
- Still need NZ rates for risk factors to plug into model
  - And may need models for these
- May need to model death and immigration/emigration
Knowledge Lab - Next Steps

- Complete literature search
  - More databases
- Update conceptual model
- Use estimates derived from literature search in the micro-simulation model
  - Program estimates into SIMARIO, in the order specified by the conceptual model
- Validate model, as per MEL-C
  - Check it is producing New Zealand rates
  - ***This is a test of the ‘best’ estimates***
Knowledge Lab - Next Steps

- Deploy model in software
  - **JAMSIM?**
    - Developed by COMPASS; User friendly
    - Not web deployable
  - **MODGEN?**
    - Developed and used by StatsCan
    - Web deployable
    - As user friendly? Basic model set-up different

- Hand over to end users to test scenarios
Acknowledgements

- COMPASS team: Peter Davis, Roy Lay-Yee, Jessica McLay, Martin von Randow
- EUAG: Jackie Fawcett (MOH), Ann Armstrong (MinEdu), Christina Connolly (MSD), Robert Lynn (MOJ), Jeremy Robertson (Families Commission), Kathleen Logan (OCC), Nathaniel Pihama (TPK), Dan Tautolo (PIFS)