National SCIENCE Challenges

A BETTER START

E Tipu e Rea

Big Data for a Better Start in Life

Examples from A Better Start National Science Challenge

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A Better Start is funded by the Ministry of Business, Innovation and Employment

Host Institution

The University of Auckland | Liggins Institute

UC University of Canterbury

University of Otago

AUT University

The University of Waikato

Massey University

Victoria University of Wellington

AgResearch

Outline

- Introduction to A Better Start and Big Data theme
- Two examples of Better Start projects:
  - Antibiotics and obesity
  - Who completes the B4 School check?
- Advantages
- Challenges
- What changes could be made?

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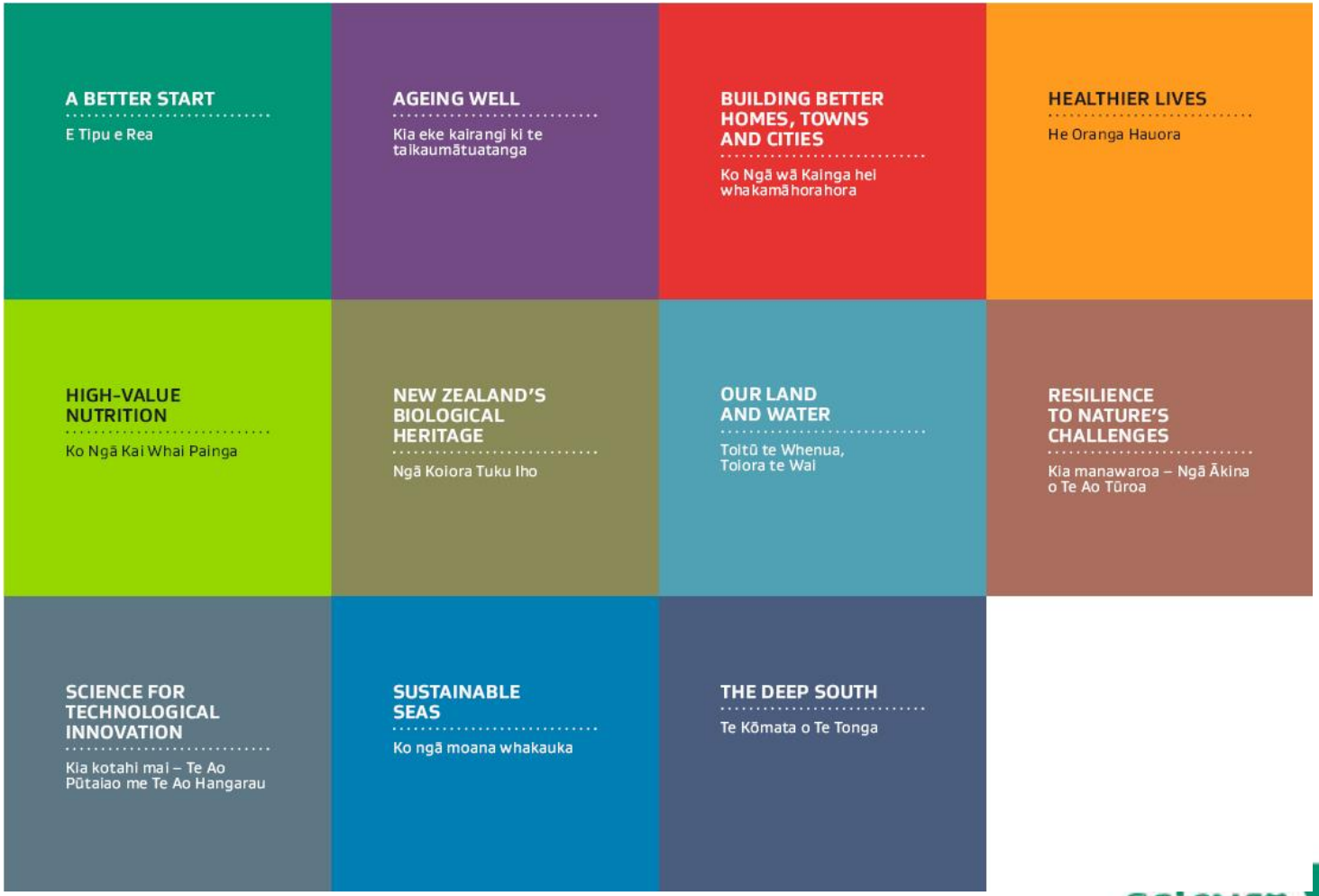

A Better Start is about creating the tools and methods to predict, prevent and intervene early so children have a healthy weight, are successful learners and teenagers can access the tools they need to look after their mental health.

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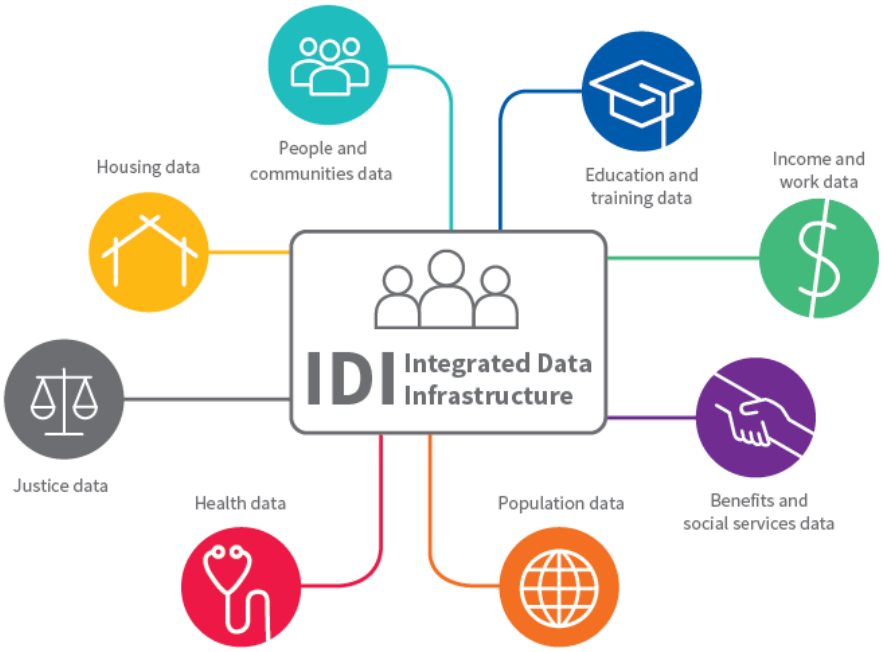
A Better Start

- Four strategic research programmes:
  - Healthy Weight
  - Successful Literacy and Learning
  - Resilient teens
  - **Big Data**, works across the other themes.
    Our approach is to identify a research question, form a team and move quickly to determine data and methods to be used.

The Integrated Data Infastructure (IDI)

- A lot of our work uses IDI data
- IDI is a large collection of NZ government administrative and survey data linked at the individual (person) level
- It allows us to connect information about a person across different sectors (eg education records to hospital admissions)



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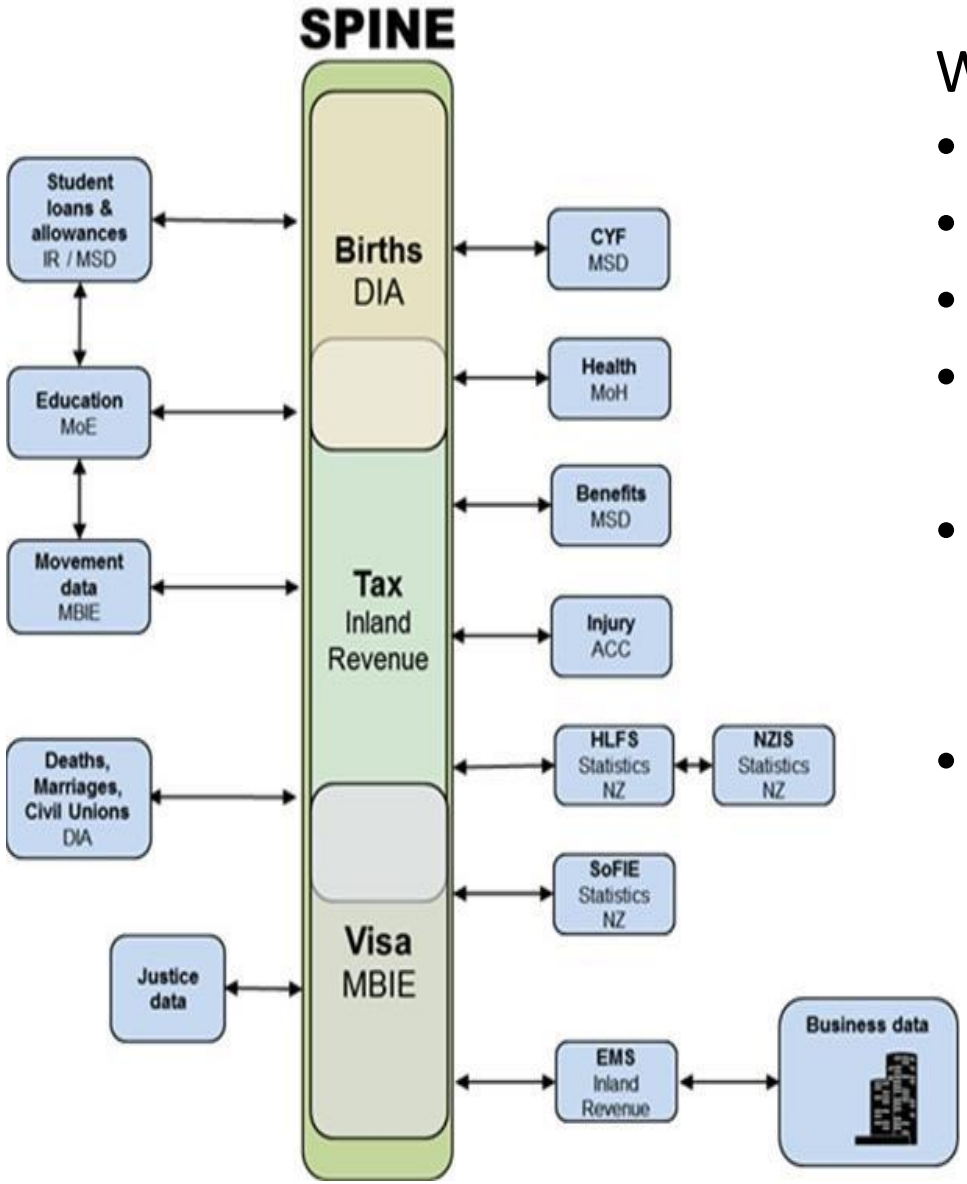
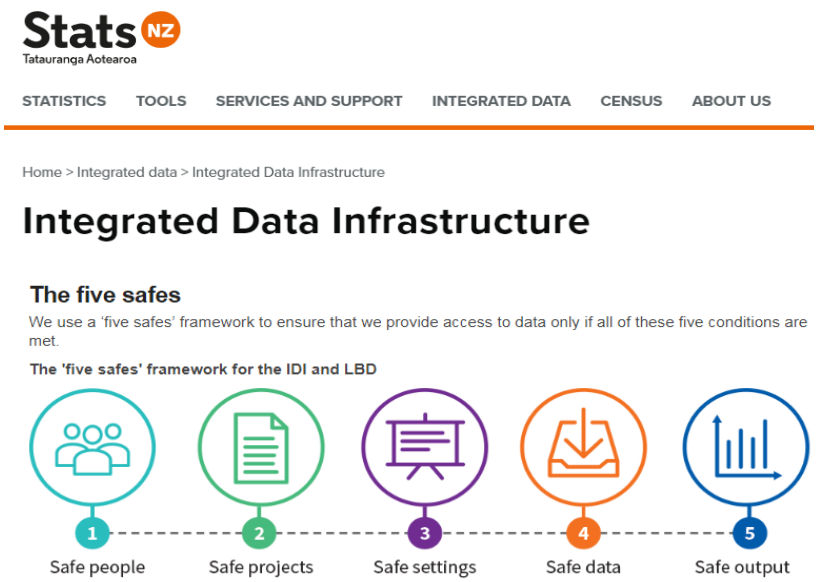


We use

- B4 School Check (obesity)
- hospital, prescriptions
- 2013 census
- PRIMHD (secondary mental health services)
- demographics, ethnicity, geographic location, border movements
- and many others

Privacy and security is critical

- Managed by Statistics NZ
- Approved users only
- All data anonymised
- Secure rooms and computer systems
- All outputs must be aggregated, rounded and checked
- For more details see www.stats.govt.nz



Examples of two Better Start projects

Disclaimer
Access to the anonymised data used in this study was provided by Statistics New Zealand in accordance with security and confidentiality provisions of the Statistics Act 1975. The findings are not Official Statistics. The results in this paper are the work of the authors, not Statistics NZ, and have been confidentialised to protect individuals from identification.

Antibiotic use and childhood obesity

Karen Leong, Wayne Cutfield, José Derraik (Healthy Weight theme)
Jessica McLay, Barry Milne, Sheree Gibb (Big Data theme)

Questions:
Are children at higher risk of obesity at age 4 if:

- they take antibiotics in the first two years of life?
- their mothers take antibiotics during pregnancy?

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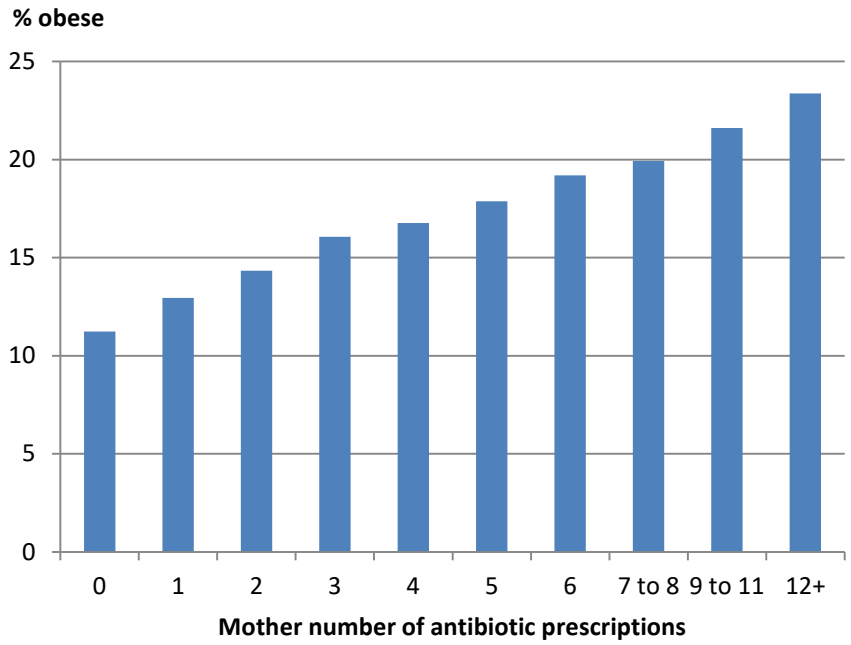
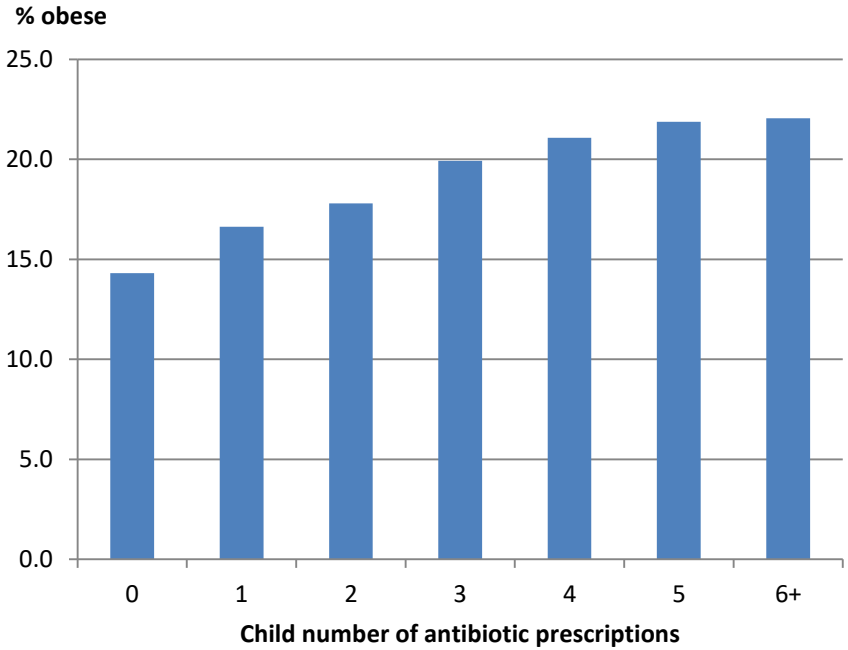
Data

- Antibiotic prescriptions from pharmaceutical data
- Height and weight from B4 School Check data (age 4)
- 150,000 observations from years 2012 to 2015
- We adjusted associations for birth weight, delivery mode, gestational diabetes, parity, gestation, hyperemesis, multiple birth, nzdep, sex, ethnicity, mother days in hospital, child days in hospital, birth month, rurality, maternal age

Mother antibiotics



Child antibiotics

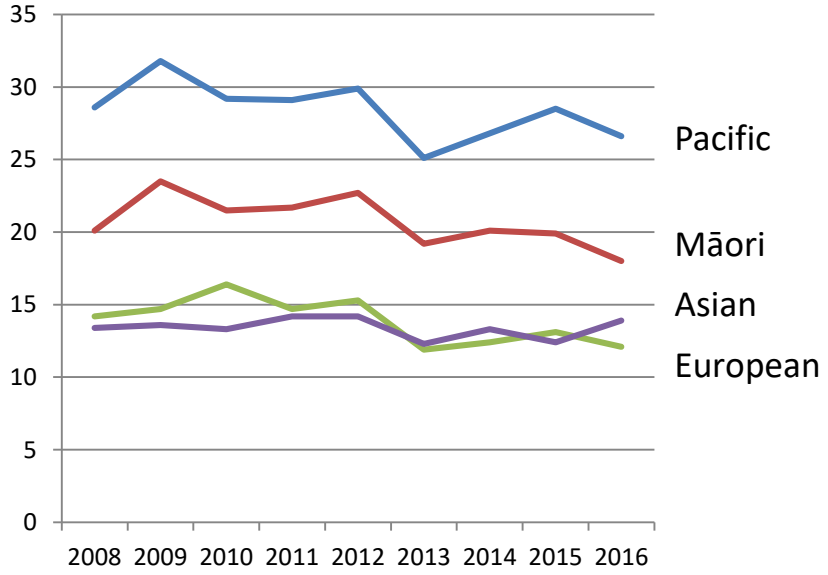


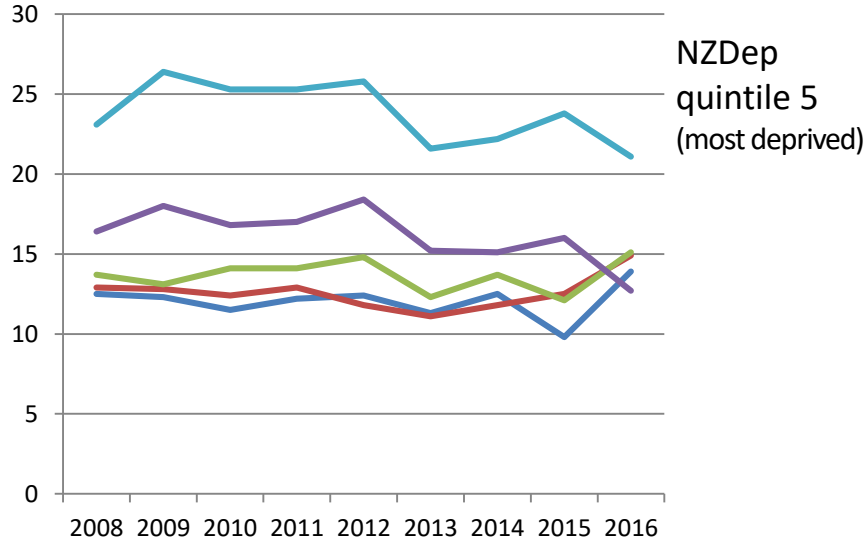
- mother and child antibiotics were significantly associated with child obesity (covariate adjusted OR 1.03 & 1.04)
- risk of obesity increased as number of prescriptions increased

Conclusion

- Antibiotic use in pregnancy and the first 2 years of life is associated with a small but significant increase in obesity
- While the increased risk is small, it is potentially important on a population level as antibiotic use in pregnancy and infancy is widespread, and is patterned by ethnicity and deprivation

% of children receiving antibiotics 0–24 months





Who receives the B4 School Check?

Big Data initiated project

Sheree Gibb, Nichola Shackleton, Rick Audas, Barry Milne

Questions:

- What is the coverage of the B4 School check in NZ?
- What can we learn about the children who miss out?

What is the B4 School check?

B4 School Check

The B4 School Check is a nationwide programme offering a free health and development check for 4-year-olds.

The B4 School Check aims to identify and address any health, behavioural, social, or developmental concerns which could affect a child's ability to get the most benefit from school, such as a hearing problem or communication difficulty.

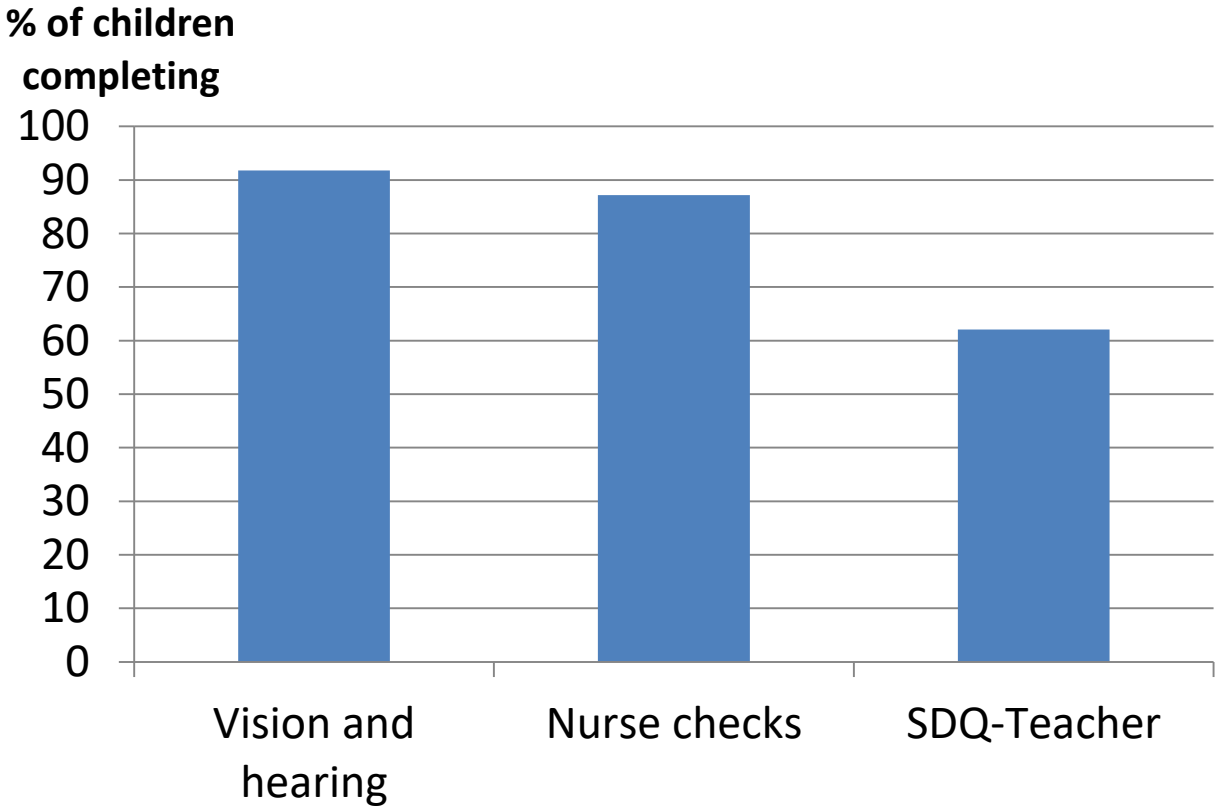
It is the 12th core contact of the Well Child Tamariki Ora Schedule of services.

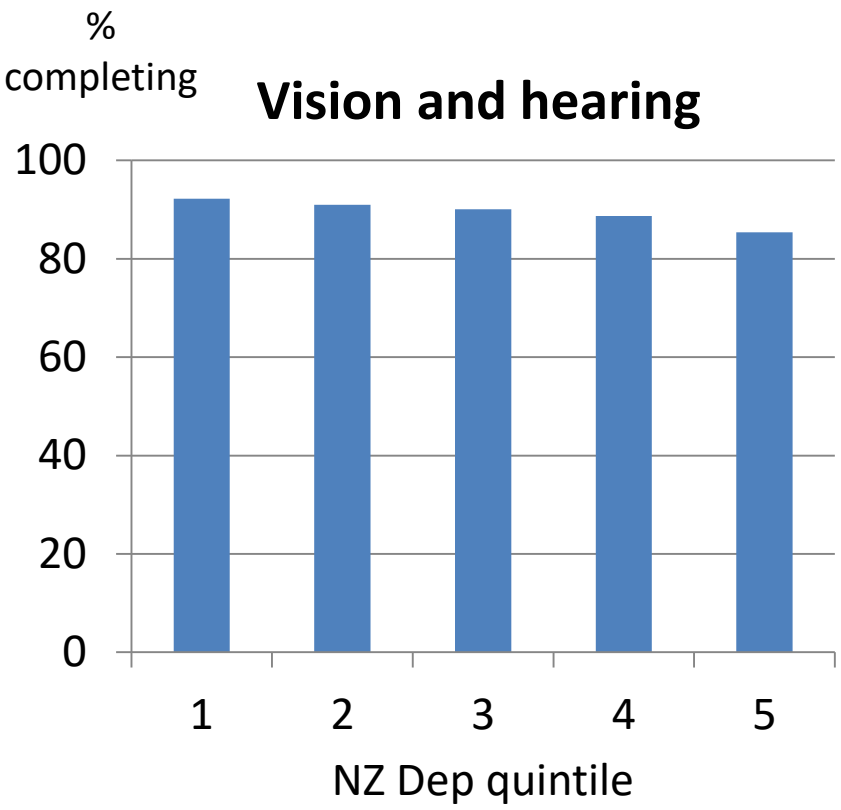
http://www.health.govt.nz/our-work/life-stages/child-health/b4-school-check

Data

- We identified a base population using a method based on activity in selected datasets, provides a population of 4-year olds that is 97–99% of official estimates
- B4 School Check coverage for years 2010/11 to 2014/15
- Checks grouped into three sets: vision and hearing; nurse; SDQ-teacher

B4SC coverage 2014/15




%
completing
Vision and hearing
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60
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20
0
1
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4
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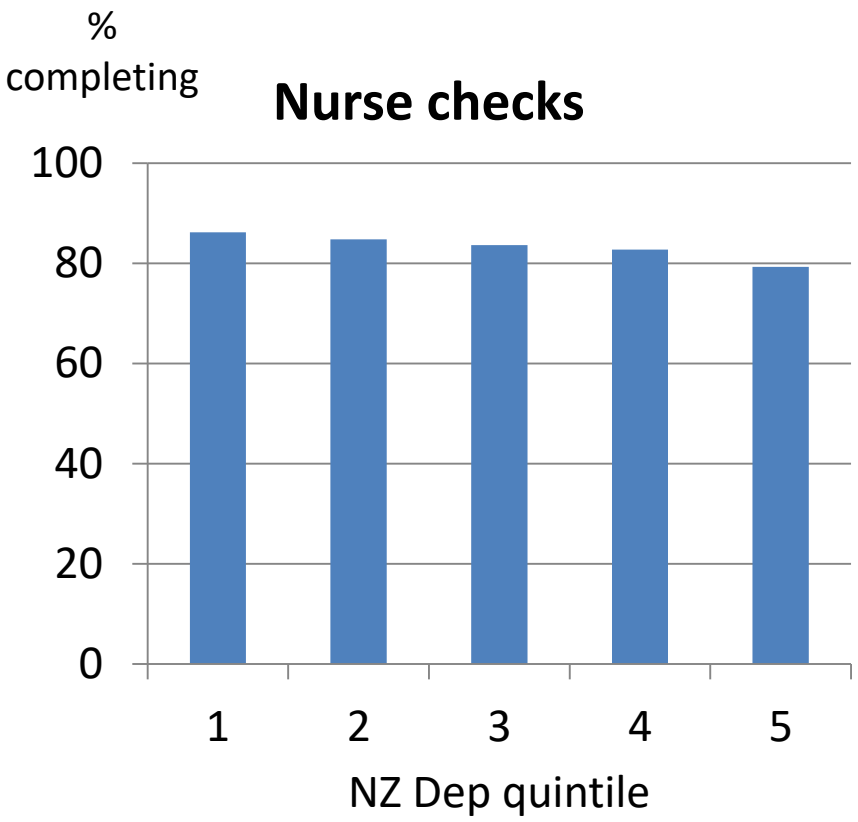
NZ Dep quintile


%
completing
Nurse checks
100
80
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40
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5
NZ Dep quintile

- Other characteristics significantly associated with missing out on a B4 School Check:
  - Family receives benefit income
  - Mother has no formal qualifications
  - Māori or Pacific ethnicity
  - Living in rented housing or large household
  - Low birthweight, mother smokes, lots of prior hospital admissions

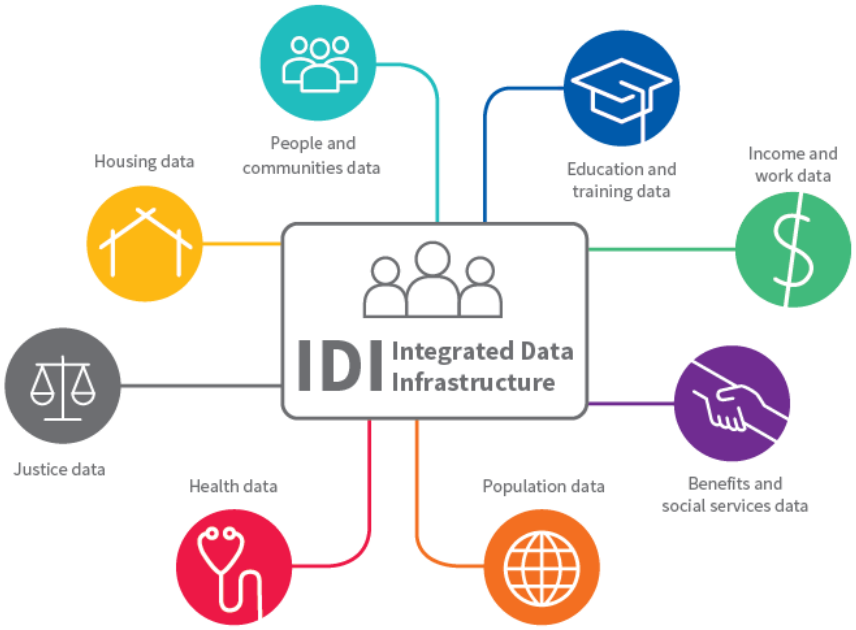
Conclusions

- Not all children are receiving a B4 School Check
- Many characteristics of children who miss a B4 School Check are associated with later life risks
- B4SC may not be reaching the children who would most benefit from it

What are the advantages of using IDI?

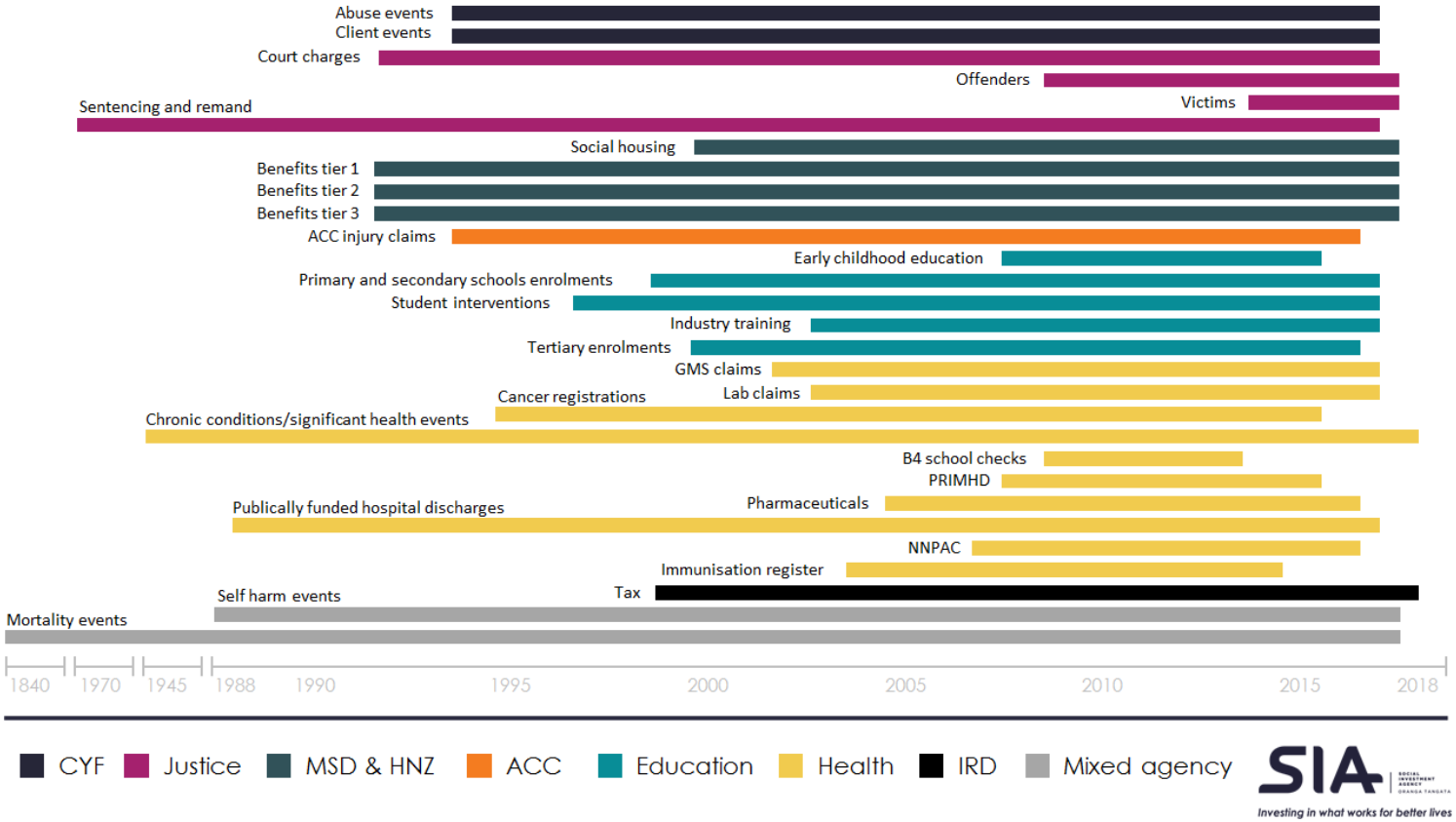
Collecting information across multiple sources

- Antibiotics + obesity
- B4SC coverage + information from benefits, census
- Justice + mental health
- Age, sex, ethnicity, NZDep available for almost everyone



Longitudinal data

- Some data sets go back quite far
- Only for those in NZ, but border movements data available to censor those who leave



Linking children to parents

- We can link children to their parents to get information about parent characteristics, e.g. pharmaceutical use, smoking, age, income

- Currently done through birth records so only possible for NZ-born children

Challenges

Data quality and understanding

- Majority of project time is spent on understanding data, investigating quality problems, data cleaning and management
  - e.g. we spent a lot of time investigating antibiotics, but could not get dose
- Documentation has improved, but still lacking
- Understanding linking errors and bias

Missing data

- Can be challenging when using variables from a range of sources
  - e.g. B4 School Check coverage: not all children have birth records or parent census records, so a lot of missing data for covariates
- Distinguishing ‘no event’ from missing data

Limited range of measures

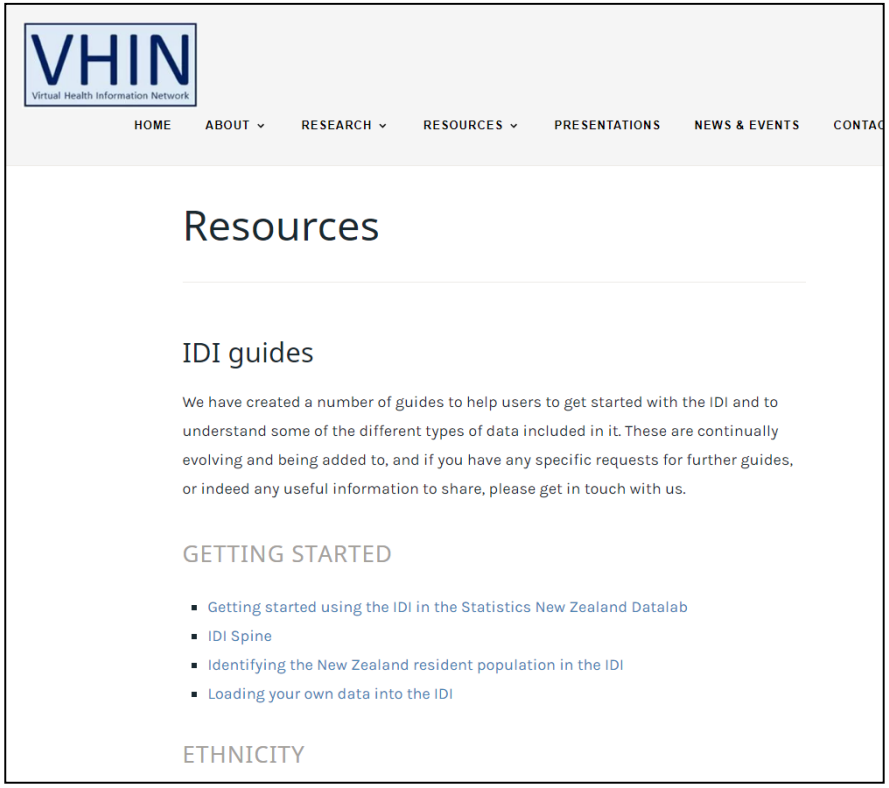
- Most data are collected for government administration and funding ("follow the money")
- Lack of 'soft' measures, e.g. questionnaires on wellbeing, mental health, etc.
- Measures of importance to Māori: Te Kupenga available, Census has iwi information, but one time point only
- Primary health care data is limited to a list of enrolments – currently one of the biggest gaps for health researchers

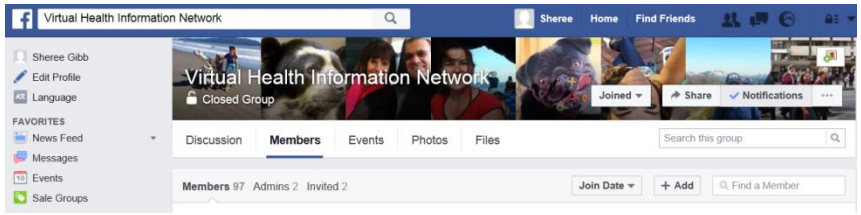
What changes could be made?

We see part of our role as driving changes to the data environment. Two of the most useful improvements would be:

- Better access to primary care data
- Promoting data literacy and understanding of IDI strengths and limitations

Virtual Health Information Network





- VHIN membership is free
- Request to join Facebook group
- Great for discussions, queries and upcoming events
- website: http://vhin.co.nz
- email: vhin@otago.ac.nz

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Introduction to IDI courses

Upcoming courses:

Introduction to IDI
Dunedin, 20 November
Wellington, 26 November

Introduction to SQL
Wellington, 27–28 November 2018

Look out for our Auckland course in February 2019

See http://vhin.co.nz for more details

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