

Complex policy and practice questions require  
complex evidence integration -

The case of early child health and development in Australia

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NHMRC Australia Fellow





**MIND THE GAP**

## Research Production

Platforms  
|  
Methods  
|  
Evidence  
|  
Synthesis  
|  
Communication

Translation



## Research Consumption

Implementation in Policy

Implementation in Practice

The Gap



Search

NHMRC

EXPLORE NHMRC 75 YEARS OF WORKING TO BUILD A HEALTHY AUSTRALIA

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Research Translation Faculty

The creation of knowledge through research underpins improvements in Australia's health service delivery and intervention. To gain benefits from health and medical research, new knowledge created through research must be translated and implemented.

One of NHMRC's primary responsibilities is supporting the effective and rapid translation of research findings into health care policy and practice. Specific measures include:

- Partnerships for Better Health, to support the transfer of research into policy and practice. This initiative has two elements:
  - Projects – the NHMRC offers funding for research to answer the research questions of organisations such as state health authorities, non-government organisations, the private sector and other organisations
  - Centres – new Policy and Practice Centres partner NHMRC with other governmental and non-government organisations in large scale policy and practice research and evidence-based research
- Funding to Centres of Research Excellence in policy and practice
- Translating Research into Practice (TRIP) Fellowships, which provide support for future leaders in translating important research findings into clinical practice
- Targeted Calls for Research in areas of particular urgency
- Practitioner Fellowships, which support clinical – medical, paramedical, allied health - and public health or health services professionals to undertake research that is linked to their practice or policy.
- Encouraging research translation through our work in clinical and public health guidelines, including setting standards for the development of high-quality, implementable clinical guidelines in Australia.

As we plan for the new NHMRC Triennium, we have placed the development of the NHMRC Research Translation Faculty at the centre of our thinking. We are asking members of our research community to become an integral part of the way NHMRC conducts business, with direct input into NHMRC work. The Faculty will directly help NHMRC confront key challenges for translation of health and medical research in Australia.

In 2012, NHMRC is inviting its funded researchers to join its new Research Translation Faculty. This initiative will support more effective and accelerated translation of health and medical research into improved policy and practice in Australia.

The Faculty will be a key advisory forum, helping NHMRC address the challenge of research translation in Australia. Initially, the Faculty will focus on two specific activities:



# Closing the gap between evidence and action: The need for knowledge translation in the field of drug policy research

BRITISH JOURNAL OF PSYCHIATRY (2000), 176, 407-411

Thomas Kerr<sup>a,b,\*</sup>, Ev

## Power Of Information: Closing The Gap Between Research And Policy

When it comes to conveying complex information to busy policy-makers, a picture is truly worth a thousand words.

by Richard Sorian and Terry Baugh

### Introduction

## Bridging the Gap Research Informing Practice and Policy

Frank J. Chaloupka, PhD, Lloyd D. Johnston, PhD

**President's column:**  
How can we reduce the knowledge gap between public health research and policy/practice?

Research findings in public health are published primarily for the research community. However, quite often they do not reach policy makers and practitioners. To successfully communicate important research knowledge to these communities it needs to be translated into recommendations for actual policy.

h and mental health policy

SINGH



c Health Association



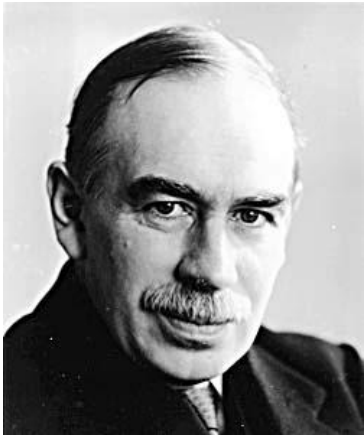
ALL RIGHTS RESERVED  
<http://www.cartoonbank.com>



**My question is: “Are we making an impact?”**

# National Collaborating Centre for Methods and Tools (Public Health Agency of Canada)

The screenshot shows the website for the National Collaborating Centre for Methods and Tools (NCCMT). The browser window title is "National Collaborating Centre for Methods and Tools - Mozilla Firefox". The address bar shows "www.nccmt.ca/index-eng.html". The website has a dark header with a search bar and navigation links: "Login", "Français", "Print This Page", "Feedback", "Glossary", "Sitemap", and "Collaborating Centres". The main content area features a navigation menu with "Home", "Resources", "Professional Development", "Networking", "About NCCMT", and "Contact Us". A prominent banner reads "Spotlight on KT Methods and Tools" with a spotlight graphic and the text "New Webinar Series: Spotlight on KT Methods & Tools. Mark your calendars!". To the right, there is a "Quick Links" section with items like "Where to start", "KT Methods and Tools", "Evidence-Informed Public Health", "Learning Modules", "Discussion Forum", "Subscribe to Our Publications", and "Join the DialoguePH Network". Below that is a "What's New at NCCMT?" section with a "View Archives" link and a notice about the "NCCMT newsletter latest issue #14". A pink arrow points to the search bar in the top right of the website.



“...there is nothing a government hates more than to be well-informed; for it makes the process of arriving at decisions much more complicated and difficult.”

John Maynard Keynes

Skidelsky. *John Maynard Keynes: a biography. Vol. 2: [the economist as saviour](#), 1920-1937* (1992) London, p630



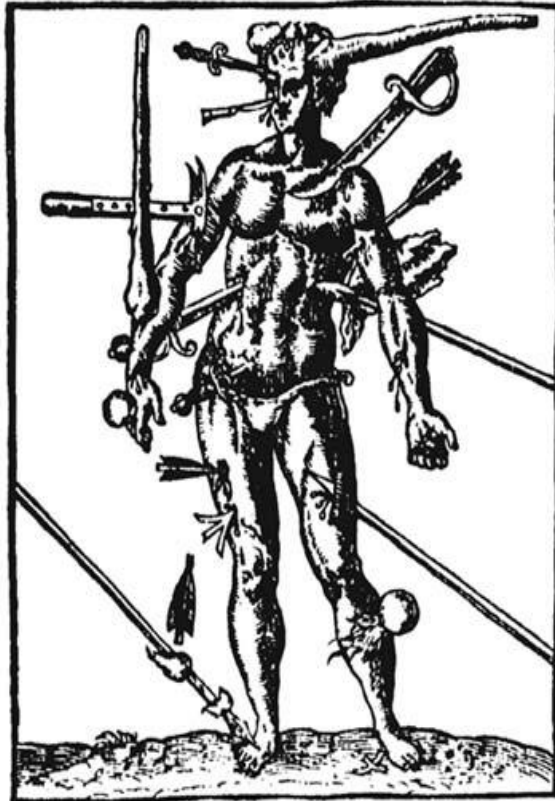
# Some Historical Examples of Research Translation in Health

# THE Method of Curing Wounds made by Gun-shot.

Alfo by Arrowes and Darts, with their Accidents.

Written by AMBROSE PARÉ of Laual, Counsellor and chiefe Chirurgian to the French King.

Faithfully done into English out of the French Copie, by  
*Walter Hamond* Chiturgeon.



London printed by Isaac Iaggard, and are to be sold in Barbican. 1617.

Ambrose Paré 1575

Treating wounds with boiling oil did more harm than good. Ligatures were more effective but 100 years before it was widely accepted

- **Scurvy**

Beneficial effects of citrus known for centuries, but Lind showed via an experiment on 12 sailors in 1747 how oranges and lemons eliminated scurvy, but 1864 before British Board of trade used citrus for all sailors



- **Smoking**

In 1950 Doll showed smoking and lung cancer linked but advertizing not completely banned in UK until 2002, US (2003), and Australia (1998).



- **Asbestos**

In 1955 Doll demonstrated relationship between asbestos and lung cancer but asbestos manufacture not banned in Australia until 1987

- **Childhood obesity**

The first data about increases in childhood obesity appeared in the 1960s, certainly by the 1980s but still little systematic policy response to quell the ‘obesogenic environment’

## Large Scale Trials in CVD Prevention

- **MRFIT (1972)**

Individual RCT of those with CVD risk factors - 361,602 screened - 12,866 were eligible and randomized

- **Nth Karelia Study (1972)**

180K intervention and 100K comparison (1975)

- **Stanford 5 City Project (1978)**

N = 300K with comparison

- **Pawtucket Heart Health**

N = 170K with comparison

- **Minnesota Heart Health (1980)**

N = 400K with comparison communities

- **COMMIT (1989)**

RCT of 22 communities involving 20K smokers

**No effects**

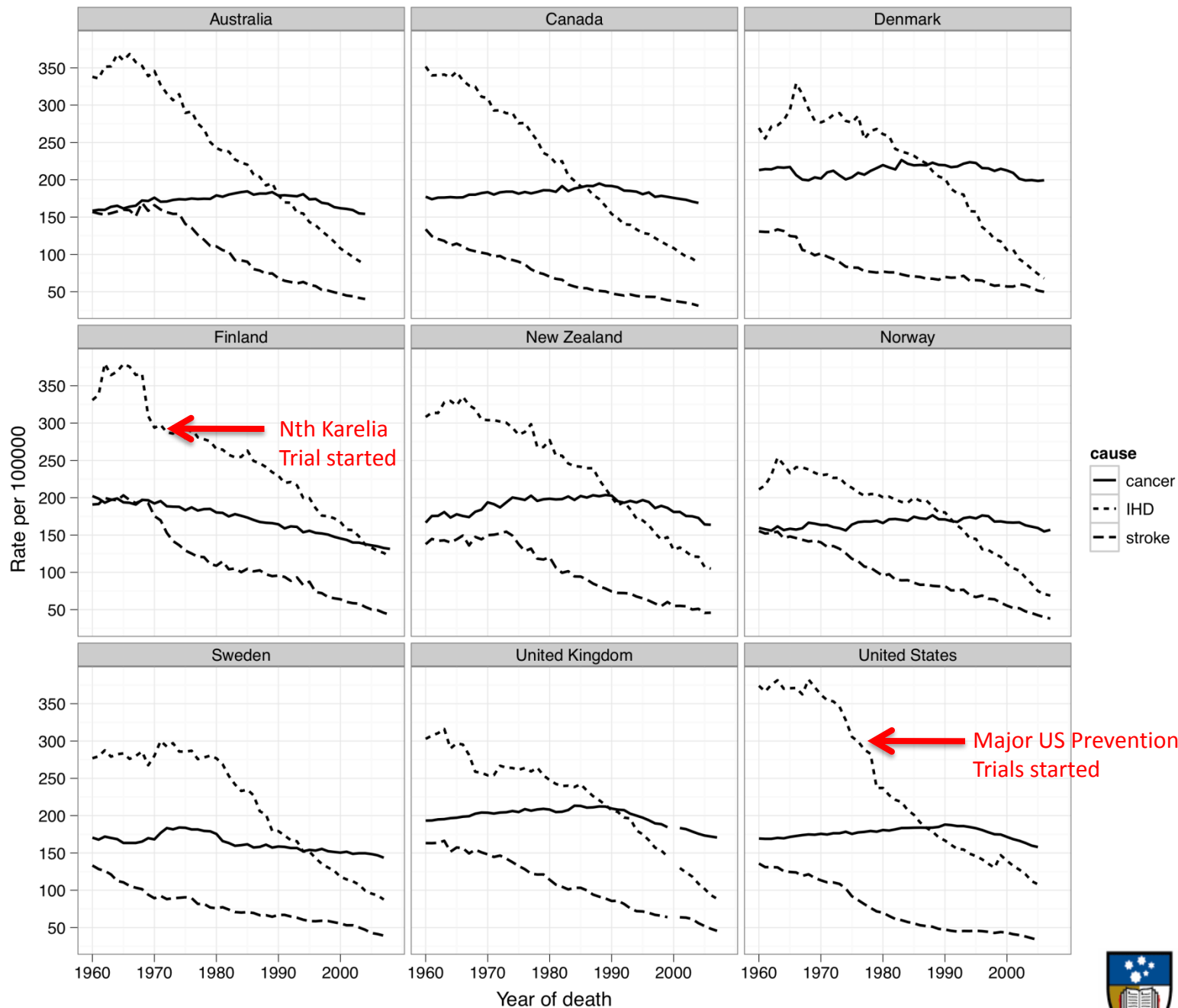
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## Community-based Health Intervention Trials: An Overview of Methodological Issues

Audie A. Atienza<sup>1</sup> and Abby C. King<sup>1,2</sup>

“The methodological issues we focus on here include randomization, statistical power, cohort versus cross-sectional assessments, secular trends, outcome measurement, and the role of conceptualization in methodological design.

Furthermore, the balance between scientific methodology and other practical issues (e.g., economic and sociopolitical issues) is discussed.” pg. 72



Harper, Lynch, Davey Smith. *Annual Reviews Public Health* (2011)

## Country and period of study

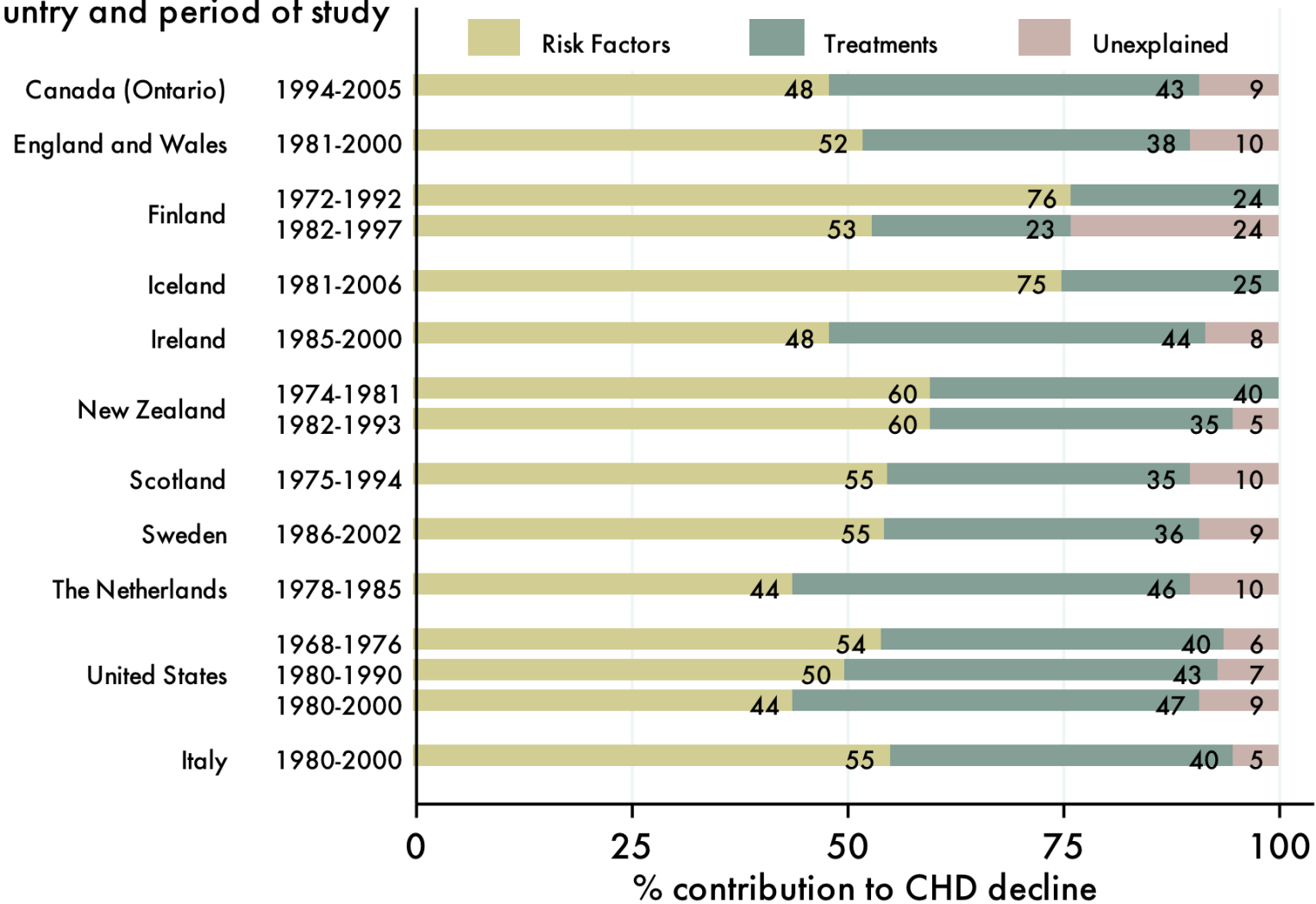


Figure 2. Estimated percentage contribution of changes in risk factors and treatments to declines in IHD mortality. Sources (refs. 3, 9, 11, 19, 20, 49, 70, 80, 141, 147)



FIG. 1. Cartoonist's depiction of the likely impact of the diet-heart link on farms around New Zealand.

Source: *New Zealand Herald*, 16 May 1973.



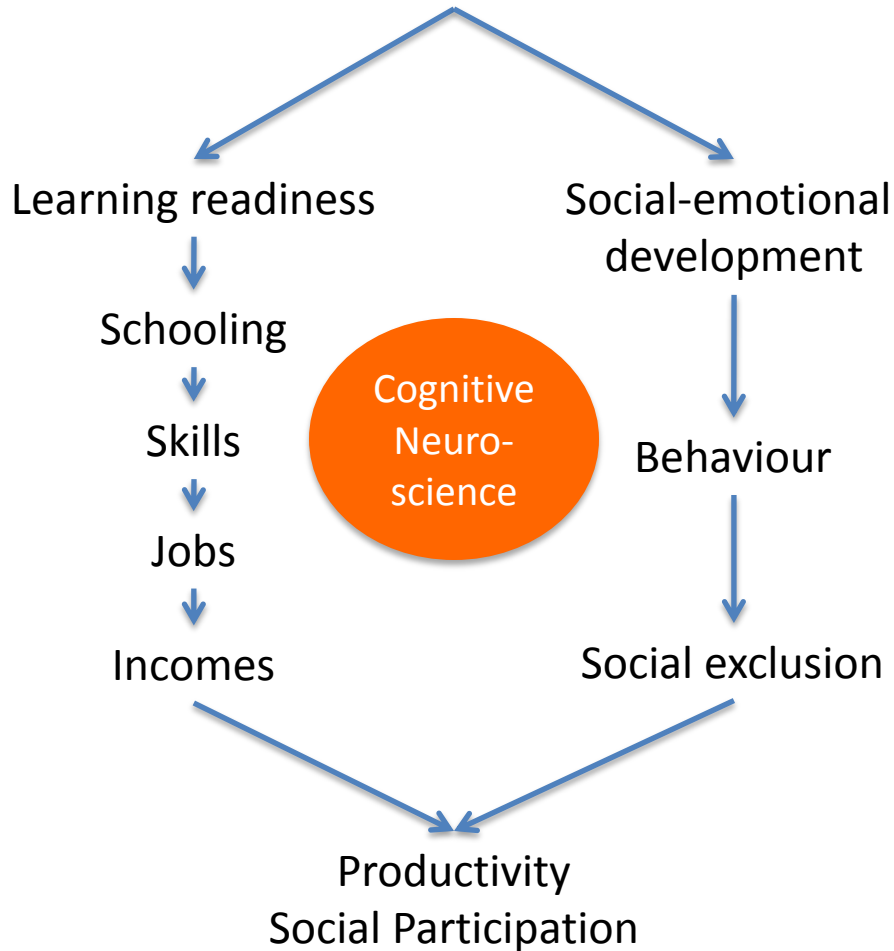
**ARACY**



Australian  
Research Alliance  
for Children  
& Youth

“We need to fill in the gaps in current knowledge about the complex issues facing children and young people as well as translate existing knowledge and evidence of 'what works' into practice and policy.”

# Policy Frameworks for Early Child Health and Development

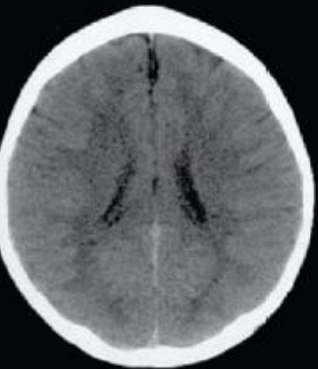


# Early Intervention: Smart Investment, Massive Savings

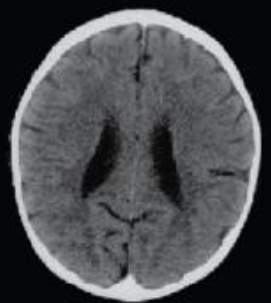
The Second Independent Report to Her Majesty's Government  
Graham Allen MP

3 Year old children

Costs to taxpayer



Normal



Extreme neglect



July 2011

HM Government

“My first Report detailed the immense penalties to society and to the individual of failing to provide a strong foundation of social and emotional capabilities early in life.

This second Report focuses more on addressing the vast financial and economic costs.”

Letter to the Prime Minister, David Cameron, July 2011



# Giving children a healthy start

Health report, February 2010



 audit  
commission

- Since 1999, there have been 20 national policies (approximately one every 6 months) aimed at improving the health of under-5s.
- In the last 10 years, £10.9 billion has been invested in programs aimed at improving the health of the under-5s, but this has not produced widespread improvements in health outcomes.
- Policy can be a problem, but here the big problem is implementation – getting quality on the ground

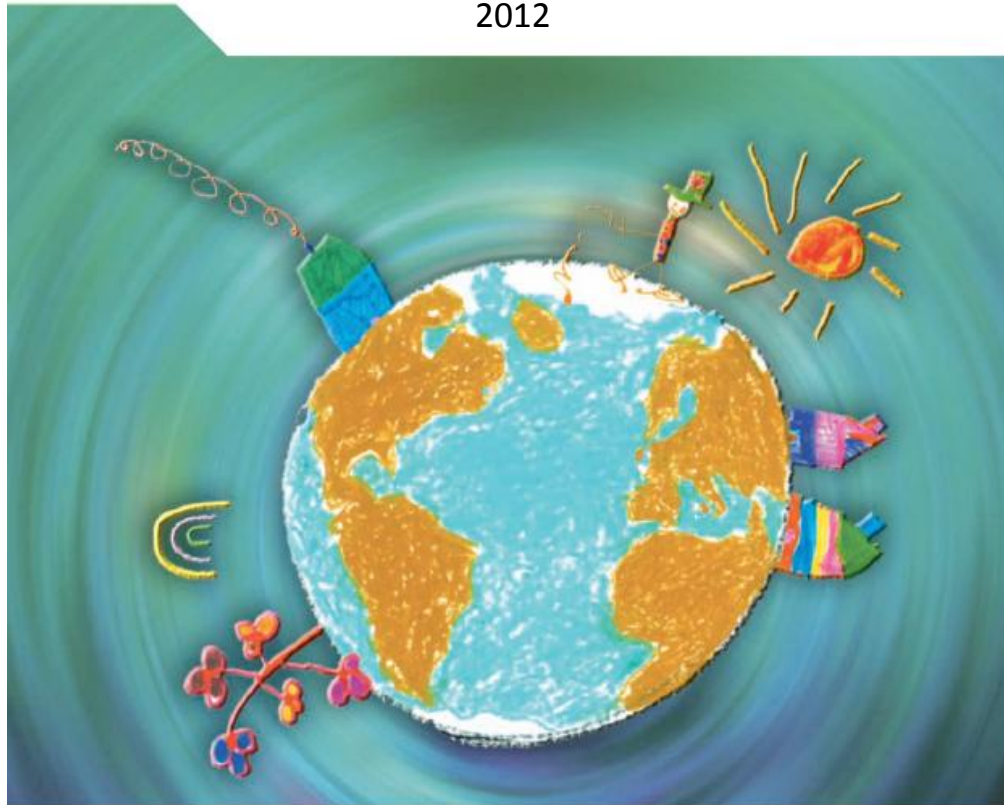


Quality Matters in Early Childhood  
Education and Care

# NEW ZEALAND

Miho Taguma, Ineke Litjens and Kelly Makowiecki

2012



# BELONGING, BEING & BECOMING



The Early Years Learning Framework for Australia

DEEWR (2009)

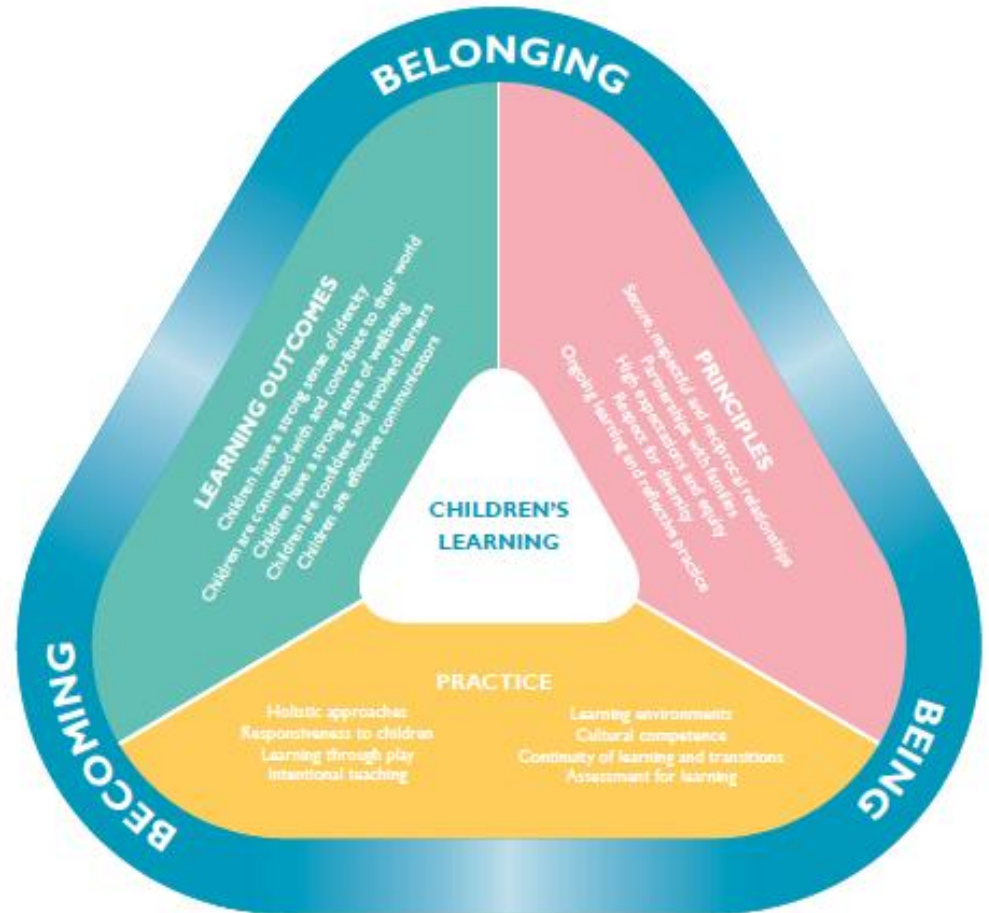


Figure 1: Elements of the Early Years Learning Framework



2012

HAVE YOUR SAY

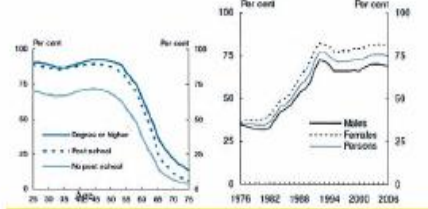
Every chance  
for every child  
Nurture. Learn. Achieve.



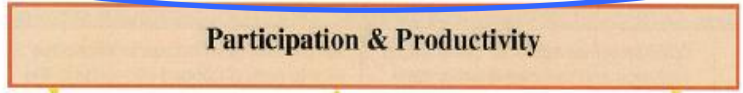
Policy discussion  
paper four

# The Participation and Productivity Policy Environment

Participation is highest for those with post-school qualifications..... but Yr 12 retention has stagnated



Early childhood, education, skills and workforce development policies could boost participation by 0.7 percentage points, and productivity by up to 1.2 per cent by 2030 (PC 2006). This corresponds to an increase in GDP of around 2.2 per cent, or around \$25 billion in today's dollars.



Average earnings are highest for those with high-level qualifications



**Early Childhood Development**  
 That children are born healthy and have access to the support, care and education throughout early childhood that equips them for life and learning, delivered in a way that actively engages parents, and meets the workforce participation needs of employers.

**Schooling**  
 That all Australian school students acquire the knowledge and skills to participate effectively in society and employment in a globalised economy.

**Skills and Workforce Development**  
 • All working aged Australians have the opportunity to develop the skills and qualifications needed, including through a responsive training system, to enable them to be effective participants in and contributors to the modern labour market.  
 • Individuals are assisted to overcome barriers to education, training and employment, and are motivated to acquire and utilise new skills.  
 • Australian industry and business develop, harness and utilise the skills and abilities of the

ASPIRATIONS  
 OUTCOMES  
 INDICATIVE PROGRESS MEASURES<sup>2</sup>  
 COAG TARGETS  
 ELECTION COMMITMENTS  
 POLICY DIRECTIONS

Early childhood, education, skills development policies could boost participation by 0.7% and productivity by up to 12% by 2030.

This corresponds to an increase in GDP of around 2.2% or around \$25 billion in today's dollars.

Children are born healthy<sup>1</sup>  
 Children acquire the basic skills for life and learning  
 Proportion of children born of low birth weight<sup>1</sup>  
 Further progress to be identified in months  
 • Universal access to early childhood education  
 • Halving the gap in maternal and child health outcomes in five years for Indigenous children  
 • Universal Access to a formal schooling, for all  
 • National rollout of the Early Childhood Workforce  
 • National Quality Standard  
 • A National Early Year Learning Framework  
 • Streamlined quality assurance  
 • Up to 260 new child care places  
 Policy directions:  
 • Improving antenatal care  
 • Strengthen the health system  
 • Improving the quality of care  
 • Enhancing and integrating services  
 • Boosting the participation of parents in the learning and development of their children

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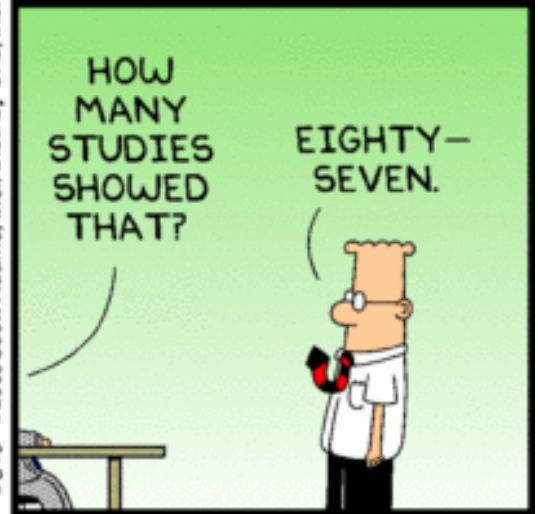
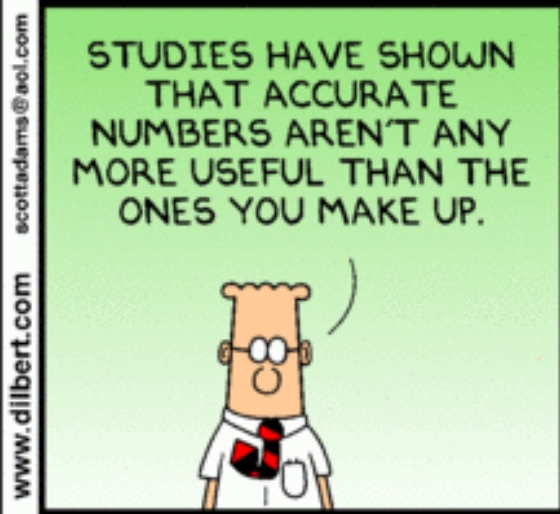
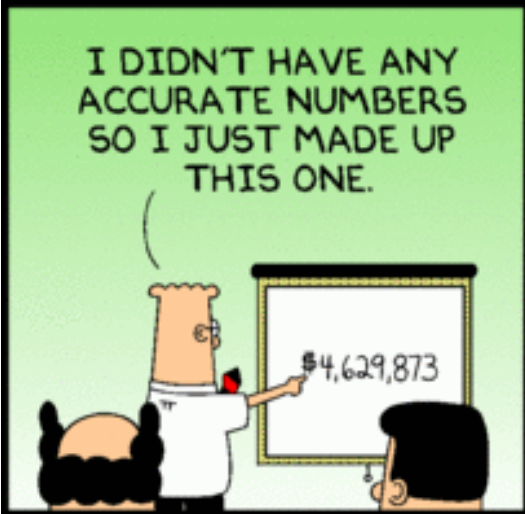
That all Australian school students acquire the knowledge and skills to participate effectively in society and employment in a globalised economy.  
 Integrated strategies for low SES school communities  
 Boosting parental engagement

All working aged Australians have the opportunity to develop the skills and qualifications needed, including through a responsive training system, to enable them to be effective participants in and contributors to the modern labour market.  
 Individuals are assisted to overcome barriers to education, training and employment, and are motivated to acquire and utilise new skills.  
 Australian industry and business develop, harness and utilise the skills and abilities of the  
 skills required by the 21<sup>st</sup> century labour market  
 Creating an investment environment and settings that optimises investment from all sources (governments, individuals, businesses and industry) including funding for delivery, tax policy, employment programs and incentives.  
 Renewal of governance framework to reinforce the role of industry and maximise effectiveness and efficiency in intergovernmental relations  
 Ensuring that skills are fully utilised and wastage of human capital is reduced

<sup>1</sup> The Productivity Agenda Working Group will work in partnership with Indigenous and Health COAG Working Groups <sup>2</sup> The target and related progress measures need to be consistent <sup>3</sup> All measures will be disaggregated by Indigenous and socio-economic status







www.dilbert.com scottadams@aol.com

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# Skill Formation and the Economics of Investing in Disadvantaged Children

James J. Heckman

This paper summarizes evidence on the effects of early environments on child, adolescent, and adult achievement. Life cycle skill formation is a dynamic process in which early inputs strongly affect the productivity of later inputs.

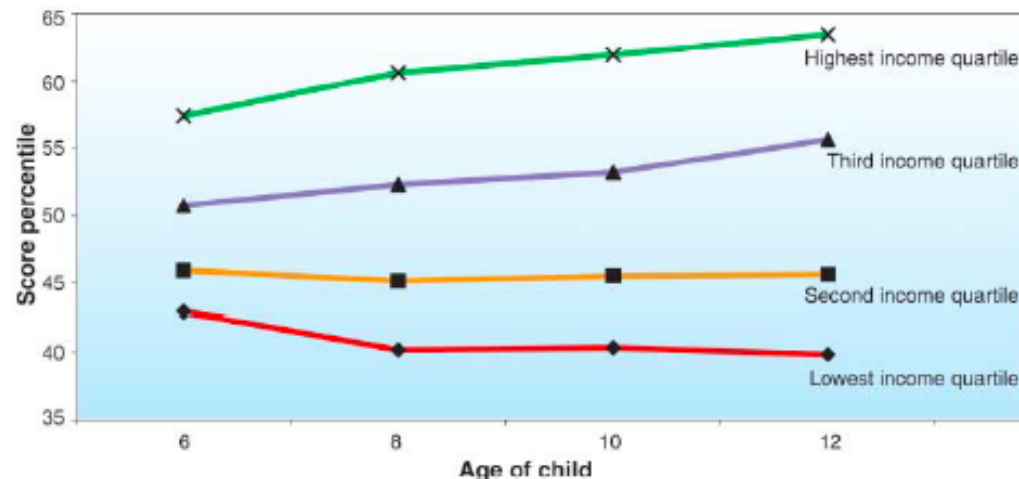
Four core concepts important to devising sound social policy toward early childhood have emerged from decades of independent research in economics, neuroscience, and developmental psychology (1). First, the architecture of the brain and the process of skill formation are influenced by an interaction between genetics and individual experience. Second, the mastery of skills that are essential for economic success and the development of their underlying neural pathways follow hierarchical rules. Later attainments build on foundations that are laid down earlier. Third, cognitive, linguistic, social, and emotional competencies are interdependent; all are shaped powerfully by the experiences of the developing child; and all contribute to success in the society at large. Fourth, although adaptation continues throughout life, human abilities are formed in a predictable sequence of sensitive periods, during which the development of specific neural circuits and the behaviors they mediate are most plastic and therefore optimally receptive to environmental influences.

A landmark study concluded that “virtually every aspect of early human development, from the brain’s evolving circuitry to the child’s capacity for empathy, is affected by the environments and experiences that are encountered in a

cumulative fashion, beginning in the prenatal period and extending throughout the early childhood years” (2). This principle stems from two characteristics that are intrinsic to the nature of learning: (i) early learning confers value on acquired skills, which leads to self-reinforcing motivation to learn more, and (ii) early mastery of a range of cognitive, social, and emotional competencies makes learning at later ages more efficient and therefore easier and more likely to continue.

Early family environments are major predictors of cognitive and noncognitive abilities. Research has documented the early (by ages 4 to 6) emergence and persistence of gaps in cognitive and noncognitive skills (3, 4). Environments that do not stimulate the young and fail to cultivate these skills at early ages place children at an early disadvantage. Disadvantage arises more from lack of cognitive and noncognitive stimulation given to young children than simply from the lack of financial resources.

This is a source of concern because family environments have deteriorated. More U.S. children are born to teenage mothers or are living in single parent homes compared with 40 years ago (5). Disadvantage is associated with poor parenting practices and lack of positive cognitive and noncognitive stimulation. A child who falls behind may never catch up. The track records for criminal rehabilitation, adult literacy, and public job training programs for disadvantaged young adults are remarkably poor (3). Disadvantaged early en-

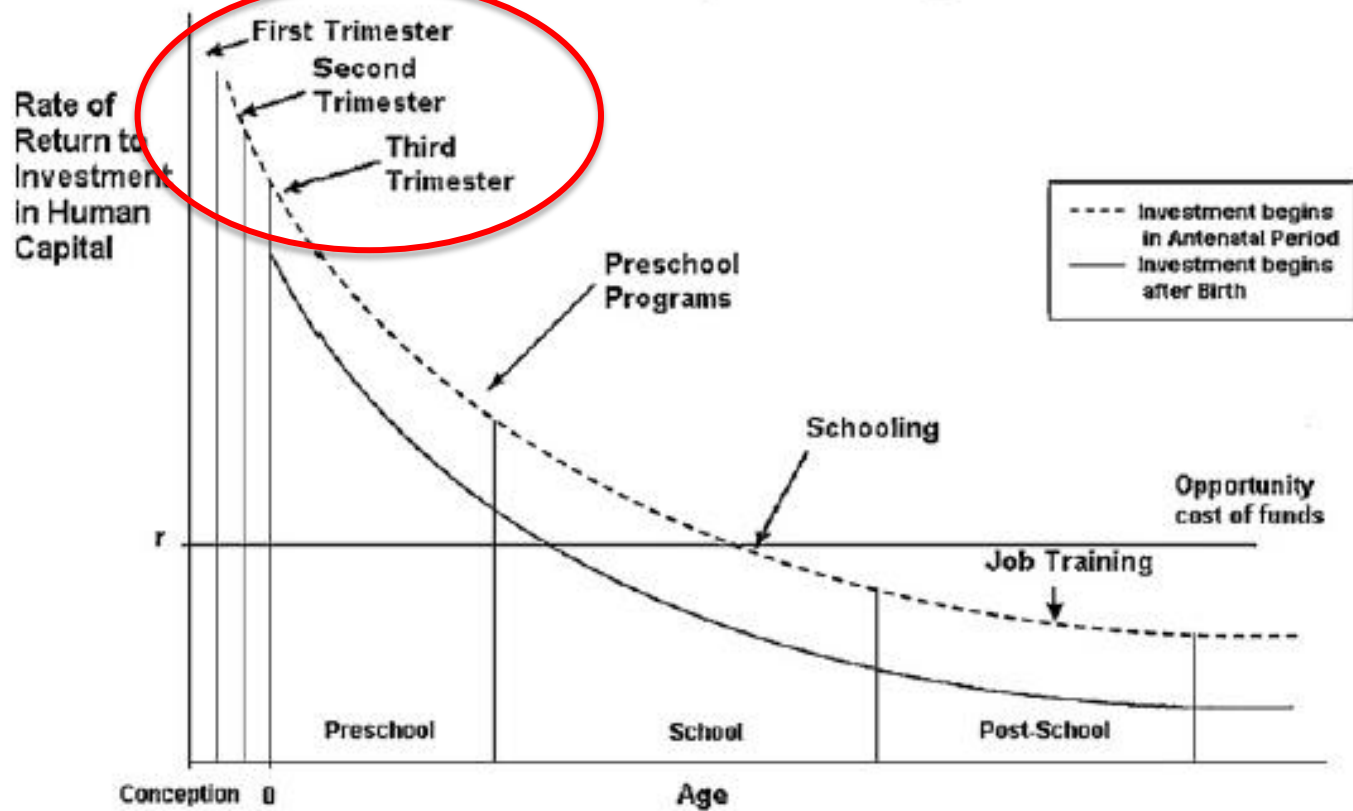


**Fig. 1.** Average percentile rank on Peabody Individual Achievement Test–Math score by age and income quartile. Income quartiles are computed from average family income between the ages of 6 and 10. Adapted from (3) with permission from MIT Press.

Department of Economics, University of Chicago, Chicago, IL 60637, USA. Department of Economics, University College Dublin, Dublin 4, Ireland. E-mail: jjh@uchicago.edu

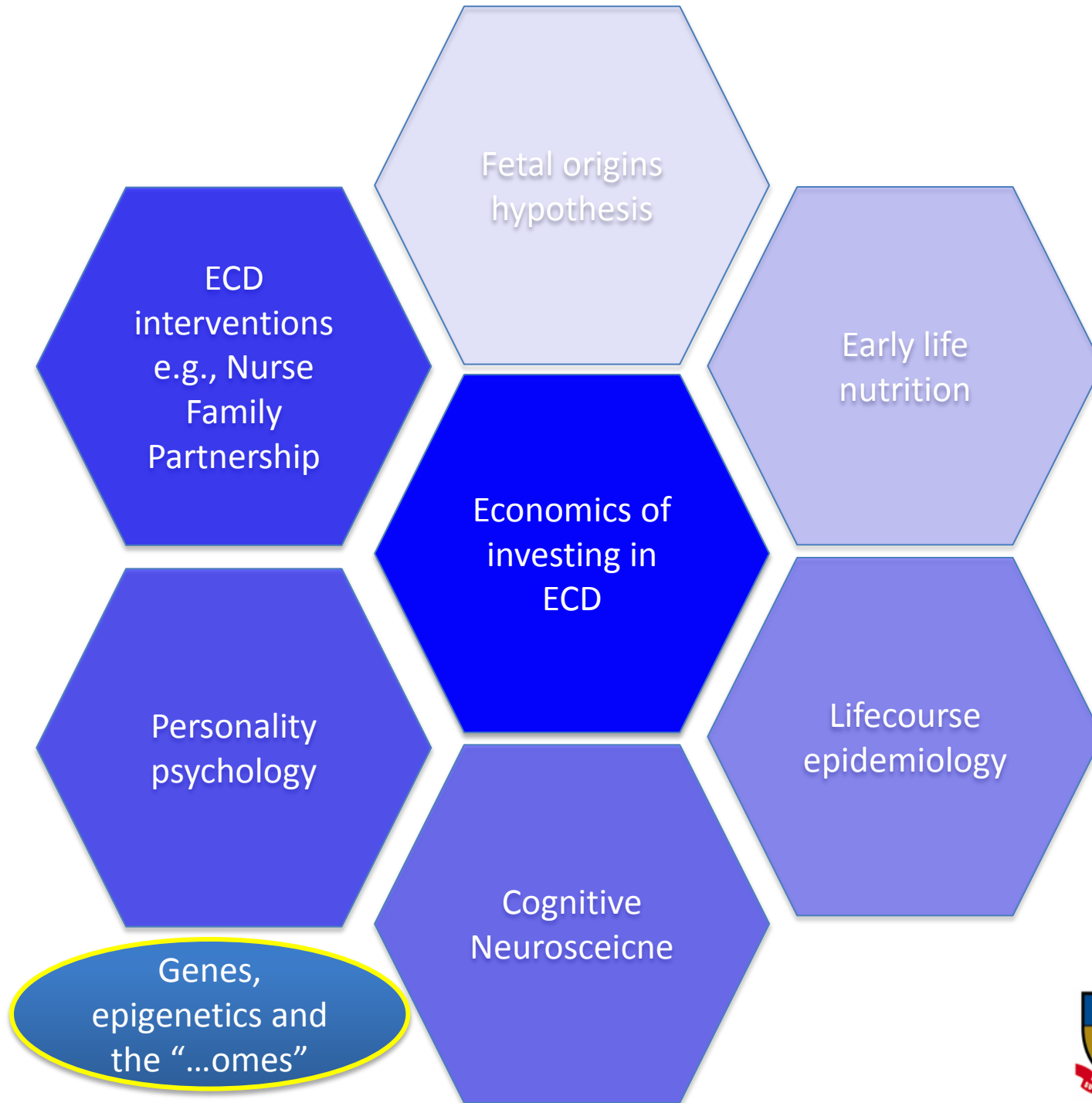
(B)

Rates of Return to Human Capital Investment Setting Investment to be Equal across all Ages



Rates of return to human capital investment setting investment to be equal across all ages

Fig. 2. Rates of return to human capital investment.

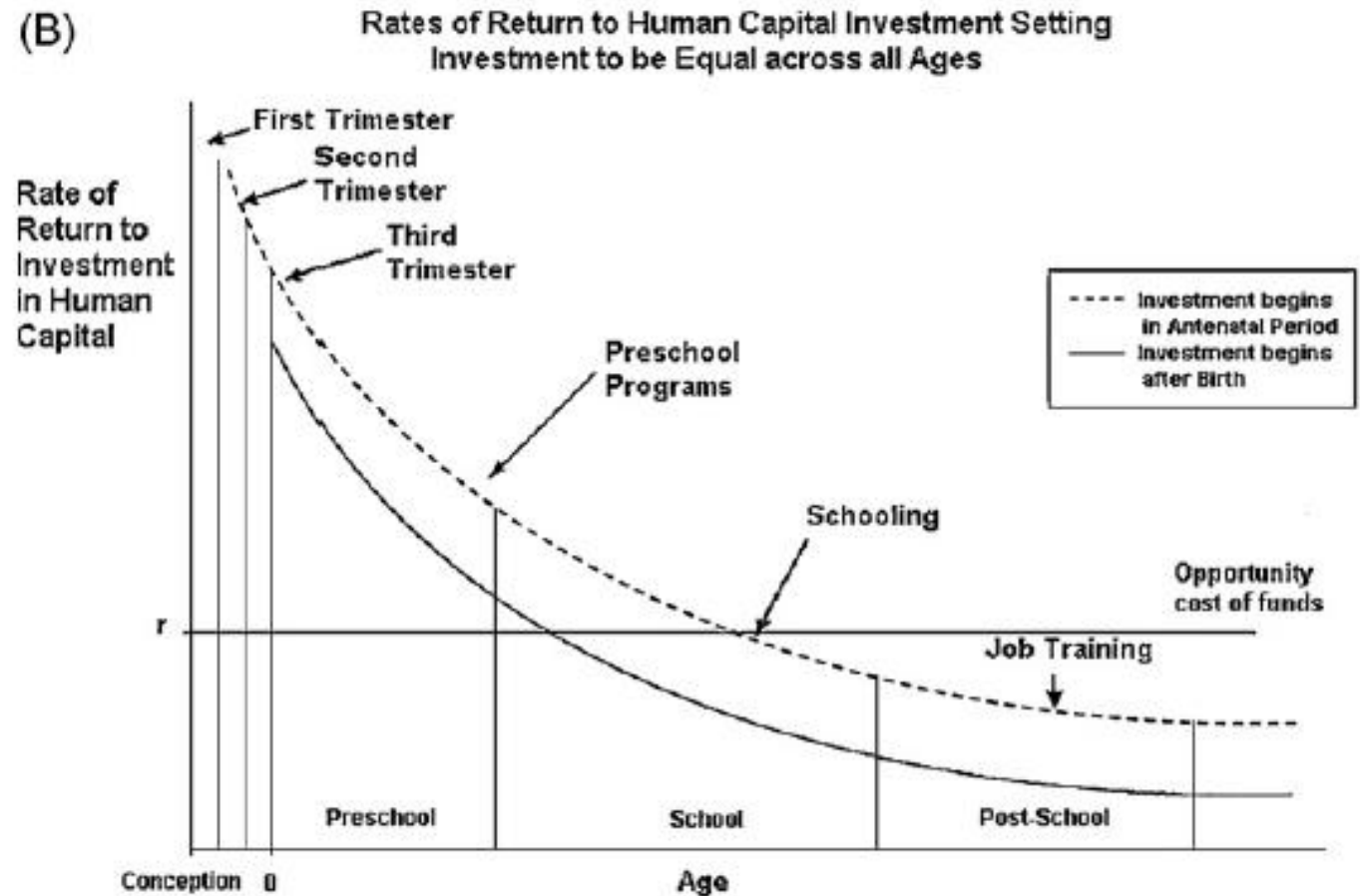




Requires more than evidence synthesis (combining - e.g., meta-analysis)

Requires complex evidence integration (making whole - e.g., simulation)

(B)



Rates of return to human capital investment setting investment to be equal across all ages

Fig. 2. Rates of return to human capital investment.

An evidence jigsaw  
for child health and development



0 4wks 2 5 6 8 10 12 14 17 25

Early childhood

Parents  
Carers

Midwives  
OBGYN

Child Health  
Nurses

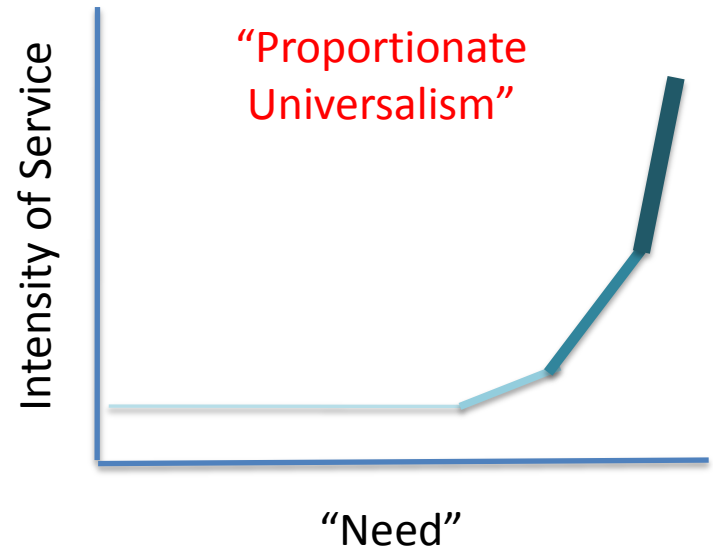
General Practice / Pediatrics

Child Care

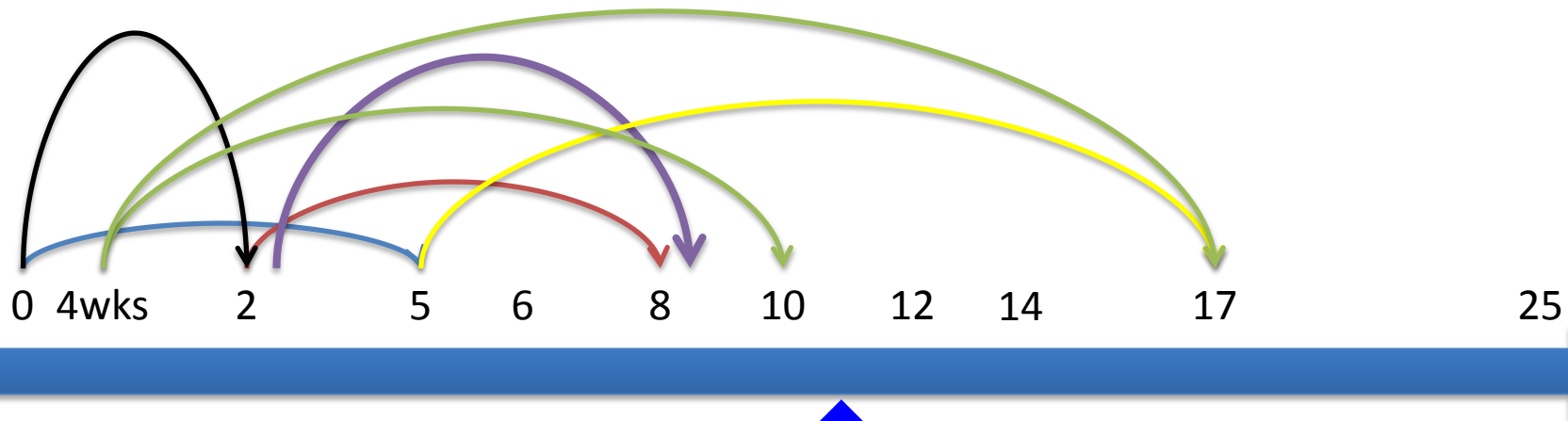
Preschool

Teachers

Child Protection and Social Work







Perinatal factors and child health and development

Family support programs

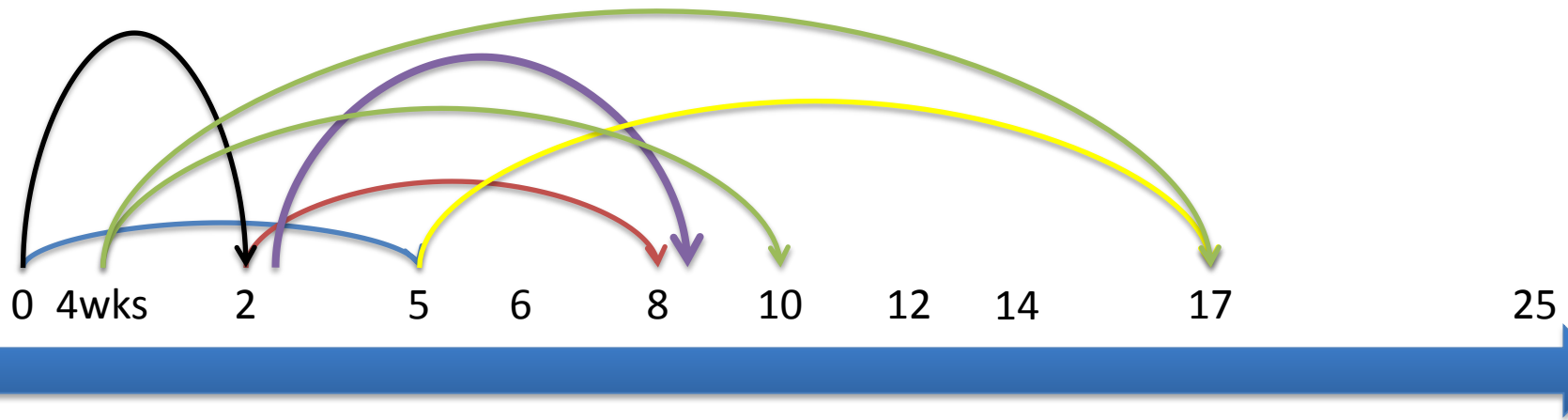
Child care and cognitive development

Early life diet and cognitive, social and emotional development, and CVD risk factor

Early life self regulation, social and emotional development

Early life social determinants, self regulation and school achievement, health behaviours and CVD risk

**Social inequality**



Perinatal factors and child health and development

Data linkage

Family support programs

Pragmatic RCTs and screening predictive validity

Child care and cognitive development

Cohorts studies - LSAC

Early life diet and cognitive, social emotional development, and CVD risk factors

Early life self regulation and cognitive, social emotional development

Cohorts studies  
-ALSPAC

Self regulation and school achievement,  
health behaviours and CVD risk

Data linkage  
and cohorts

0 4wks 2 5 6 8 10 12 14 17 25

Data Linkage n= ~20,000 births per year in SA

Natural Experiment

Family Home Visiting

RCTs

Family Home Visiting; Weaning diet

Interventions

Integrated Children's Centres (Sure Start) – childcare/preschool

Screening

Universal contact (4wks) – FHV; 4 yr health check; AEDI @ 5)

Cohorts: LSAC and LSIC

Cohorts: LSAY

ALSPAC

0 4wks

2

5

6

8

10

12

14

17

25

Data Linkage n= ~20,000 births per year

- Perinatal (pregnancy) includes depression
- Universal Contact Visit (age 4-6 weeks) includes depression, weight, height, etc
- Age 4 – preschool health check includes height, weight
- AEDI (age 5) physical, language, social, emotional, communication
- NAPLAN (ages 8, 10, 12 14) reading, writing, literacy, numeracy
- Hospitalizations
- Emergency Dept
  
- Child care and preschool
  
- General Practice?

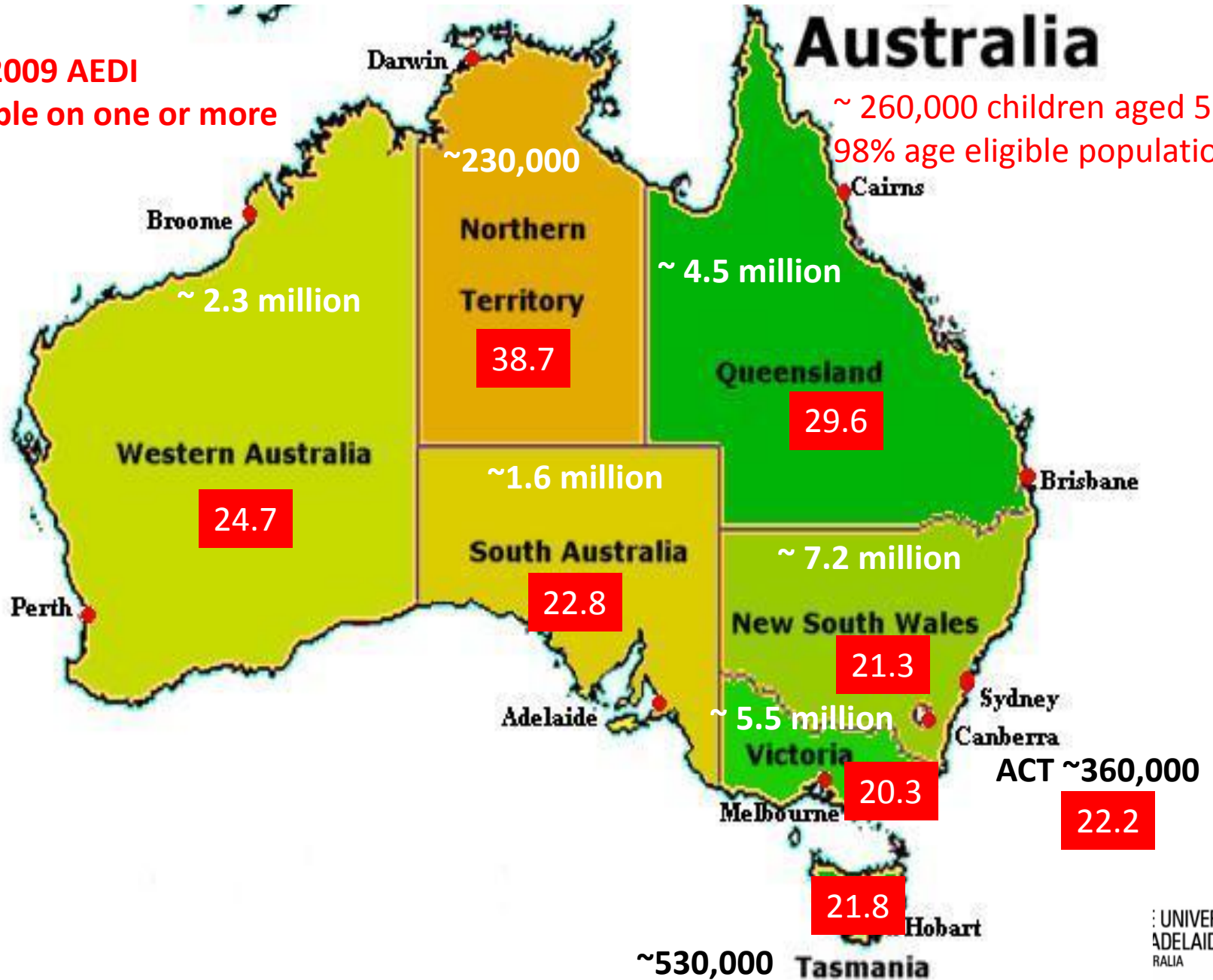
~ 22 million people

# Australia

~ 260,000 children aged 5  
98% age eligible population

2009 AEDI

% vulnerable on one or more



0 4wks 2 5 6 8 10 12 14 17 25

Natural Experiment

Family Home Visiting Evaluation

RCTs

Family Home Visiting; Weaning diet

Interventions

Integrated Children's Centres – childcare/preschool

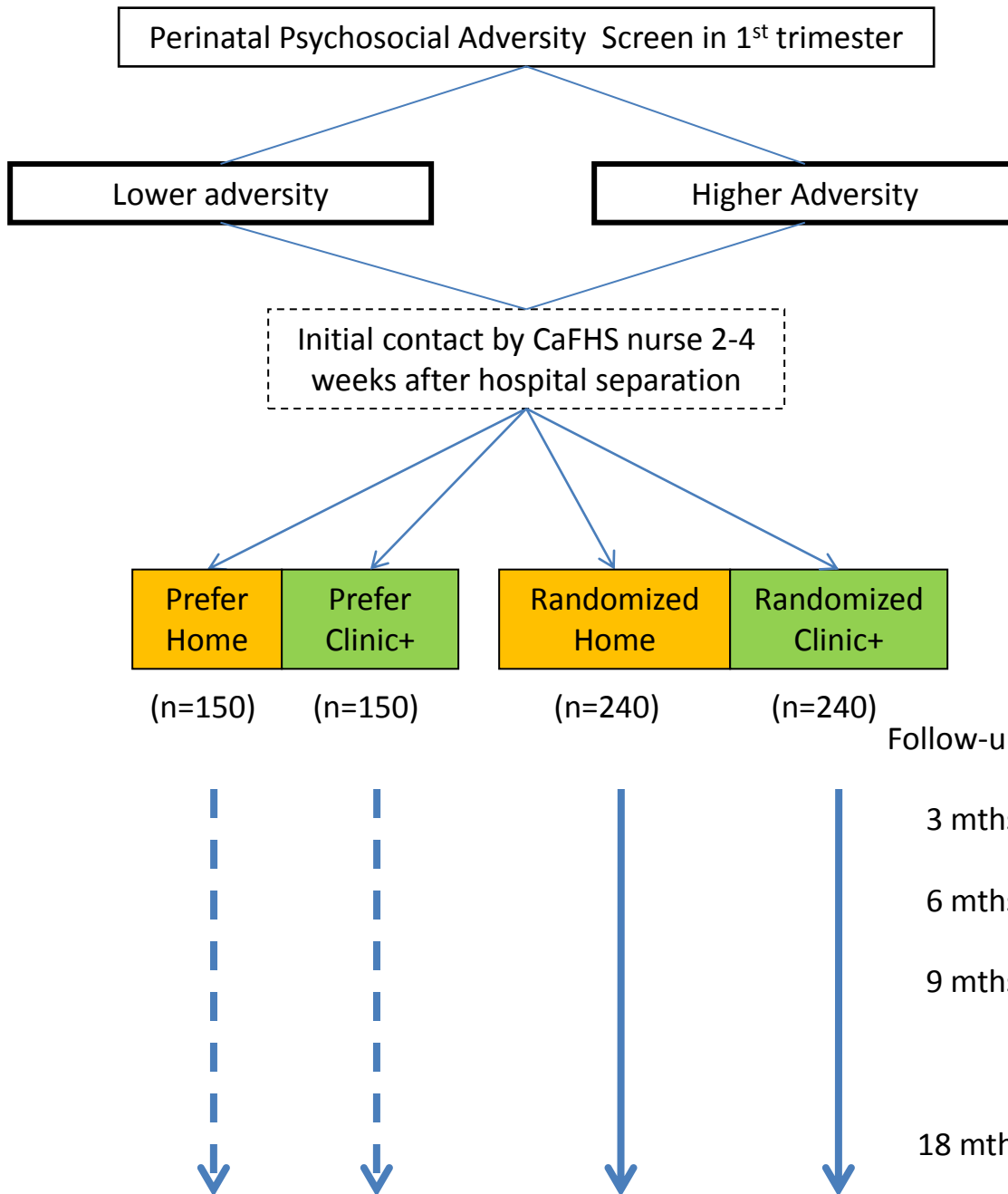
### Family Home Visiting (FHV)

- Evaluation of natural experiment roll-out 2009-2011, follow-up to 2014
- Pragmatic trial of universal contact visit
- Planned RCT of 'next gen' FHV

### Weaning Diet Trial – obesity prevention


### Evaluation of Intervention

- Children's Centres – integrate quality child care and preschool (Sure Start)



Pragmatic  
Randomized  
Preference  
Equivalence Trial  
of Nurse Home Visiting

0 4wks 2 5 6 8 10 12 14 17 25



Screening

“Proportionate Universalism” – but who gets more intensive support?

Screening for FHV at 3-4 weeks postpartum

- Risk stratification

3-4 Year Old Health Check

- Done by both GPs and Child Family Health Nurses (@ 4 yr immunization)
- Care pathways?

AEDI at age 5

- Risk stratification
- Care pathways?



# PEDIATRICS®

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

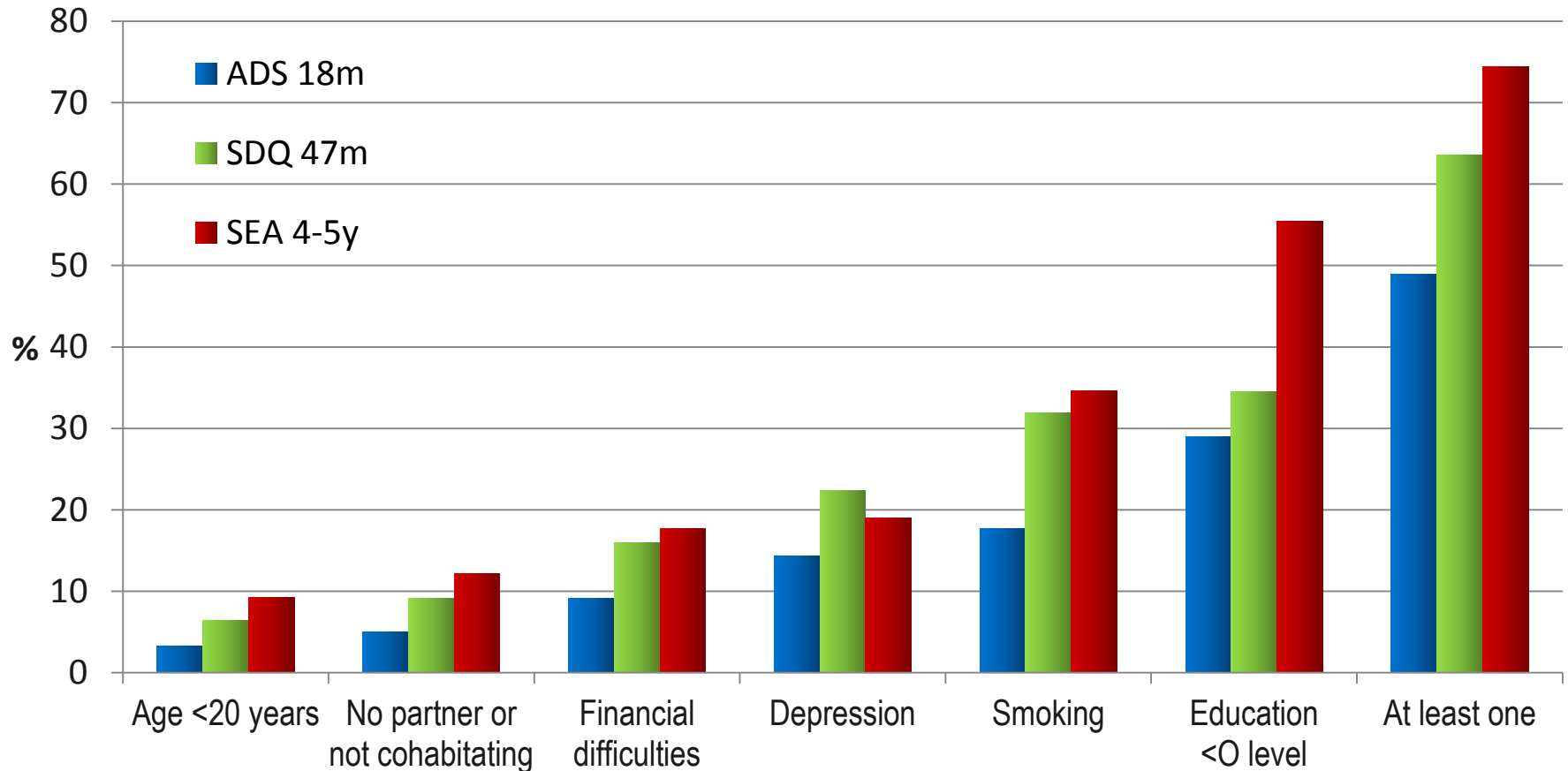
## **Young Maternal Age and Poor Child Development: Predictive Validity From a Birth Cohort**

Catherine R. Chittleborough, Debbie A. Lawlor and John W. Lynch

*Pediatrics*; originally published online May 2, 2011;

DOI: 10.1542/peds.2010-3222

# Proportion of child outcome cases identified with each predictor



0 4wks

2

5

6

8

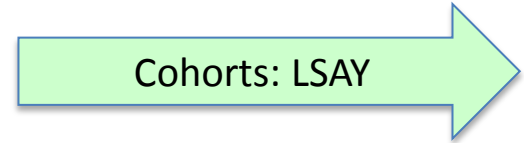
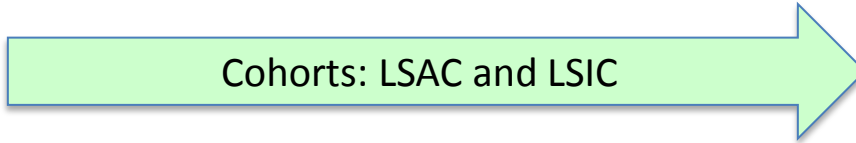
10

12

14

17

25



**Table 1 Measures included in the Outcome Index in each cohort at Waves 1, 2 and 3**

Domain	Subdomain	Aged 0–1	Aged 2–3	Aged 4–5	Aged 6–7 and 8–9
Health/ Physical	Health	Overall rating of health Special health care needs Health problems	Overall rating of health Special health care needs Health problems Weight status	Overall rating of health Special health care needs Health problems Weight status	Overall rating of health Special health care needs Health problems Weight status
	Motor		PedsQL Physical Health	Pedsql Physical Health	Gross motor coordination PedsQL Physical Health
Social/ Emotional	Internalising	STSI Approach STSI Irritability STSI Cooperativeness	Factor-analysed BITSEA Internalising	SDQ Emotional Symptoms	SDQ Emotional Symptoms
	Externalising		Factor-analysed BITSEA Externalising	SDQ Conduct Problems SDQ Hyperactivity	SDQ Conduct Problems SDQ Hyperactivity
	Social Competence		Factor-analysed BITSEA Social Competence	SDQ Peer Problems SDQ Prosocial	SDQ Peer Problems SDQ Prosocial
Learning/ Academic	Language and Literacy	CSBS Total Standardised Score	Child's communication skills MCDI-III Vocabulary MCDI-III Grammatical Markers	WAI PPVT	PPVT ARS Language and Literacy
	Numeracy and Cognition			Teacher rating of numeracy skills	WISC-IV Matrix Reasoning ARS Mathematical Thinking

0

25

Cohorts: LSAY

National

n = 1995

• ages 0-1

= ~12,000

n=10,000

ages PISA sample

• ages 1-4

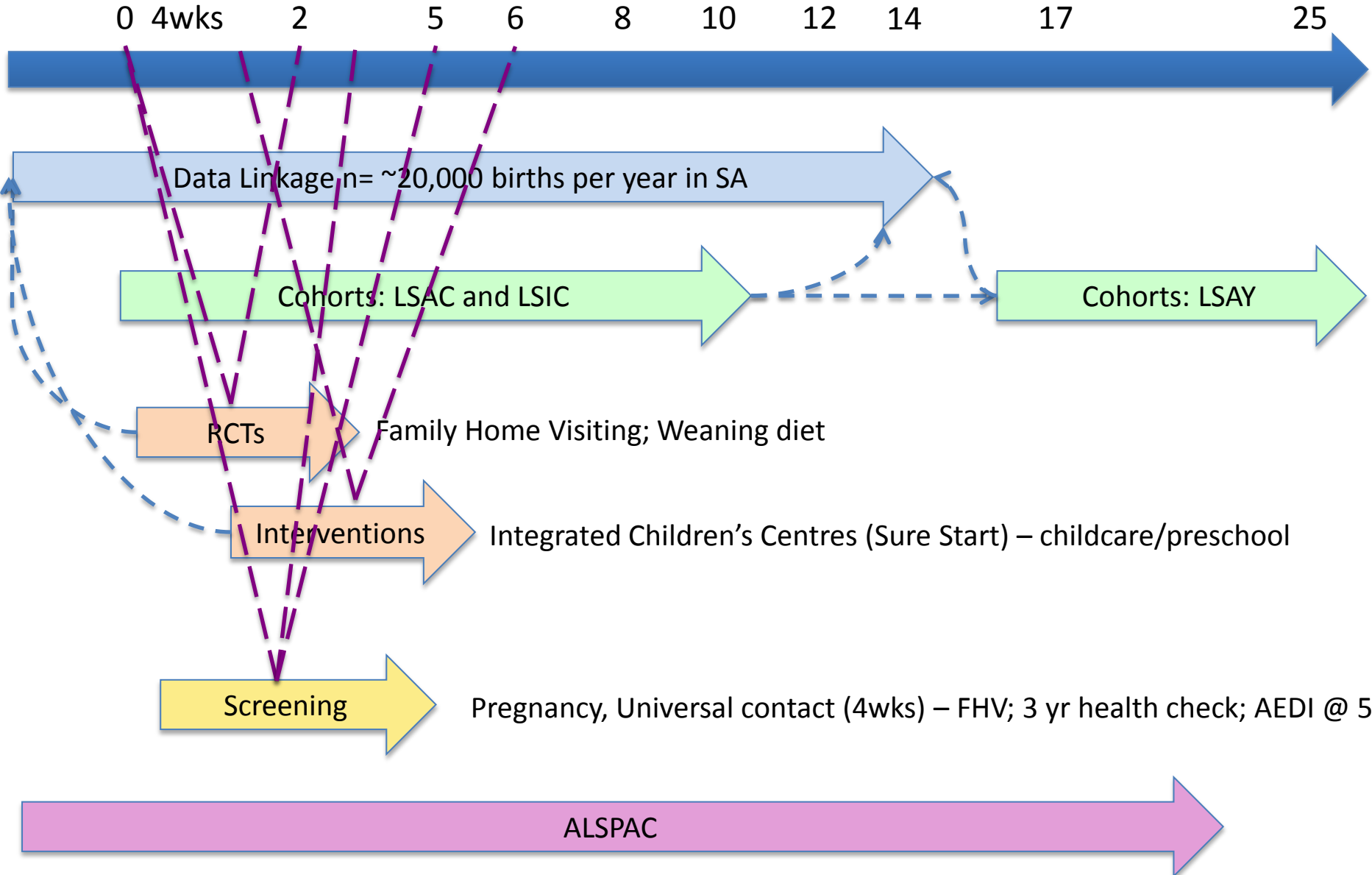
cohorts from school

• behavior

• LSAC sir

Notes: PedsQL = Pediatric Quality of Life inventory; STSI = Short Temperament Scale for Infants; BITSEA = Brief Infant Toddler Social Emotional Adjustment scale; SDQ = Strengths and Difficulties Questionnaire; CSBS = Communication and Symbolic Behaviour Scale; MCDI-III = MacArthur Communicative Development Inventory, Level III; WAI = Who Am I? test; PPVT = Peabody Picture Vocabulary Test; ARS = Academic Rating Scale; WISC-IV = Wechsler Intelligence Scale for Children IV.





Requires more than evidence synthesis (combining)

Requires complex evidence integration (making whole)

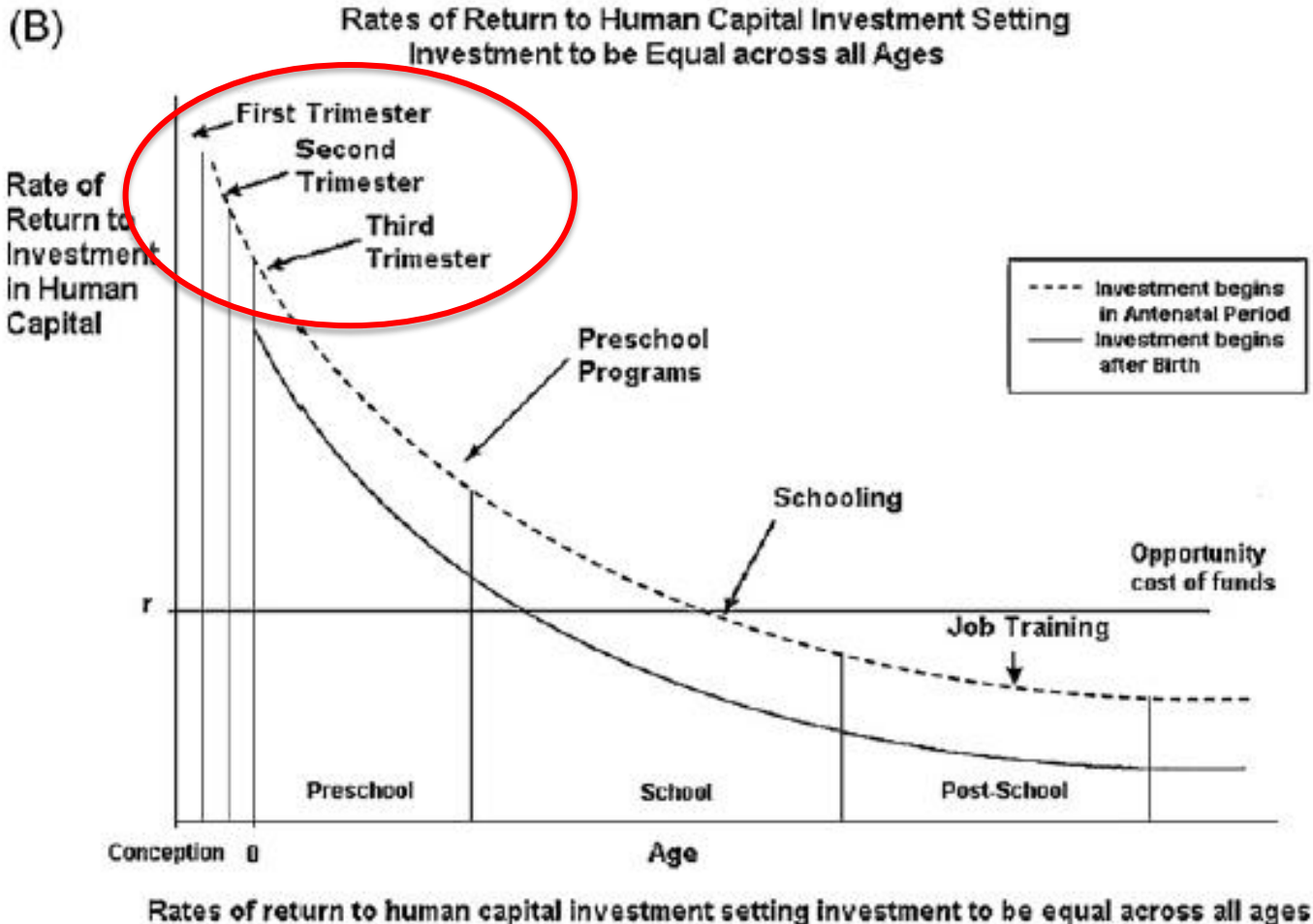
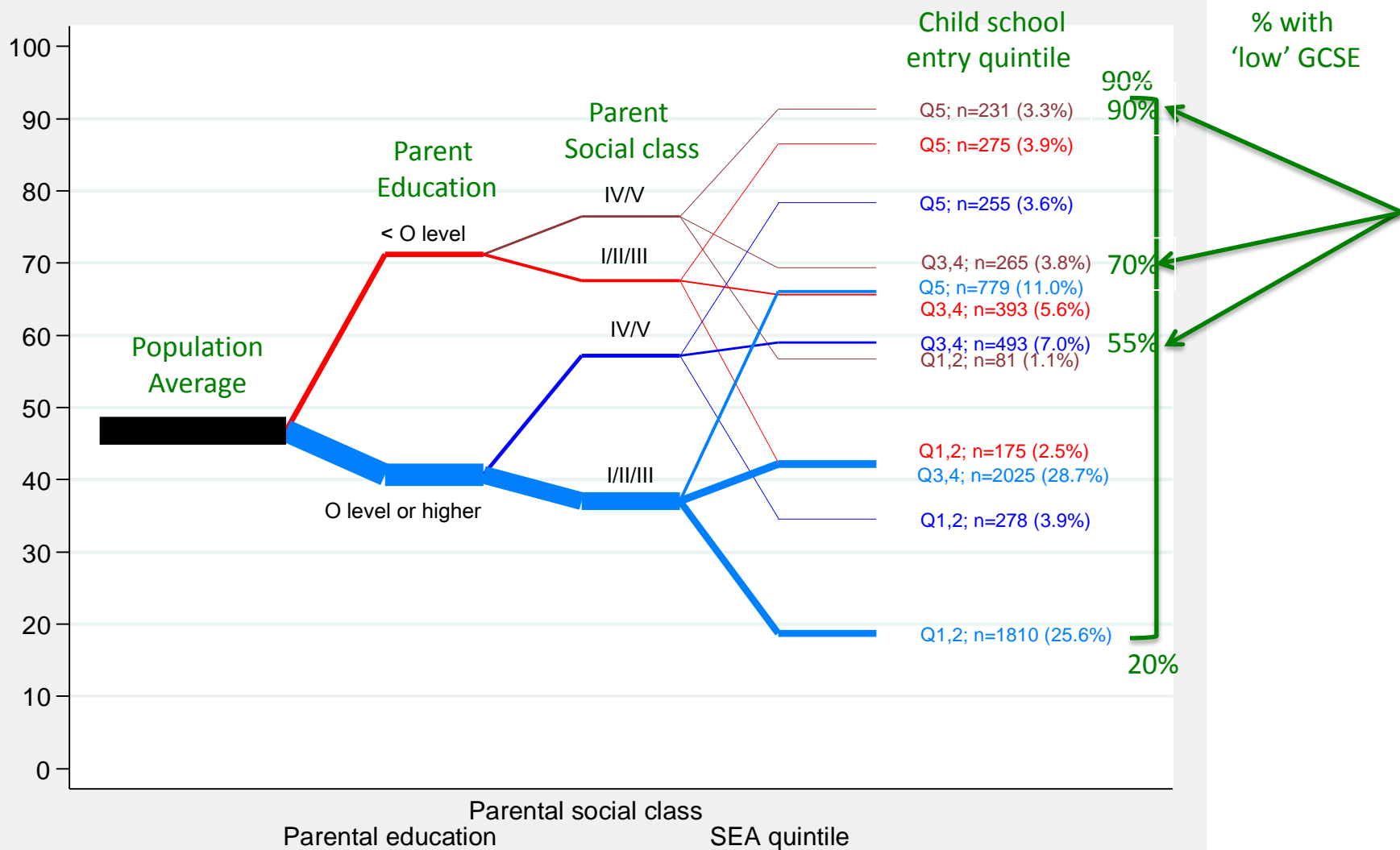


Fig. 2. Rates of return to human capital investment.

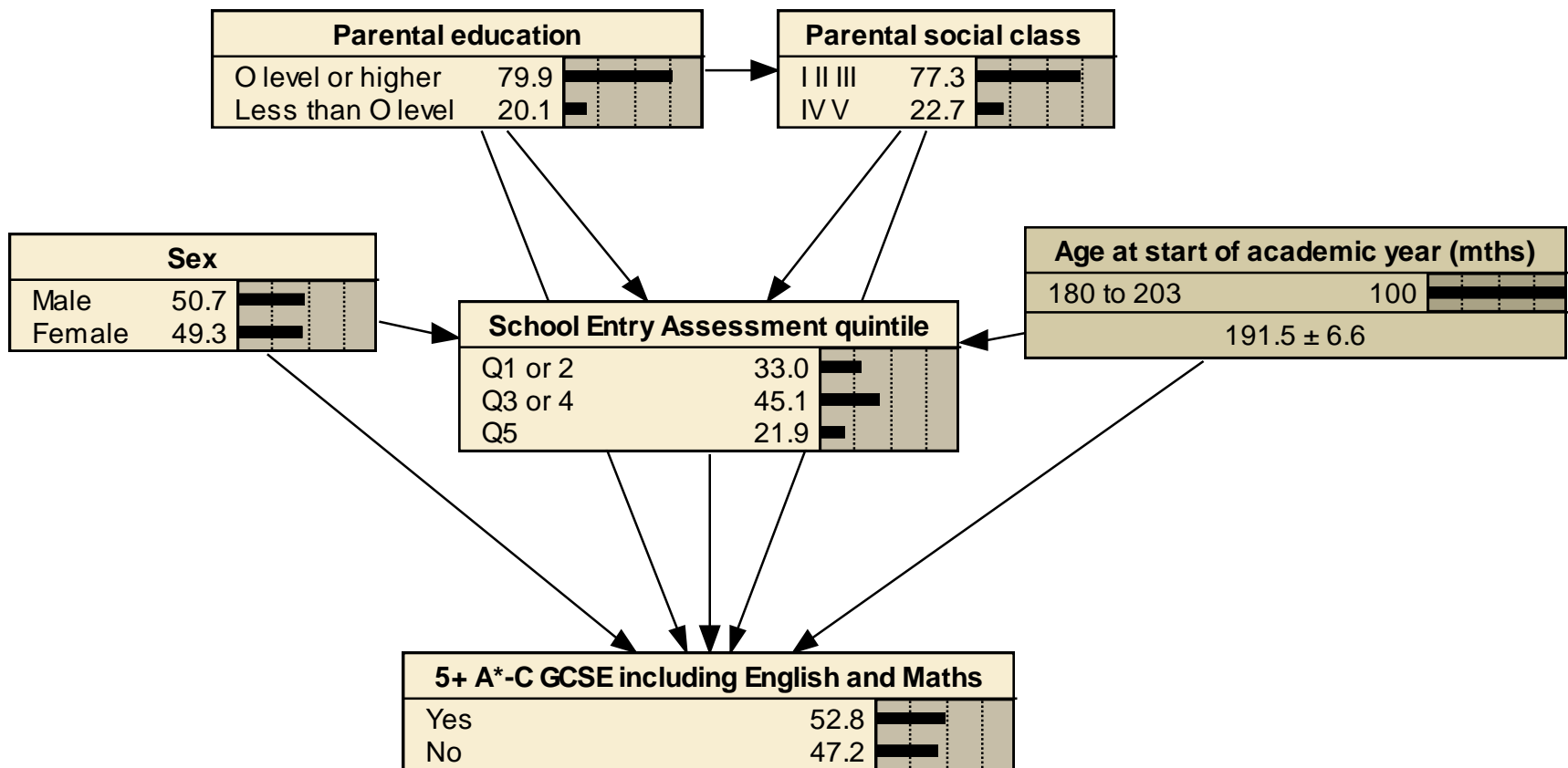
# Evidence Integration

What if ... ?



ALSPAC Data (unpublished)

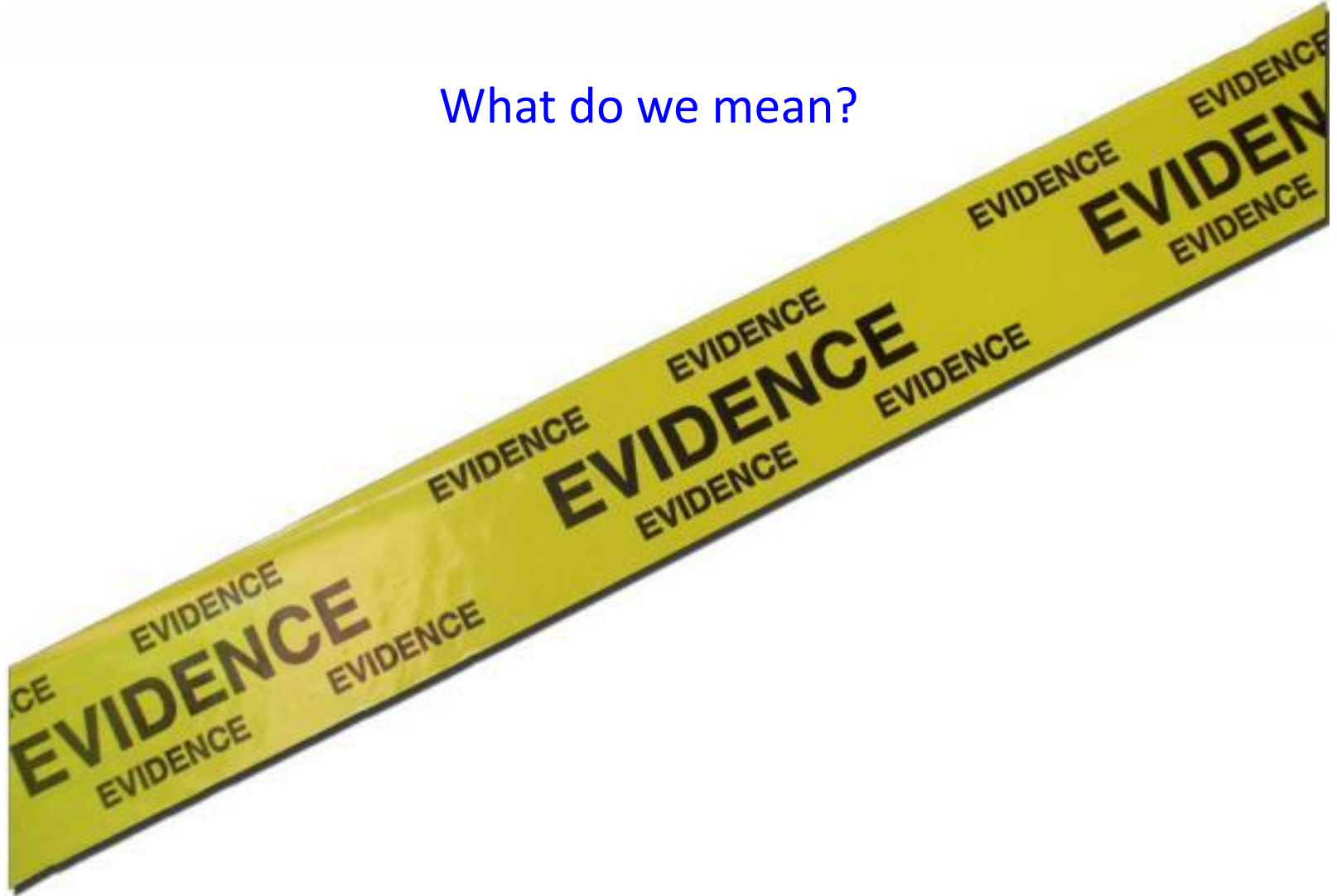




Bayesian Network

ALSPAC data, N=7060

What do we mean?



Research  
Production

The Gap

Translation



Research  
Consumption

Different concepts and  
uses of 'evidence'

“Statistics are like a drunk with a lamp post: used more for support than illumination.”

Winston Churchill



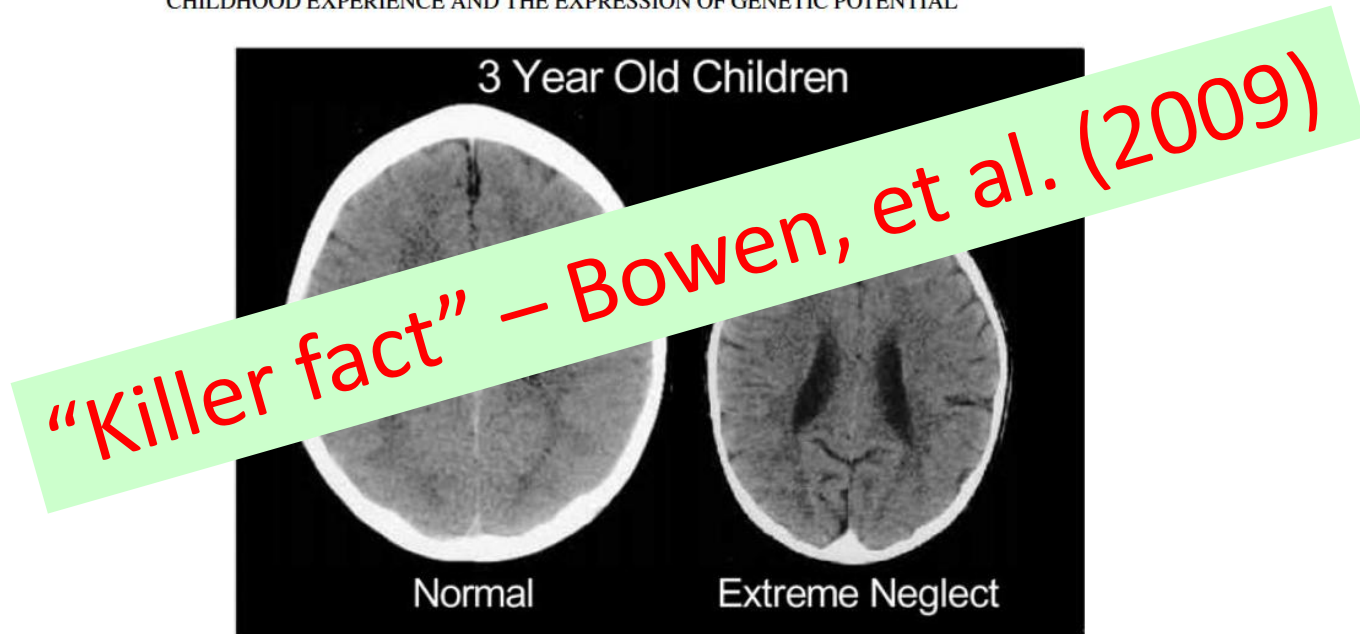
## Childhood Experience and the Expression of Genetic Potential: What Childhood Neglect Tells Us About Nature and Nurture

BRUCE D. PERRY

The ChildTrauma Academy, 5161 San Felipe, Suite 320, Houston, TX 77056, USA

(E-mail: ChildTrauma1@aol.com)

### CHILDHOOD EXPERIENCE AND THE EXPRESSION OF GENETIC POTENTIAL



*Figure 1.* Abnormal brain development following sensory neglect in early childhood. These images illustrate the negative impact of neglect on the developing brain. In the CT scan on the left is an image from a healthy three year old with an average head size (50th percentile). The image on the right is from a three year old child suffering from severe sensory-deprivation neglect. This child's brain is significantly smaller than average (3rd percentile) and has enlarged ventricles and cortical atrophy.

## Iain Duncan Smith 'distorted' research on childhood neglect and brain size

Research focusing on effects of extreme abuse was 'grossly misrepresented' by former Tory leader, neuroscientist says

Paul Lewis and Sarah Boseley

guardian.co.uk, Friday 9 April 2010 18.27 BST

[A](#) [larger](#) | [smaller](#)



Iain Duncan Smith at an estate in Glasgow. His recent speeches have drawn a link between children's brain development and crime in later life. Photo: Murdo Macleod

Dr Perry was shown the transcript along with three other examples ...

Dr. Perry concluded Duncan Smith's comments were an

"oversimplification" that "greatly misrepresents the way we would explain the impact of neglect or trauma on the developing brain".

He added: "to oversimplify this way is, essentially, to distort".

## Uncomfortable Science



John Tukey (1915-2000) - Princeton statistician

“Uncomfortable science” – when there is a need to draw an inference from a limited sample of data, where further samples influenced by the same cause system will not be available.

“Far better an approximate answer to the right question, which is often vague, than an exact answer to the wrong question, which can always be made precise.”

John Tukey. The future of data analysis. *Ann Math Stat* (1962)