



Institute of Metabolic Science



MRC
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Unit



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CAMBRIDGE

Trends in overweight: Encouragement for further action

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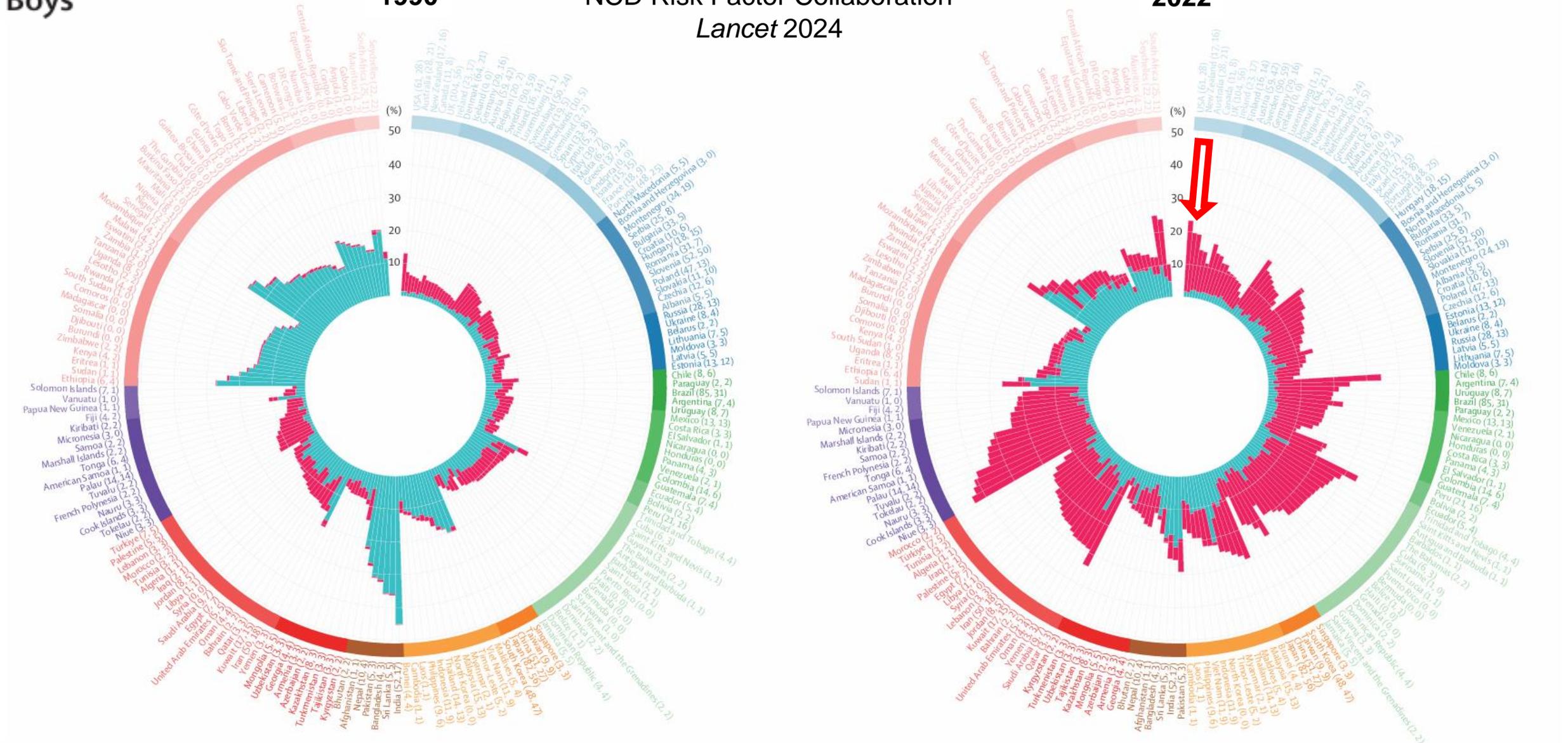
Cambridge University Hospitals NHS Trust

Boys

1990

NCD Risk Factor Collaboration
Lancet 2024

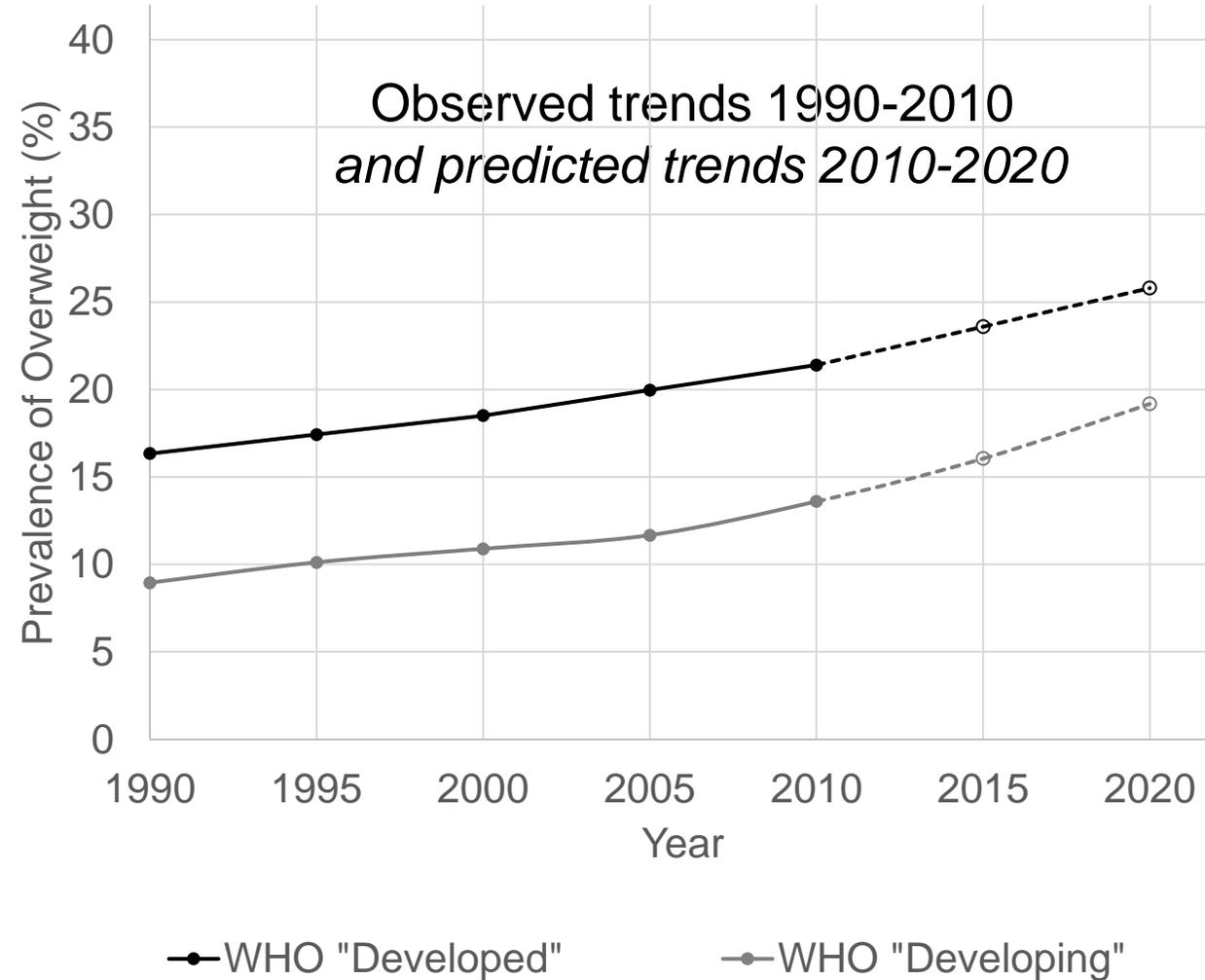
2022



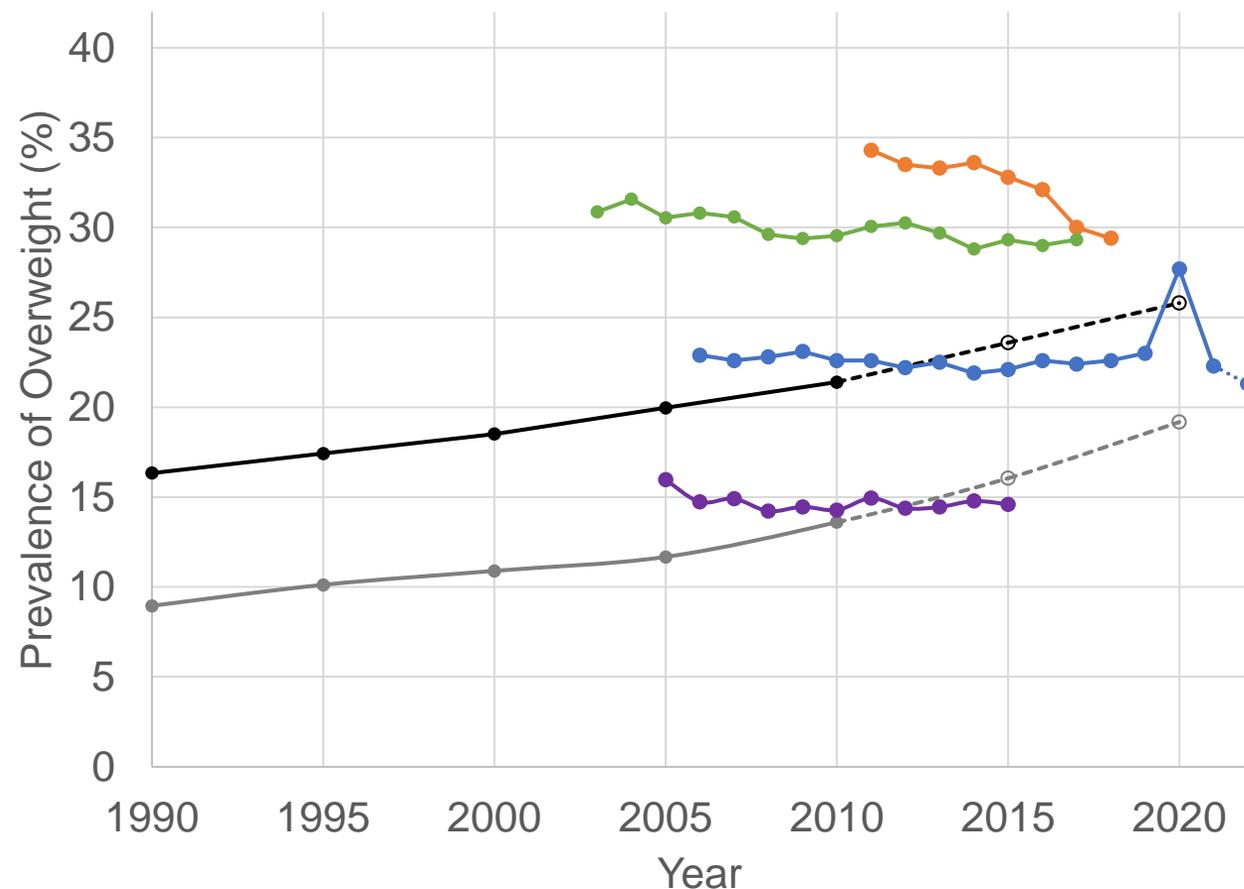
Thinness
Obesity

- High-income English-speaking countries
- Northwestern Europe
- Southwestern Europe
- Central Europe
- Eastern Europe
- Southern Latin America
- Central Latin America
- Andean Latin America
- The Caribbean
- East Asia and the Pacific
- Southeast Asia
- South Asia
- Central Asia
- Middle East and north Africa
- Polynesia and Micronesia
- Melanesia
- East Africa
- West Africa
- Central and southern Africa
- Other sub-Saharan Africa

Prevalence of overweight in preschool children (BMI or Wt-F-Ht > 85th centile at 4-5 years)



Prevalence of overweight in preschool children (BMI or Wt-F-Ht > 85th centile at 4-5 years)



Relative reductions:

-15% in New Zealand

-5% in Victoria (Australia)

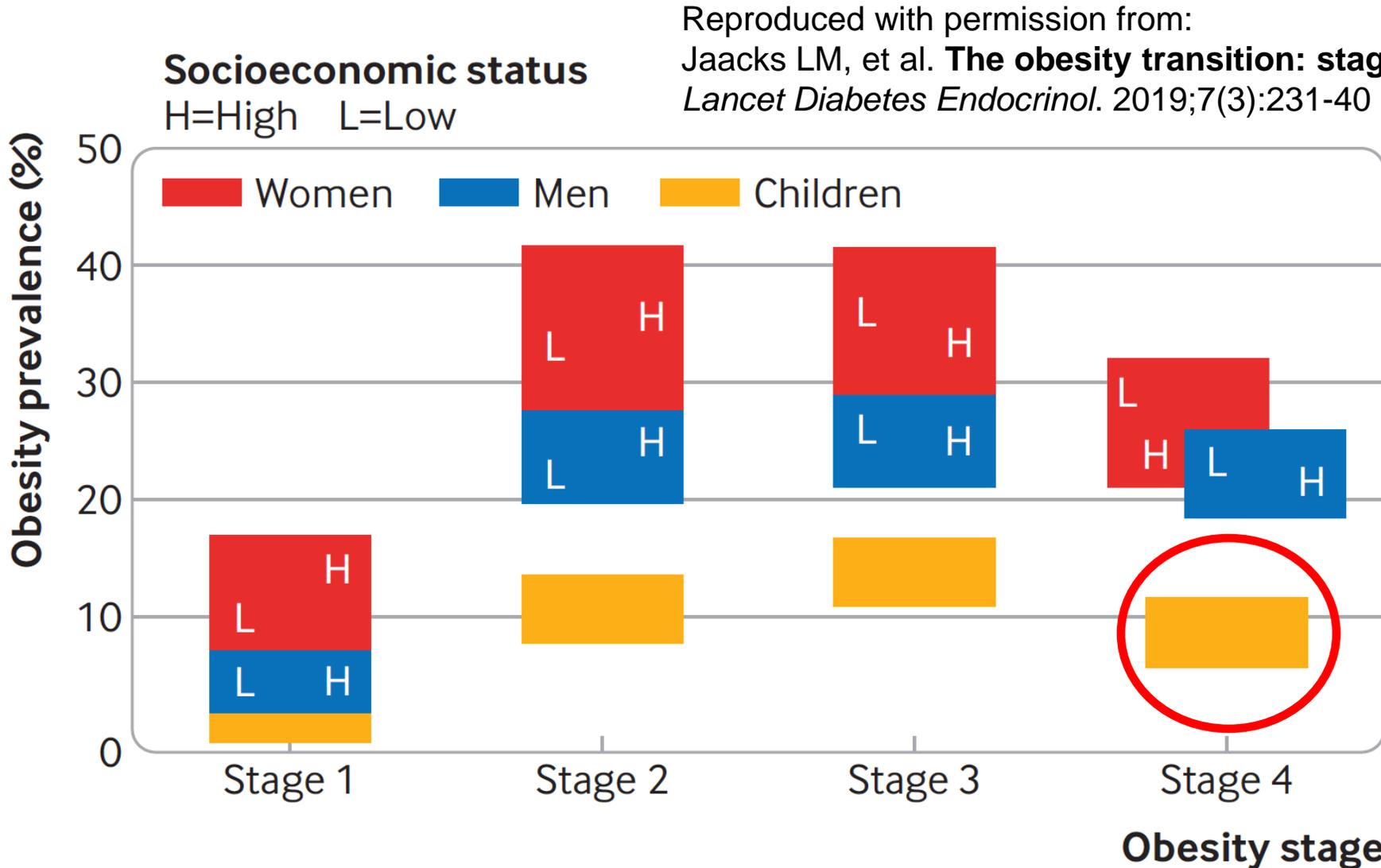
-3% in England (-7%, updated data)

-9% in Germany

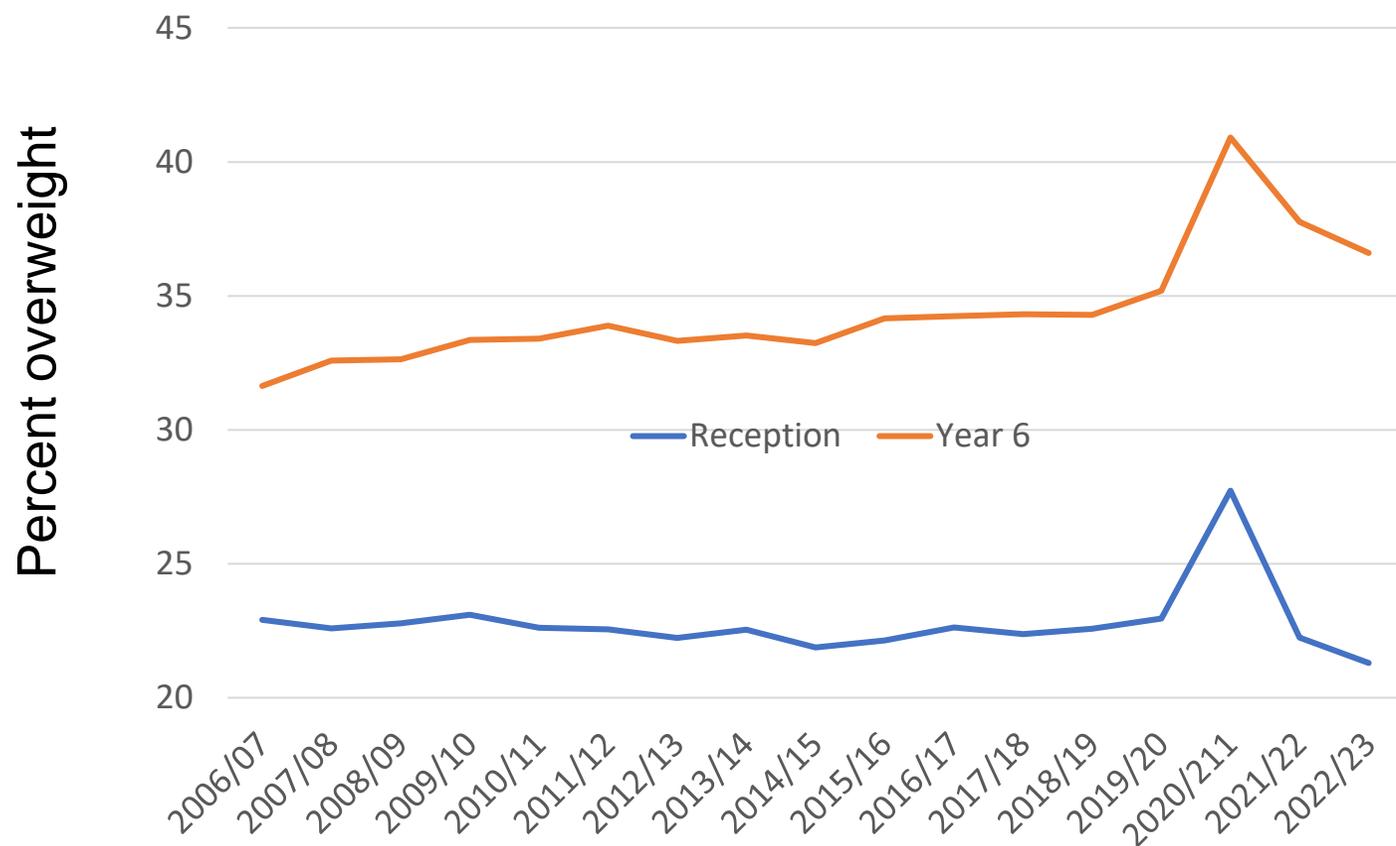
—●— WHO "Developed" —●— WHO "Developing" —●— England
—●— New Zealand —●— Victoria (Australia) —●— Germany

de Onis et al, *Public Health Nutrition* 2010
Sarah Maessen et al, *BMJ* 2023
www.bmj.com/food4thought23

Four stages of the obesity epidemic



Prevalence of overweight in children in England

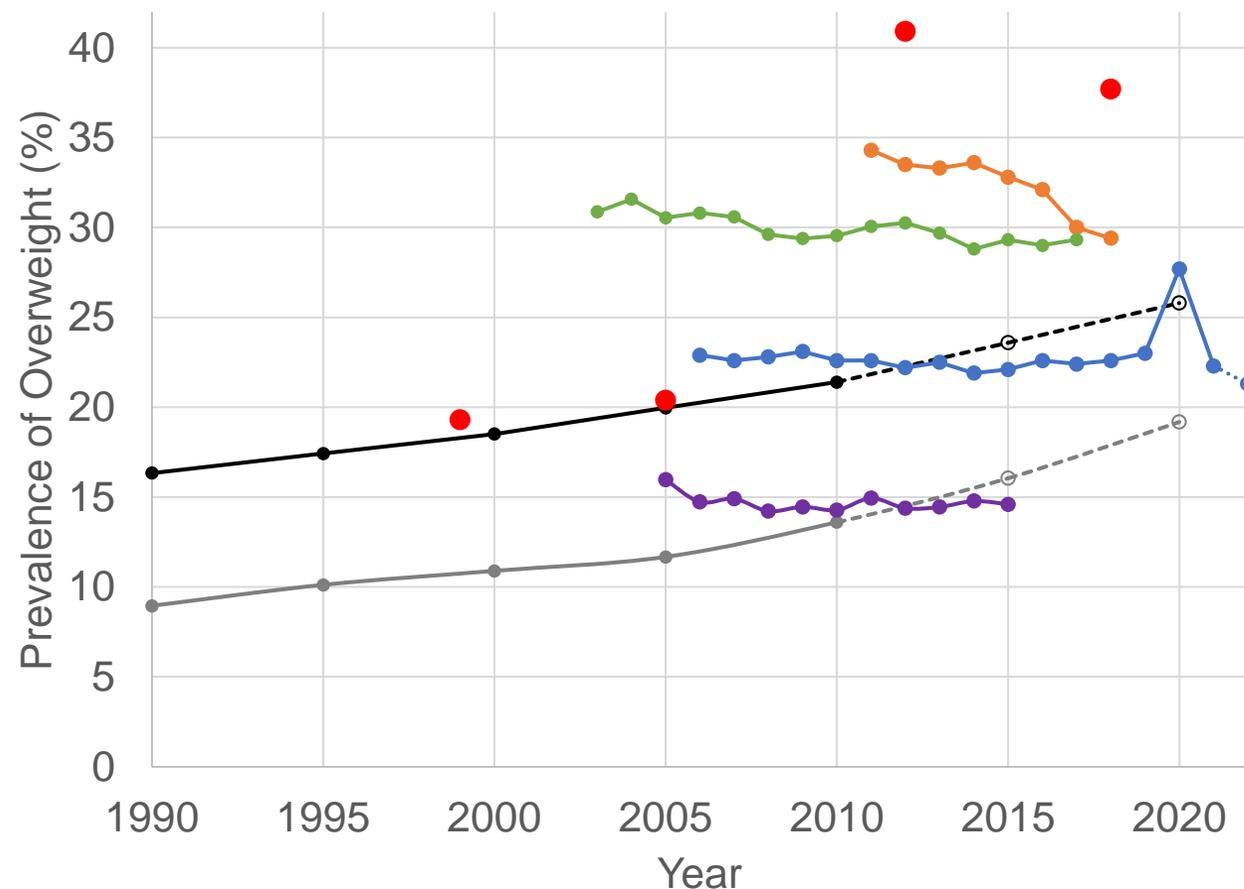


Relative changes:

+16% in Year 6 (age 10-11)

-7% in Reception (age 4-5)

Prevalence of overweight in preschool children (BMI or Wt-F-Ht > 85th centile at 4-5 years)



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- WHO "Developed"
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- England
- New Zealand
- Victoria (Australia)
- Germany
- South Africa

de Onis et al, *Public Health Nutrition* 2010
 Sarah Maessen et al, *BMJ* 2023
www.bmj.com/food4thought23

Reasons are likely multifactorial

- Awareness of infancy and early childhood overweight → dietary and policy changes

Rapid Infancy Weight Gain and Subsequent Obesity

Fat mass
at 17 years



Early primary studies, e.g.
ALSPAC cohort. Ong et al, *BMJ* 2000
SWEDES cohort. Ekelund et al, *AJCN* 2006

Systematic Reviews:

Monteiro & Victora *Obes Rev* 2005

13 studies

Baird et al. *BMJ* 2005

10 studies

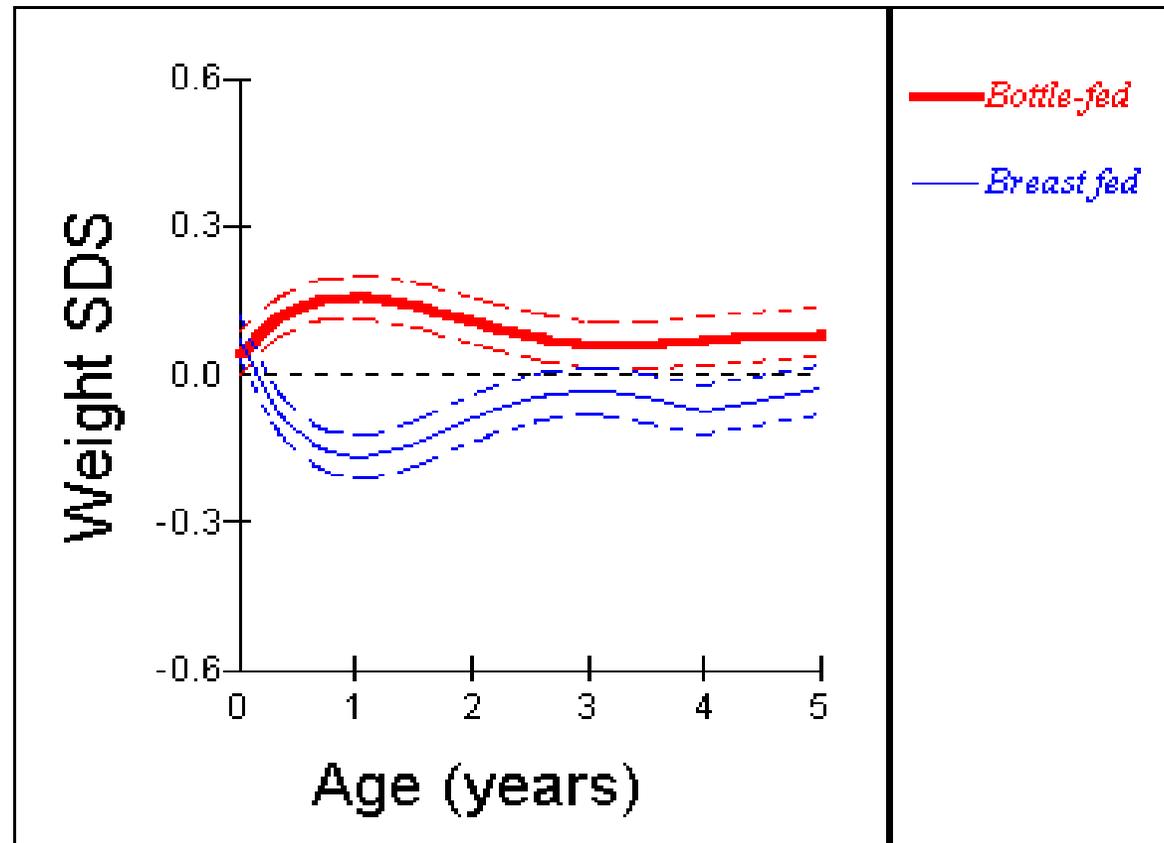
Ong & Loos *Acta Paediatrica* 2006

21 studies

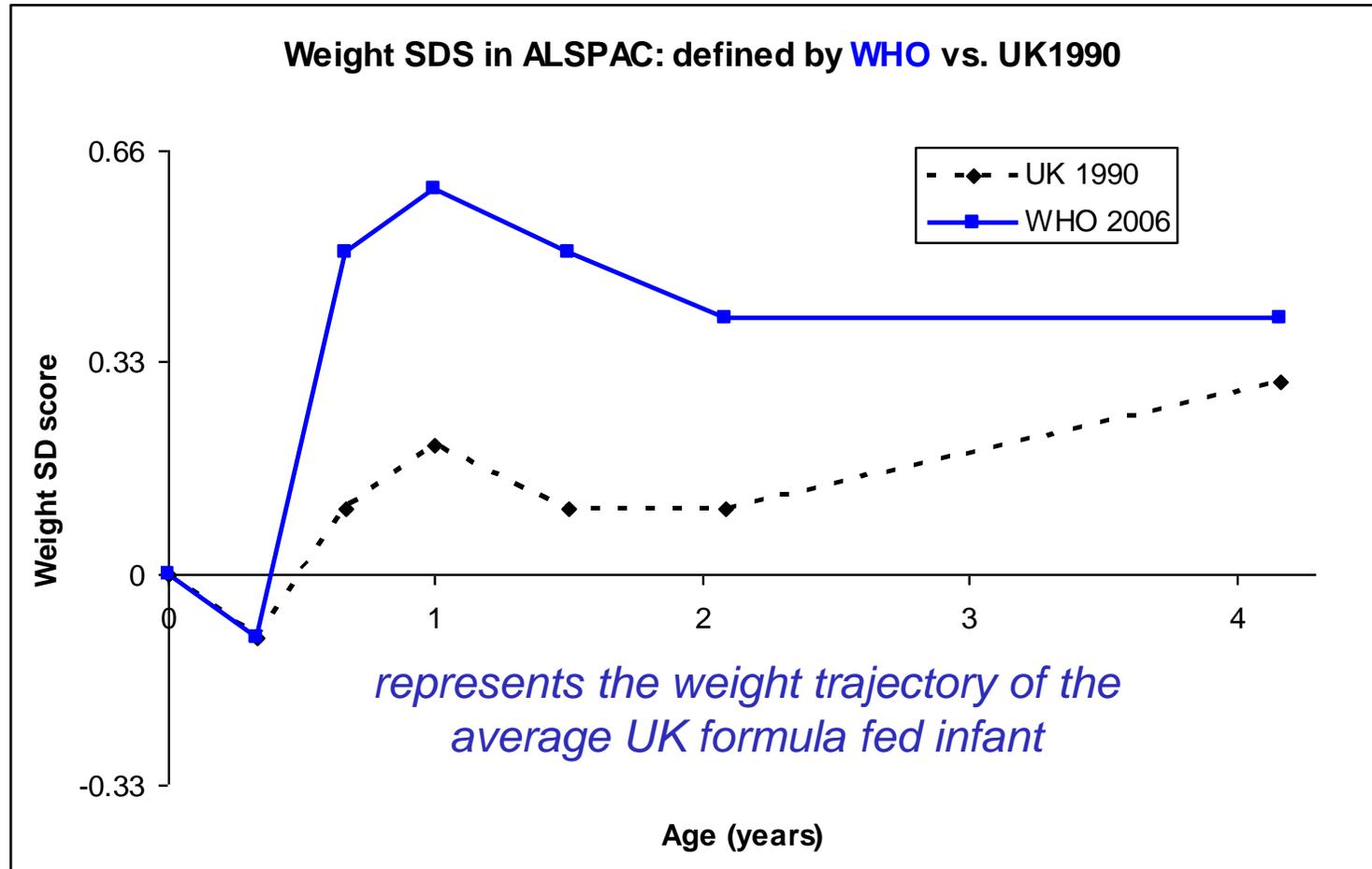
Woo-Baidal et al. *Am J Prev Med* 2016

+ve association in 45/46 studies

Formula-fed infants grow *too rapidly*



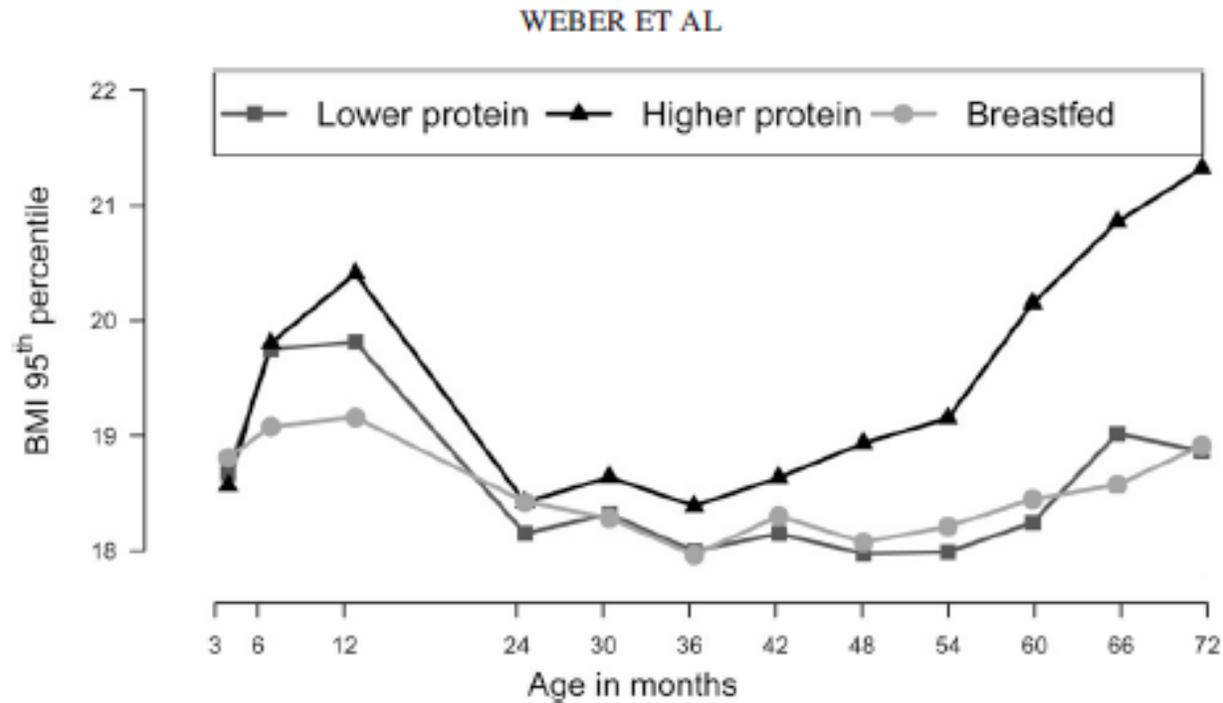
The WHO 2006 Growth Standard: defines optimal growth



Application of WHO Growth Standards in the UK. SACN 2007
Lakshman et al. *Arch Dis Child*. 2008

Formula milk composition and infant weight gain

Lower protein (1.77 vs. 2.9 g/100 kcal) → Lower Weight gain and BMI



Koletzko et al. *Am J Clin Nutr* 2009
Weber et al. *Am J Clin Nutr* 2014

Overnutrition in UK infants and young children

UK Scientific Advisory Committee on Nutrition (SACN) report

- 75% of infants (aged 4 to 18 months) have intakes that exceed the UK EAR for energy.
- The same proportion exceed the WHO growth standard median for weight.

Age	% participants above EAR	
	Boys	Girls
12 to 18 months	88	88
18 to 23 months	96	87
24 to 35 months	69	69
36 to 47 months	47	58

EAR, Estimated average requirement



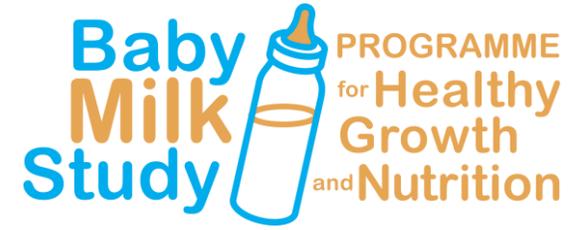
Based on DNSIYC & NDNS National Surveys
Feeding in the 1st Year of Life, SACN report 2018

Feeding young children aged 1 to 5 years, SACN report, July 2023

RCTs of obesity prevention in infancy

- BabyMilk (Cambridge, UK) – *Arch Dis Child* 2018
- NOURISH (Australia) – *Pediatrics* 2015
- INSIGHT (USA) – *JAMA* 2018
- POI (NZ) – *AJCN* 2018
- EPOCH (Aus/NZ) – *Pediatr Obes* 2020

*Many others**



Structural determinants of healthy weight in young children

- **Environment** - e.g. space and facilities for outdoor play; infrastructure for active travel to school; density of take-away outlets;
- **Social** - e.g. awareness of early childhood overweight; **maternal smoking in pregnancy**
- **Policy** - e.g. provision of early years education and childcare; provision and promotion of healthy food and physical activity in early education settings
- **Commercial** - e.g. reduction in protein content of infant milk formulas; reformulation of foods and drinks to reduce free sugars

Reductions in maternal smoking:

New Zealand: 16.2% to 13.1%
from 2006 to 2018

Australia: 13.7% to 9.2% from
2010 to 2020

England: 15.8% to 9.1% from
2006/7 to 2021/22

Structural determinants of healthy weight in young children

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Early years education/childcare:

New Zealand: Paid parental leave from 2002.

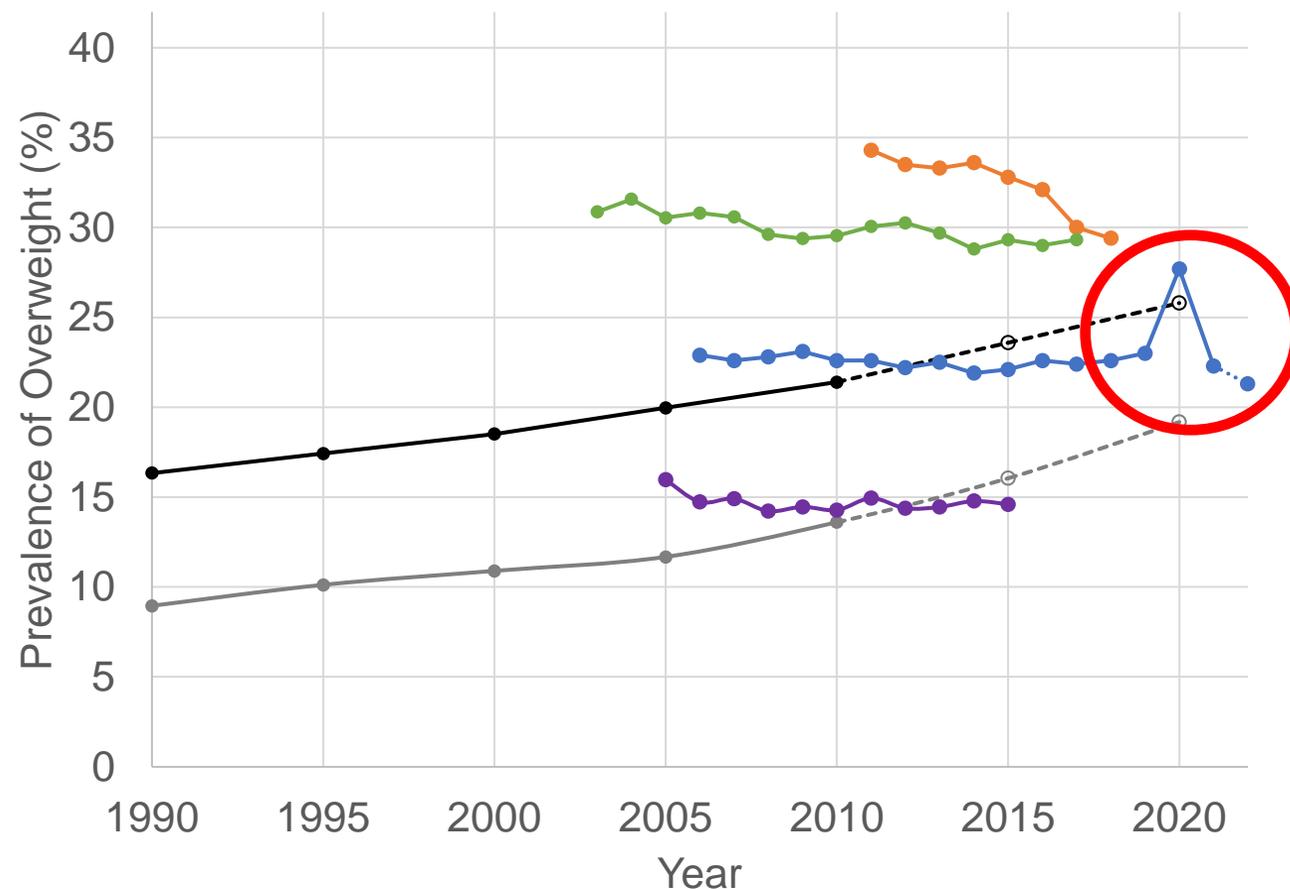
20 hours/wk early childhood education in 2000s

Australia: increasing use of centre-based childcare over the last 10-15 years

England: 15-30 hours/wk childcare for all 3- and 4-year-olds since 2010

Germany: Day Care Expansion Act increasingly implemented since 2005

Prevalence of overweight in preschool children (BMI or Wt-F-Ht > 85th centile at 4-5 years)



Relative reductions:

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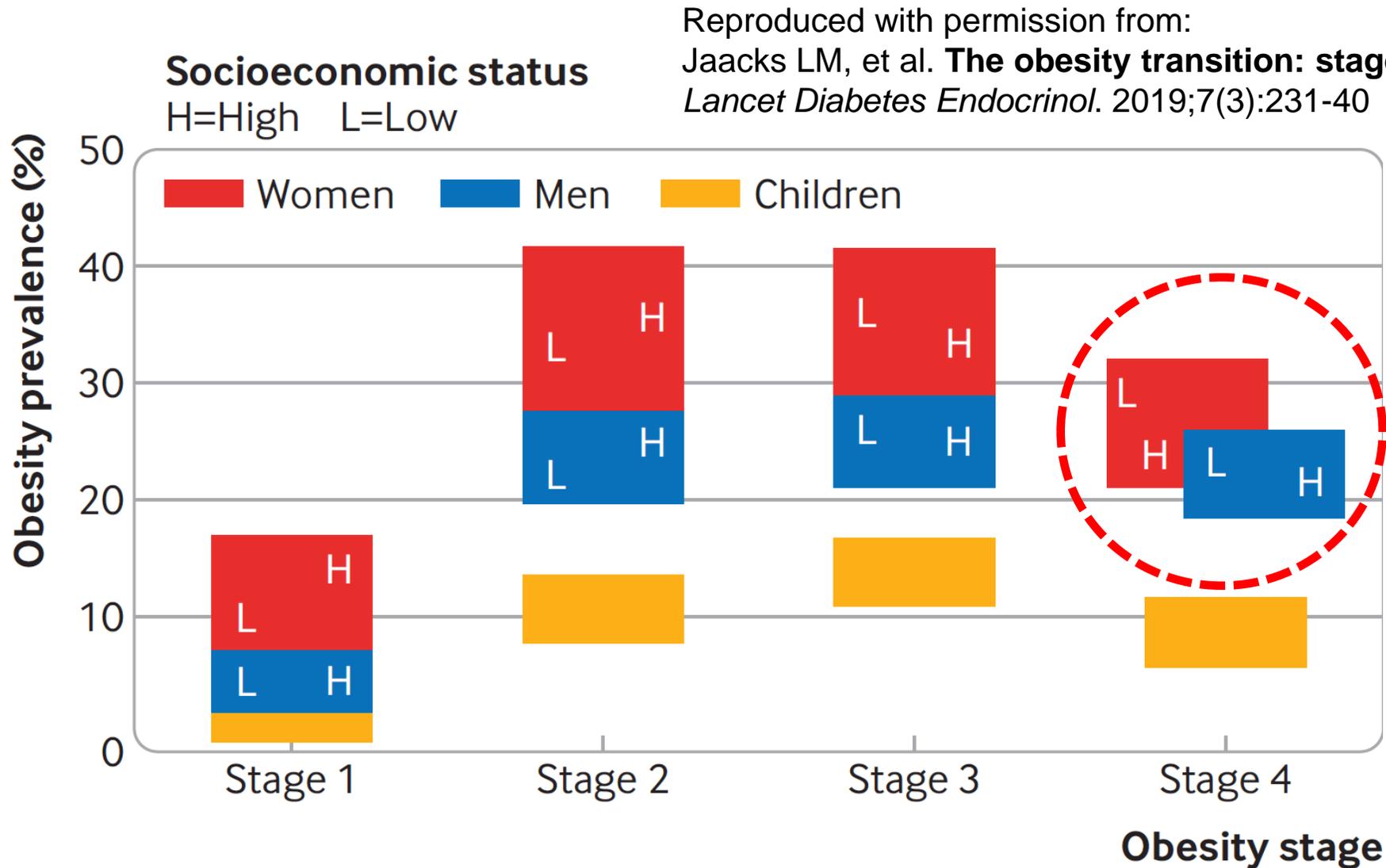
Summary – recent trends in preschool age overweight

1. Recent trends are encouraging!
2. The reasons are likely multifactorial – *including: awareness, monitoring, attitudes & beliefs, diet, maternal smoking, early education*
3. Efforts needs to be maintained and strengthened
4. Ensure that all families benefit – *including: low & middle income country settings*

FOOD FOR THOUGHT 2023

High but decreasing prevalence of overweight in preschool children:
encouragement for further action

Any lessons for older children & adults?



Any lessons for older children & adults?

1. **Optimism** – increasing trends are not inevitable!
2. Need for **Multifactorial** changes – e.g. *awareness, attitudes & beliefs, diet, monitoring, changes to the physical & nutritional environments*
3. Need for interventions that require **Low Individual Agency**

Why Are Some Population Interventions for Diet and Obesity More Equitable and Effective Than Others? The Role of Individual Agency

Jean Adams , Oliver Mytton, Martin White, Pablo Monsivais

Published: April 5, 2016 • <https://doi.org/10.1371/journal.pmed.1001990>

Agency vs. Structure

– What determines an individual's behavior?

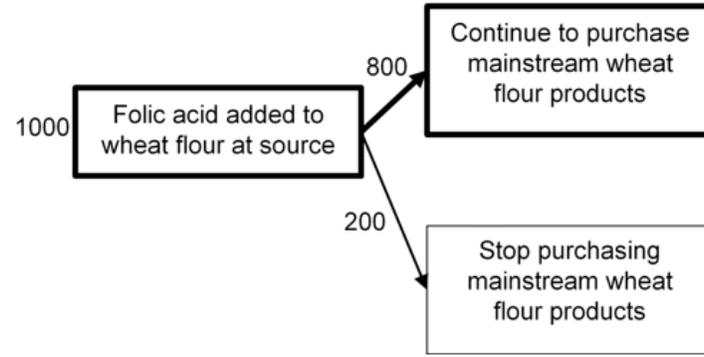
- **Agency**-making individual choices based on free-will
- **Structure**-cultural and structural influences operate in the decision making process
 - How society is organized
 - Society is patterned

Why Are Some Population Interventions for Diet and Obesity More Equitable and Effective Than Others? The Role of Individual Agency

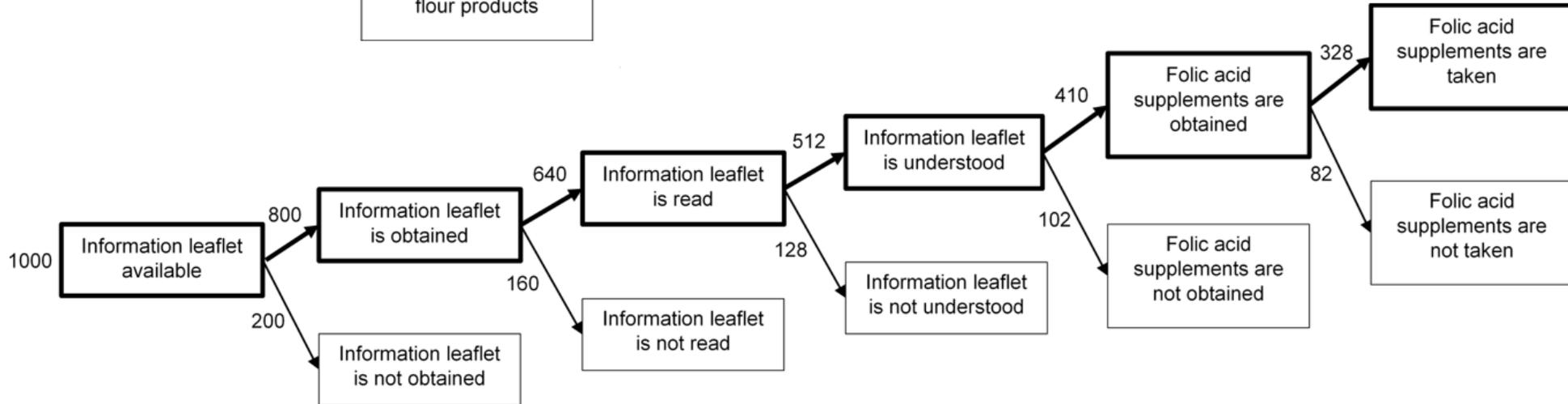
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LOW Individual Agency



HIGH Individual Agency



The **UK Soft Drinks Industry Levy**– a tiered tax on soft drinks (April 2018) – was associated with:

- a) **Extensive Reformulation:** 34% fewer eligible drinks (>5g/100 ml sugar)
- b) **Less purchased sugar** from soft drinks: by 8g (3%) per household/week; larger effects in households with children and lower incomes
- c) **Less consumed total free sugar:** in adults 11g (20%) less per day and in children 5g (10%) less
- d) **Lower obesity prevalence** by 5,234 (8%) cases/year in Year 6 girls, especially in the most deprived areas
- e) **Fewer children admitted to hospital for tooth extractions** by 5638 (12%) per year
- f) **Fewer children admitted to hospital for asthma** by 21% per year
- g) **Improved health:** 200,000 QALYs gained and £174m lower healthcare costs
- h) **No long-lasting financial effects on companies**

Any lessons for older children & adults?

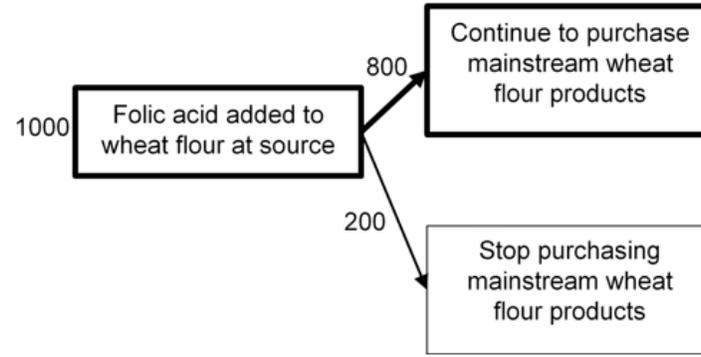
1. **Optimism** – increasing trends are not inevitable!
2. Need for **Multifactorial** changes
3. Need for **Low Agency** interventions, e.g.
 - **Further Reformulation** of foods & drinks (e.g. *lower free sugars, energy content*)
 - **Restrictions on the marketing** of unhealthy foods
 - **Price changes**
 - **Restrictions on the availability** of unhealthy foods and food outlets

Why Are Some Population Interventions for Diet and Obesity More Equitable and Effective Than Others? The Role of Individual Agency

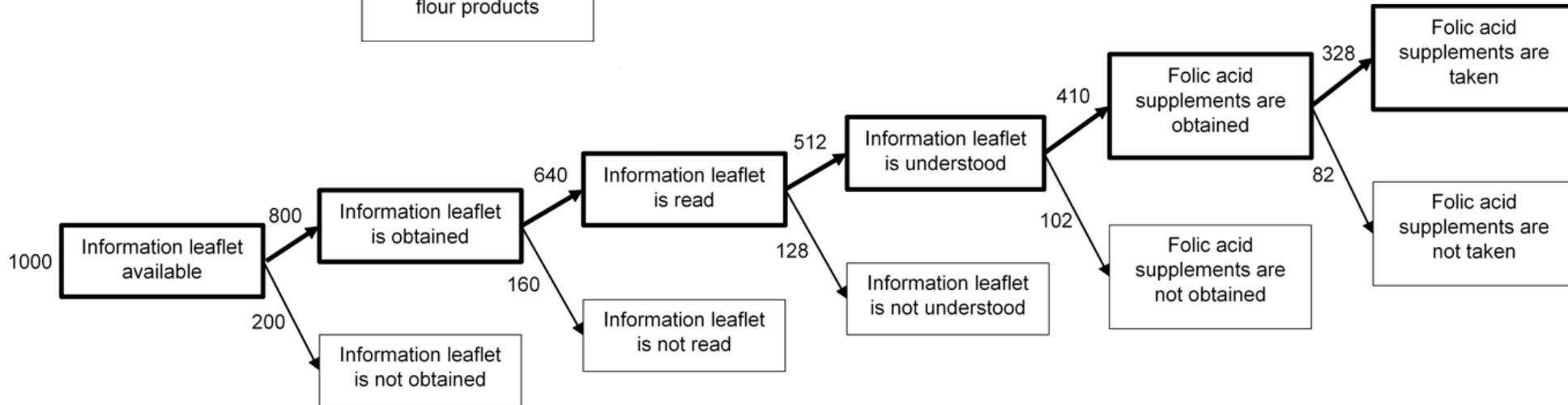
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LOW Individual Agency

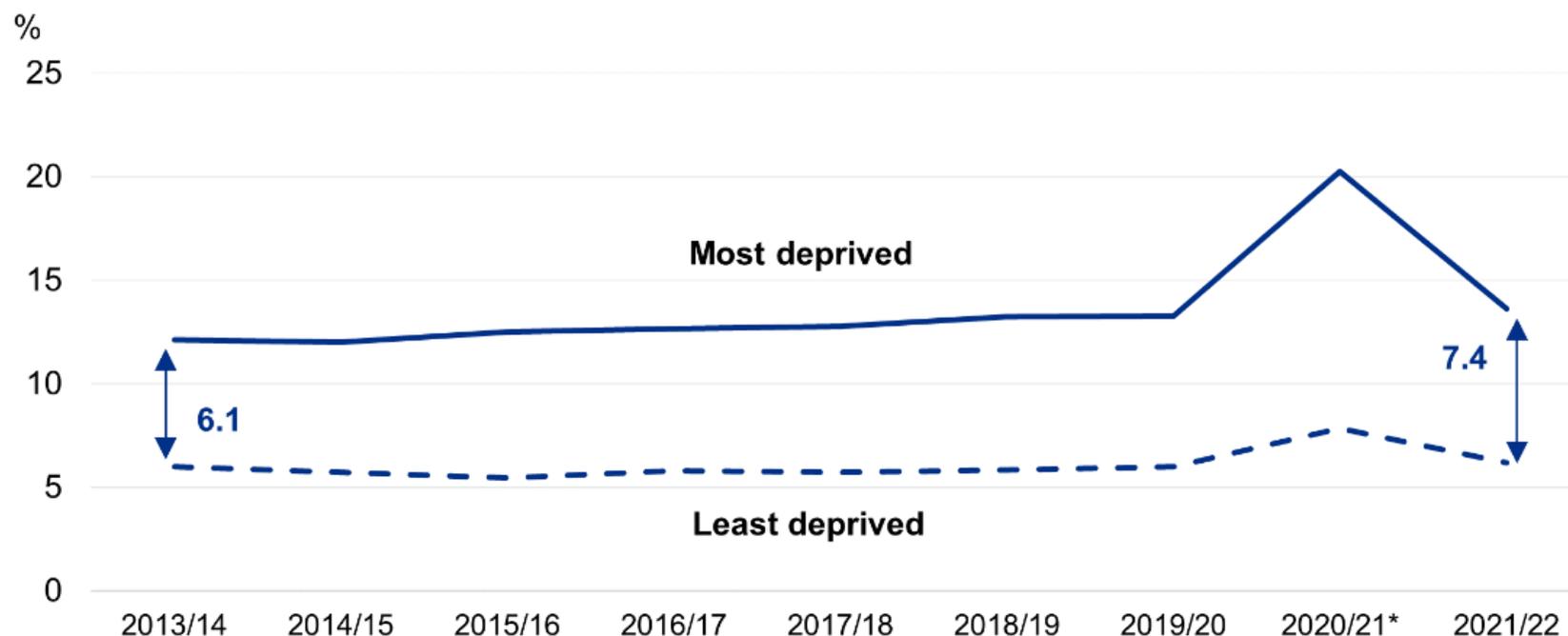


HIGH Individual Agency



Prevalence of obesity in Reception age children in England, by Deprivation

Prevalence of children living with obesity in Reception by most and least deprived IMD deciles (based on postcode of pupil), 2013/14 to 2021/22

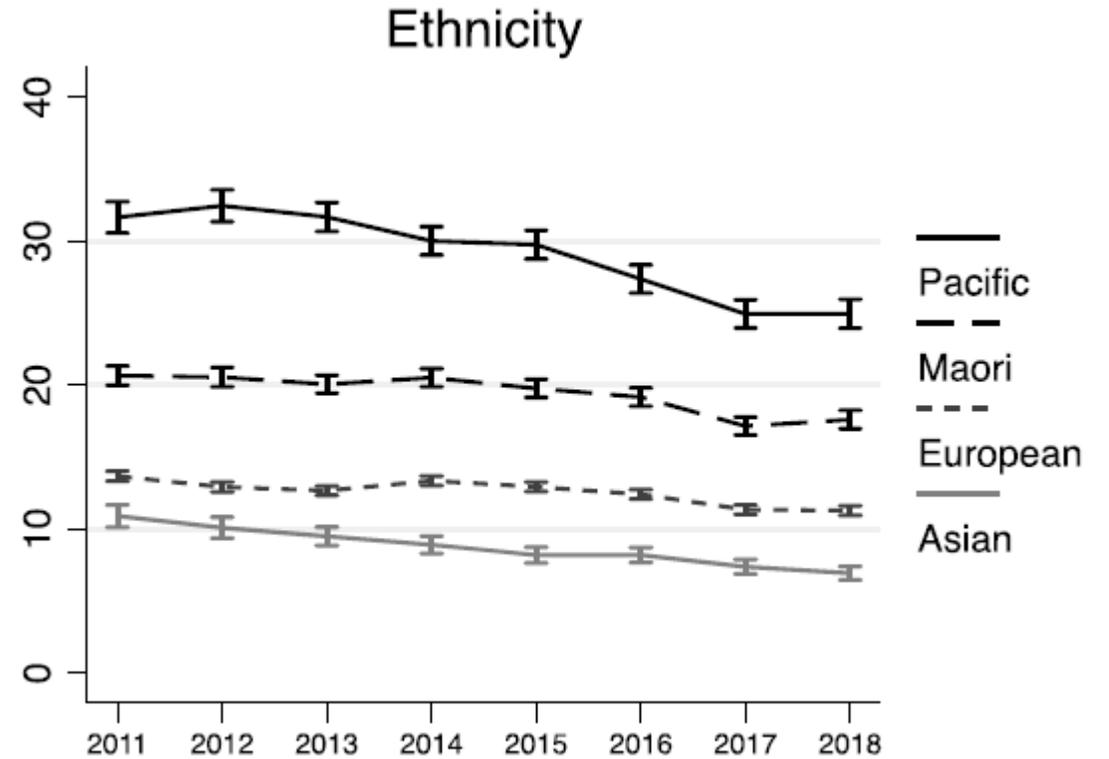
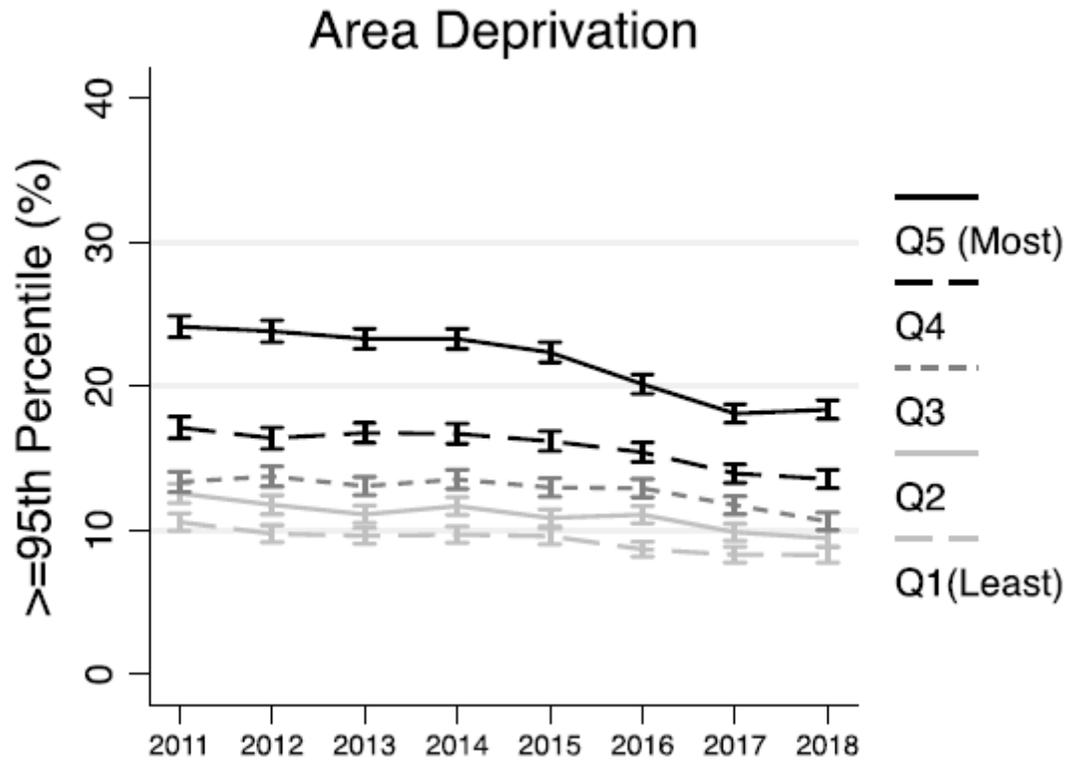


* Figures for 2020/21 are based on weighted data, see Methodology and Data Quality section in 2020/21 report for more information.
For more information: Table 6e National Child Measurement Programme, England, 2021/22 School Year

National Child Measurement Programme, England, 2021/22
school year - NDRS (digital.nhs.uk)

Larger absolute reductions in the most deprived areas & in Pacific ethnicity children

New Zealand B4 School Check (B4SC) data 2011-18

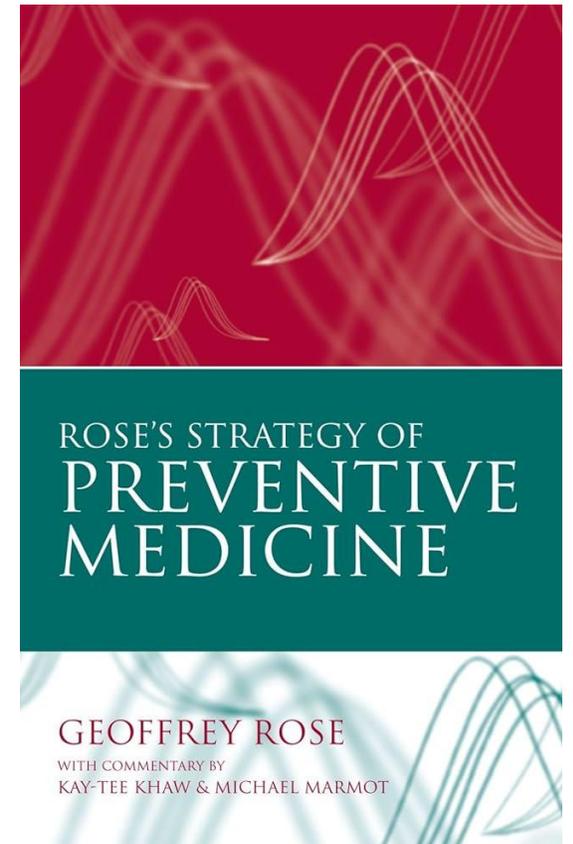
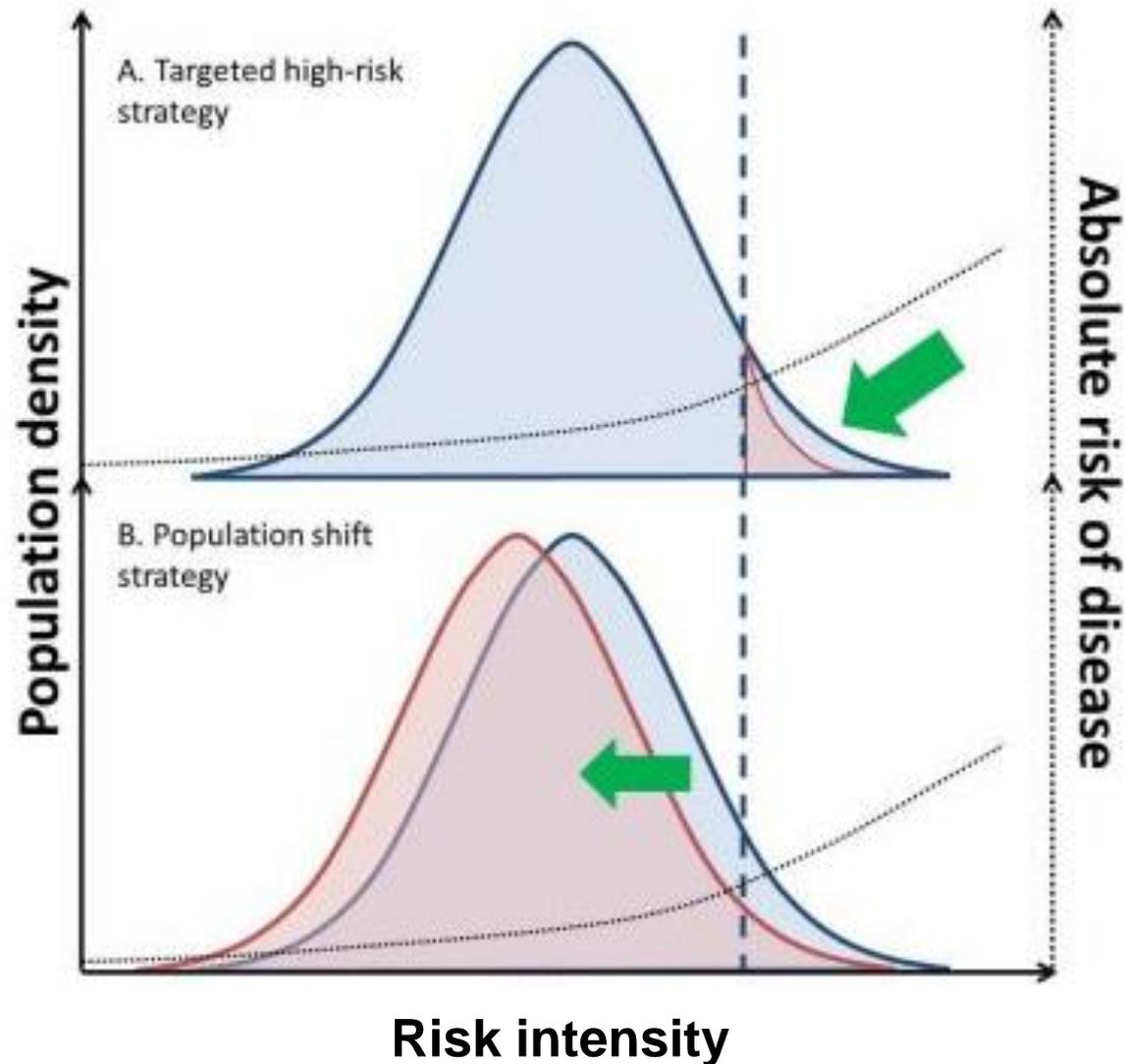


Vision Mātauranga

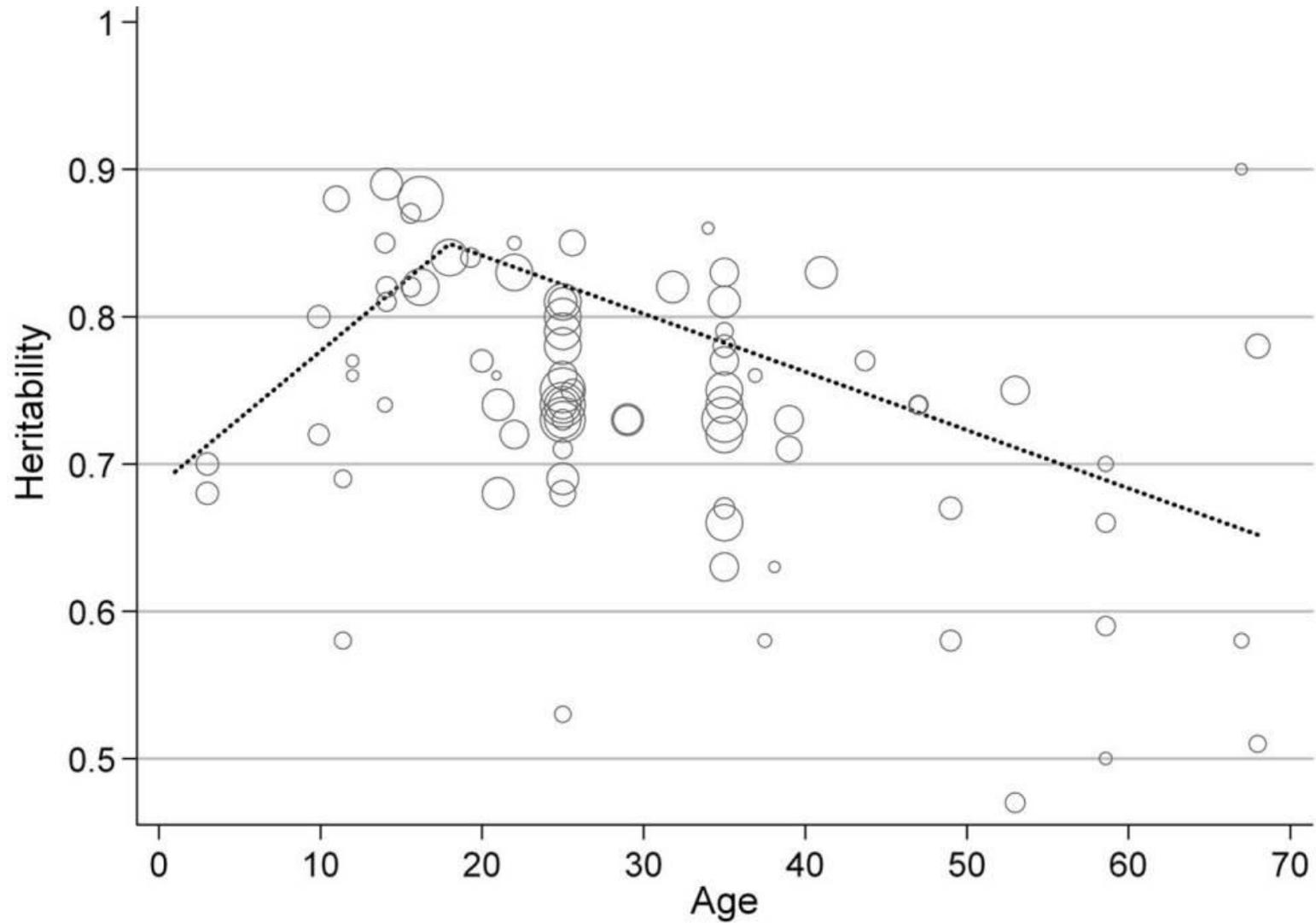
Engaged Treaty Relationships	Minimum Cultural Competencies	Māori Vision Mātauranga Assessors	Māori Authority over Mātauranga Māori
Activity Mapping	Vision Mātauranga Assessment Standards	Mātauranga Māori = Science Excellence	Pro-active Māori Workforce Development

Rauika Māngai. (2020). A Guide to Vision Mātauranga: Lessons from Māori Voices in the New Zealand Science Sector.

Population AND Targeted high risk (precision) prevention



Heritability of BMI: a review of twins studies



Variation in the Heritability of Child Body Mass Index by Obesogenic Home Environment

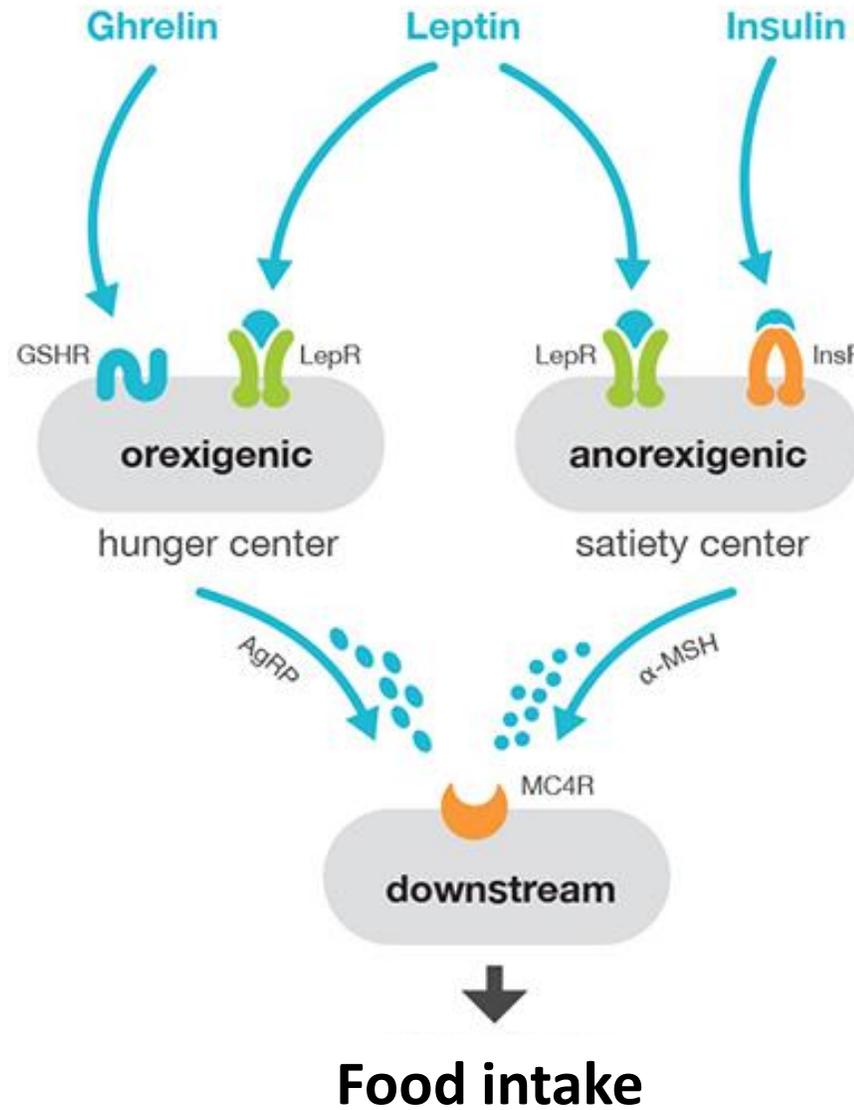
Stephanie Schrepft, PhD; Cornelia H. M. van Jaarsveld, PhD; Abigail Fisher, PhD; Moritz Herle, PhD; Andrea D. Smith, PhD; Alison Fildes, PhD; Clare H. Llewellyn, PhD

Heritability of BMI at mean age 4.1 years

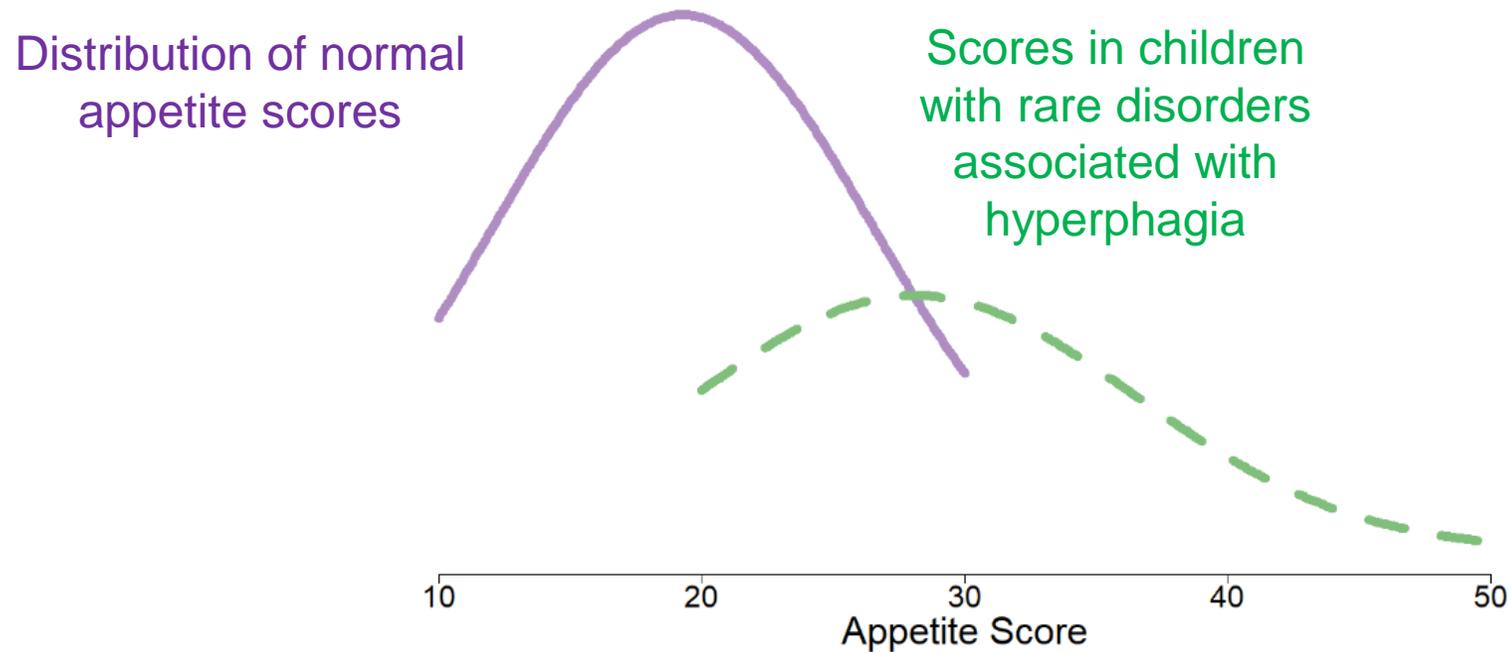
- Was much higher in *obesogenic households** – **86%**
- than in *low risk households** – **34%**

*Assessed by parent-reported food, physical activity, and media influences in the home

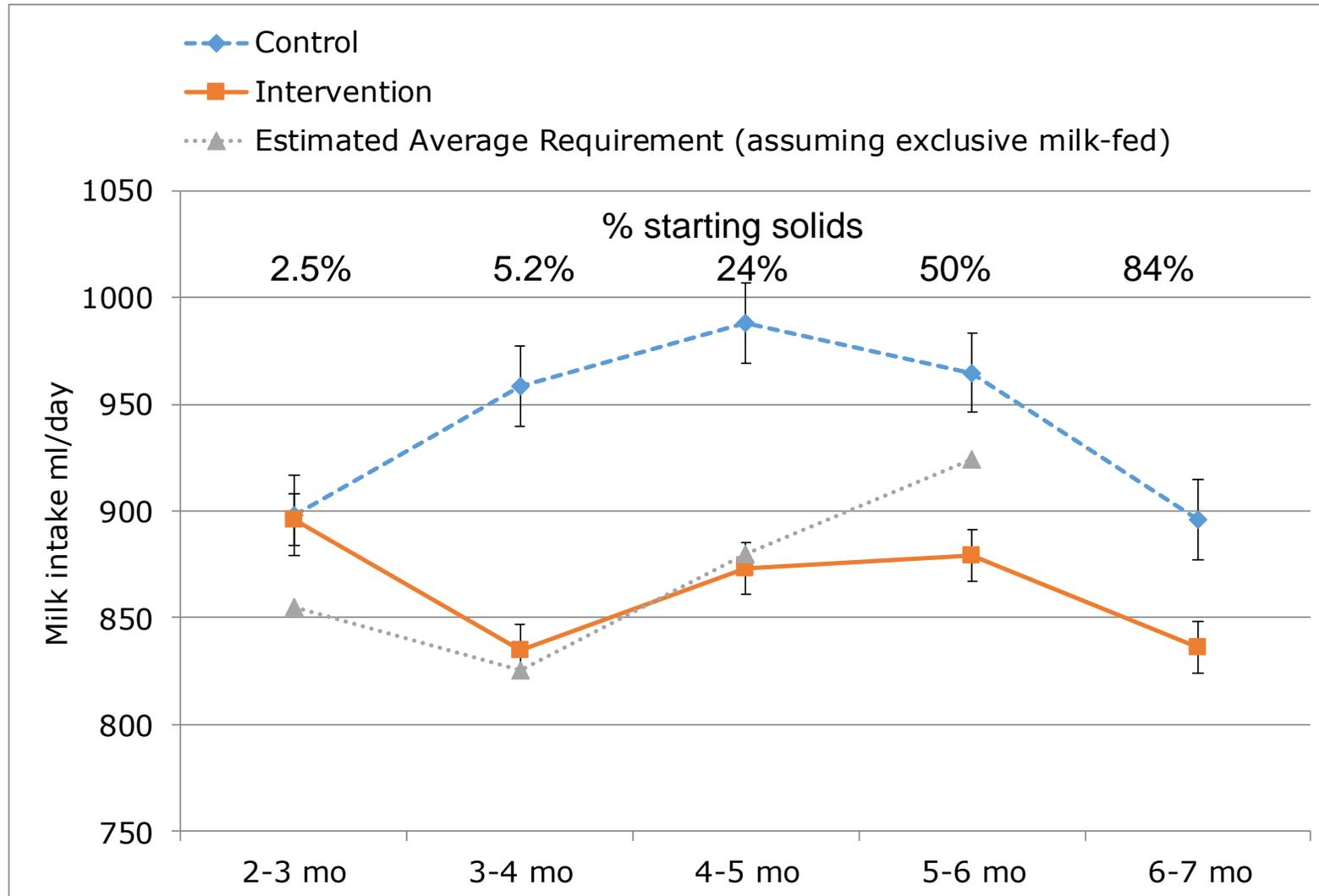
Appetite & Satiety signaling in the hypothalamus



Wide range of appetite traits in young children

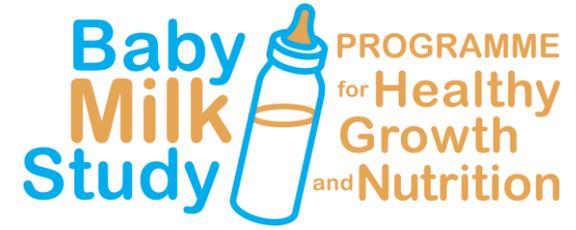


The BabyMilk intervention reduced formula milk intakes (n=669)



RCTs of obesity prevention in infancy

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- POI (NZ) – *AJCN* 2018
- EPOCH (Aus/NZ) – *Pediatr Obes* 2020



Most are based on ‘Responsive Feeding’ principles:

“feeding practices that encourage the child to eat in response to physiological and developmental needs, which encourage self-regulation in eating and support cognitive, emotional and social development”



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Acknowledgements

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Shane Norris, Univ Witwatersrand, South Africa

Christoph Beger, Leipzig University, Germany,

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- & Metabolic Research Laboratories

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Felix Day

Raj Lakshman

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BabyMilk Study Team

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