The Dunedin Study: Insights for advancing family wellbeing

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Retention in the Dunedin Study

Age	Year	Number	Percent*
Birth	1972-73		
3	1975-76	1037	100%
5	1977-78	991	96%
7	1979-80	954	92%
9	1981-82	955	92%
11	1983-84	925	90%
13	1985-86	850	82%
15	1987-88	976	95%
18	1990-91	993	97%
21	1993-94	992	97%
26	1998-99	980	96%
32	2004-05	972	96%
38	2010-12	961	95%
45	2017-18	?	?

* *Percentage seen of those who were eligible (i.e. alive) at each age*

Canada
4

USA
11

UK
34

Europe
10

Asia
7

Mid-East
3

Africa
2

Australia
172

Dunedin, n=334
Elsewhere in NZ, n=384
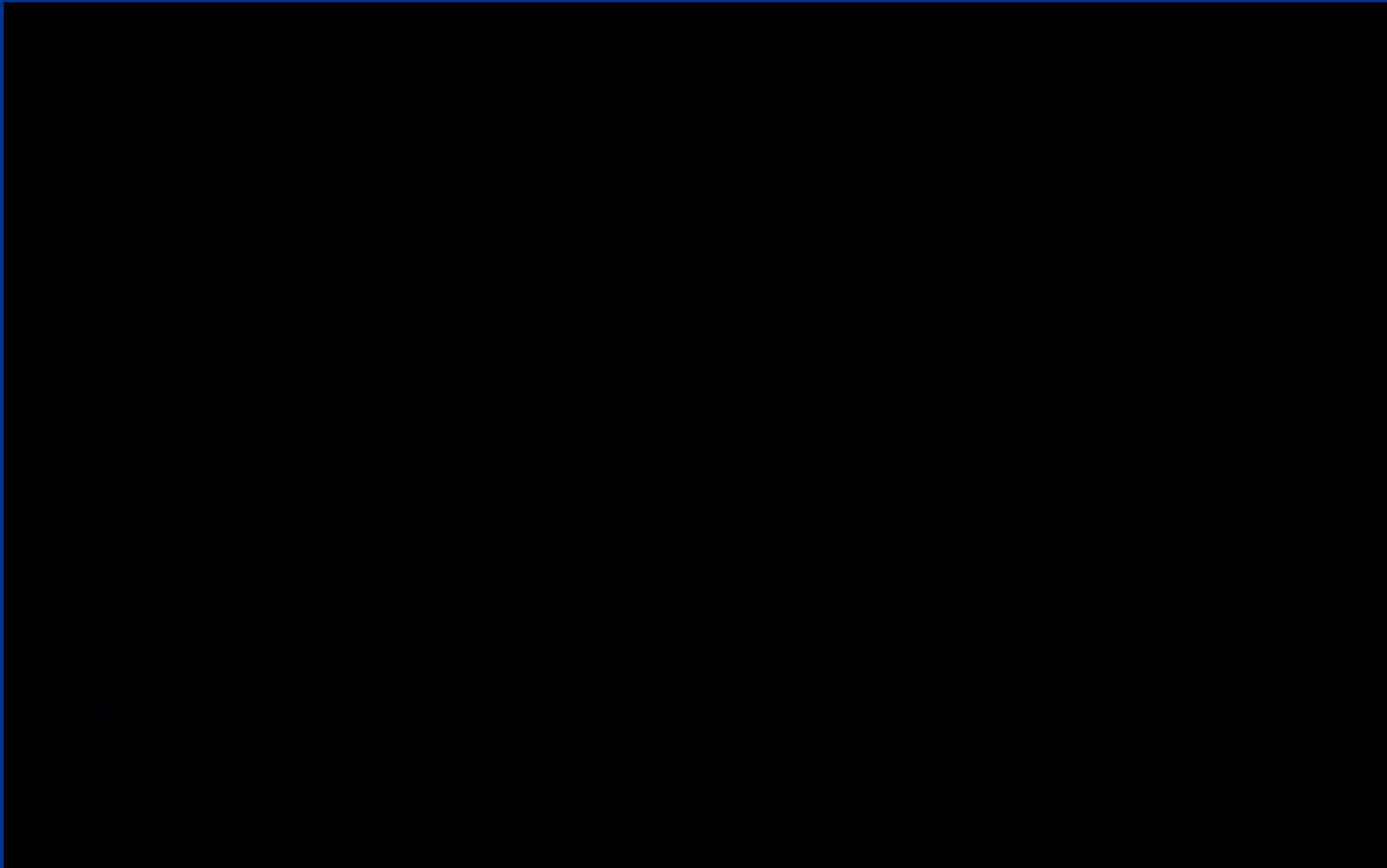
Three key aspects…

- **High retention**

- **Breadth**

- **Depth**

Families are the *key* developmental context & need…

- To be safe

- To be loving

- To be stimulating

- To be predictable

- To have sufficient resources

The family context and relative poverty

- **Socio-economic status-health gradient is well recognised**

- **But when does it emerge?**

- **Generic or specific effects on health?**

- **Can childhood disadvantage result in long-lasting damage?**

What did we find?

- **Doubling of risk for cardiovascular disease**

- **Trebling of risk for oral health disease**

- **Specific effects on mental health and substance abuse**

- **Tested three mobility hypotheses:**

  - **Upward mobility hypothesis**
  - **Downward mobility hypothesis**
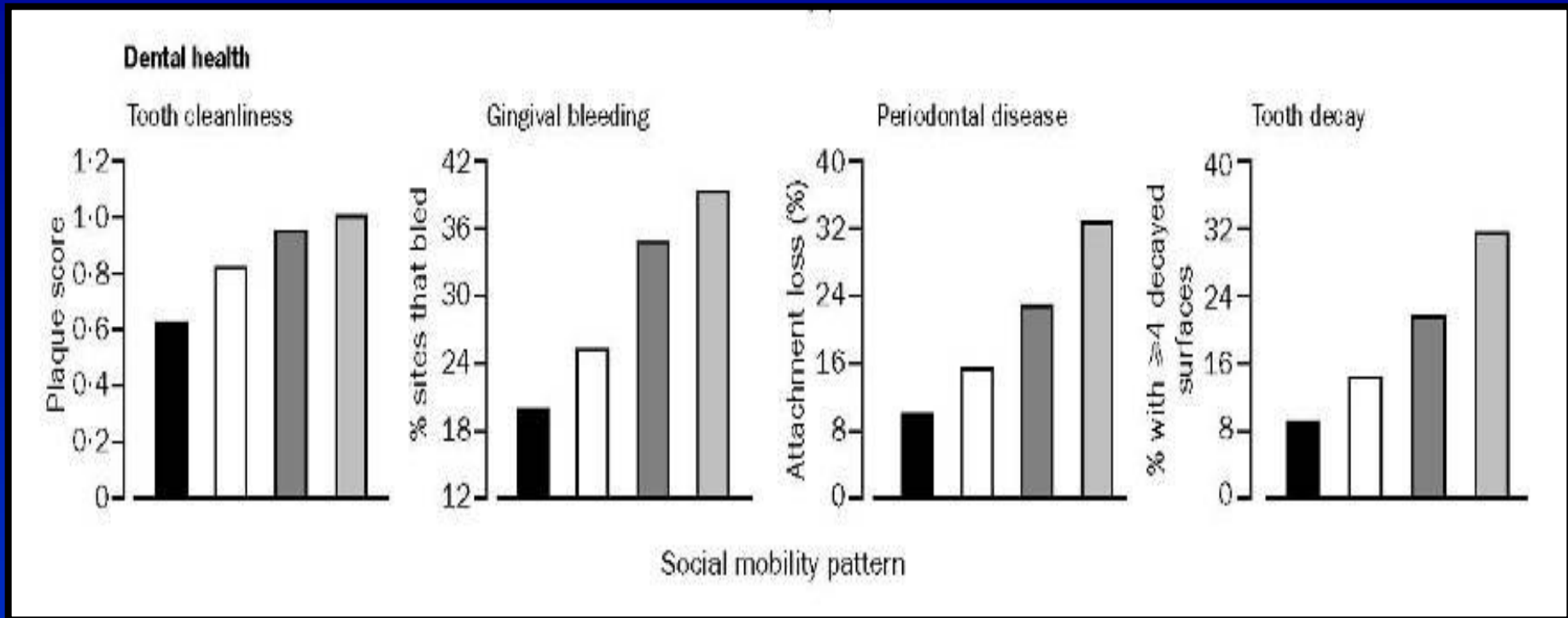 - **Childhood origins hypothesis**

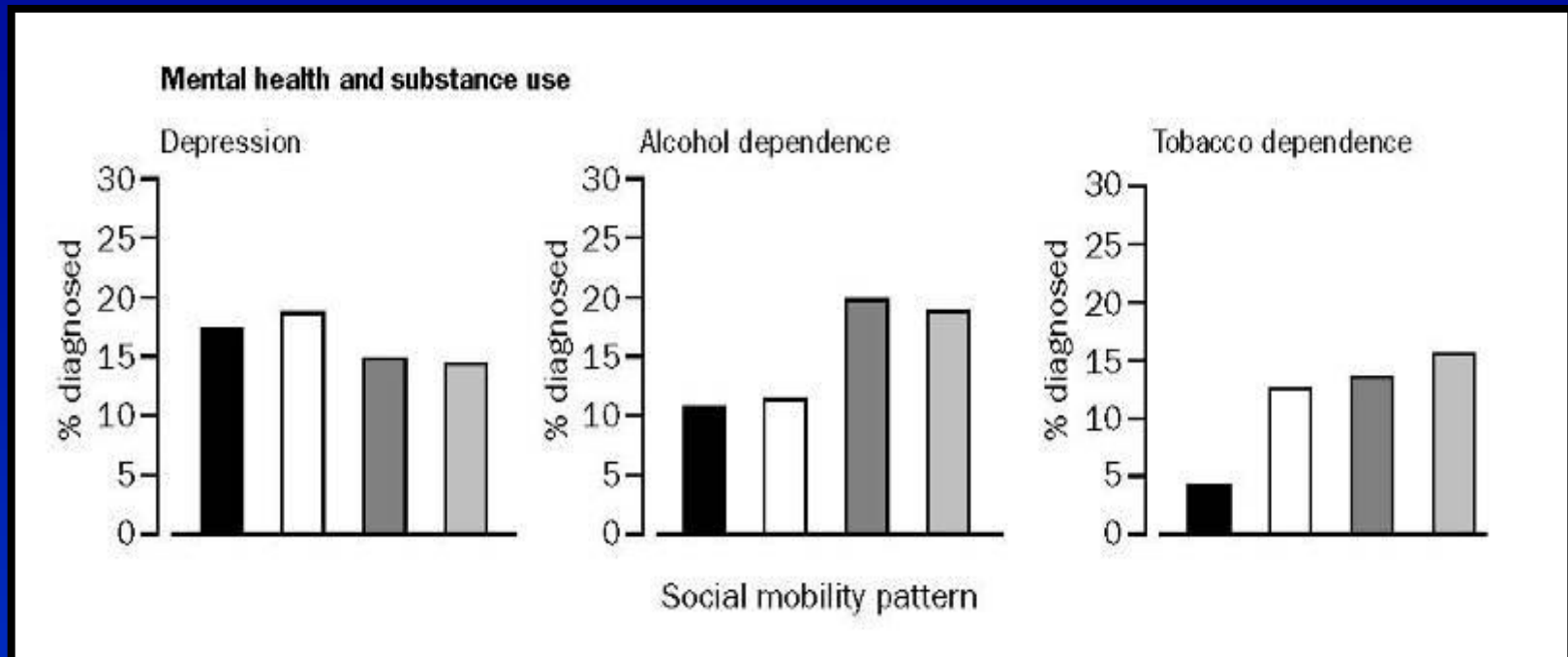# Effect of social mobility from child to adult
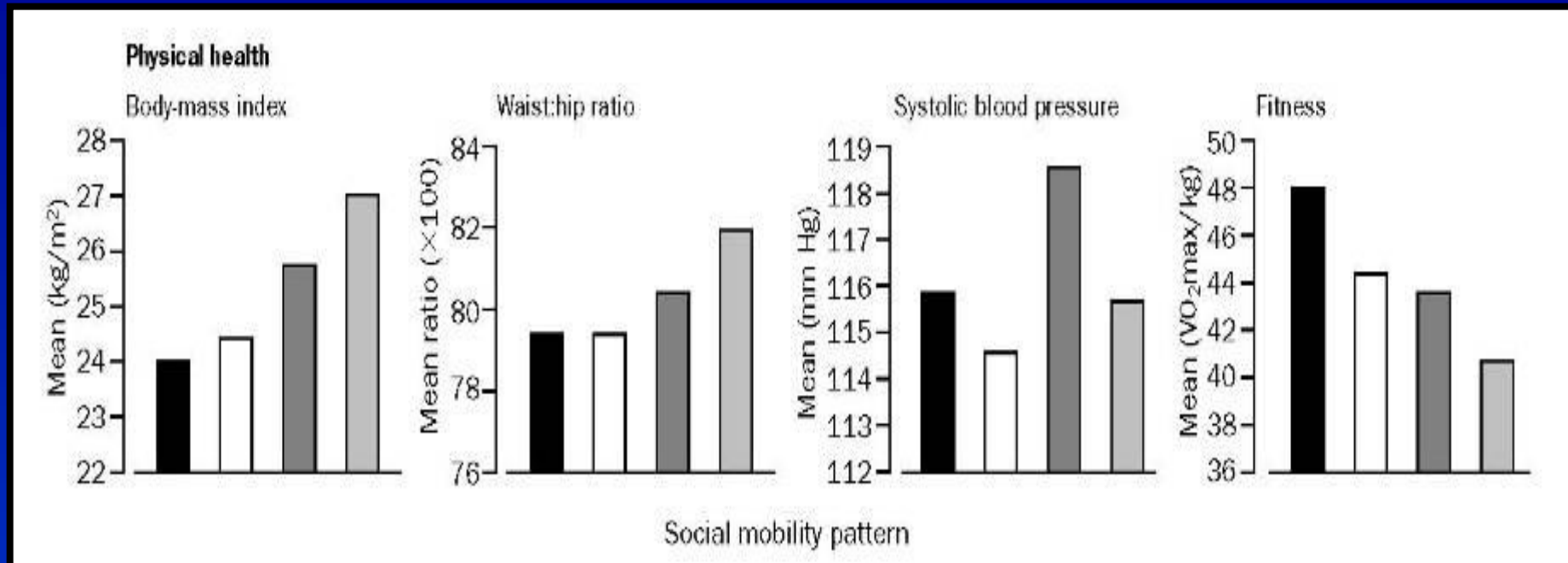
Poulton, R., Caspi, A., Milne, B.J., Thomson, W.M., Taylor, A., Sears, M.R., & Moffitt, T.E. *Lancet*, 2002, 360(9346): 1640-1645 .

Effect of social mobility from child to adult

Effect of social mobility from child to adult

"Familial" and non-familial childhood risks

- Sought to understand why children exposed to different adverse psychosocial experiences are at elevated risk for age-related disease (i.e., NCDs).

- Tested whether adverse childhood experiences predict enduring abnormalities and stress sensitive biological systems: the nervous, immune and endocrine/metabolic systems.

- Three childhood predictors:
    - Socioeconomic disadvantage
    - Maltreatment
    - Social isolation

- Three adult outcomes:
    - Depression
    - Inflammation
   - Clustering of metabolic risk markers

Prediction of three age-related-disease risks in adults with different levels of exposure to adverse childhood experiences and established developmental risk factors

| | Risk Ratio (95% CI) | | | | | |
| | Panel 1: Major Depression | | Panel 2: hsCRP >3 mg/L | | Panel 3: Clustering of Metabolic Risk Markers | |
	Bivariate[a]	Multivariate[b]	Bivariate[a]	Multivariate[b]	Bivariate[a]	Multivariate[b]
Adverse Childhood Experiences						
Childhood SES						
High	1 [Reference]	1 [Reference]	1 [Reference]	1 [Reference]	1 [Reference]	1 [Reference]
Average	0.78 (0.53-1.15)	0.90 (0.60-1.34)	1.59 (1.00-2.52)	1.55 (0.98-2.46)	1.53 (0.89-2.61)	1.52 (0.89-2.57)
Low	1.22 (0.80-1.87)	1.14 (0.72-1.79)	1.96 (1.19-3.25)	1.63 (0.98-2.70)	2.65 (1.52-4.62)	2.11 (1.20-3.70)
Childhood maltreatment						
No	1 [Reference]	1 [Reference]	1 [Reference]	1 [Reference]	1 [Reference]	1 [Reference]
Probable	1.18 (0.84-1.66)	1.07 (0.76-1.51)	1.18 (0.87-1.60)	1.16 (0.85-1.58)	1.56 (1.13-2.14)	1.39 (1.01-1.93)
Definite	2.28 (1.58-3.27)	1.69 (1.13-2.55)	1.80 (1.26-2.58)	1.56 (1.08-2.26)	1.28 (0.77-2.11)	1.04 (0.65-1.67)
Childhood social isolation						
Very low	1 [Reference]	1 [Reference]	1 [Reference]	1 [Reference]	1 [Reference]	1 [Reference]
Low	1.32 (0.80-2.16)	1.35 (0.84-2.17)	1.29 (0.83-2.02)	1.31 (0.84-2.05)	1.12 (0.64-1.95)	1.14 (0.67-1.95)
High	1.22 (0.74-2.00)	1.20 (0.74-1.95)	1.42 (0.92-2.20)	1.39 (0.91-2.15)	1.52 (0.90-2.55)	1.34 (0.81-2.24)
Very high	1.99 (1.25-3.17)	1.76 (1.12-2.77)	1.62 (1.05-2.50)	1.60 (1.04-2.47)	2.34 (1.43-3.83)	1.96 (1.21-3.17)
Established Developmental Risk Factors						
Family history	1.88[c] (1.36-2.61)	1.71[c] (1.23-2.39)	...	...	1.74[d] (1.28-2.38)	1.49[d] (1.09-2.03)
Birth weight	0.72 (0.54-0.96)	0.78 (0.59-1.04)	0.74 (0.57-0.95)	0.78 (0.61-1.01)	1.16 (0.86-1.56)	0.91 (0.68-1.21)
Childhood BMI	1.07 (0.91-1.27)	1.10 (0.93-1.29)	1.12 (0.97-1.30)	1.13 (0.99-1.30)	1.58 (1.41-1.78)	1.53 (1.35-1.73)

Prediction of number of age-related-disease risks in adults with different levels of exposure to adverse childhood experiences and established risk factors

	Incidence Rate Ratio (95% CI)[a]			
	No. of Age-Related-Disease Risks at Age 32 y[b]			
	Panel 1: Bivariate Analysis	Panel 2: Adverse Childhood Experiences Model	Panel 3: Developmental Risks Model	Panel 4: Life-Course Model
Adverse Childhood Experiences				
Childhood SES				
High	1 [Reference]	1 [Reference]	1 [Reference]	1 [Reference]
Average	1.33 (0.99-1.80)	1.36 (1.00-1.85)	1.38 (1.02-1.88)	1.36 (1.00-1.86)
Low	1.89 (1.36-2.62)	1.66 (1.19-2.33)	1.60 (1.14-2.26)	1.55 (1.09-2.21)
Childhood maltreatment				
No	1 [Reference]	1 [Reference]	1 [Reference]	1 [Reference]
Probable	1.37 (1.11-1.69)	1.28 (1.03-1.59)	1.27 (1.02-1.57)	1.26 (1.01-1.56)
Definite	1.81 (1.38-2.38)	1.59 (1.19-2.11)	1.50 (1.12-2.01)	1.55 (1.15-2.08)
Childhood social isolation				
Very low	1 [Reference]	1 [Reference]	1 [Reference]	1 [Reference]
Low	1.25 (0.91-1.71)	1.24 (0.91-1.71)	1.26 (0.92-1.72)	1.26 (0.92-1.73)
High	1.35 (0.99-1.84)	1.31 (0.96-1.79)	1.27 (0.93-1.74)	1.29 (0.94-1.76)
Very high	1.87 (1.38-2.51)	1.73 (1.27-2.34)	1.66 (1.22-2.25)	1.63 (1.20-2.21)
Established Developmental Risk Factors				
Family history of depression	1.33 (1.09-1.62)	. . .	1.25 (1.02-1.53)	1.23 (1.00-1.50)
Family history of CV disease	1.30 (1.05-1.60)	. . .	1.24 (1.00-1.54)	1.24 (0.99-1.54)
Birth weight	0.81 (0.68-0.97)	. . .	0.78 (0.65-0.94)	0.79 (0.66-0.95)
Childhood BMI	1.22 (1.10-1.35)	. . .	1.22 (1.10-1.35)	1.22 (1.10-1.35)
Established Concurrent Risk Factors				
Adult SES	0.79 (0.69-0.91)	. . .	. . .	0.88 (0.75-1.02)
Adult smoking	1.05 (0.96-1.16)	. . .	. . .	0.96 (0.87-1.07)
Adult physical activity	0.94 (0.86-1.02)	. . .	. . .	0.94 (0.86-1.03)
Adult diet	0.99 (0.90-1.08)	. . .	. . .	1.00 (0.91-1.11)

Distribution of mean (SD) age-related-disease risks at age 32 years with different levels of exposure to adverse childhood experiences (percentages and standard errors)
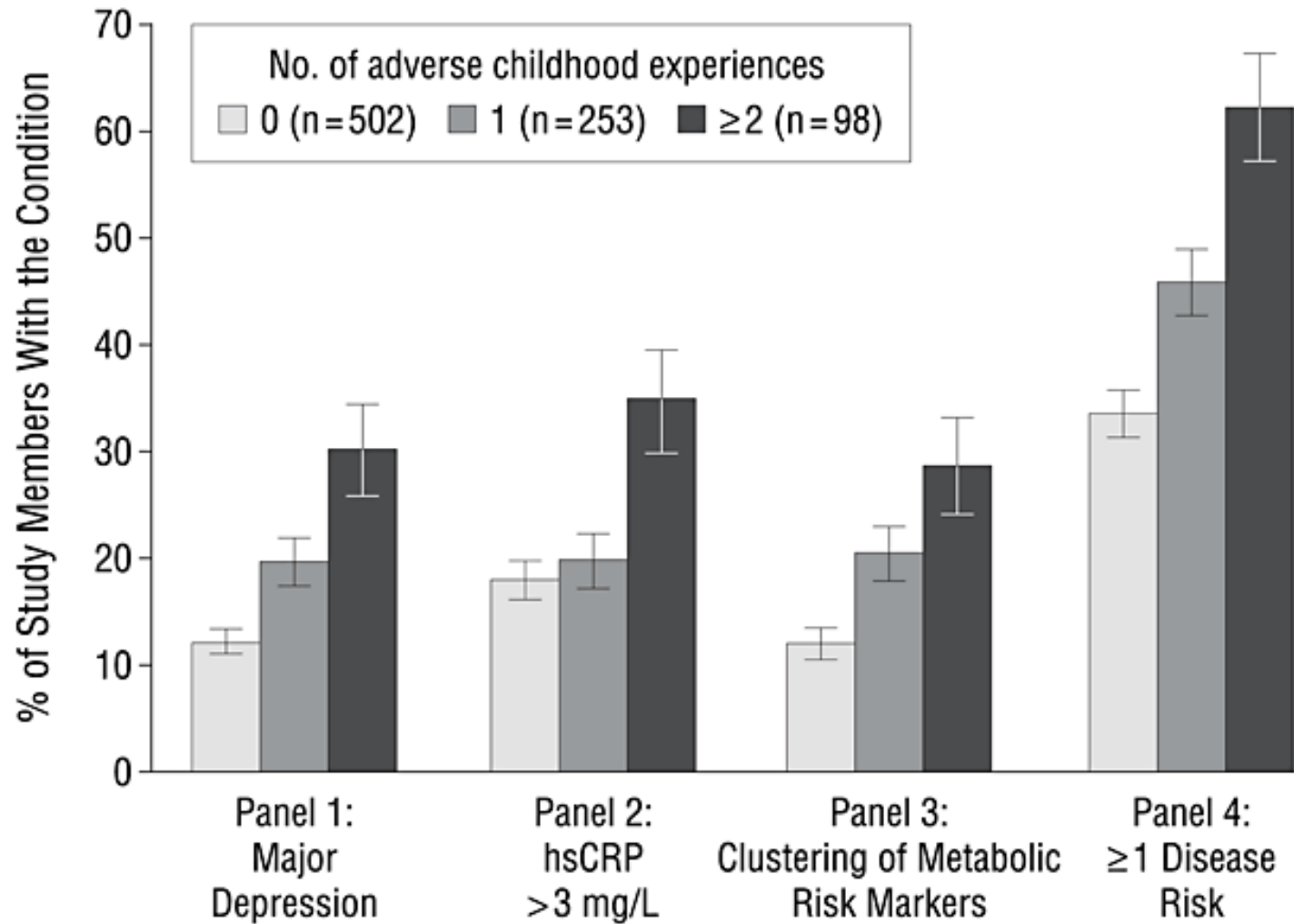
Take home messages

- **The enduring consequences of adverse childhood experiences were not explained by established developmental or concurrent risk factors.**

- **Four important findings are apparent:**

  – **First, our results indicate that groups of children exposed to different adverse experiences do not necessarily overlap.**

    This suggests that different interventions are needed to tackle each adverse childhood experience.

– **Second, our results indicate that children exposed to a greater number of adverse experiences have a greater number of age-related disease risks in adult life.**

The cumulative effect of adverse childhood experiences points to new opportunities for disease prevention.

– **Third, our results indicate that children exposed to adverse psychosocial experiences have enduring abnormalities in multiple biological systems.**

Although some specificity was observed (e.g. SES does not predict depression), the overall picture was that adverse childhood experiences may simultaneously affect nervous, immune and endocrine/metabolic functioning in adulthood.

– **Fourth, our results indicate that children exposed to adverse experiences are more likely to have age-related disease risks in adult life, regardless of their family liability for disease, birth weight, childhood weight, and adult SES and health behaviours.**

Modifying established risk factors is unlikely to wholly mitigate the economic health burden associated with adverse childhood experiences.

Promoting healthy psychosocial experiences for children may be necessary to improve the quality of longer lives and reduce health care costs across the lifecourse.

Childhood Self-Control
Health, Wealth and Public Safety
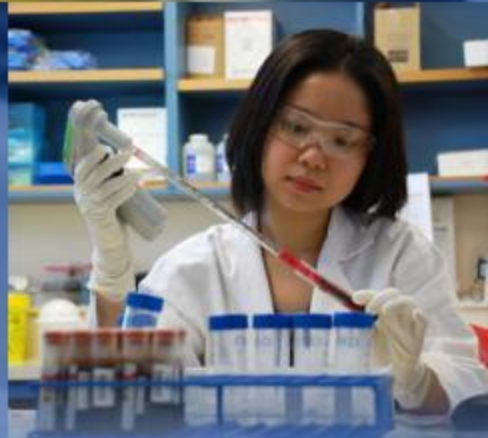
What is Self-control?

Self-control is the ability to regulate one's emotions, desires, and behaviours in the service of later rewards.

- **Think before you speak or act**

- **Resist temptations**

- **Give considered response instead of an impulsive one**

- **Resist saying something inappropriate (or hurtful)**

- **Resist 'tit for tat' (hurting someone because that person hurt you)**

- **Resist jumping to conclusions**

Self-control: More necessary today than it used to be?

- **AVOID OBESITY** in an era of ready food availability

- **MAINTAIN FITNESS** in an era of sedentary jobs

- **SUSTAIN MARRIAGES** in an era of easy divorce

- **PREVENT ADDICTION** in an era of access to substances

- **RESIST SPENDING** in an era of sophisticated marketing

- **SAVE FOR OLD AGE** in an era without guaranteed pensions

Measuring Childhood Self-control

- **Predictor: A composite of ratings**

- **Persists across ages 3, 5, 7, 9, 11 years**

- **Agreed upon by multiple reporters**
  - *Staff observations of child's self-control in the clinic*
  - *Parents' reports*
  - *4 different teachers' reports*
  - *Child's self-reports*

- ✓ **Impulsive, acts without thinking.**
- ✓ **Can't wait his or her turn.**
- ✓ **Low frustration tolerance.**
- ✓ **Dislikes effortful tasks.**
- ✓ **Fleeting attention, easily distracted.**
- ✓ **Lacks persistence, easily forgets goals.**
- ✓ **Often goes for the risky thing.**
- ✓ **Requires constant attention and motivation from an adult.**

Health Measures
Assessments of Physical Health

Health Outcomes:
A count of clinical measures in adulthood

- **Cluster of metabolic abnormalities (17%)**
  - *E.g. obesity, blood pressure, cholesterol*

- **Periodontal disease (20%)**

- **Sexually-transmitted infection serology (18%)**

- **Inflammation biomarkers abnormal (20%)**

- **Respiratory airflow obstruction (17%)**

Self-control gradient:

Children with low self-control had poorer health than those with high self-control
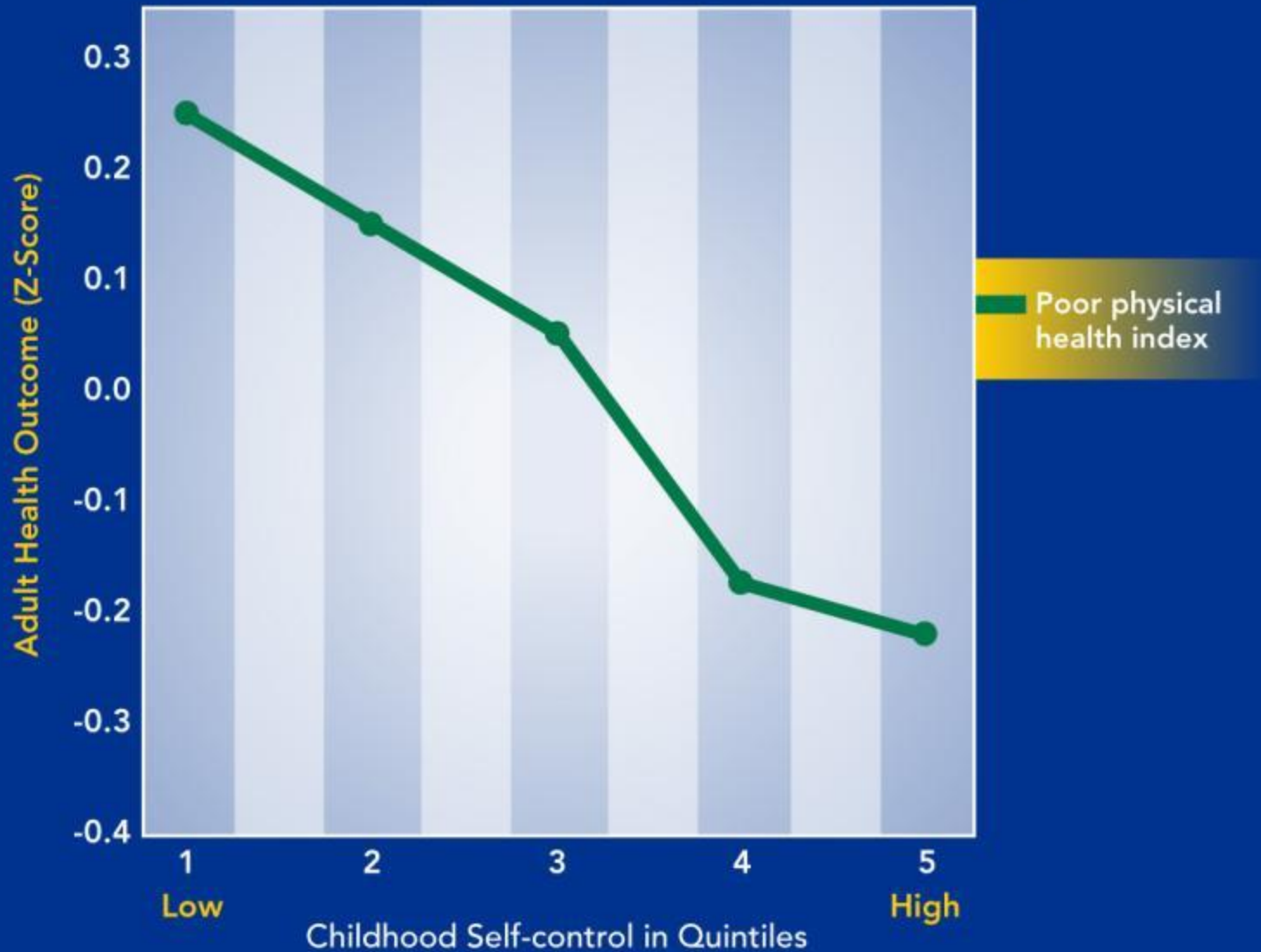
Personal Interviews
(drug and alcohol dependence or addictions)

Health Outcomes:
DSM-IV substance dependence diagnoses in adulthood

- **Tobacco dependence (19%)**

- **Alcohol dependence (8%)**

- **Cannabis dependence (5%)**

- **Harder Drug dependence (3%)**

- **Corroborated by informant reports**

Self-control gradient:

Children with low self-control had more substance-use problems than those with high self-control
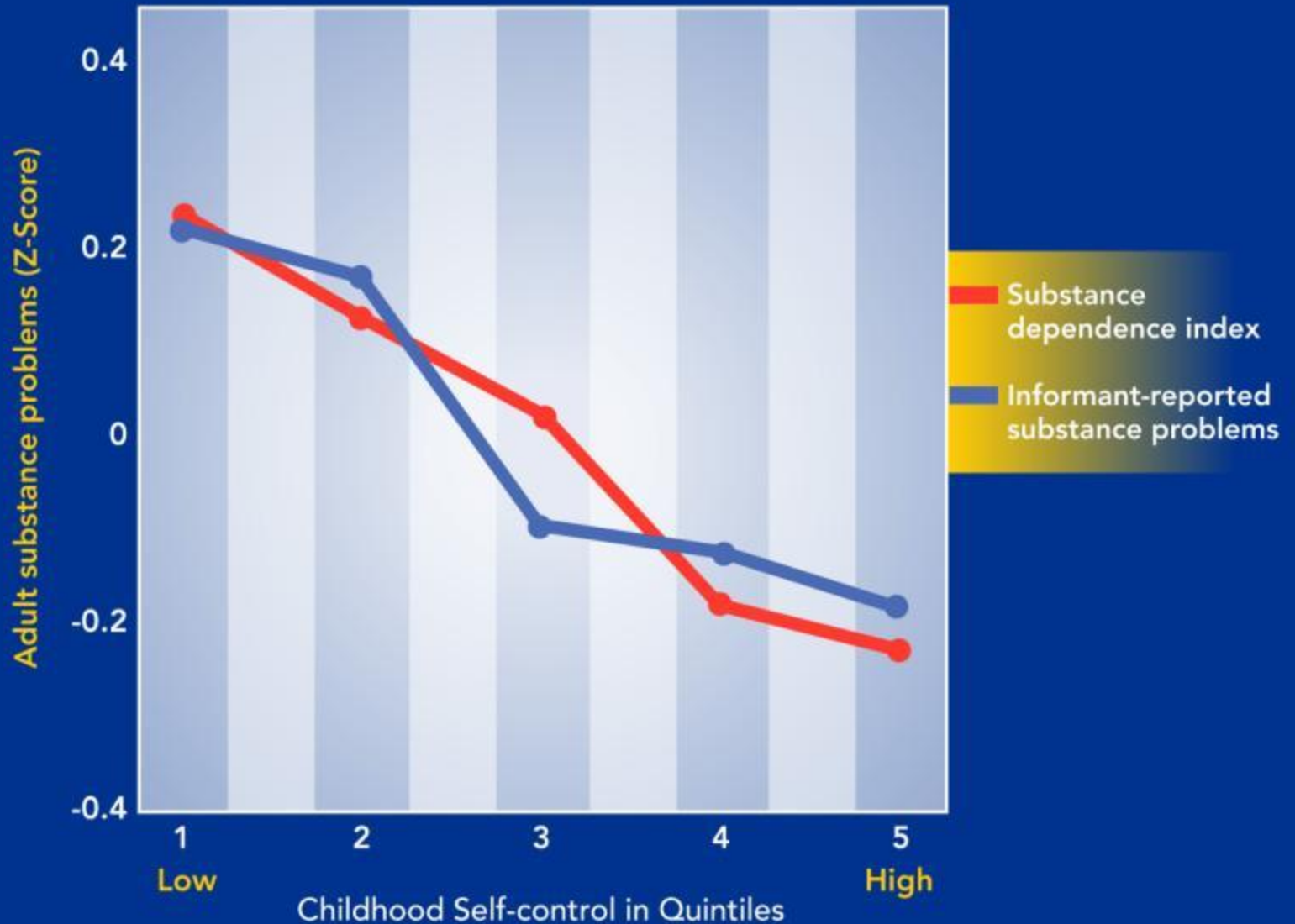
Wealth Measures
Assessments of Financial Success

Adult wealth outcomes in adulthood

- **Income in NZ dollars**

- **Occupational prestige**

Self-control gradient:

Children with low self-control had less wealth than those with high self control
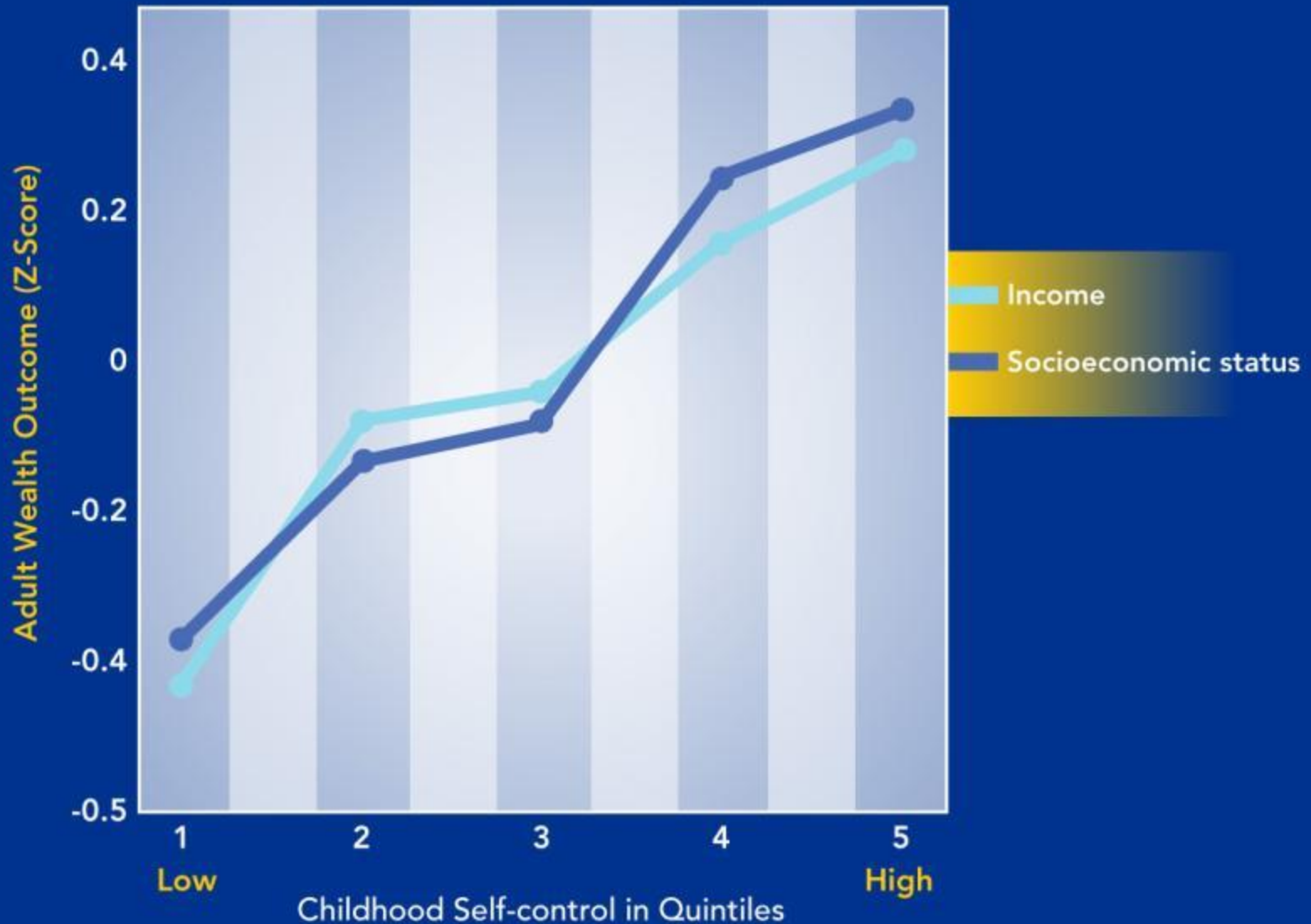
Financial planfulness in adulthood

- **Attitudes toward saving and saving behaviour**

  E.g.

  - *Is saving for the future important to you?*

  - *Do you save money by putting money away and not touching it?*

- **Financial building blocks**

  E.g.

  - *Home ownership*

  - *Investments*

  - *Retirement plan*

Self-control gradient:
Children with low self-control had not begun planning for the future

Adult Wealth Outcome (Z-Score)

Childhood Self-control in Quintiles

Low — 1
High — 5

Financial planfulness
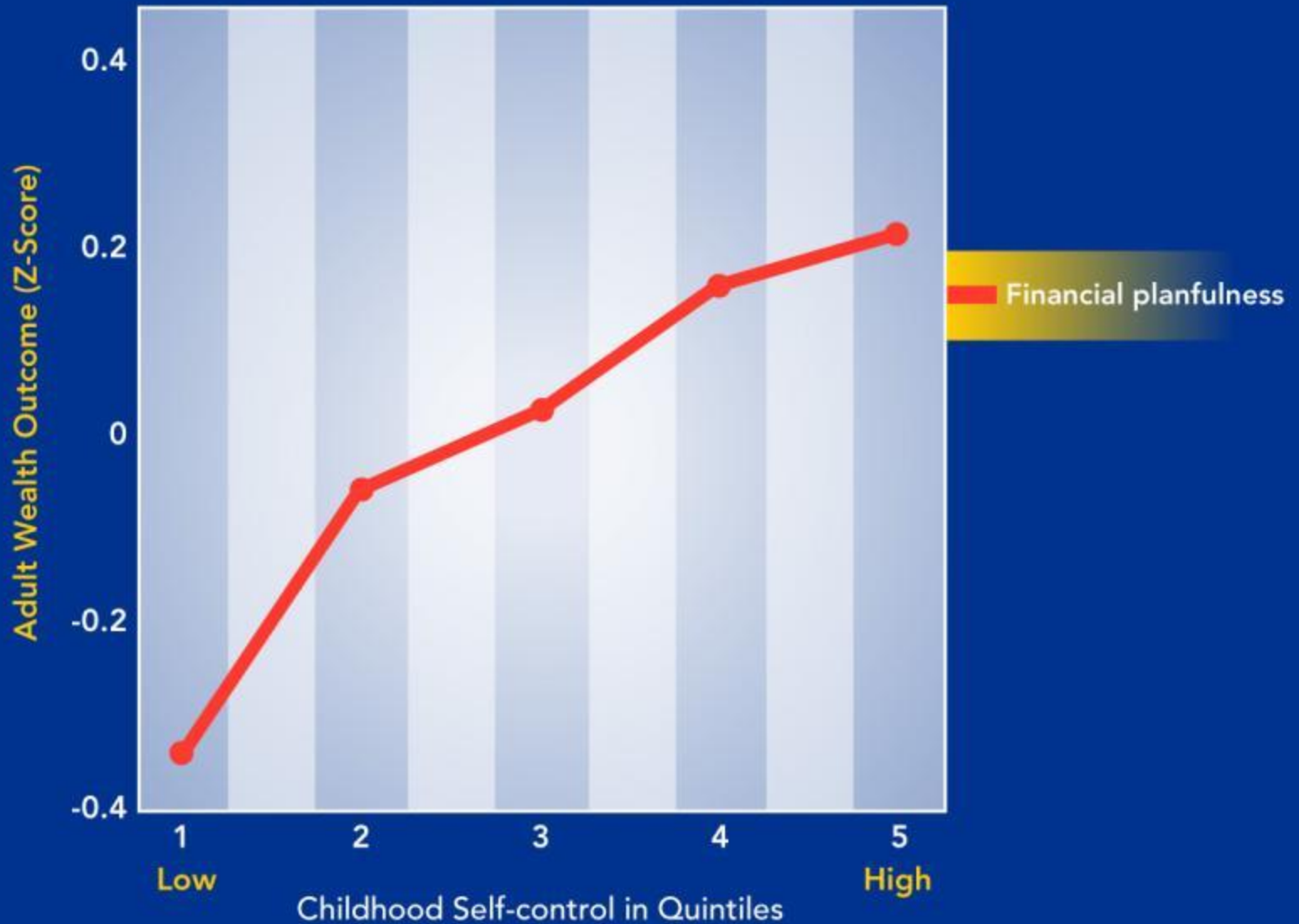
Financial struggles in adulthood:
self & informant reports

- **Money-management difficulties E.g.**
  - *Do you find it difficult to meet the cost of…*
    - *Rent, mortgage*
    - *Phone or heating bills*
    - *Major repairs to car or house*
    - *Do you find yourself living paycheck to paycheck?*

- **Credit problems E.g.**
  - *Turned down for a credit card*
  - *Sold belongings to a pawnbroker*
  - *Declared bankrupt*

Self-control gradient:

Children with low self-control had more financial problems than those with high self-control
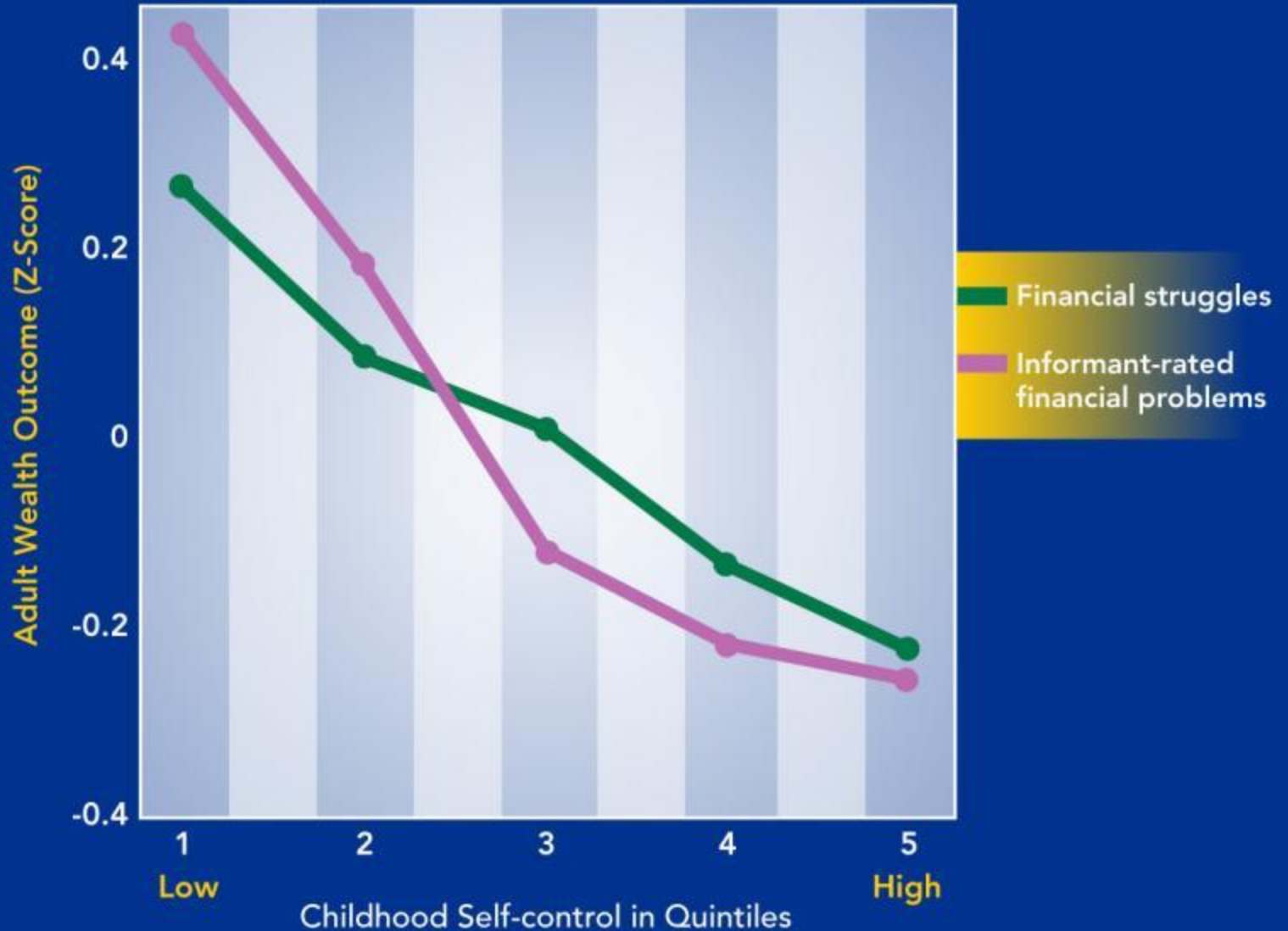
Crime Measures
Assessments of Criminal Outcomes

Criminal court convictions, age 18 to adulthood

New Zealand and Australian Police

Self-control gradient:

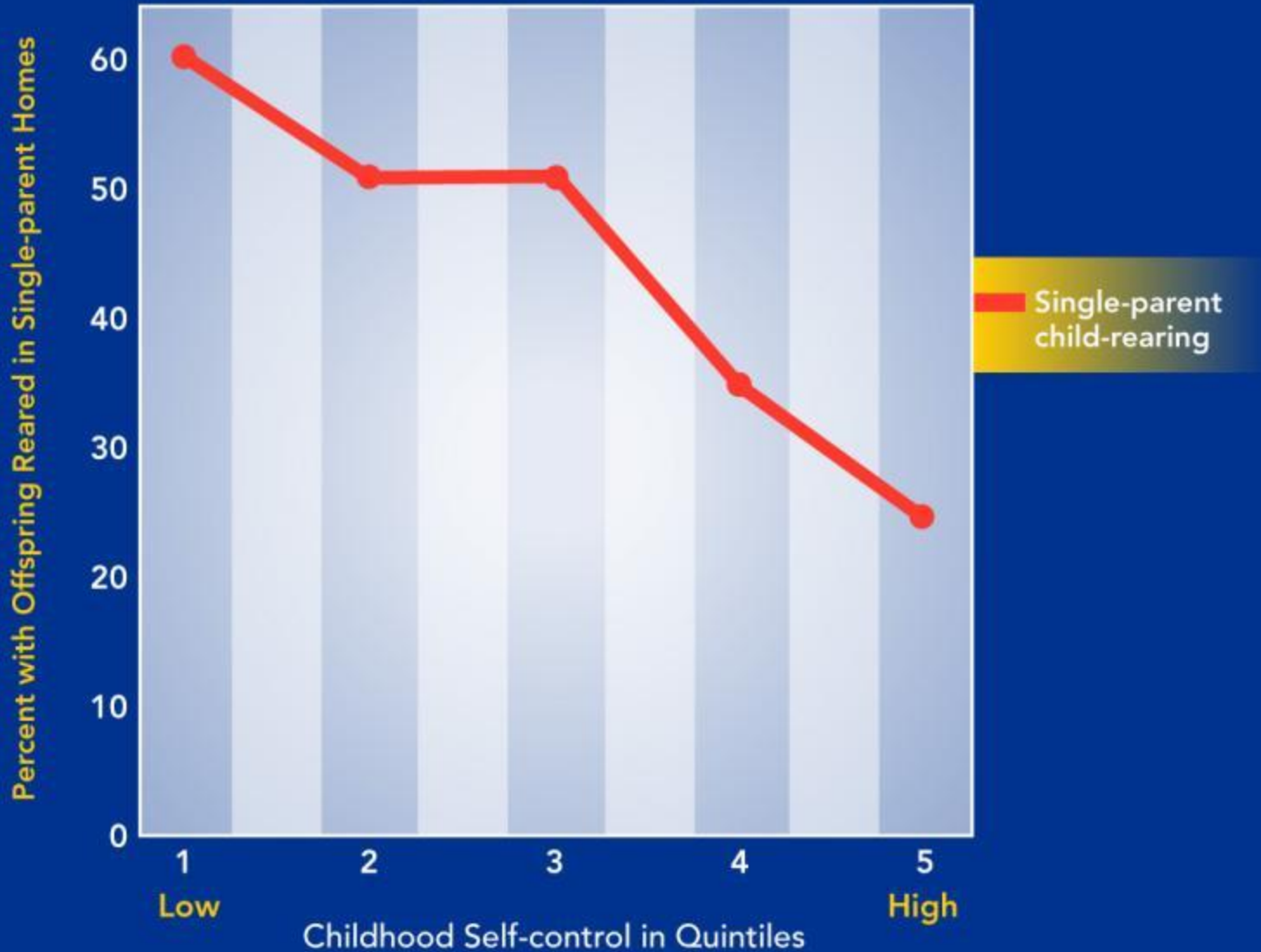*Children with low self-control had more crime conviction than those with high self-control*
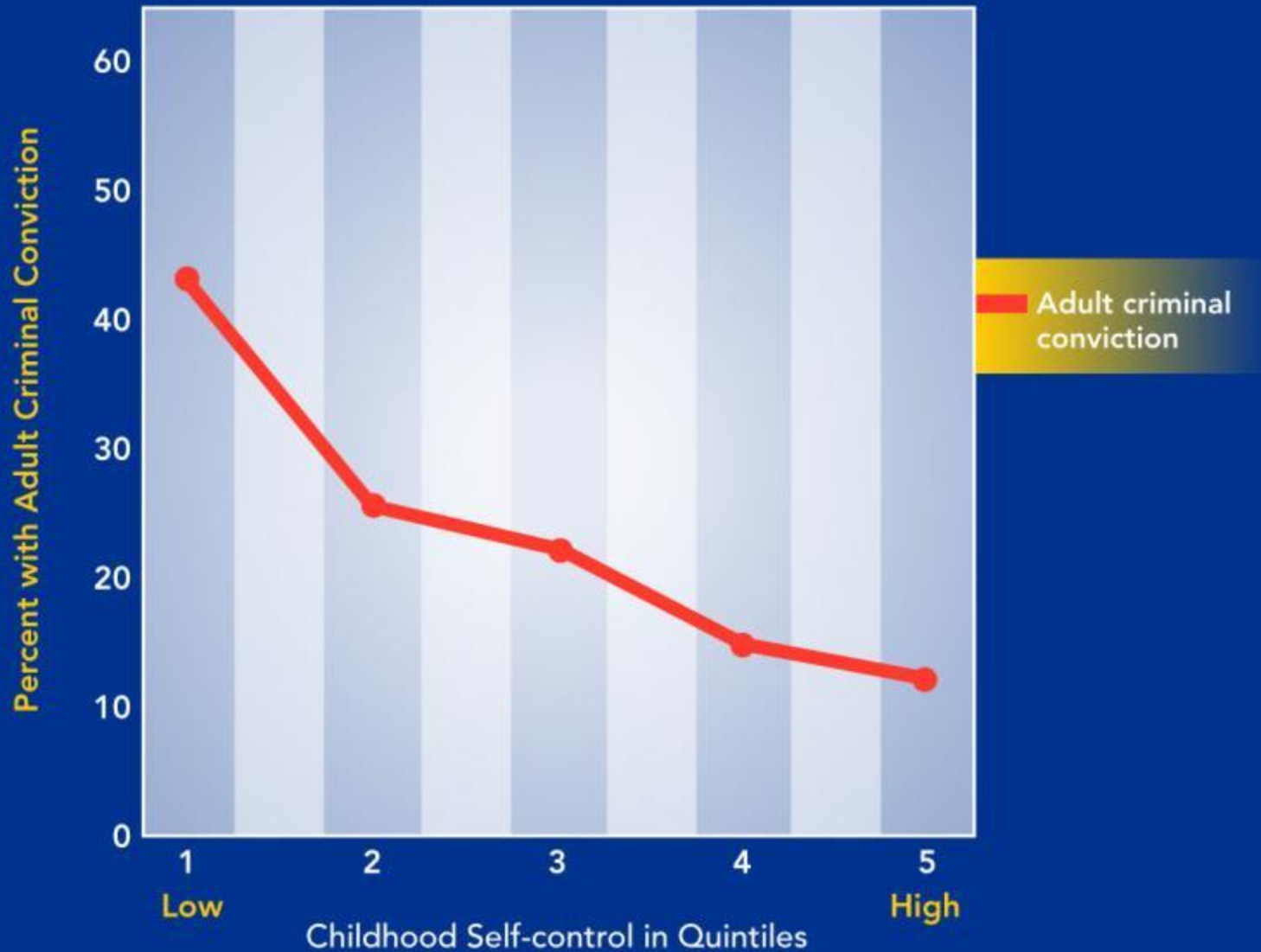
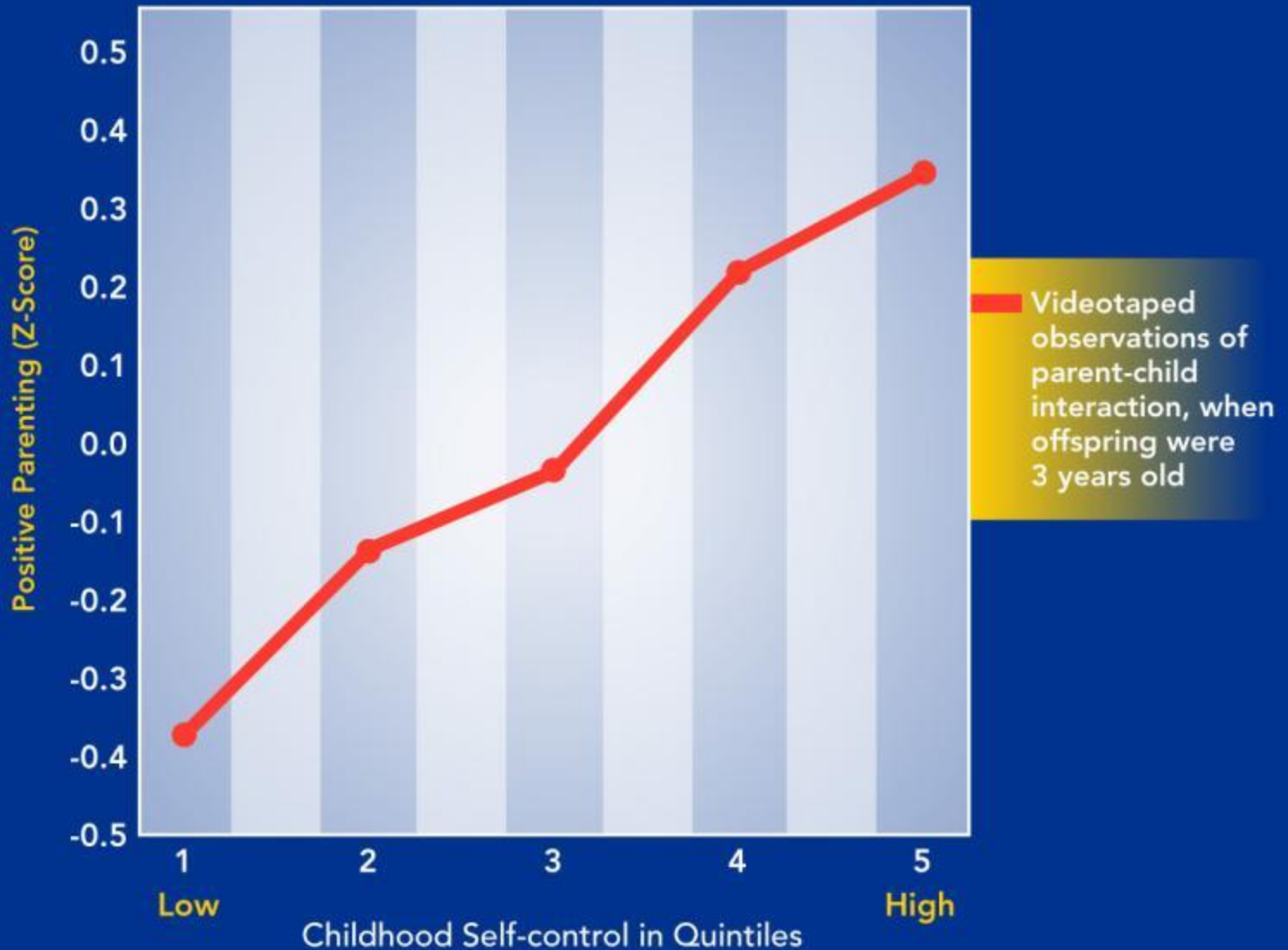# Parenting Measures
Assessments of Parental Involvement

Self-control gradient:

Children with low self-control had more single-parent child-rearing than those with high self-control

Self-control gradient:

Children with low self-control were less warm/sensitive/stimulating parents with their own child

Videotaped observations of parent-child interaction, when offspring were 3 years old

Positive Parenting (Z-Score)

Childhood Self-control in Quintiles

Low — 1

High — 5

All analyses shown today controlled for four main alternative explanations…

Gradients looked the same in

- **Children from high-income families**

- **Children with above-average IQ**

- **Girls**

- **Children without ADHD diagnoses**

Economic Measures

Costs to government

Costs to Government
Poor childhood self-control predicts duration of welfare-benefit use in adulthood
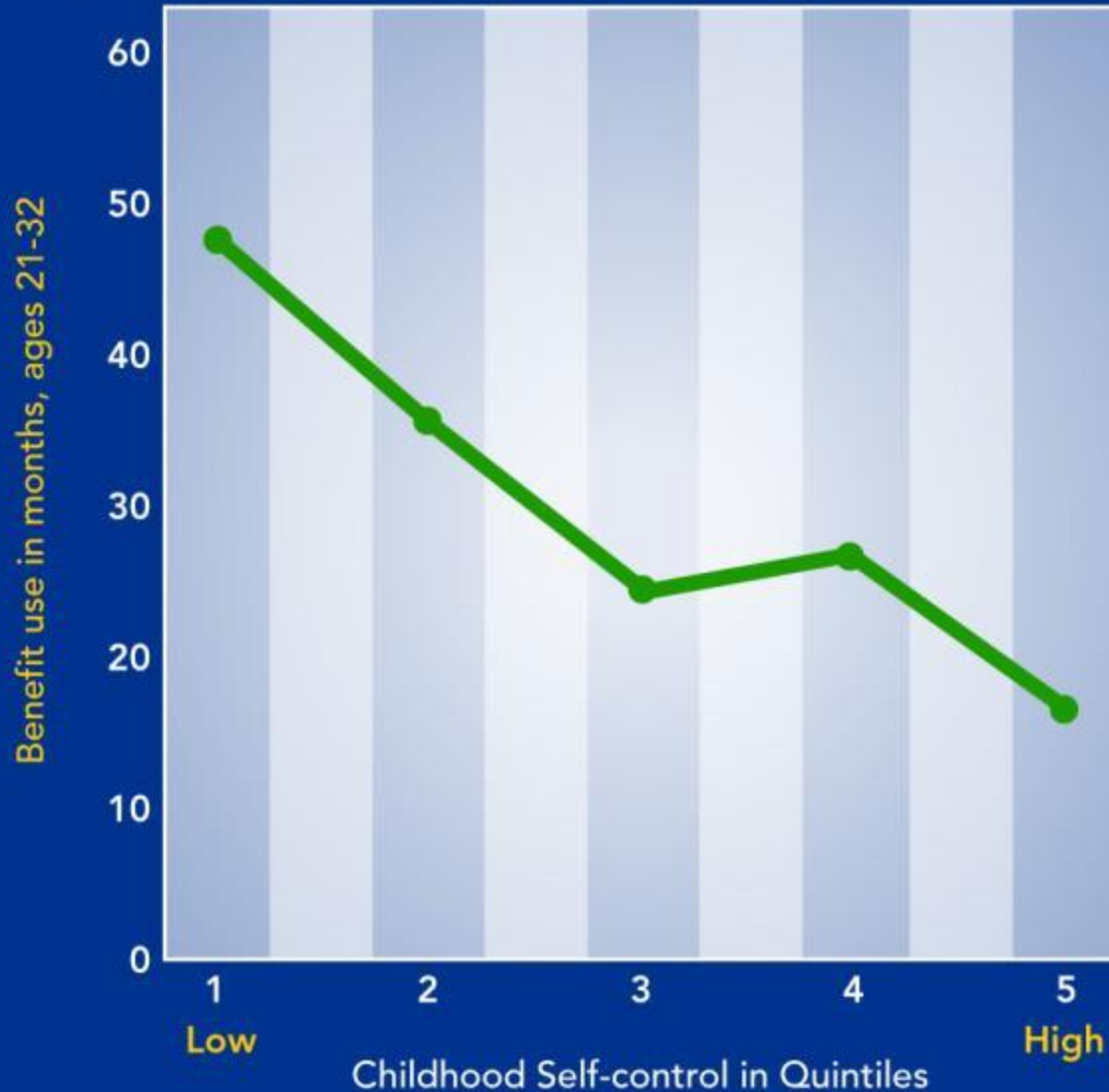
Welfare-benefit use records are from the New Zealand Ministry of Social Development
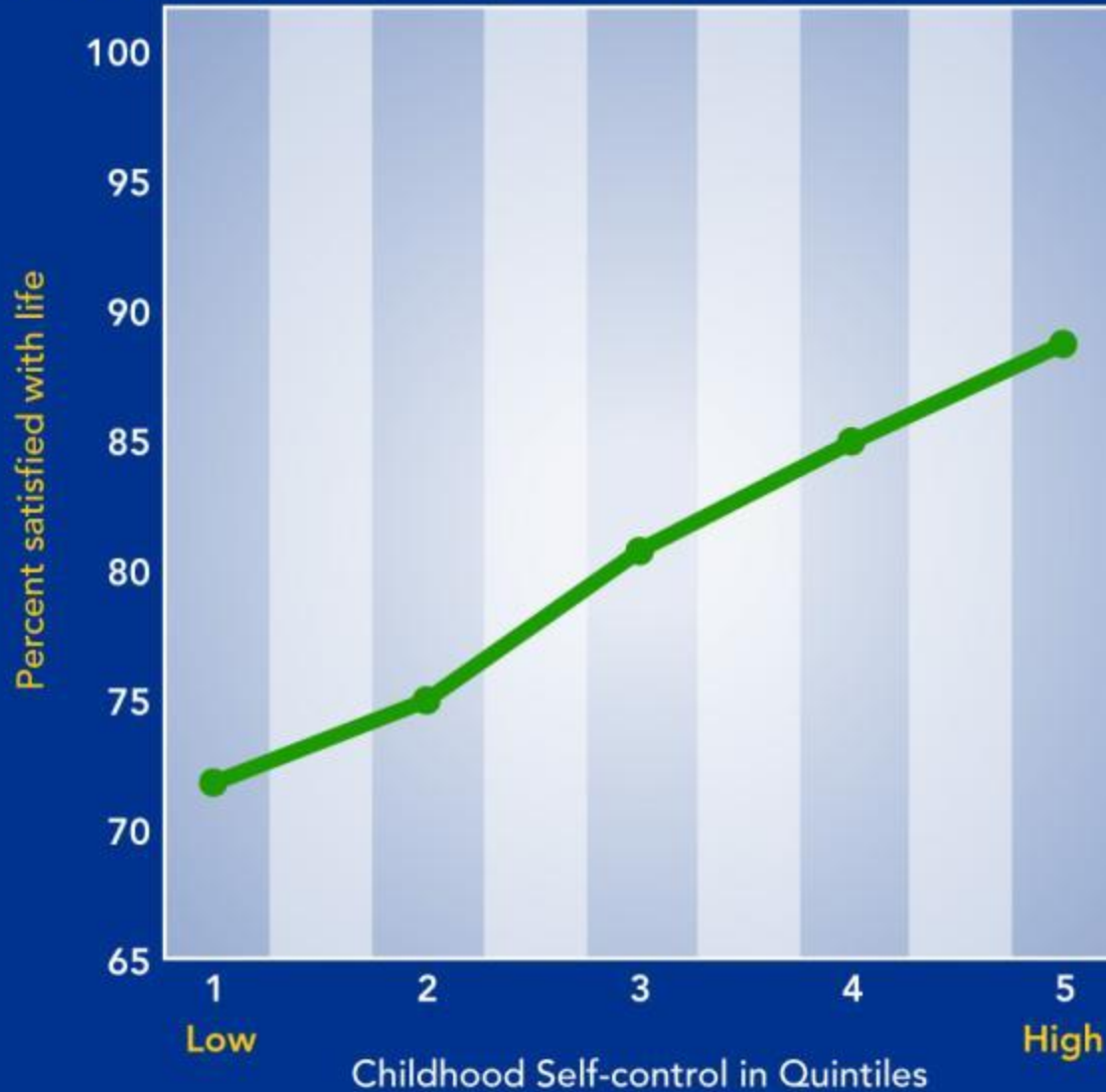
But are they happy?

Are people with very high self-control less satisfied with life?

Life satisfaction

Children with high self-control were more satisfied with life

Percent satisfied with life (y-axis)

Childhood Self-control in Quintiles (x-axis): Low (1) to High (5)

Multiple outcomes: Implications

Enhancing self-control might reduce costs of…

- crime control

- health care

- social welfare

- a healthy and financially secure old age

- improve the life chances of the next generation

Moffitt, et al (2011). A gradient of childhood self-control predicts health, wealth, and public safety . *PNAS (Proceedings of the National Academy of Sciences of the USA)*, Vol. 108(7), 2693-2698.

Moffitt, Poulton & Caspi (2013). Lifelong Impact of Early Self-Control. *American Scientist*, Vol. 101(5), 352-359.

Childhood vs. adolescence: Implications

- **Preventing adolescent mistakes is not enough to eliminate the gradient of life success**

- **Consequences of self-control start accumulating from early childhood**

- **Early intervention for best cost/benefit ratio**
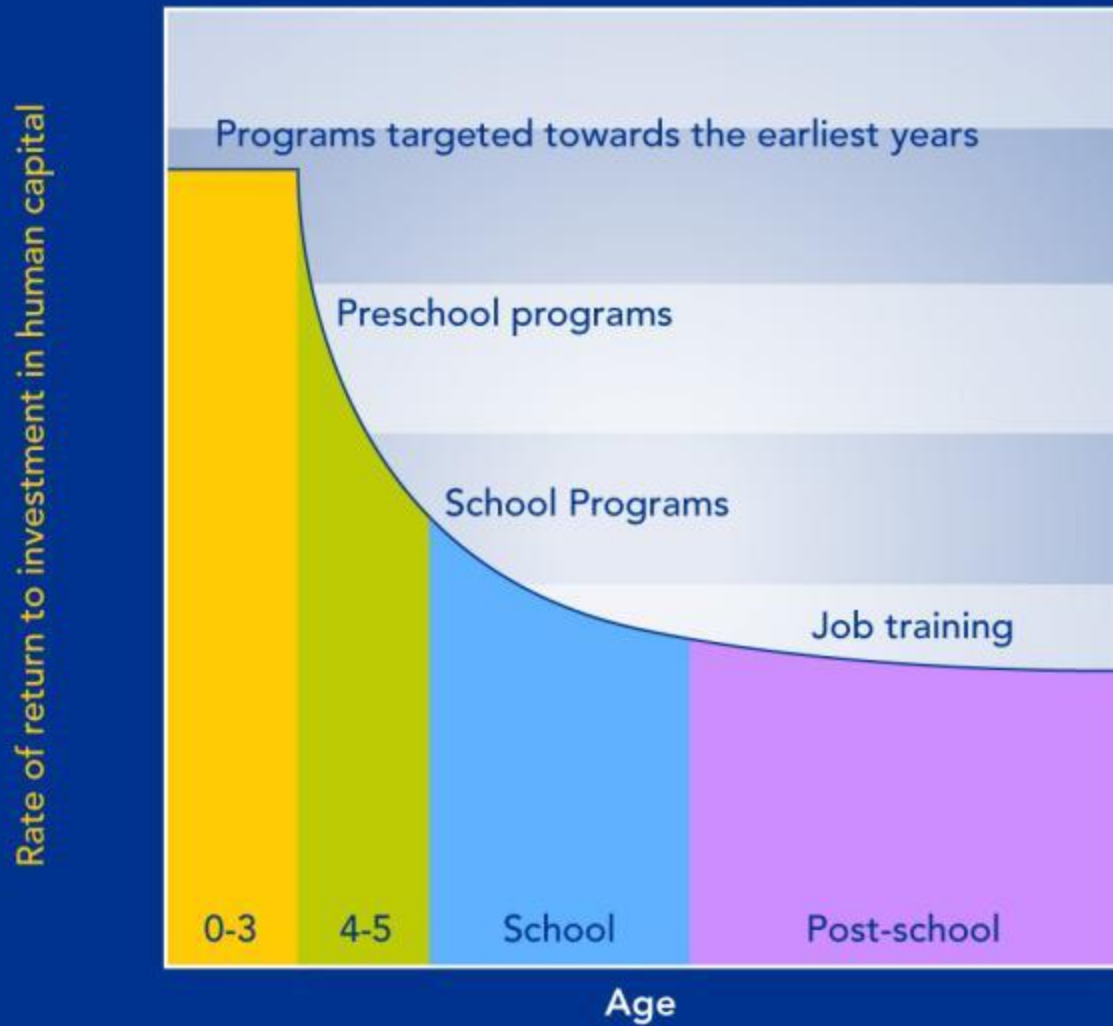
The self-control gradient: implications

- **Targeted vs. universal intervention?**

- **Even children above average on self-control can benefit from better self-control skills**

- **Even intelligent children from well-to-do homes can benefit from better self-control skills**

- **The gradient implies universal enhancement**

Teaching SAVING teaches SELF-CONTROL

Is it time for modern nations to teach self-control skills to all children?

teach?

# Early intervention: how much return can be expected?

Empirical support for the importance of investing early for practitioners, policy-makers and politicians alike.

Caspi A, Houts R, Belsky D, Harrington HL, Hogan S, Ramrakha S, Poulton R, and Moffit TE. Childhood forecasting of a small segment of the population with large economic burden *Nature Human Behavior, 1, 0005, 2017*.

New Zealand's Admin Data Bases and Electronic Medical Records

- The 1,000 cohort members have used….

- 24,997 monthly social welfare benefit payments

- 8,958 bed-nights in NHS hospitals

- 66,811 pharmacy prescriptions

- 6,919 insurance claims for injuries paid

- 2,141 convictions in criminal courts

- 5,760 tobacco pack-years (42,076,800 cigarettes)

- 2,924 kilograms of excess weight over obese BMI

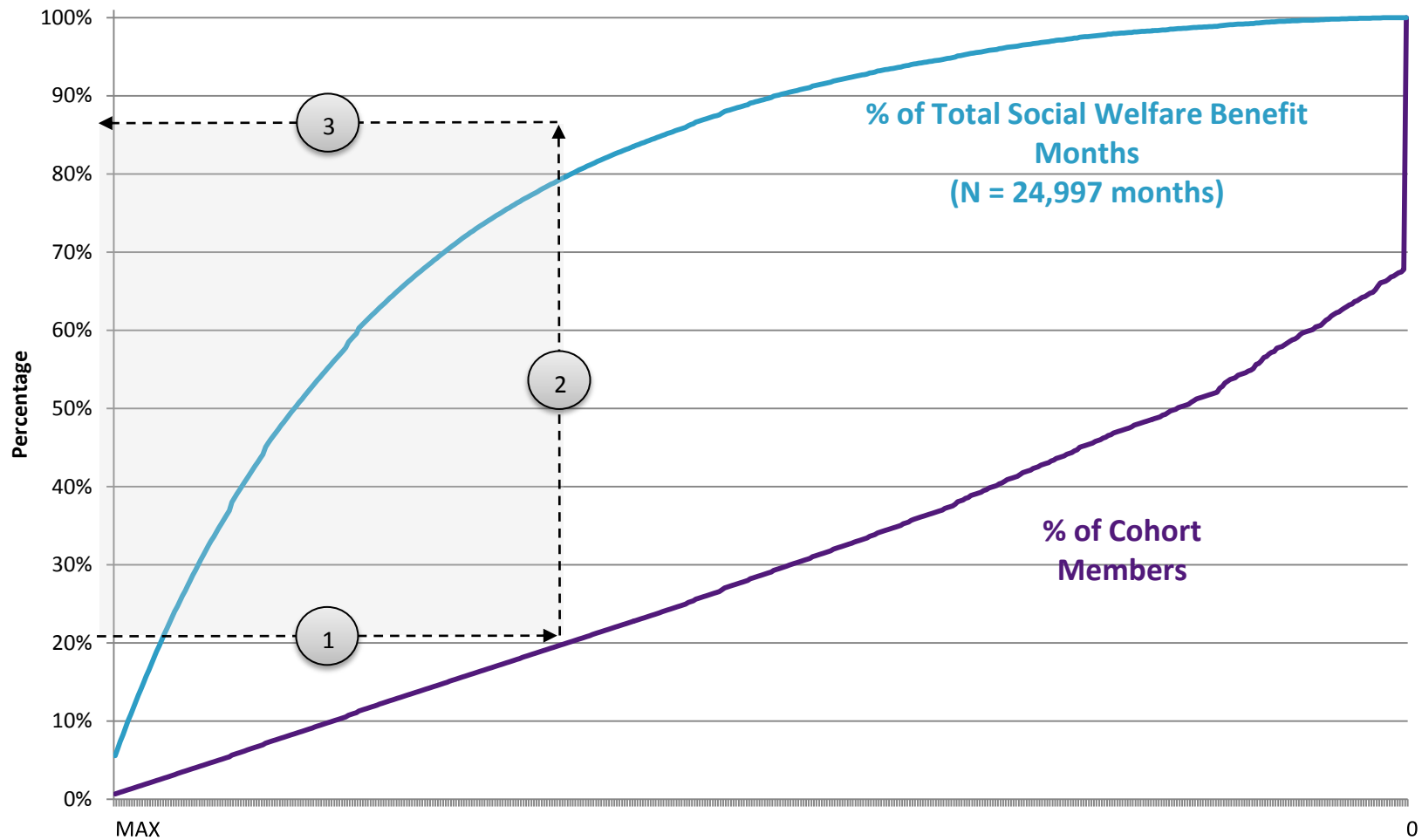- 2,755 fatherless child-years among cohort members' offspring

The Pareto Principle

80%

20%
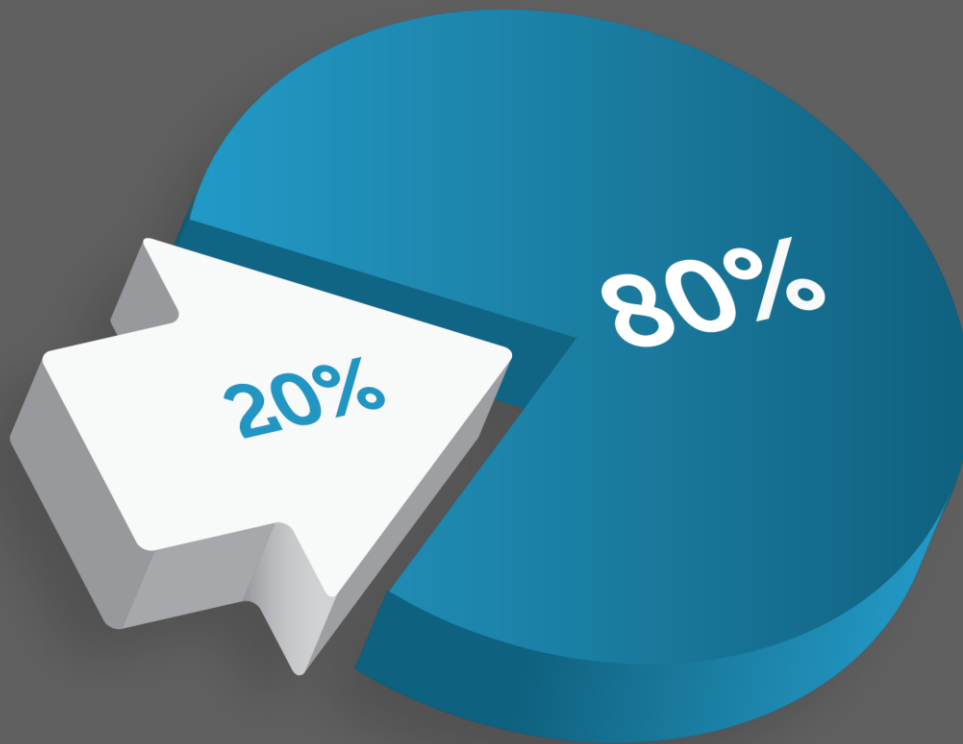
20% of actors account for ~**80%** of outcomes.

Vilfredo Pareto, 1848-1923

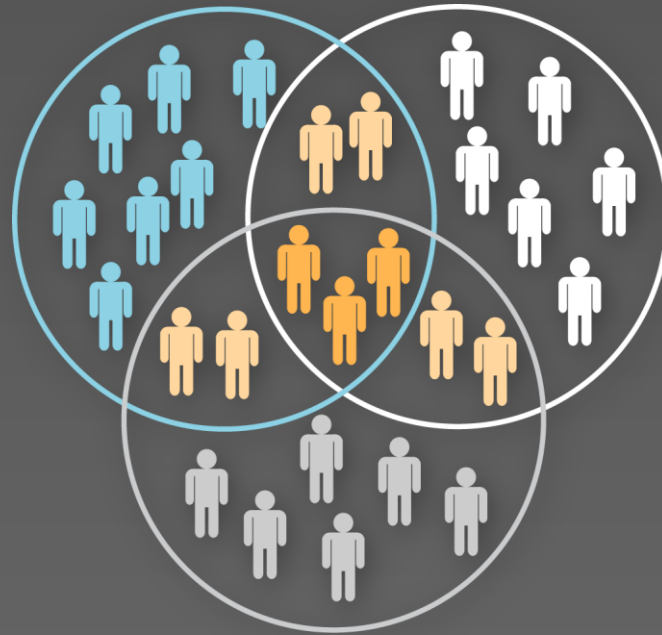fits each of the Dunedin administrative outcomes

For example......social welfare benefits:

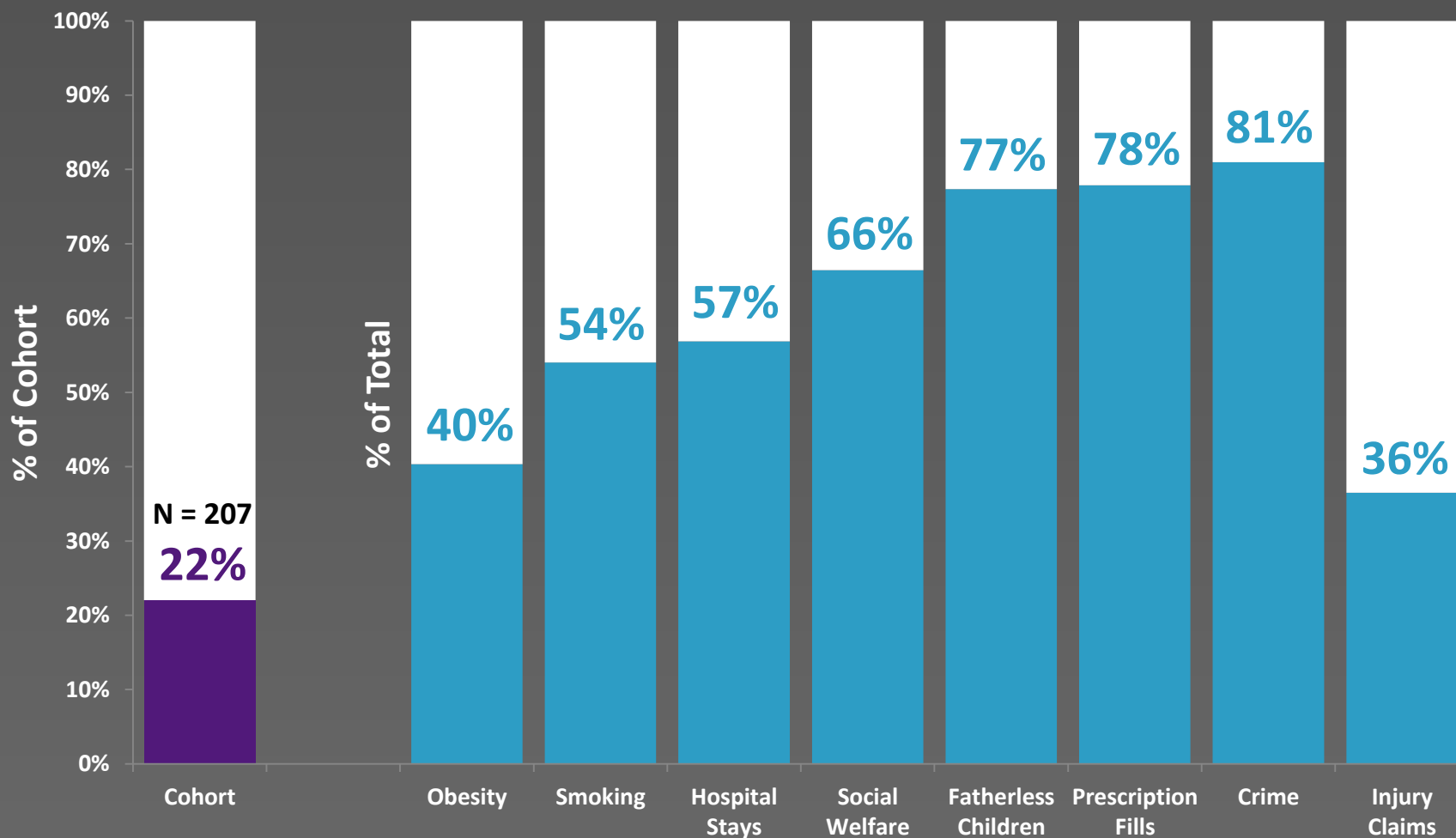**20% of Cohort Members = 81% of Social Welfare Benefit Months**

High-cost 20% groups are not independent sets of individuals, their membership overlaps.

Ultra-high-cost segment is the center.

The Ultra-High-Cost population segment:
How many health and social services do they use?

45-min assessment at age three predicted the ultra-high-cost segment

BRAIN HEALTH ASSESSMENT at 3:
Pediatric neurology exam
Peabody Picture Vocab test
Reynell Receptive Language test
Bayley Motor Skills test
Examiner-rated poor behavior control

Cohen's d effect size = .6
ROC area under curve = .80
 Good sensitivity/specificity balance

Change across the social sector

Expert Panel
Final Report

Investing in New Zealand's
Children and their Families

DECEMBER 2015

The Modernising Child, Youth and Family Panel (Rebstock, P., Bush, M., Douglas, P., Dunlop, D., Leahy, H., Poulton, R.). *Expert Panel Final Report: Investing in New Zealand's Children and their families.* Ministry of Social Development, Wellington, April 2016.

According to a senior Government official, this is probably he most significant change in New Zealand's social sector since the Social Security Act in 1972.

Acknowledgements

- **This on-going research would not have been possible without the co-operation and commitment of the Study members, their families and friends over a long period of time.**

- **Core funding for the Dunedin Multidisciplinary Health and Development Research Unit comes from the Health Research Council of New Zealand and the NZ Ministry of Business, Innovation & Employment (MBIE).**

For copies of research articles referred to in this presentation or other information on the Study, contact:

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http://dunedin study.otago.ac.nz