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The Australian Research Centre for Population Oral Health
(ARCPHO)

Fluoride and oral health inequalities: childhood caries

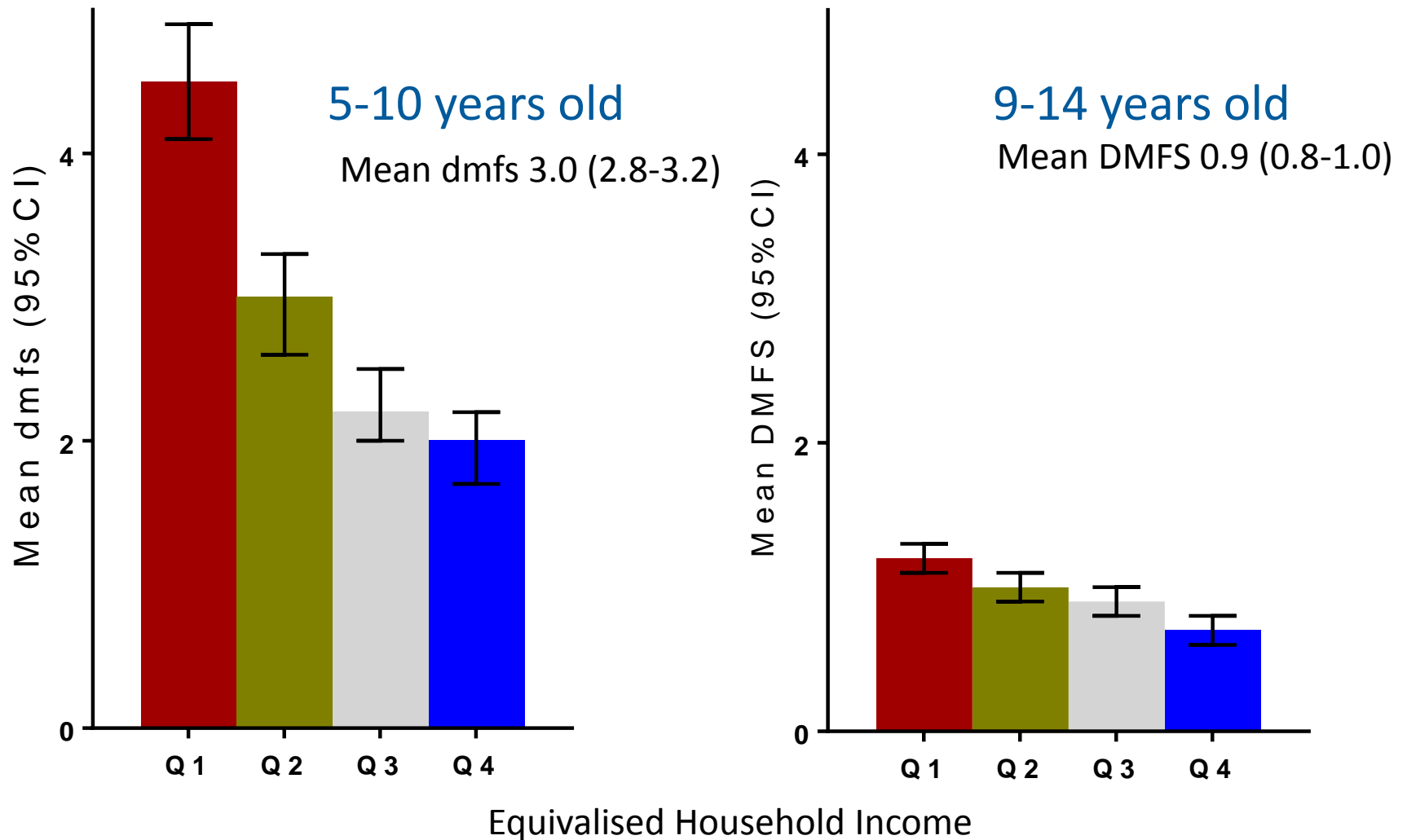
John Spencer, Loc Do, Diep Ha

September 2017

adelaide.edu.au

seek LIGHT

Inequality in childhood caries experience- Australian children 2012-14



Inequalities in childhood caries

- Social determinant models for childhood caries offer a wide range of possible interventions to reduce both caries experience and inequalities in caries
 - Many interventions are aimed at reducing risk factors
 - Some aim to increase protective factors especially through fluorides
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Aim

To explore some theoretical considerations and empirical evidence for the role of fluoride in inequalities in childhood caries

Impact of fluoride interventions on inequalities in childhood caries

Depends on:

Community/population effectiveness

Social distribution and intensity of the interventions

Effectiveness of fluoride interventions

Efficacy/effectiveness varies

Preferred – those interventions that maintain a low fluoride concentration at the tooth surface

Suggests a rank order of efficacy/effectiveness established in trials

However in the translation to the real world the impact of fluorides on a community/population will also depend on the individual effort needed to obtain a preventive benefit

Frieden's Health Impact Pyramid

Suggests an inverse relationship between individual needed to implement an intervention and community/population impact

**Individual
Effort Needed**

Population Impact

High

Low

❖ Social circumstances which determine and stabilize individual behaviours resist efforts at behaviour change

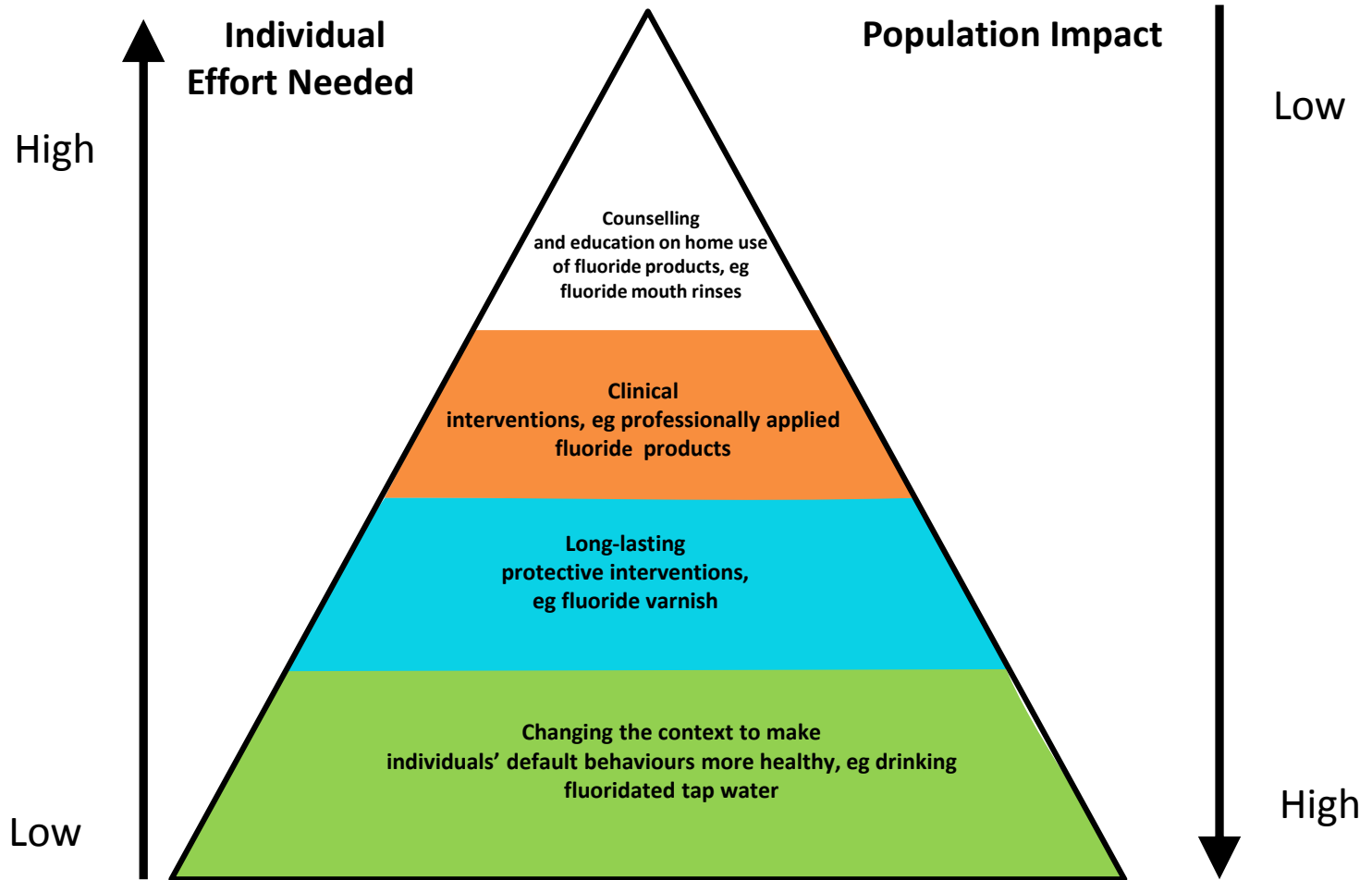
❖ The very circumstances which shape inequality in child caries impede the population impact of fluoride interventions which rely on individual effort

Low

High

(Frieden 2010).

The Fluoride Impact Pyramid

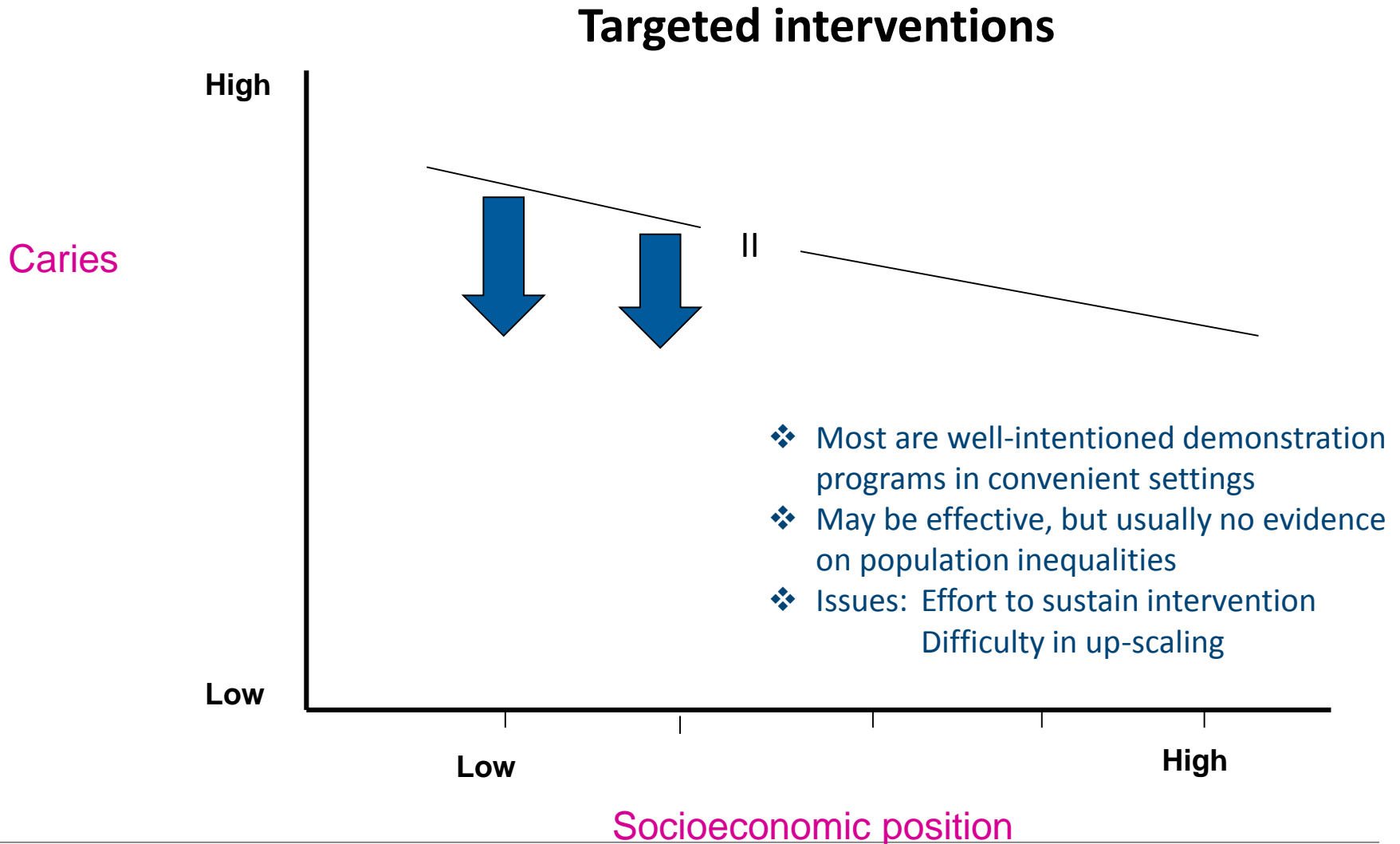


Social distribution of fluoride interventions

Fluoride interventions may be

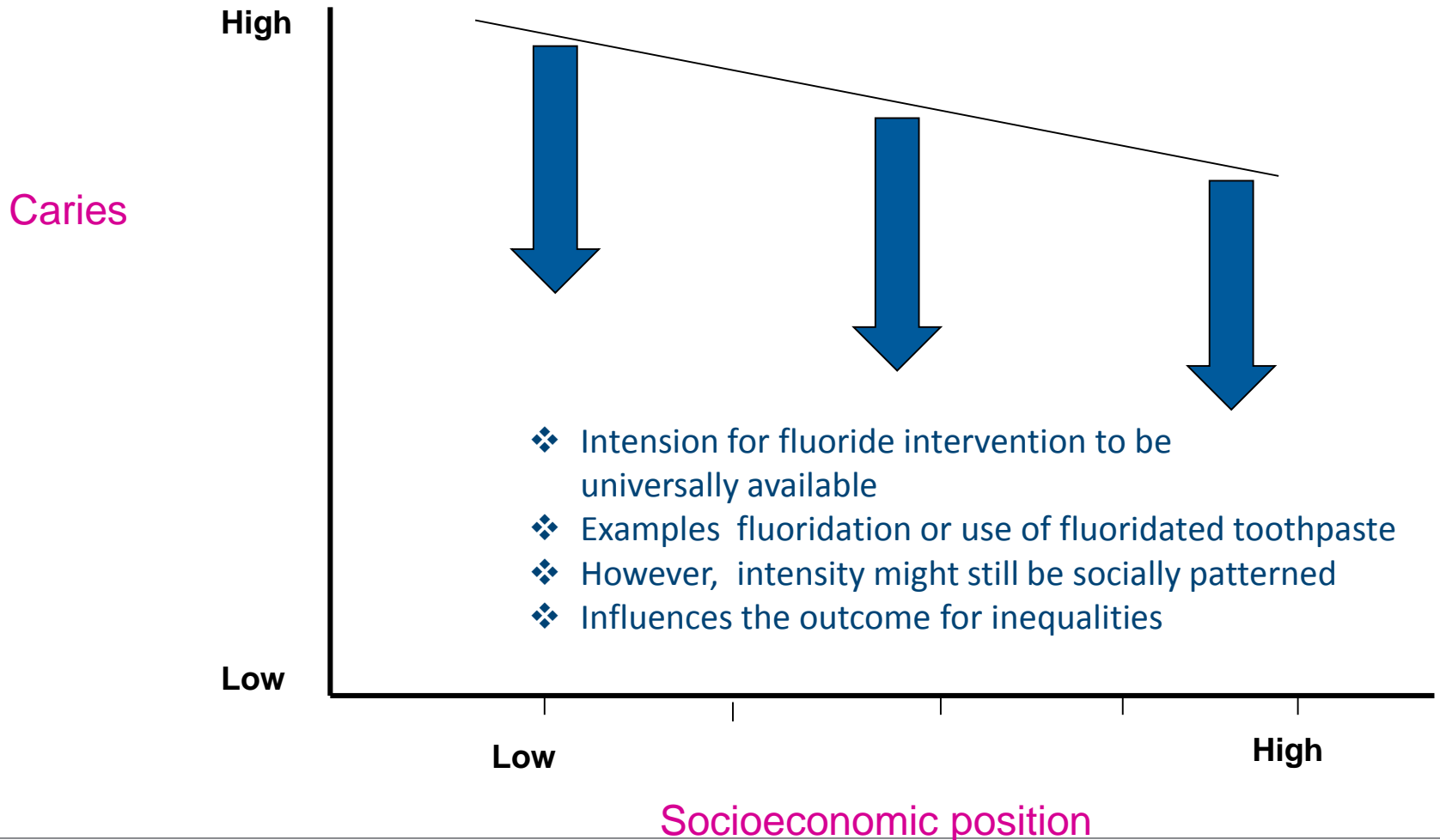
- Targeted, or
 - Universal
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Childhood caries inequalities

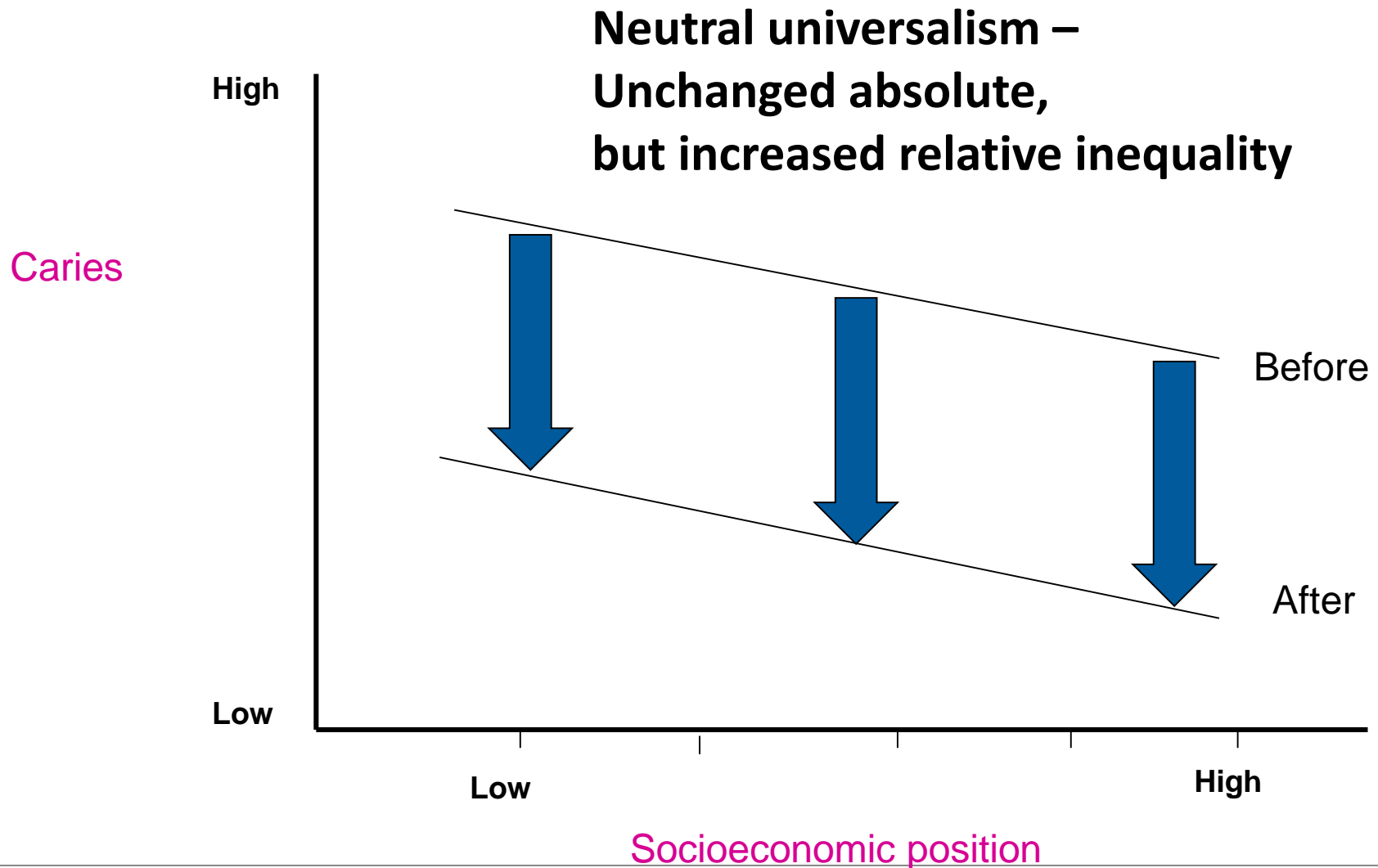


Childhood caries inequalities

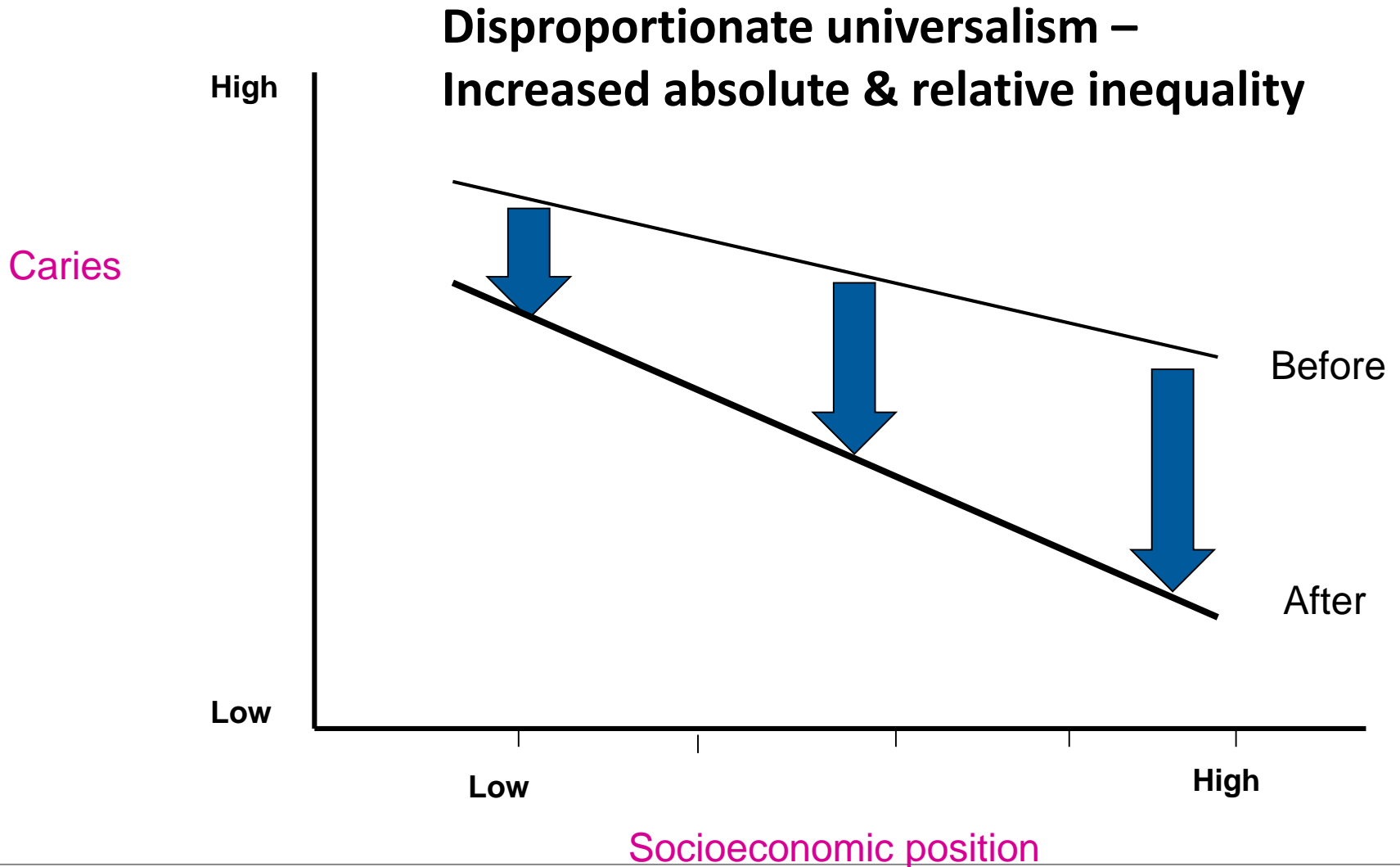
Universal interventions



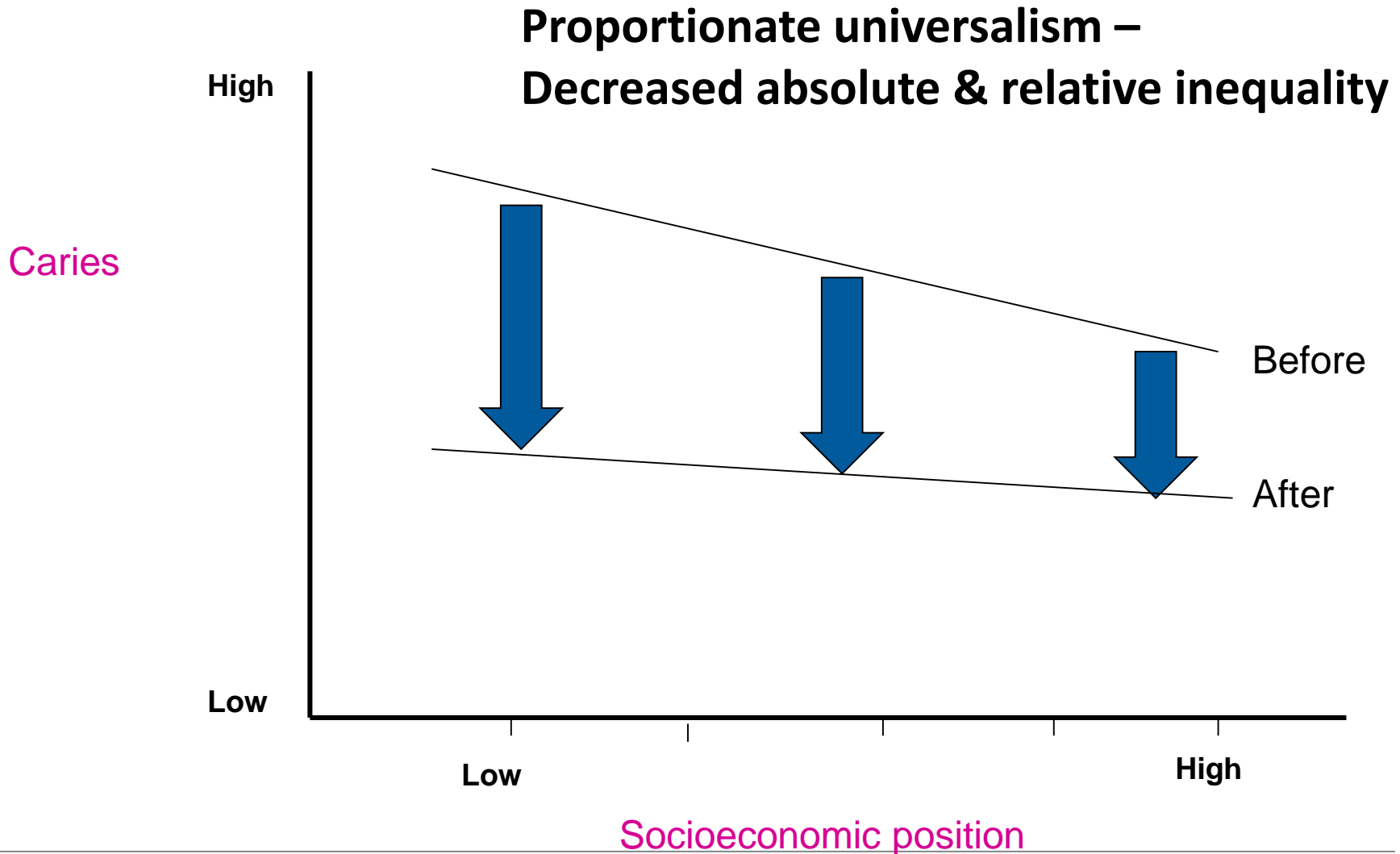
Childhood caries inequalities



Childhood caries inequalities



Childhood caries inequalities



Empirical evidence : water fluoridation

- York review (McDonagh et al 2000)–

Some evidence that water fluoridation reduced caries in lower SES children in the UK

- Cochrane review(Iheorzor-Ejiofor et al 2015) –

Insufficient evidence the water fluoridation results in a change in caries by SES

- More recently, NHMRC (2017) concluded –

Water fluoridation reduces caries across SES groups

Limited evidence that it reduces inequalities
Cautioned, limited number of studies, especially from Australian context, studies low quality and had varying results

Called for further research

Impact of water fluoridation on inequalities in childhood caries

Depends on:

- ❖ Social distribution, and
 - ❖ Intensity
of the intervention
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Association between household income and exposure to water fluoridation

Equiv. Household Income	Exposed to WF Row % (95%CI)	
Q1 (Low)	66.8	(63.1-70.1)
Q2	66.7	(63.1-70.1)
Q3	70.7	(67.1-72.1)
Q4 (High)	76.0	(72.1-79.5)

Exposure to water fluoridation was significantly associated with SES

Distribution by household income of Australia child population and those exposed to water fluoridation

Income	Population %	Exposed to WF Col % (95%CI)	
Q1(Low)	29.5	28.2	(25.8-30.7)
Q2	24.0	23.0	(21.6-24.4)
Q3	21.2	21.4	(20.1-22.8)
Q4(High)	25.2	27.4	(24.8-30.2)

The social distribution of fluoridated water is not significantly biased by SES

Distribution by household income of Australia child population and exposure to water fluoridation, tooth brushing 2+ /day and having had professionally applied topical fluoride

Income	Population %	Exposed to WF %	Brush 2+ /day %	Topical fluoride %
Q1(Low)	29.5	28.2	25.1	19.1
Q2	24.0	23.0	23.6	22.6
Q3	21.2	21.4	22.4	23.7
Q4(High)	25.2	27.4	28.9	34.6

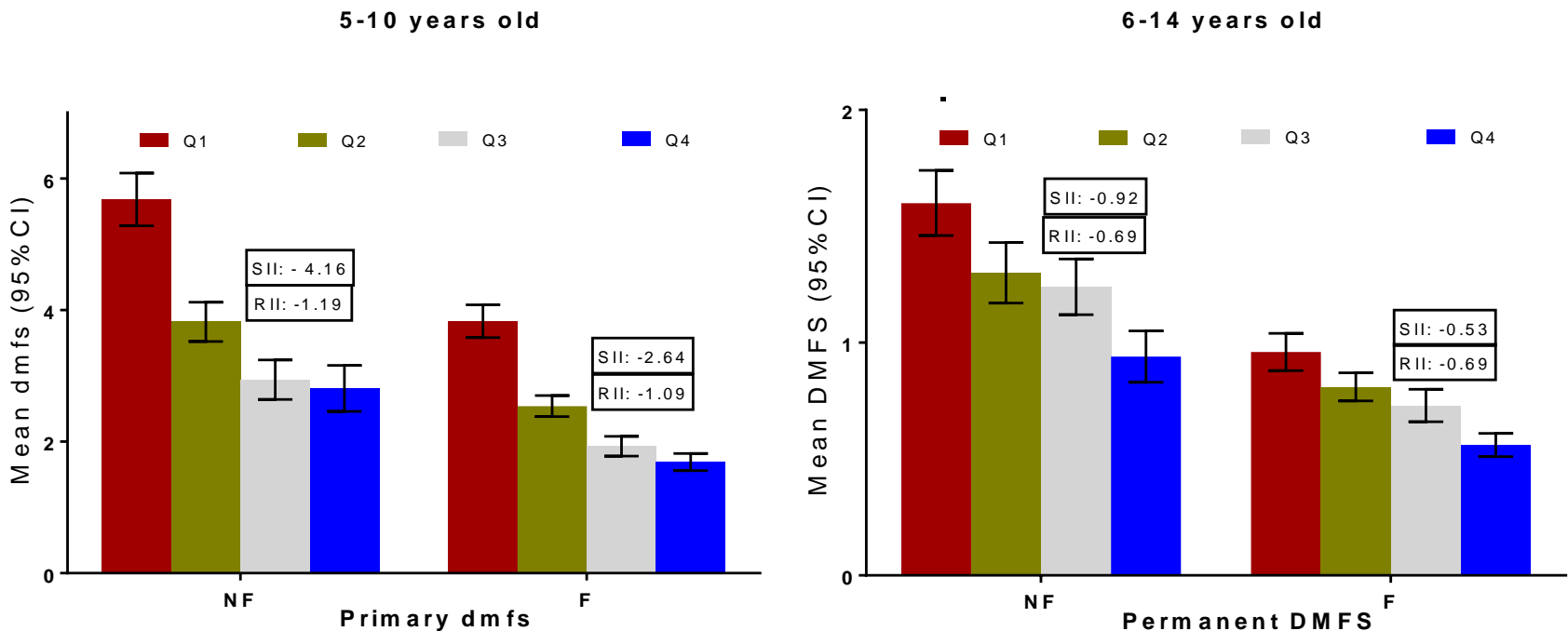
The social distribution of brushing 2+ a day and having had a professionally applied topical fluoride are significantly biased by SES

Empirical evidence : water fluoridation

- A default behaviour, drinking tap water becomes a positive preventive behaviour (Mechanic, 1997)
 - However, fluoridated water is delivered to households at the same concentration (intensity)
 - So, it is interesting to look at the outcome for caries experience and inequality in childhood caries as a result of exposure to water fluoridation
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Empirical evidence : water fluoridation

Caries experience 5-10-year old (dmfs) and 9-14-year old (DMFS) Australian children by equalized household income quartiles and water fluoridation status (Do et al, submitted September 2017)



- ❖ Absolute inequality in childhood caries reduced, relative inequalities unchanged
- ❖ Inequalities not eliminated
- ❖ A composite of interventions required

Empirical evidence : water fluoridation

Summary

- Social distribution of exposure to water fluoridation not biased, but intensity of the fluoride delivery across social status groups is not proportionate to the risk of caries
 - All SES groups benefit (**benefit is universal**)
 - Yet, low SES groups benefit more from water fluoridation than high SES groups
 - Some mechanisms of fluoride action are related to the presence of sub-clinical caries activity, water fluoridation is associated with a greater effect for low SES groups (**benefit is proportionate**)
 - Consistent with social justice and equal opportunity for children
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Policy implications

- Interventions using fluoride vary in community/population effectiveness depending on their need for individual effort
 - Fluoride interventions may be neutral, increase or decrease absolute and/or relative inequalities depending on their social distribution and intensity
 - Recent findings show that water fluoridation reduces absolute but not relative inequalities in childhood caries, supporting social justice and equal opportunity as considerations in setting public policy
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Further information:

Do & Spencer 2016; Do et al, submitted