MRC Epidemiology Unit

UNIVERSITY OF CAMBRIDGE

Interventions to change behavior: a public health perspective

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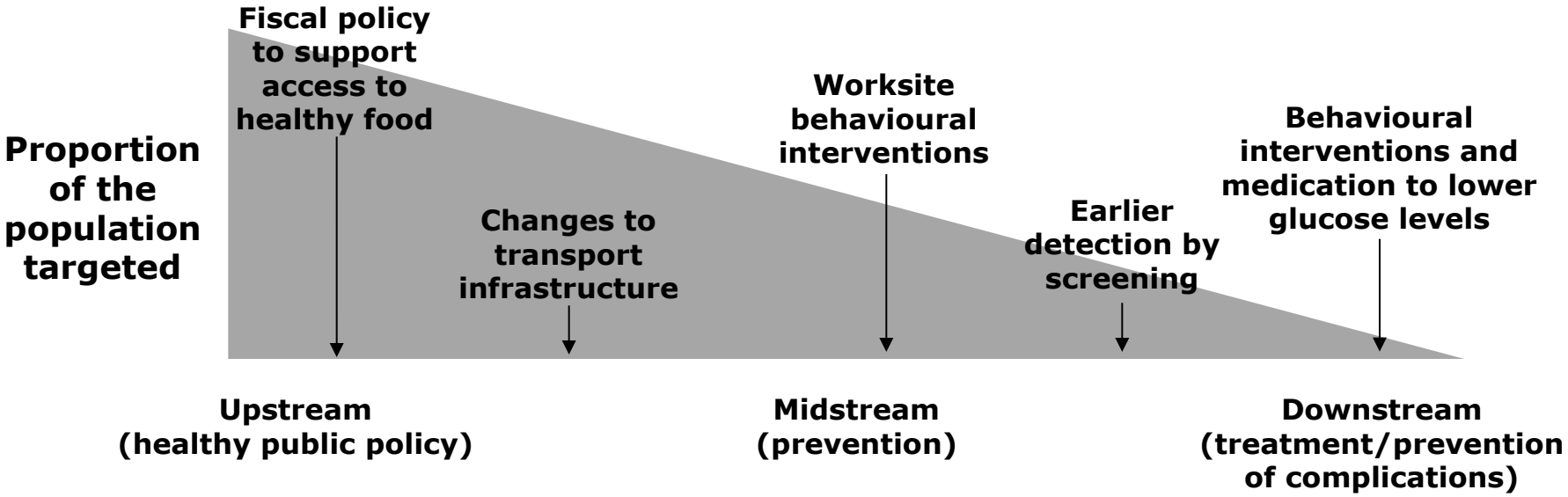
Cambridge Diabetes Seminar, Clare College, Wednesday 3 April 2019

Wellcome Trust – MRC IMS Institute of Metabolic Science

Cambridge Institute of Public Health


Proportion of the population targeted
Fiscal policy to support access to healthy food
Changes to transport infrastructure
Worksite behavioural interventions
Earlier detection by screening
Behavioural interventions and medication to lower glucose levels
Upstream (healthy public policy)
Midstream (prevention)
Downstream (treatment/prevention of complications)

Learning objectives

- To understand the important determinants of physical activity and dietary behavior; and how this informs research, practice and policy
- To understand the nature of evidence that informs population level interventions
- To understand the importance of ‘systems perspectives’ to guide action and as a template for evaluation
- To consider how best to engage with policy makers to shape public policy

What influences the way we behave?

In pairs (5 minutes): What factors influence what ***you*** eat or how physically active you are?

- Focus on one behaviour.
- Think as broadly as possible.
- Try and group or classify the influences.

What influences the way we behave?

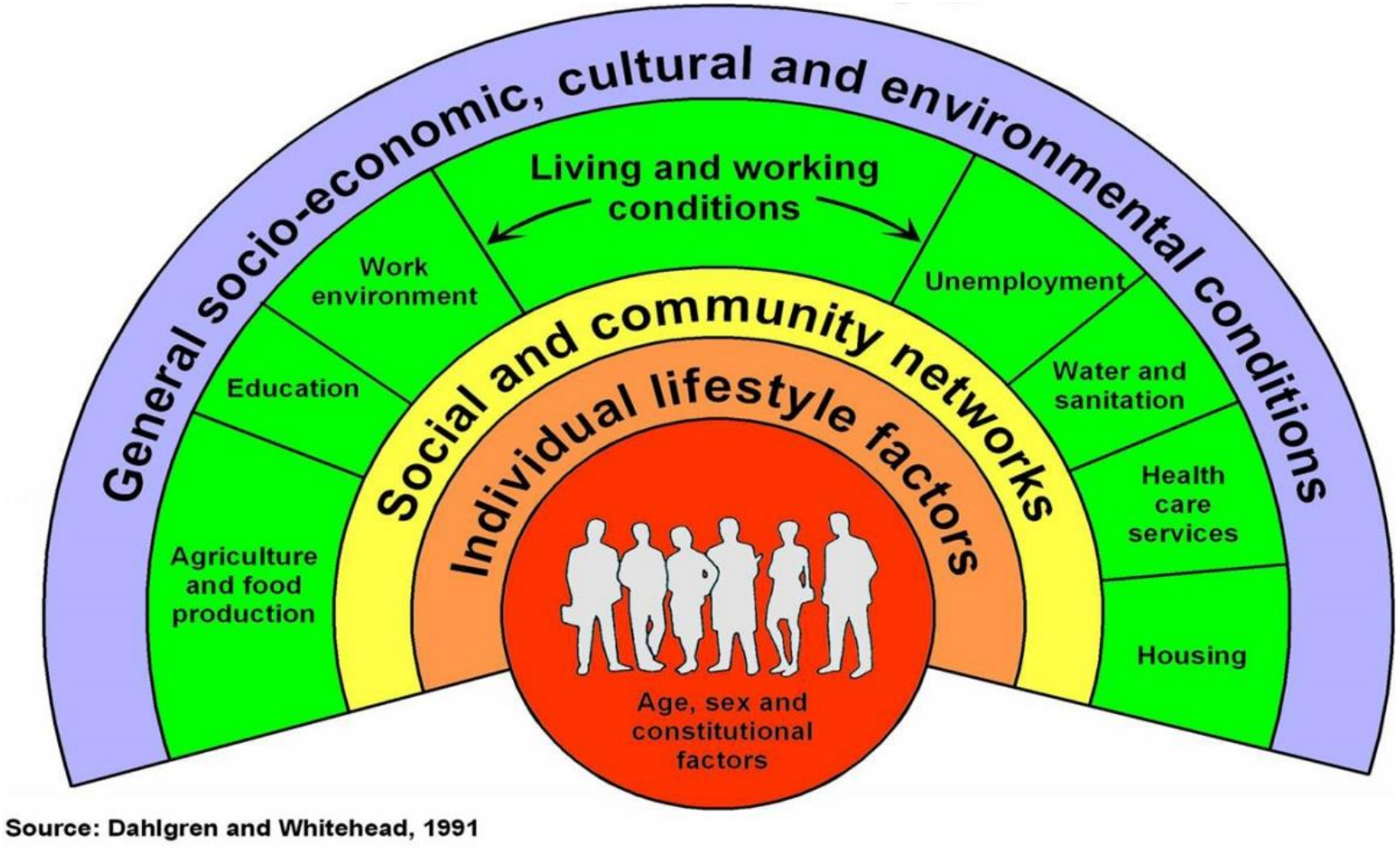
Go to: www.menti.com

Code: 99 97 47

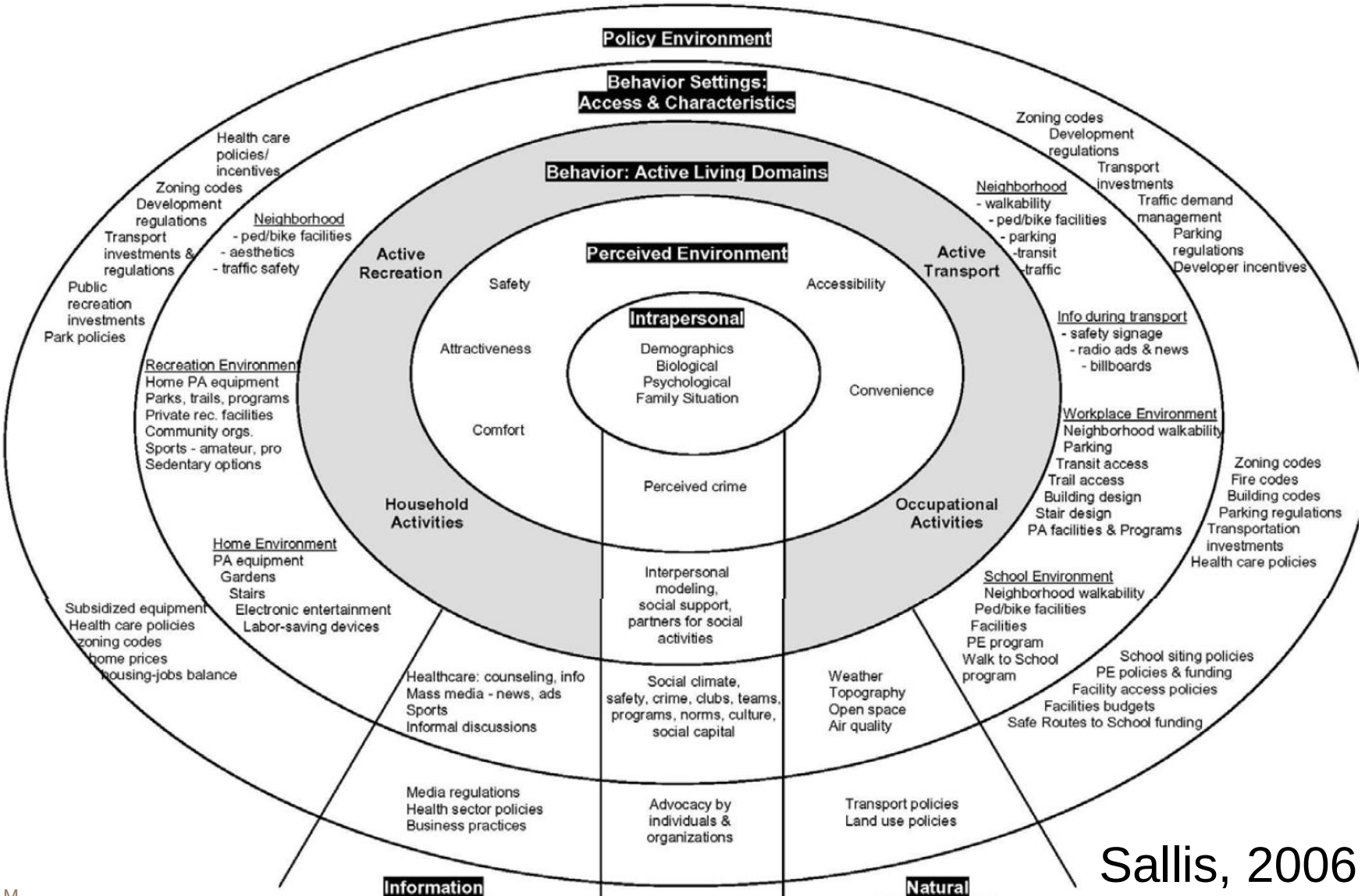
What influences the way we behave?

- Individual Factors (age, sex, genes, personality)
- Social Influences (family, friends, colleagues, society)
- Economic influences (costs, income)
- Environmental influences (green space, walking routes, food advertising)
- Policy environment (public transport vs cars; agriculture; regulation of food industry)

Socio-ecological model for health

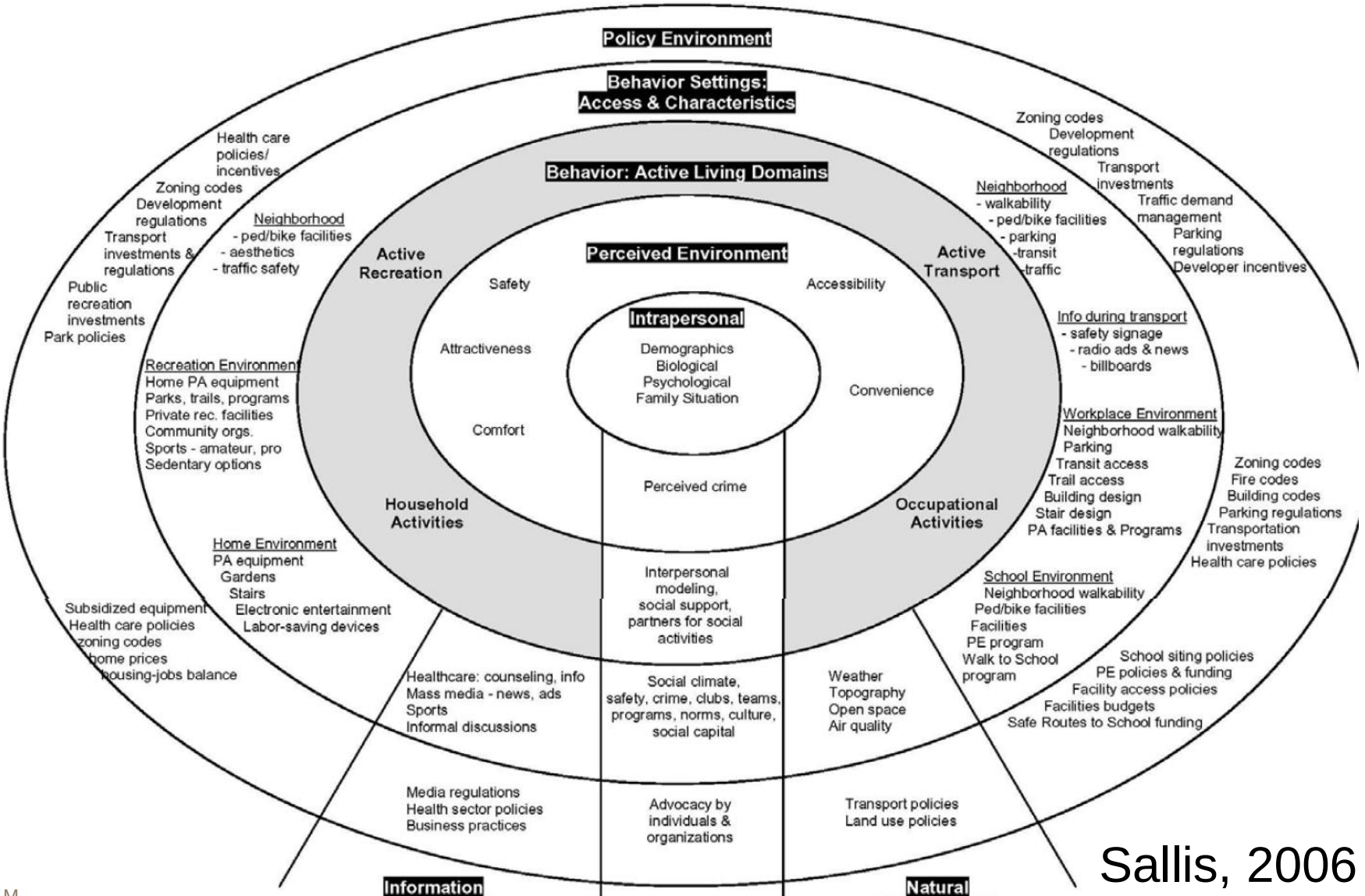


Socio-ecological model for physical activity

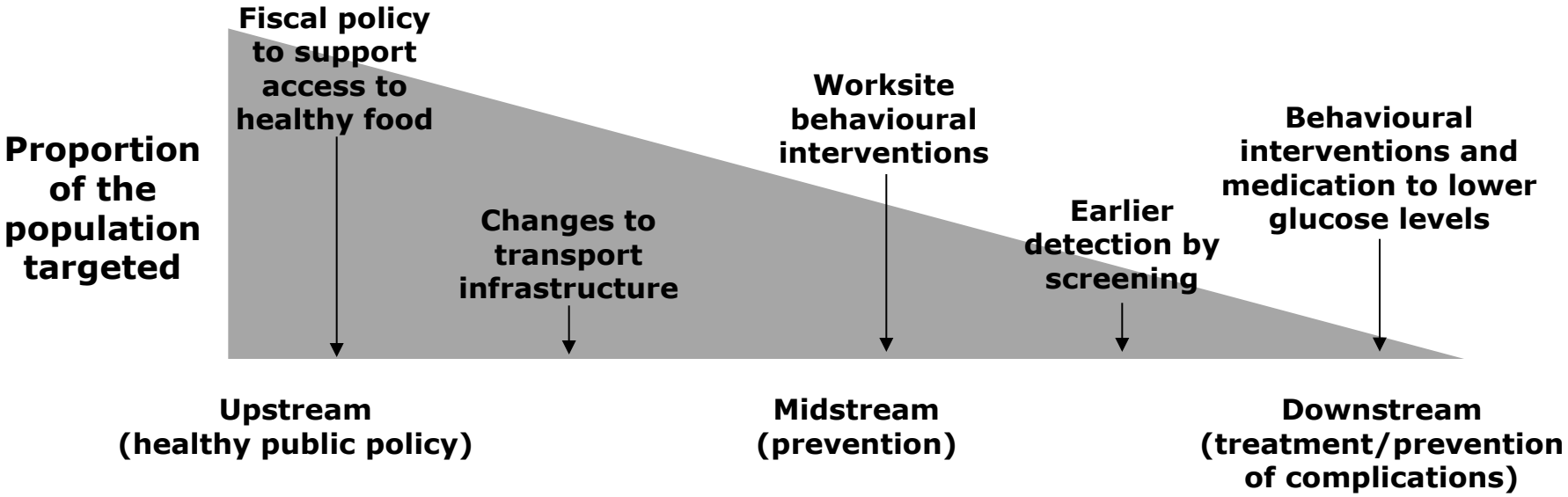


Sallis, 2006

How might this guide research, practice or policy?

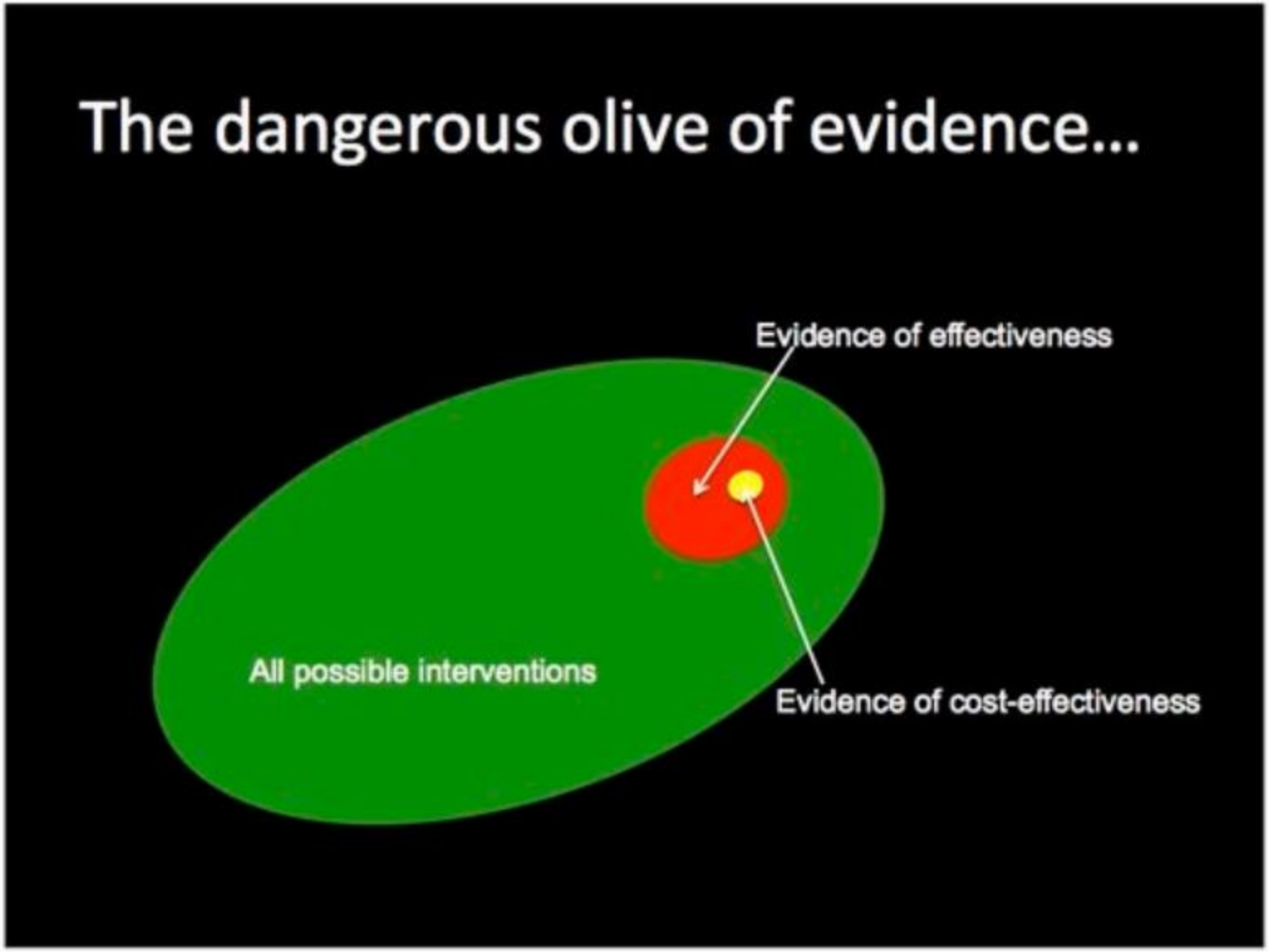


Sallis, 2006



Less amenable to study/different form of evidence

→ less evidence being available



Credit: Dr Harry Rutter

UK Sugar Tax: Soft Drinks Industry Levy

Case Study: Evidence to inform sugar tax

There is no RCT of a sugar tax.

No country had introduced (and evaluated) a tax on sugary drinks (in 2016).

How can we test whether a sugar tax is likely to work – and provide that evidence to policy makers?

Case Study: Evidence to inform sugar tax

Evidence of need

- Surveillance data (obesity prevalence, consumption of SSBs)
- Evidence of harms of SSBs (e.g. de Ruyter et al, 2012)

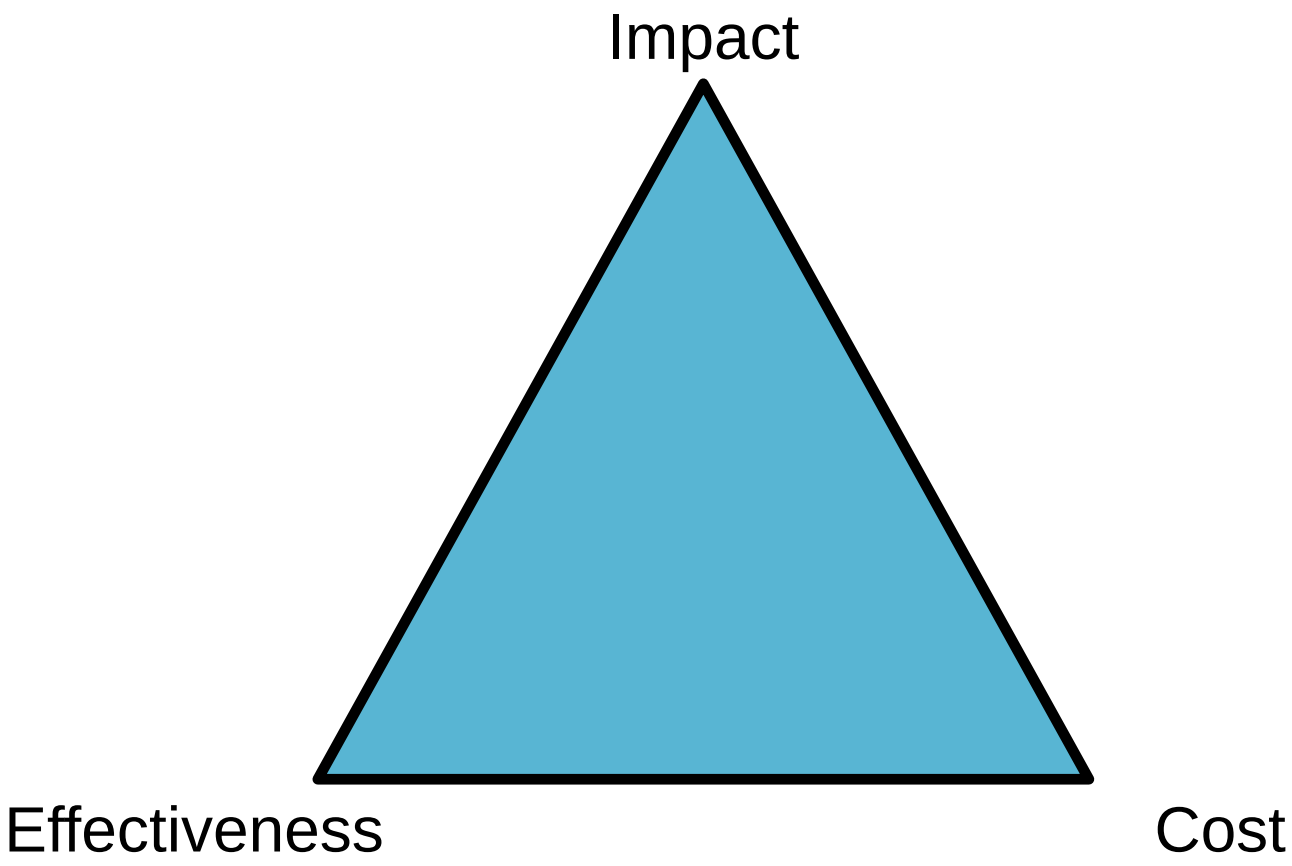
Evidence of efficacy

- Evidence of the effect of price on purchases
- Evidence of harms of SSBs (e.g. de Ruyter et al, 2012)
- Modelling studies (e.g. Briggs et al, BMJ, 2013)

Evidence to inform implementation

- Public attitudes
- Learning from similar interventions

Evidence into policy: political perspective



The UK Soft Drinks Industry Levy

Category	Sugar Concentration	Levy
High Sugar	>8g/100ml	24p per litre
Mid Sugar	5-8g/100ml	18p per litre
Low Sugar	<5g100ml	Exempt

The UK Soft Drinks Industry Levy

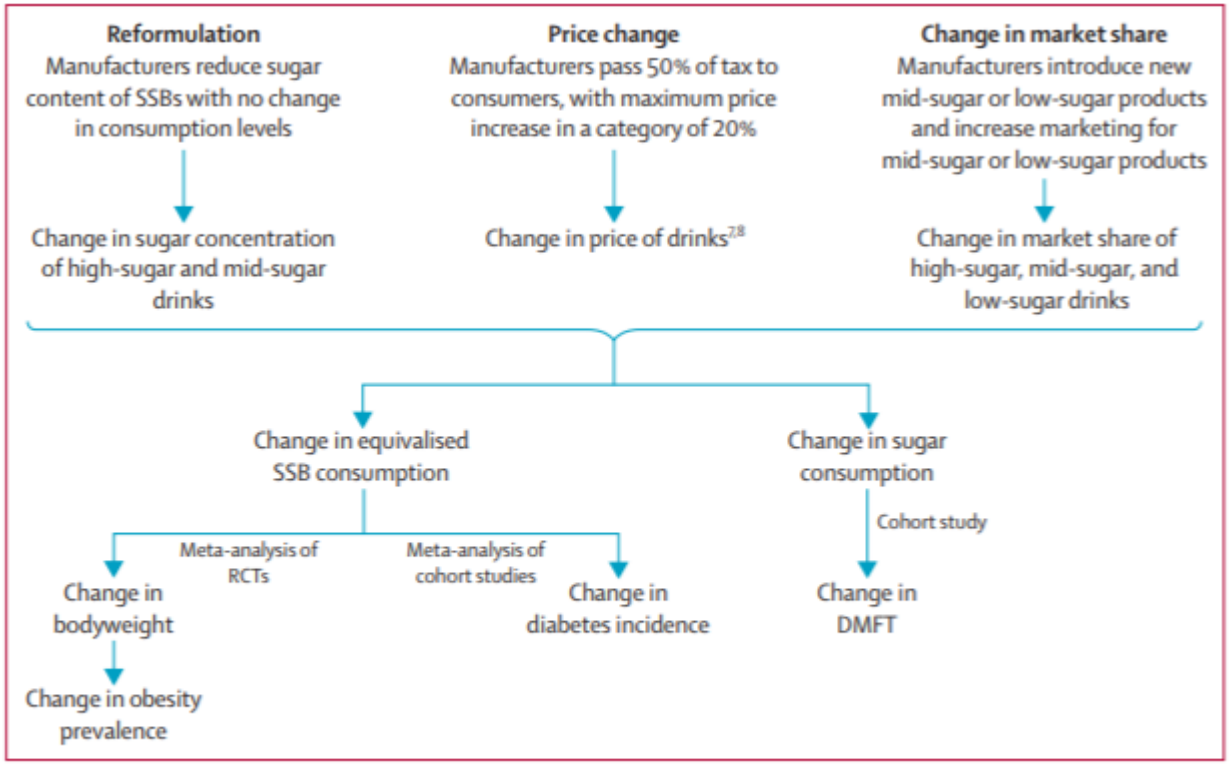


Figure: **Conceptual model**
DMFT=decayed, missing, or filled teeth. RCT=randomised controlled trial. SSB=sugar-sweetened beverage.

Briggs et al, Lancet PH, 2017

The UK Soft Drinks Industry Levy

	Reformulation		Price change		Change in market share	
	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
Male sex						
Boys aged 4–10 years	61·7	11·2	34·5	12·4	38·6	−3·8
Boys aged 11–18 years	137·6	25·0	77·0	27·7	86·0	−8·6
Men aged 19–64 years	71·0	12·9	39·7	14·3	44·4	−4·4
Men aged ≥65 years	24·0	4·4	13·4	4·8	15·0	−1·5
Female sex						
Girls aged 4–10 years	51·9	9·5	29·1	10·4	32·5	−3·2
Girls aged 11–18 years	93·2	17·0	52·1	18·7	58·3	−5·8
Women aged 19–64 years	49·7	9·0	27·8	10·0	31·1	−3·1
Women aged ≥65 years	23·5	4·3	13·2	4·7	14·7	−1·5
Total						
Total (95% UI)	58·5 (54·5 to 62·6)	10·7 (10·0 to 11·4)	32·7 (30·3 to 35·3)	11·8 (10·9 to 12·7)	36·6 (34·9 to 38·3)	−3·6 (−3·8 to −3·4)

Data are in mL per person per day. UI=uncertainty interval. *Where equivalisation results in the same sugar intake for each equivalised unit of sugar-sweetened beverage.

***Table 4*: Reduction in equivalised* volume of sugar-sweetened beverage consumed with each scenario**

Briggs et al, Lancet PH, 2017

Evaluation of the Soft Drinks Industry Levy

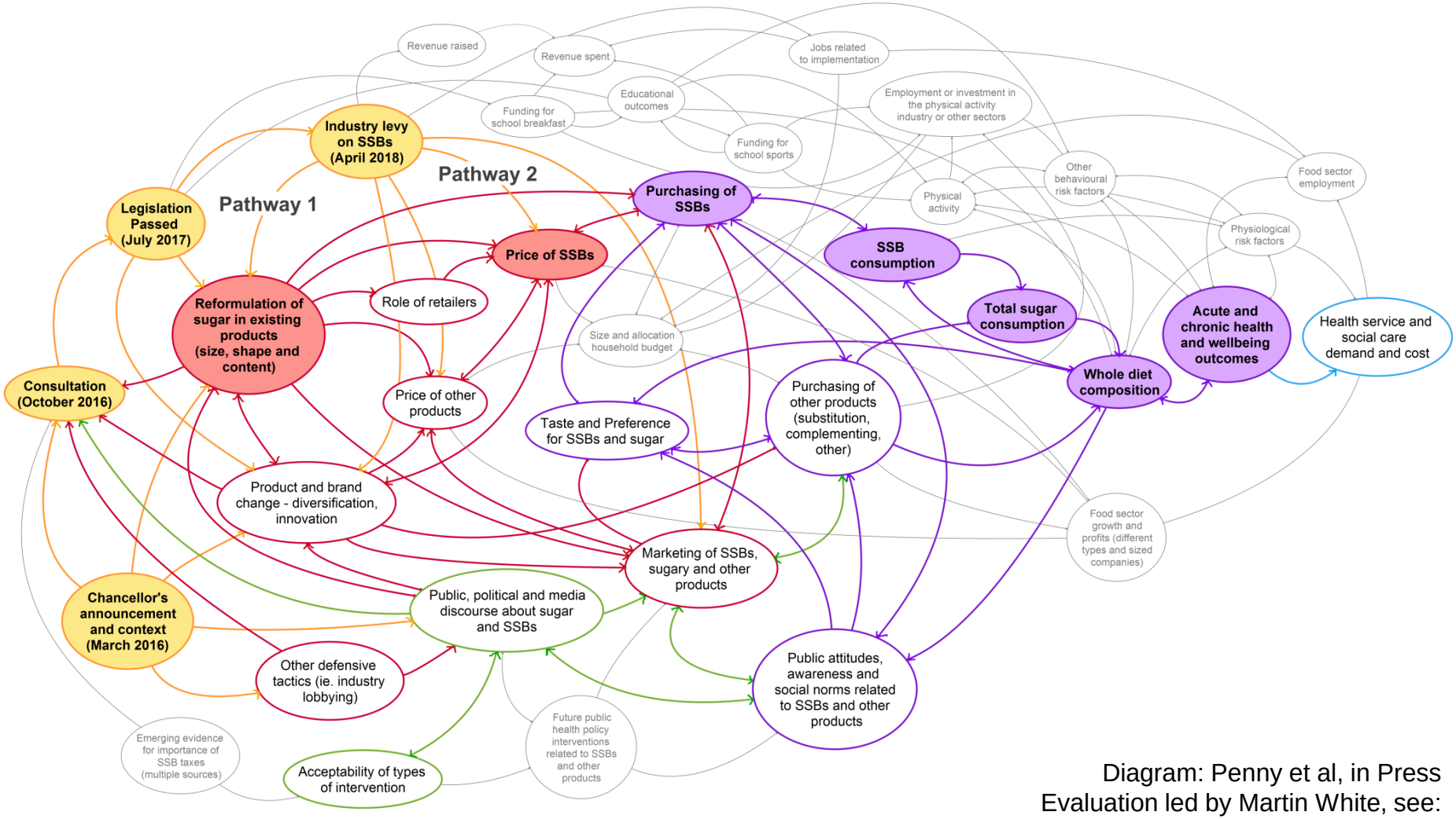


Diagram: Penny et al, in Press
Evaluation led by Martin White, see:
https://www.cedar.iph.cam.ac.uk/research/dietary-public-health/food-systems-public-health/sdil/

Viewpoint

The need for a complex systems model of evidence for public health

Harry Rutter, Natalie Savona, Ketevan Glonti, Jo Bibby, Steven Cummins, Diane T Finegood, Felix Greaves, Laura Harper, Penelope Hawe, Laurence Moore, Mark Petticrew, Eva Rehfuess, Alan Shiell, James Thomas, Martin White

Lancet 2017; 390: 2602–04

Published Online
June 13, 2017
http://dx.doi.org/10.1016/S0140-6736(17)31267-9

London School of Hygiene & Tropical Medicine, London, UK (H Rutter MB BChir, N Savona PhD, K Glonti MSc, S Cummins PhD, M Petticrew PhD); **The Health Foundation, London, UK** (J Bibby PhD, L Harper BSc); **Simon Fraser University, Vancouver, BC, Canada** (D T Finegood PhD); **Public Health England, London, UK**

Despite major investment in both research and policy, many pressing contemporary public health challenges remain. To date, the evidence underpinning responses to these challenges has largely been generated by tools and methods that were developed to answer questions about the effectiveness of clinical interventions, and as such are grounded in linear models of cause and effect. Identification, implementation, and evaluation of effective responses to major public health challenges require a wider set of approaches[1,2] and a focus on complex systems.[3,4]

A complex systems model of public health conceptualises poor health and health inequalities as outcomes of a multitude of interdependent elements which require high levels of individual agency, have low reach and impact, and tend to widen health inequalities.[9–11] Shifts within multiple elements across the many systems that influence obesity are required, some of which might only have small effects on individuals but can drive large changes when aggregated at population level.[12]

Although randomised controlled trials of individual-level interventions are relatively straightforward to do, it is often impossible to randomise a population-level intervention, such as the introduction of a national tax on sugar-sweetened beverages, or the multiple factors that support cycling, such as physical infrastructure, spatial planning, and integration with public transport. Approaches to research that aim to understand single

Systems Thinking

System = A collection of parts working together that are interdependent; it will changes or evolve over time; it is the effectiveness of the entire system that is important

Systems Thinking = way of understanding how the system operates

Implications:

- Less reliance on linear models; greater acknowledgement of uncertainty
- Broader set of consequences that may have value
- Greater awareness of unintended consequences

Mapping the environmental causes of diabetes

You will need pen and paper….

Start with one factor that you think is important…

1. Ask the questions “what influences this factor?” and “how do other factors impact upon this cause?”
2. Map how these factors influence this cause

   This is, and should be, based on your expertise

Mapping the environmental causes of diabetes

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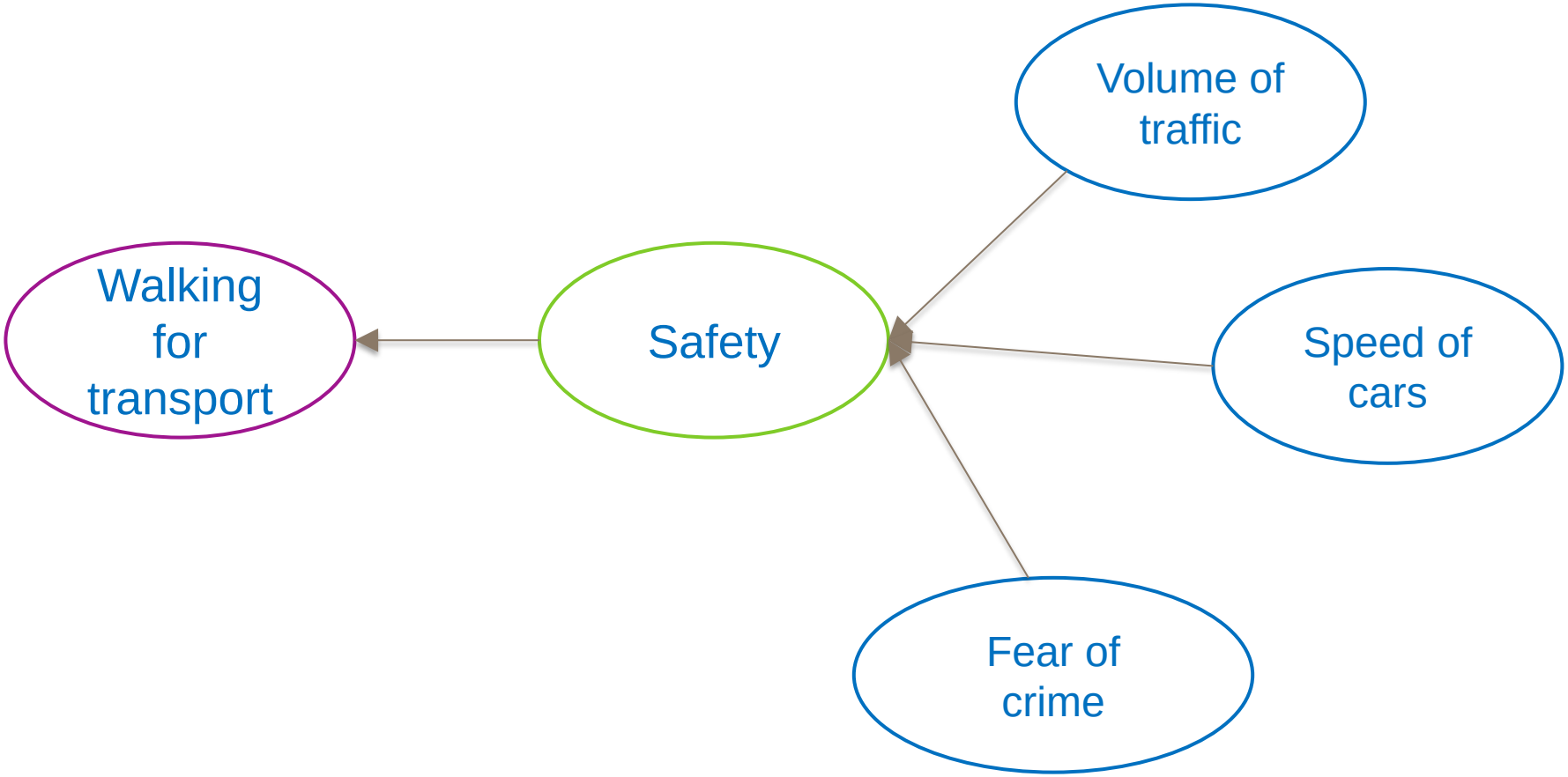
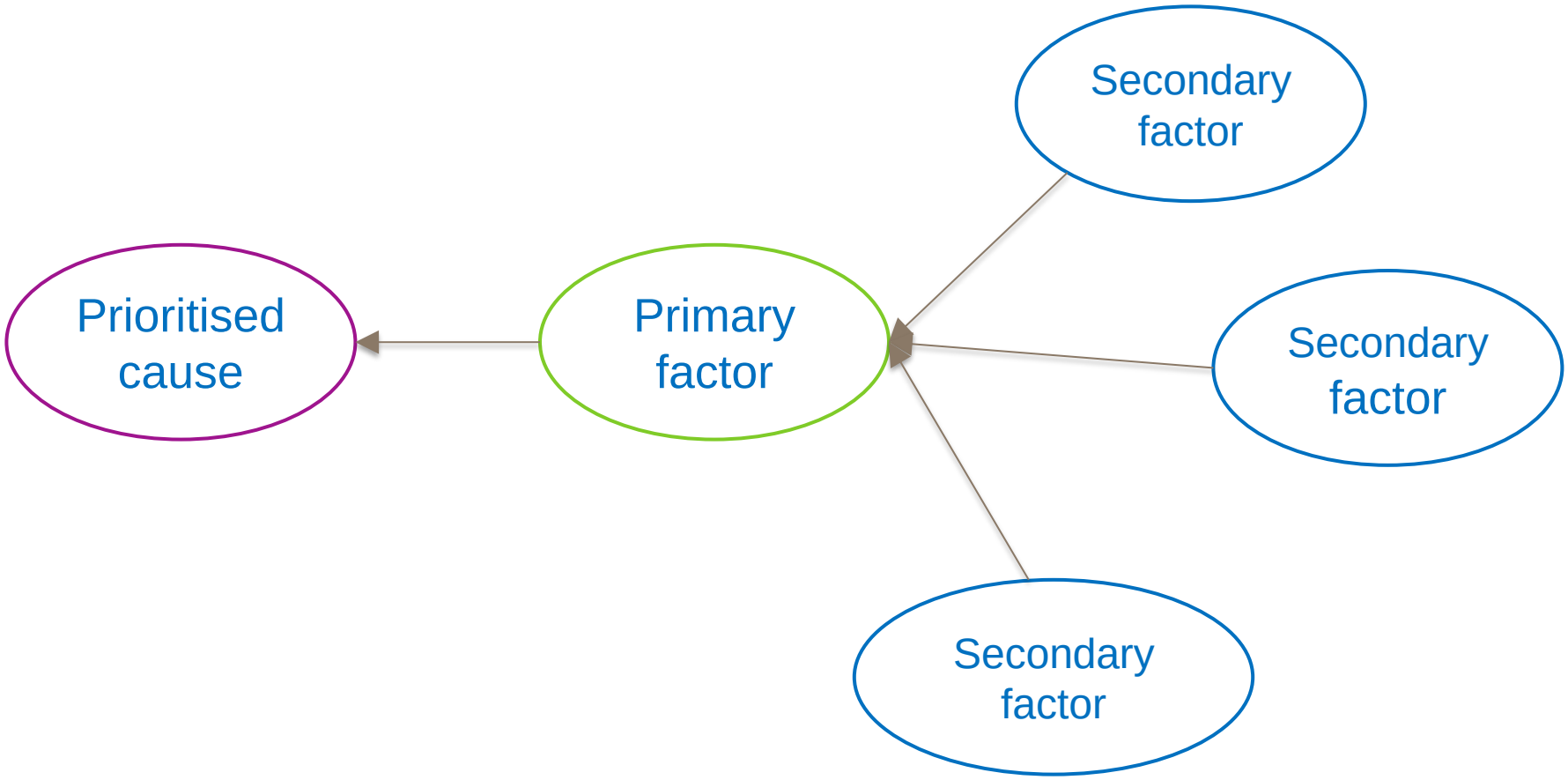
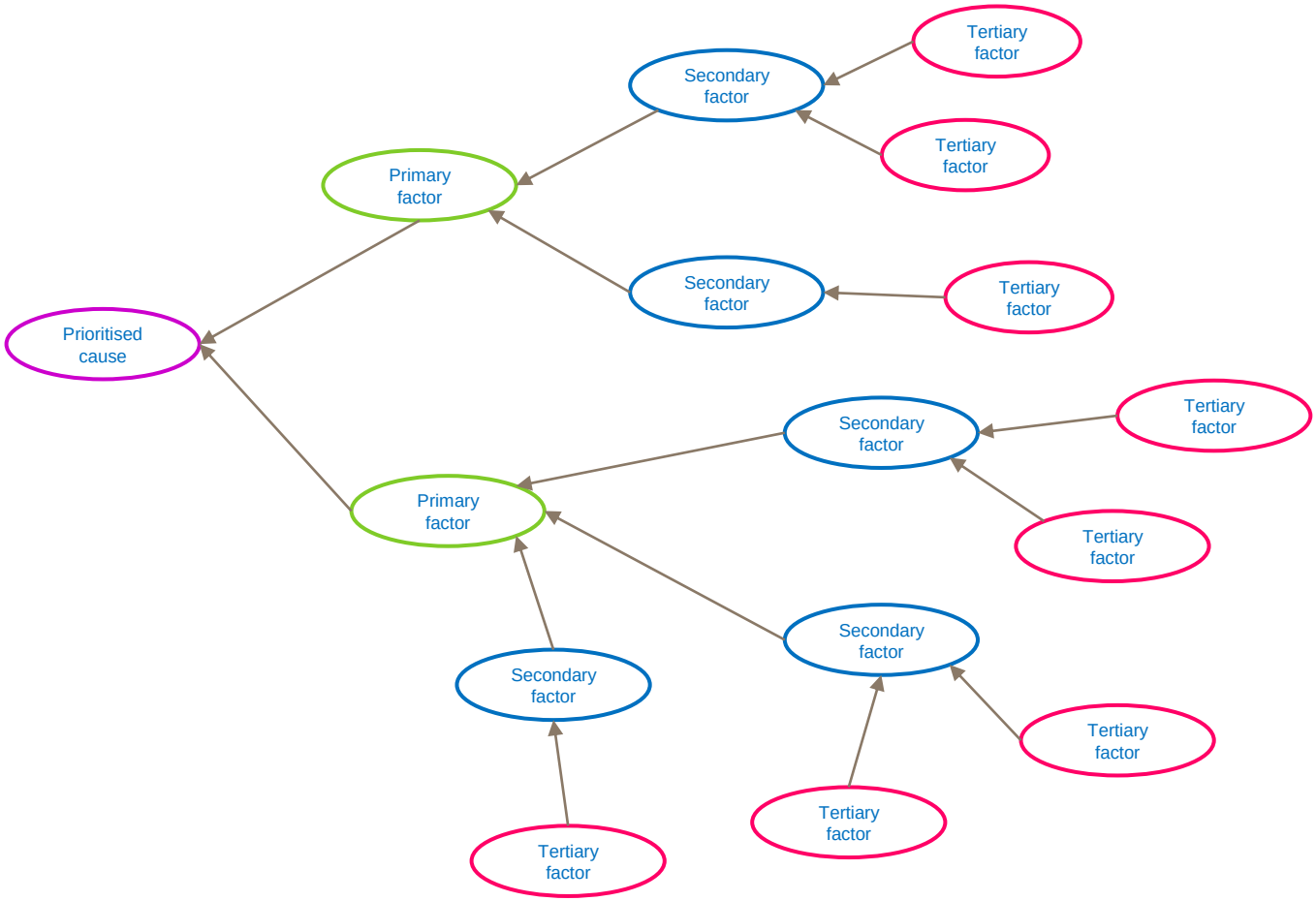


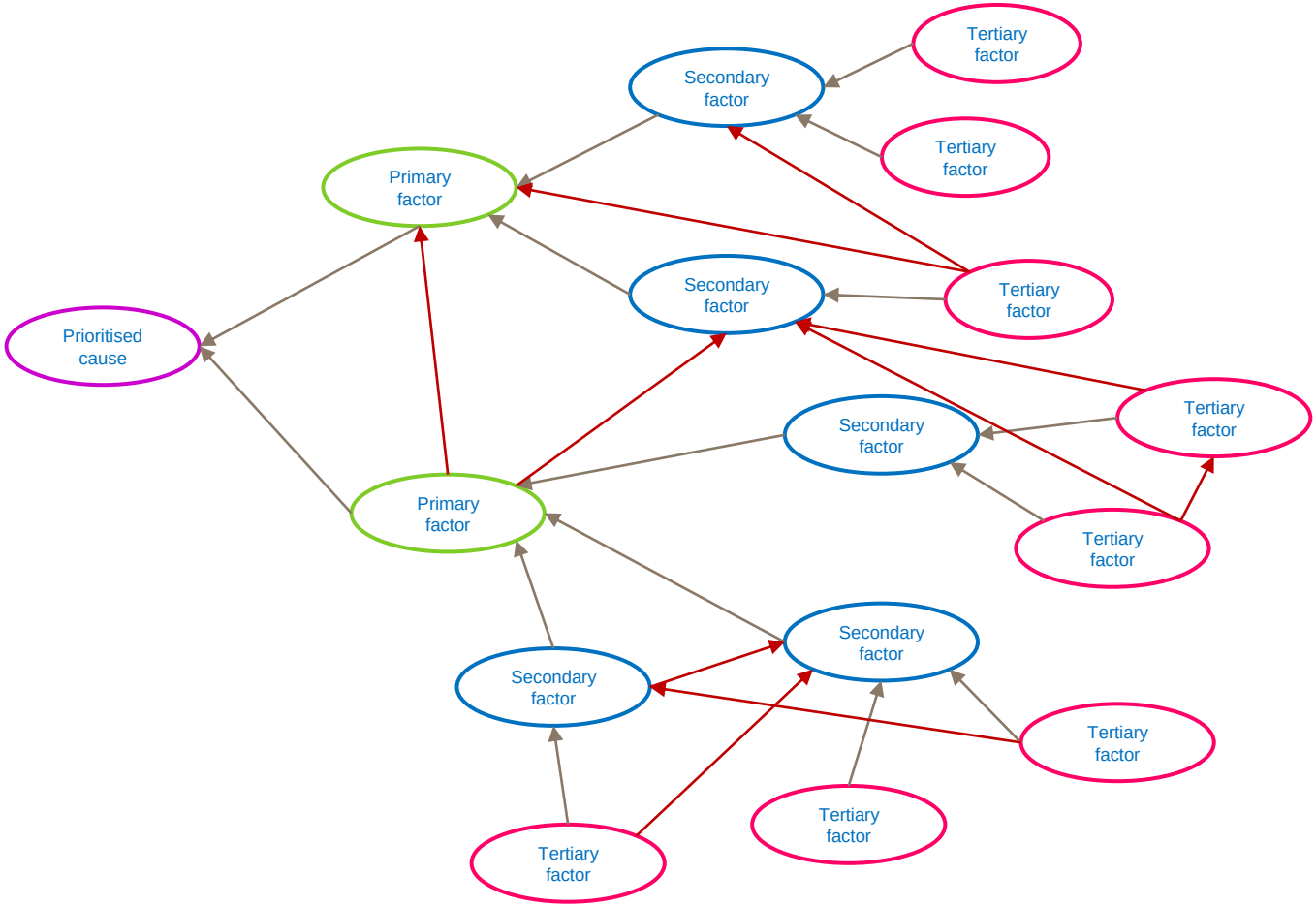
Mapping the environmental causes of diabetes



Mapping the local causes of diabetes



Mapping the local causes of diabetes



Recap

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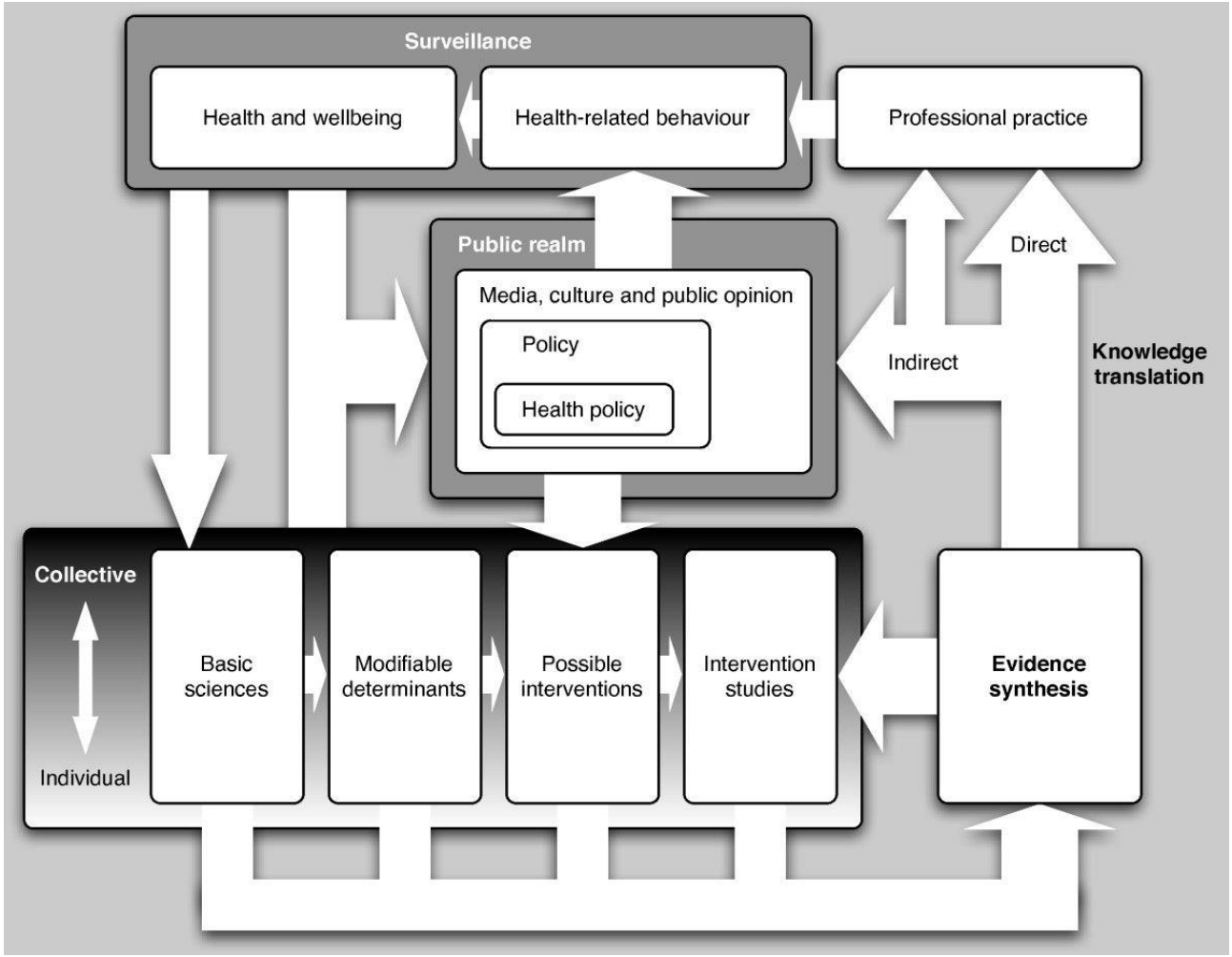
A translational framework for public health research



Ogilvie et al, BMC Public Health, 2009