



Best-ReMaP
Healthy Food for a Healthy Future

Policy Symposium on NCD Prevention:

Future directions for nutrition and physical activity policies to prevent NCDs across Europe

14th-16th June 2022
Thon Hotel Brussels City Centre



The four projects organising this event have received European funding as follows: CO-CREATE and STOP have received funding from the European Union's Horizon 2020 Research and Innovation Programme under the grant agreement No. 7744210 and No. 774548 respectively. JA Best-ReMaP has received funding from the European Union's Health Programme under the grant agreement No. 951202 and PEN has received funding from the Joint Programming Initiative "A Healthy Diet for a Healthy Life" (JPI HDHL).



Session 4 - Bergen
16:30 – 18:00



Best-ReMaP
Healthy Food for a Healthy Future

From maps to policies:
a systems approach to diet,
physical activity and obesity

Chair:
Prof. Nanna Lien
University of Oslo, Norway

#NCDPrevention22



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From concepts to policies: a systems approach to diet, physical activity and obesity

Nanna Lien, Department of Nutrition, University of Oslo, Norway
on behalf of the CO-CREATE consortium

Session 4 Brussels June 14th, 2022

Aim of this session

- ▶ To present systems approaches as a useful tool to evaluate policies and identify policy recommendations for a healthy diet, physical activity and the prevention of obesity.

→ Confronting obesity: Co-creating policy with youth

Wicked problems

- ▶ A wicked problem is a social or cultural problem that is difficult or impossible to solve for as many as four reasons:
 - ▶ incomplete or contradictory knowledge,
 - ▶ the number of people and opinions involved,
 - ▶ the large economic burden, and
 - ▶ the interconnected nature of these problems with other problems.”

• (Rittel and Webber, 1973)

→ Confronting obesity: Co-creating policy with youth

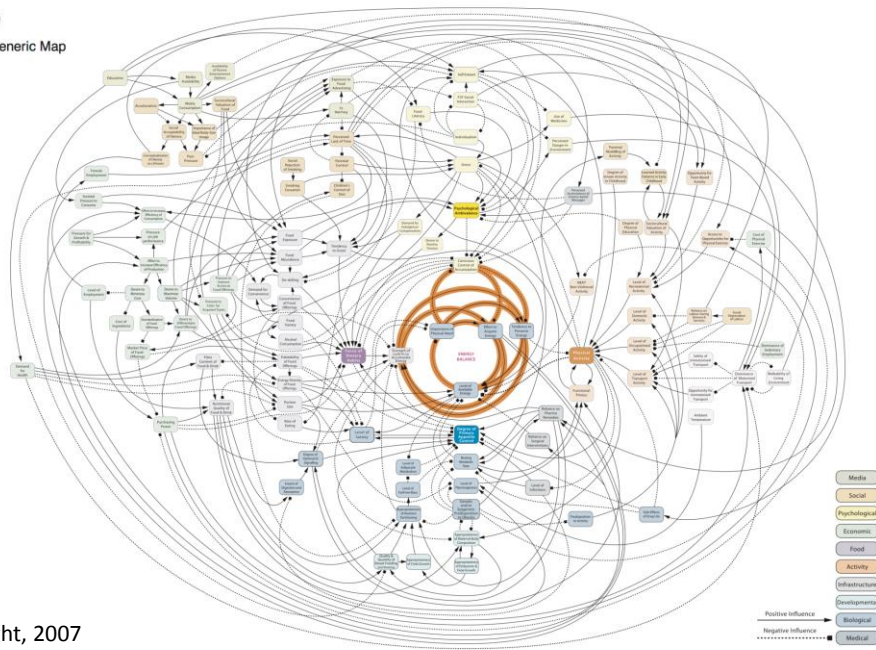
What characterizes systems approaches ?

- ▶ These approaches are specifically geared to identifying, understanding, and quantifying
 - ▶ nonlinear relationships among system components
 - ▶ time-delayed effects
 - ▶ bidirectional relationships between component parts (i.e., feedback loops)
 - ▶ emergent phenomena (i.e., properties of the system that emerge from the individual constituents of the system without being attributable to any given component)

▶ Mabry et al [Am J Public Health](#). 2010 July; 100(7): 1161–1163

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Map 0
Full Generic Map



Source: Foresight, 2007

with youth

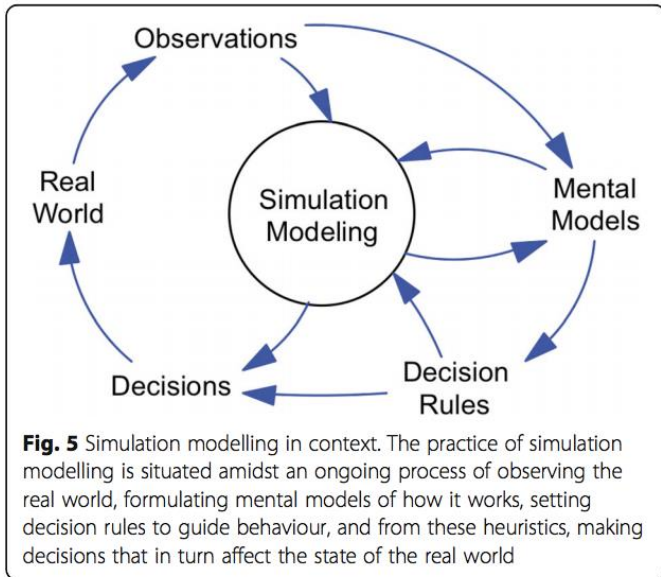


Fig. 5 Simulation modelling in context. The practice of simulation modelling is situated amidst an ongoing process of observing the real world, formulating mental models of how it works, setting decision rules to guide behaviour, and from these heuristics, making decisions that in turn affect the state of the real world

Northridge and Metcalf Health Research Policy and Systems (2016) 14:74

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From spaghetti bowls to useful models

Table 1 Summary of best principles from systems science for informing the modelling process, recommendations for action by implementation scientists and contributing thought leaders and key references

Best principle	Recommendations	Thought leader [Reference]
1. Model the problem, not the system	Conduct formative research; construct models collaboratively in interdisciplinary teams	Sterman [34]
2. Pay attention to what is important, not just what is quantifiable	Use qualitative data to derive causal relationships; be guided by deep thinking and multiple perspectives	Meadows [36]
3. Leverage the utility of models as boundary objects	Create modifiable and readily perceptible representations of models; build trust and agreement by representing local knowledge	Black [43]
4. Adopt a portfolio approach to model building	Work in parallel to develop separate but related models in diverse ways; encourage exploration with 'flawed' models rather than aiming for perfection	Metcalf [6]

Northridge and Metcalf Health Research Policy and Systems (2016) 14:74

→ Confronting obesity: Co-creating policy with youth

Agenda

- ▶ Meaningful participant engagement: using group model building.
- ▶ Evaluating policies: Using a systems approach to understand the mechanisms of the EU School Fruit and Vegetable Scheme.
- ▶ Understanding the complexity of socioeconomic inequalities in dietary behaviors and physical activity: a systems approach.
- ▶ Deriving recommendations based on systems approaches.
- ▶ Interactive discussions.

→ Confronting obesity: Co-creating policy with youth



 **The CO-CREATE project** has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 774210. The products of the research are the responsibility of the authors; the European Commission is not responsible for any use that may be made of them.



→ Confronting obesity: Co-creating policy with youth

June 14th, 2022

Meaningful participant engagement: using Group Model Building (GMB)

Anaely Aguiar

University of Bergen, Norway *on behalf of Co-Create*

Work package leader: Natalie Savona (LSHTM)



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& TROPICAL
MEDICINE



"...in addition to being a target group, adolescents should be actively involved in working towards the SDGs at all levels — as agents for change at the community, national, and international levels." (p.2356)

The *Lancet* Commission on adolescent health

Kleinert, S., & Horton, R. (2016). Adolescent health and wellbeing: a key to a sustainable future. The Lancet, 387(10036), 2355.

→ Confronting obesity: Co-creating policy with youth

Systems thinking principles

- ▶ **Goal: to improve *our problem-solving skills* to adapt to the dynamic nature of complex systems and create desirable futures.**

"an organizing rubric"

"help us unravel the complexity of causal forces"

Leischow, S. J., Best, A., et al. (2008).

Leischow, S. J., Best, A., et al. (2008).

→ Confronting obesity: Co-creating policy with youth

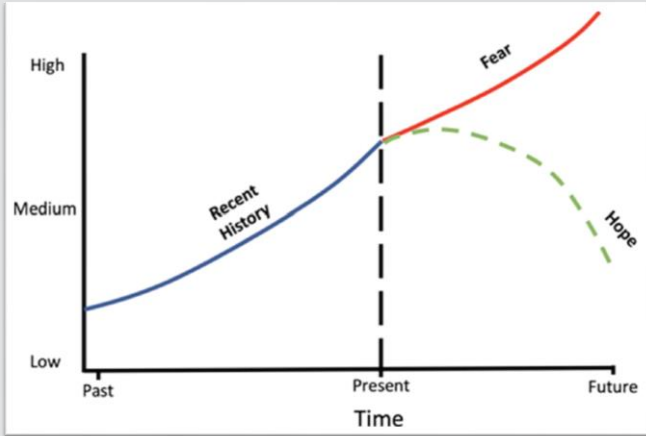
Systems mapping: Group Model Building (GMB)

- ▶ **Systems thinking in action**
- ▶ A group facilitation technique that
 - ▶ helps groups discuss complex problems
 - ▶ engages diverse stakeholders
 - ▶ builds a visual representation of their understanding of the drivers of the problem
 - ▶ motivates people to action
 - ▶ allows collaborative development of policy / interventions / evaluations

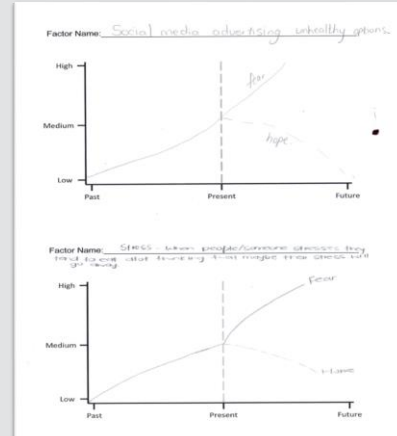


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GMB process in Co-Create



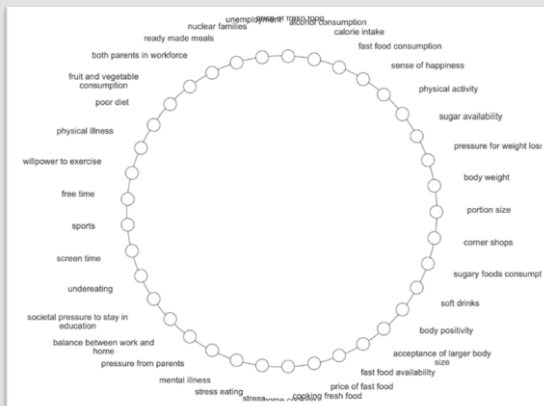
Sample of a "behavior over time" graph



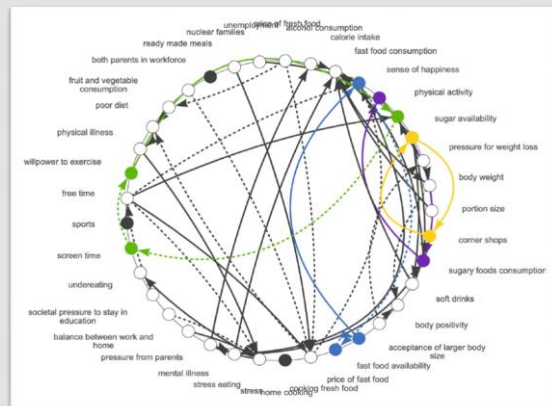
Example of a graph drawn by participants

➔ Confronting obesity: Co-creating policy with youth

GMB process in Co-Create



Connections circle stage 1

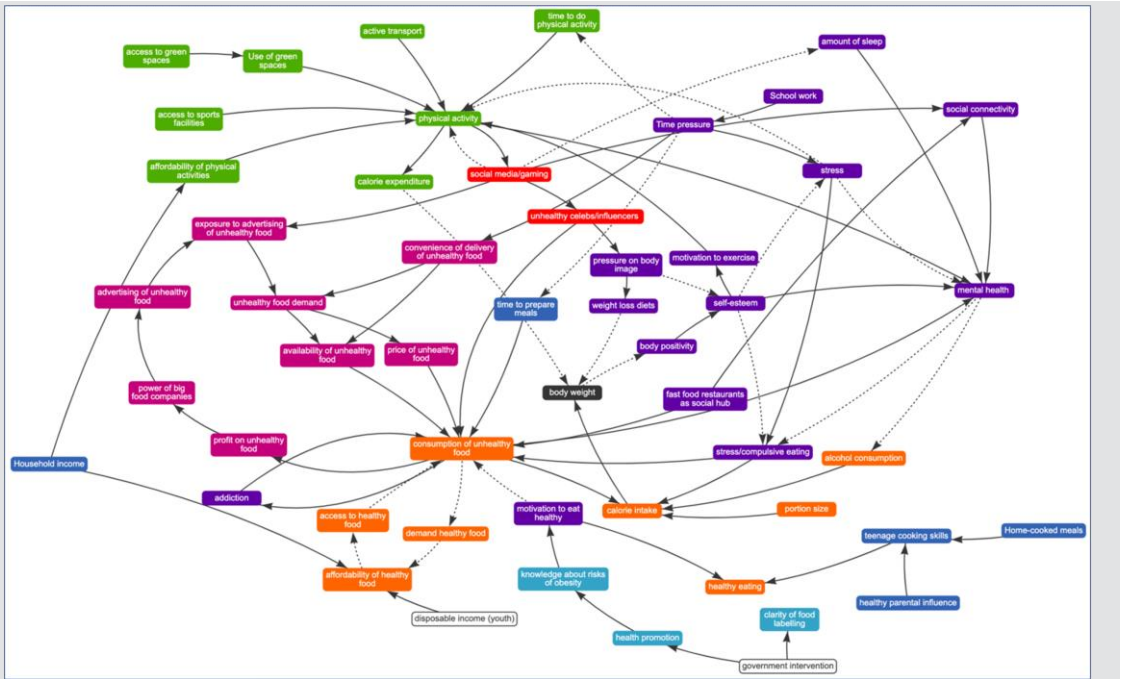


Connections circle stage 2

➔ Confronting obesity: Co-creating policy with youth

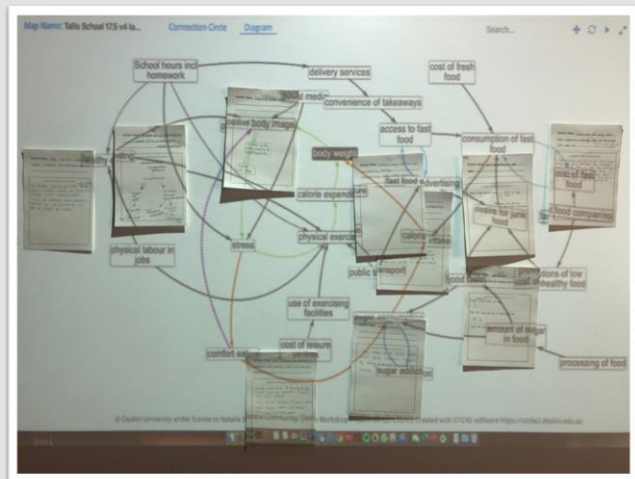
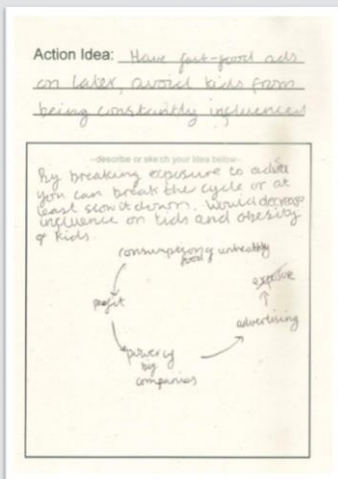
Consolidated CO-CREATE map

Savona et al. (2021) EIPH



GMB process in Co-Create

Action ideas activity

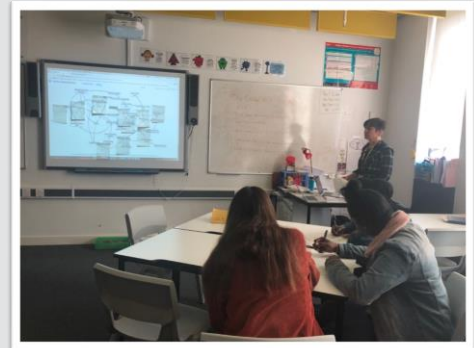


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GMB: meaningful engagement in



- ▶ Population of interest identifies factors relevant to *them*
- ▶ Grounded in *community-based* system dynamics
- ▶ Participants are the **experts**
- ▶ Co-create *shared* learning and insights
- ▶ *Engaging / interactive* process
- ▶ *All voices* represented on the map
- ▶ Useful for *sensitive* topics/anonymity



→ Confronting obesity: Co-creating policy with youth

Using the system maps

- ▶ Visually represent how adolescents perceive obesity
- ▶ Identify feedback loops that amplify, or balance systems change
- ▶ Meaningful youth engagement → youth alliances
- ▶ Identify places to intervene in the system → policy levers
- ▶ Align policy questions with research needs
- ▶ Inform a System Dynamics simulation model



→ Confronting obesity: Co-creating policy with youth



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→ Confronting obesity: Co-creating policy with youth

Policy evaluation: Applying a systems perspective to understand the mechanisms of the European School Fruit and Vegetable Scheme



Author(s): Mahshid Zolfaghari¹, Biljana Meshkovska¹, Anna Banik², Carlijn B.M. Kamphuis³, Birgit Kopainsky⁴, Aleksandra Luszczynska², Celine Murrin⁵, Nanna Lien¹; on behalf of the PEN consortium

Contact information: mahshid.zolfaghari@medisin.uio.no

1. Department of Nutrition, University of Oslo, Oslo, Norway. 2. Faculty of Psychology in Wroclaw, SWPS University of Social Sciences and Humanities, Wroclaw, Poland. 3. Department of Interdisciplinary Social Science, Utrecht University, Utrecht, The Netherlands. 4. System Dynamics Group, Department of Geography, University of Bergen, Bergen, Norway. 5. School of Public Health, Physiotherapy and Sport Science, University College Dublin, Dublin, Ireland



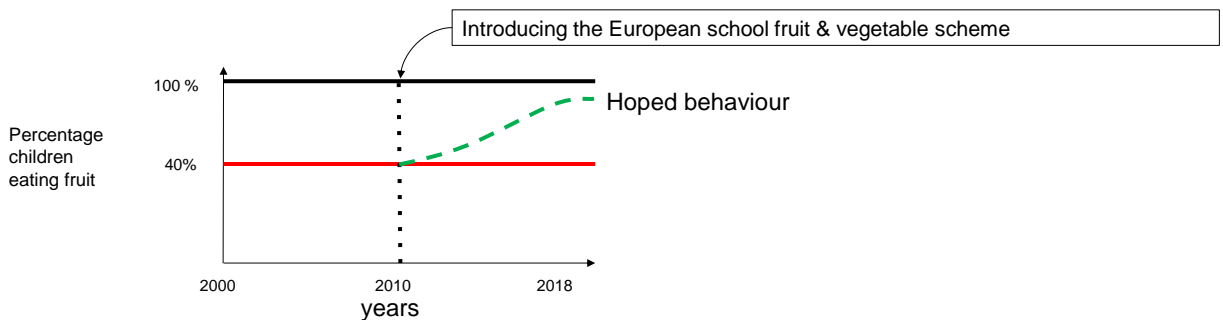
Funded by the Joint Programming Initiative "A Healthy Diet for a Healthy Life" (JPI HDHL) with contributions from national funding agencies of participating countries

Brussel, 14 June 2022



What is puzzling?

On average only **40%** of European 7–9-year-olds and 11–13–15-year-olds consume fruit daily and there has been **little change since 2000**.



Williams J, Buoncristiano M, Nardone P, Rito AI, Spinelli A, Hejgaard T, et al. A Snapshot of European Children's Eating Habits: Results from the Fourth Round of the WHO European Childhood Obesity Surveillance Initiative (COSI). *Nutrients*. 2020;12(8):2481. Inchley J, et al. Spotlight on adolescent health and well-being: Findings from the 2017/2018 Health Behaviour in School-Aged Children (HBSC) survey in Europe and Canada. *International report*. 2020;1.

What do we already know about the Scheme?

- The Scheme's impact is consistent with similar interventions which have a mean effect of 0.28 portions per day, primarily on fruit consumption.



Micha R, et al. Effectiveness of school food environment policies on children's dietary behaviors: A systematic review and meta-analysis. PLoS One. 2018;13(3):e0194555.

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Aim

This study aimed to apply a **systems approach** to provide an integrated perspective of the **mechanisms** of the European School Fruit and Vegetable Scheme (the Scheme) to understand better how to increase its **long-term impact** on children's fruit and vegetable consumption.



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What is a systems thinking approach?



Systems thinking uses causal loop diagrams (CLD) to depict the feedback structure of systems and to capture and communicate **hypotheses** about the **causes underlying the behaviour over time in a system.**

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Why use system's perspective for policy evaluation?

System thinking is an **alternative** approach to policy evaluation. It seeks to understand and explain the general **system reaction** to a policy, and the **dynamic path of a response**, rather than the precise numerical value of the policy impact.

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Method

- **Data collection:** Peer-reviewed articles and documents of national governments related to the Scheme.
- **Data analysis:** The coding approach was based on a method developed and applied in system dynamics to translate textual data into causal loop diagram systematically.
- **Model validation:** In three stages by consulting with experts (two individuals and a group) in school-based fruit and vegetable programmes, children's fruit and vegetable consumption, and the Scheme, using disconfirmatory interview guidelines.

Kim H. et al. Building confidence in causal maps generated from purposive text data: mapping transcripts of the Federal Reserve. Syst Dyn Rev. 2012;28(4):311., Andersen DL, et al. The disconfirmatory interview as a strategy for the assessment of system dynamics models. Syst Dyn Rev. 2012;28(3):255.

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What do the symbols on the CLD mean?

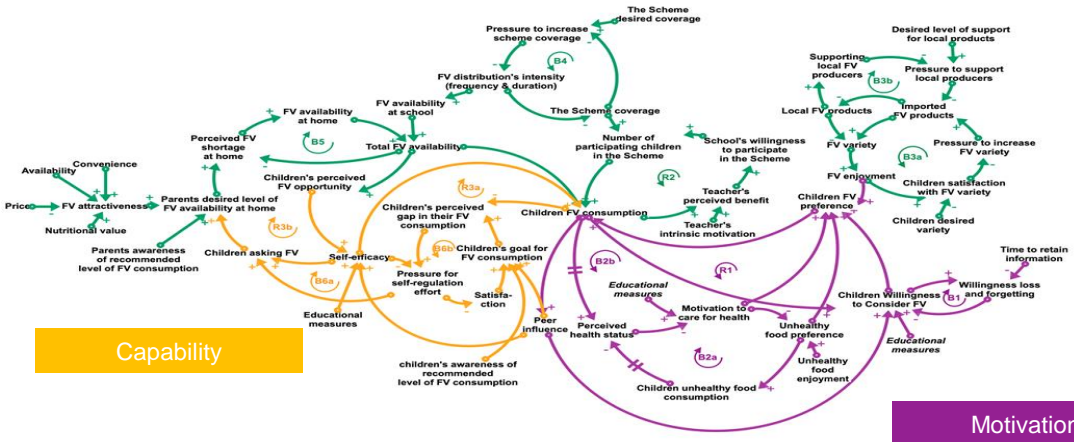
- **Reinforcing feedback loop** : A reinforcing feedback loop (indicated by R) **enhances whatever direction of change is imposed on the system**. A reinforcing loop can lead to exponential growth and improvement (virtuous cycle) or forceful collapses (vicious cycle).
- **Balancing feedback loop (or, goal seeking feedback loop)**: A balancing feedback loop (indicated by B) **opposes whatever direction of change is imposed on the system**. They can be a source of stability or resistance to change.



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Results

Opportunity

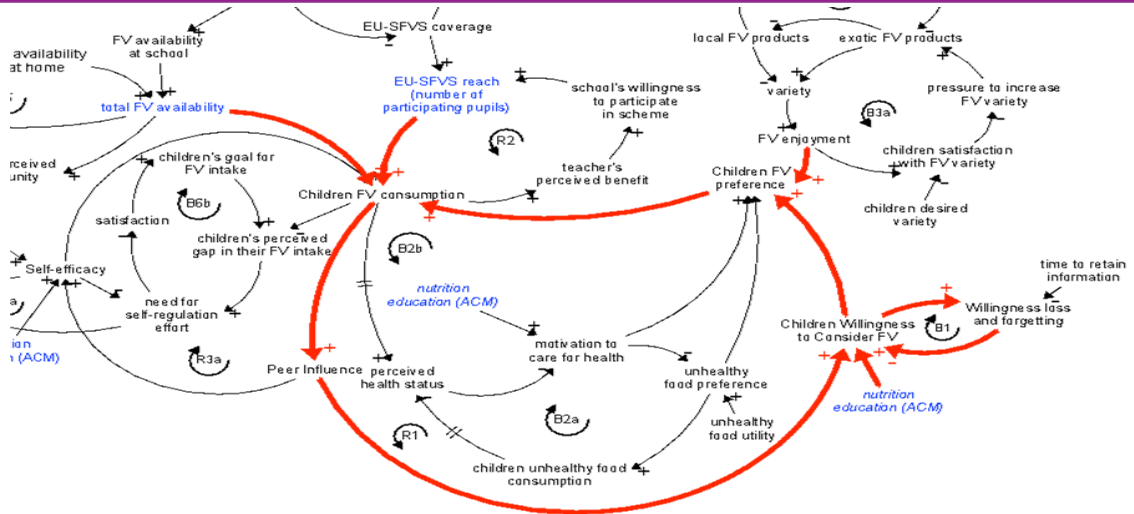


Capability

Motivation

Results

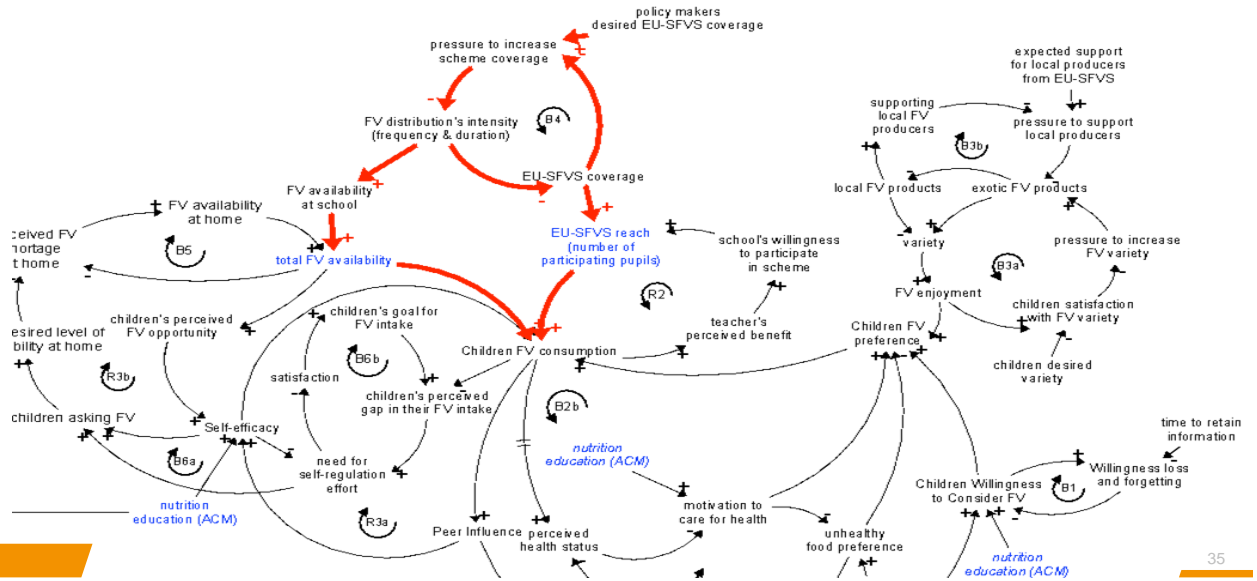
Motivation-R1: social habituation loop



Results



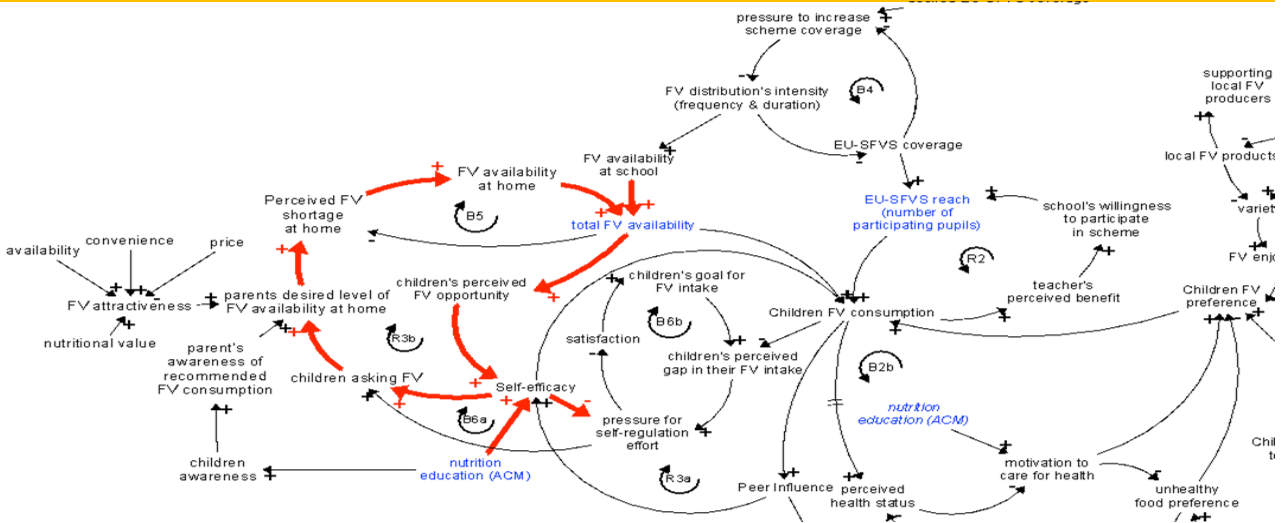
Opportunity-B4: Scheme reach at the price of its intensity



Results



Capability-R3b: I have plenty of FV, so I may ask for more



Discussion

Our CLD reflects the principle of "limit to growth," a systems archetype that emphasises that every growth path (e.g., increasing children's FV consumption) has inherent limits.

- The children's social interaction (R1),
- Self-efficacy (R3a),
- Asking for FV from parents (R3b),

- Financial resources (B4),
- Widespread awareness of recommended FV consumption (B5),
- The availability of a diverse range of FV products (B3a,b),
- School acceptance of the scheme (R2),

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Key points

- Factors influencing children's long-term FV consumption and the effectiveness of school-based FV policies are **interrelated**.
- The interrelated motivation, opportunity, and capability mechanisms highlight the crucial role of **multi-component interventions** in addressing children's low FV consumption.
- Providing **ongoing opportunities** for children to consume FV by engaging more **schools and parents**, while **strengthening motivation and capability** mechanisms through **age-appropriate educational measures**, should be the primary focus of school-based FV policy programmes.

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UNDERSTANDING THE COMPLEXITY OF SOCIOECONOMIC INEQUALITIES IN DIETARY BEHAVIORS AND PHYSICAL ACTIVITY



A SYSTEMS APPROACH

Frank J. van Lenthe, Erasmus Medical Centre² & Utrecht University³

On behalf of PEN-WP5: Alexia Sawyer¹ Carlijn Kamphuis³, Laura Terragni⁴, Gun Roos⁴, Maartje Poelman⁵, Mary Nicolaou¹, Wilma Waterlander¹, Sanne Djojosoeparto³, Marie Scheidmeir⁶, Agnieszka Neumann-Podczaska⁷, and Karien Stronks¹

1. Amsterdam University Medical Centres 2. Erasmus Medical Centre 3. Utrecht University 4. Oslo Metropolitan University 5. Wageningen University & Research 6. Johannes Gutenberg-University Mainz, 7. Poznan University of Medical Sciences



Funded by the Joint Programming Initiative "A Healthy Diet for a Healthy Life" (JPI HDHL) with contributions from national funding agencies of participating countries

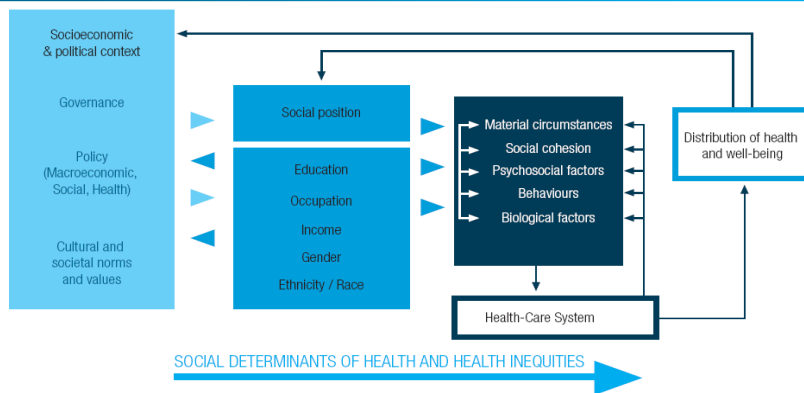
Brussels; 14 June 2022

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 Policy Evaluation Network (PEN)
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SOCIOECONOMIC INEQUALITIES IN HEALTH

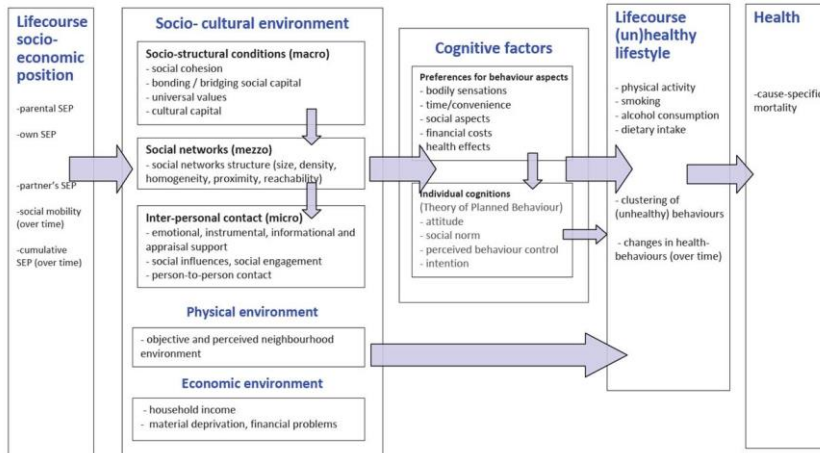
Figure 4.1 Commission on Social Determinants of Health conceptual framework.



Source: Amended from Solar & Irwin, 2007



SOCIOECONOMIC INEQUALITIES IN HEALTH: A SOCIO-ECOLOGICAL PERSPECTIVE



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WHY TAKE A SYSTEMS PERSPECTIVE?

Examine the economic, social and physical food environment as a complex adaptive system – i.e. a system of multiple, interconnected factors that exert non-linear influence on an outcome over time

Unpack dynamics:

- Feedback / non-linearity
- Emergence
- Adaptation



Causal loop diagrams (CLD) map causal connections and feedback loops

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FOOD ENVIRONMENTS: TRIANGULATING FINDINGS

How theory can help to understand the potential impact of food environment policies on socioeconomic inequalities in diet: an application of Bourdieu's capital theory and the scarcity theory

Sanne K. Djojoseparto¹, Carlijn B.M. Kamphuis², Janas M. Harrington³, Anne Lene Løvhaug⁴, Gun Roos⁵, Alexia D.M. Sawyer⁶, Karien Stronks⁶, Laura Terragni⁴, Liv Elin Torheim^{4,7}, Stefanie Vandevijvere⁸, Maartje P. Poelman⁹ and Frank J. van Lenthe^{1,10}

Løvhaug et al. *BMC Public Health* (2022) 22:433
<https://doi.org/10.1186/s12889-022-12827-4>

BMC Public Health

RESEARCH

Open Access

The potential of food environment policies to reduce socioeconomic inequalities in diets and to improve healthy diets among lower socioeconomic groups: an umbrella review

Anne Lene Løvhaug^{1†}, Sabrina Ionata Granheim², Sanne K. Djojoseparto³, Janas M. Harrington⁴, Carlijn B. M. Kamphuis⁵, Maartje P. Poelman⁶, Gun Roos⁵, Alexia Sawyer⁸, Karien Stronks⁸, Liv Elin Torheim¹, Cliona Twohig⁴, Stefanie Vandevijvere⁹, Frank J. van Lenthe^{10,3} and Laura Terragni¹

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OUR CONTRIBUTION

Sawyer et al. *International Journal of Behavioral Nutrition and Physical Activity* (2021) 18:96
<https://doi.org/10.1186/s12966-021-01164-1>

International Journal of Behavioral Nutrition and Physical Activity

REVIEW

Open Access

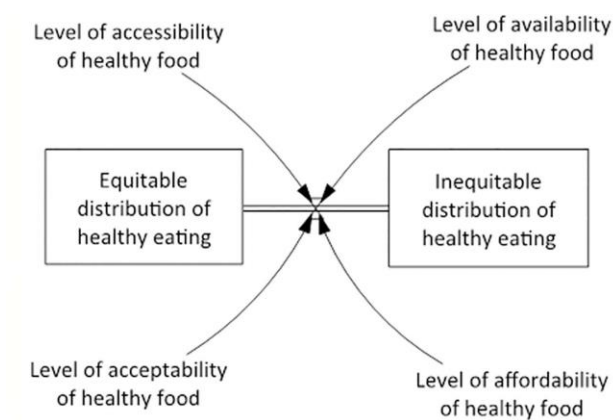
Dynamics of the complex food environment underlying dietary intake in low-income groups: a systems map of associations extracted from a systematic umbrella literature review

Alexia D. M. Sawyer^{1*}, Frank van Lenthe², Carlijn B. M. Kamphuis³, Laura Terragni⁴, Gun Roos⁵, Maartje P. Poelman⁶, Mary Nicolaou¹, Wilma Waterlander¹, Sanne K. Djojoseparto⁷, Marie Scheidmeir⁸, Agnieszka Neumann-Podczaska⁹, Karien Stronks¹ and on behalf of the PEN Consortium



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OBJECTIVE: UNDERSTAND DYNAMICS UNDERLYING FOOD ENVIRONMENTS IN LOW-INCOME GROUPS

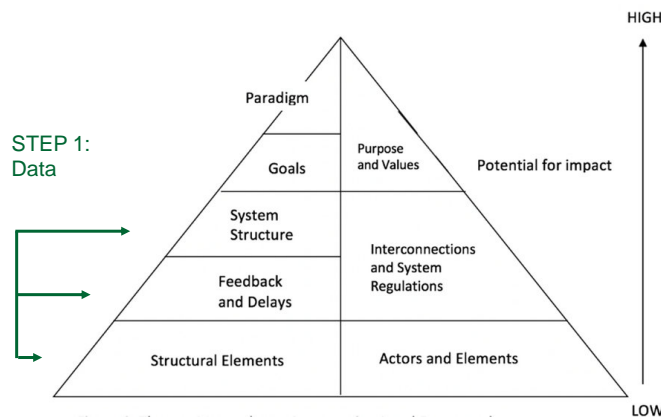


1. Friel S, Pescud M, Malbon E, et al. Using systems science to understand the determinants of inequities in healthy eating. *PLoS One* 2017;12:e0188872.

2. Caspi C, Sorensen G, Subramanian SV, et al. The local food environment and diet: a systematic review. *Health & Place* 2012;18:1172-1187.

NOVEL METHOD: SYSTEMS-BASED ANALYSIS OF CLD

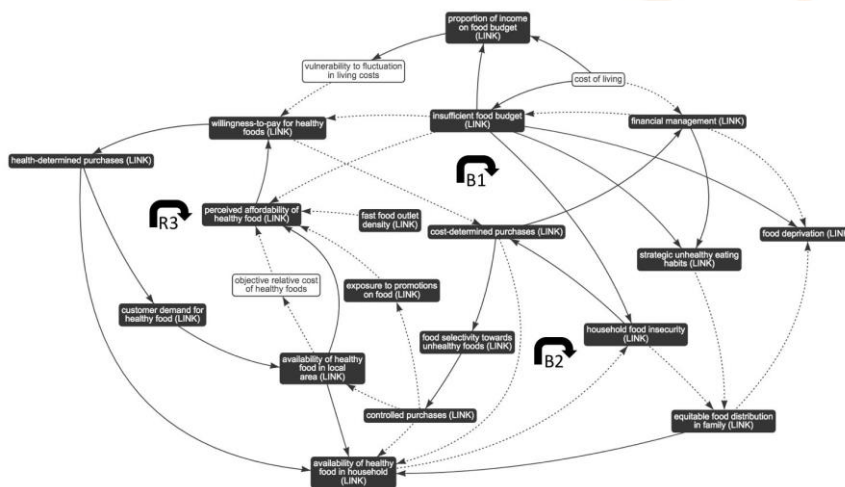
Analysis plan inspired by Intervention Level Framework⁸



8. Johnston LM, Matteson CL, Finegood DT. Systems science and obesity policy: a novel framework for analyzing and rethinking population-level planning. *Am J Public Health*. 2014; 104(7):1270-1276.

SS2: HOUSEHOLD FINANCES

Goal: strategic mitigation of limited household finances



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CONCLUSIONS

- Poor dietary intake in low-income groups can – and should be - presented as an emergent property of a complex adaptive system, that sustains a food environment that increases the acceptability, availability, affordability and acceptability of unhealthy foods.
- Reshaping the system requires
 - Longer-term management of household finances
 - Socially-oriented practices around a healthy food production, supply and intake
 - Supported by paradigm shifts

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DERIVING RECOMMENDATIONS BASED ON SYSTEM APPROACHES



Frank J. van Lenthe, Erasmus Medical Centre² & Utrecht University³

On behalf of PEN-WP5: Alexia Sawyer¹ Carlijn Kamphuis³, Laura Terragni⁴, Gun Roos⁴, Maartje Poelman⁵, Mary Nicolaou¹, Wilma Waterlander¹, Sanne Djojosoeparto³, Marie Scheidmeir⁶, Agnieszka Neumann-Podczaska⁷, and Karien Stronks¹

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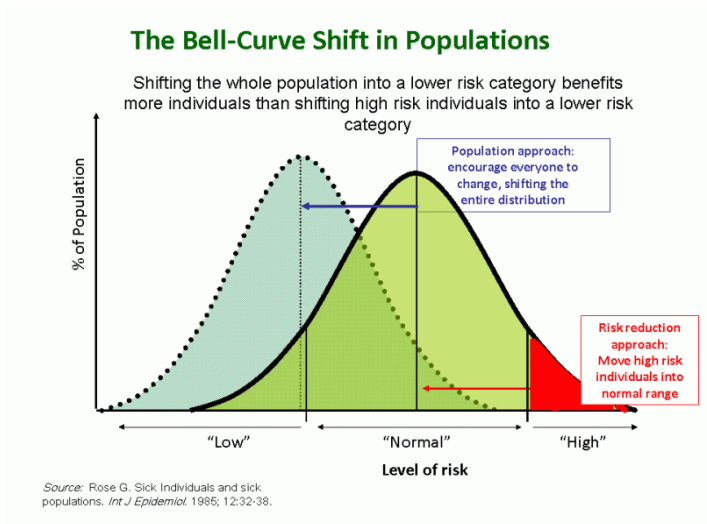
Funded by the Joint Programming Initiative "A Healthy Diet for a Healthy Life" (JPI HDHL) with contributions from national funding agencies of participating countries

Brussels; 14 June 2022

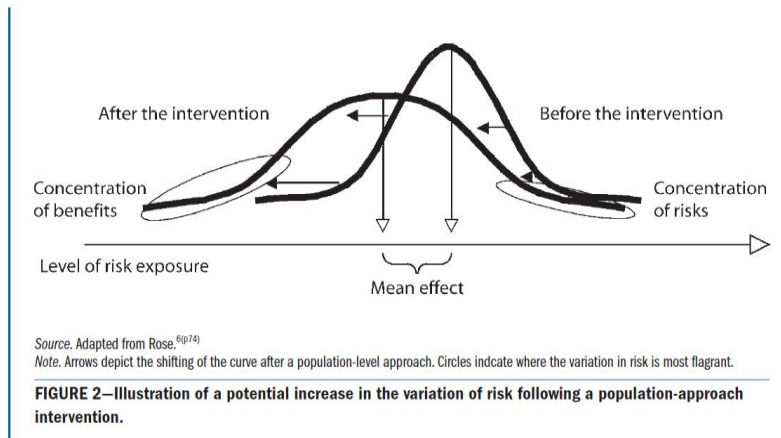
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STRATEGIES OF PREVENTION



PREVENTION STRATEGIES REVISITED



Frohlich and Potvin. Am J Public Health 2008

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INTERVENTION-LEVEL FRAMEWORK

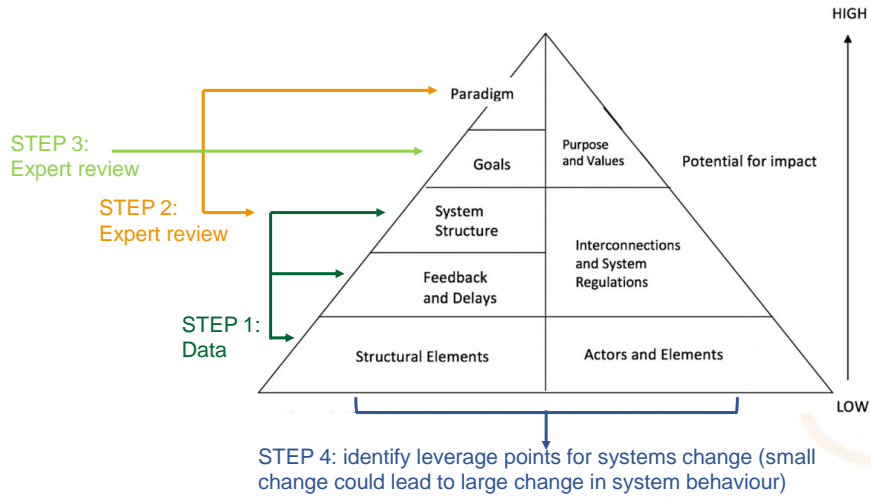
Description of Intervention Level Framework	
Level	Description
Paradigm	System's deepest held beliefs Source of system's goals, rules, and structures Difficult to intervene at this level but can be very effective
Goals	Targets that conform to the system's paradigm and need to be achieved for paradigm to shift Actions at this level can change aim of the system
System structure	Interconnections between system elements and subsystems Actions at this level will shift the system structure by changing system linkages or incorporating novel elements
Feedback and delays	Allows the system to regulate itself by providing information about the outcome of different actions back to the source of the actions
Structural elements	Actions at this level can create new feedback or increase gain around existing loops Subsystems, actors, and physical elements of the system Easiest level at which to intervene Many actions at this level are usually required to create system-wide change

Johnston et al., Am J Public Health. 2014; 104(7):1270-1278.

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SYSTEMS-BASED ANALYSIS OF CLD

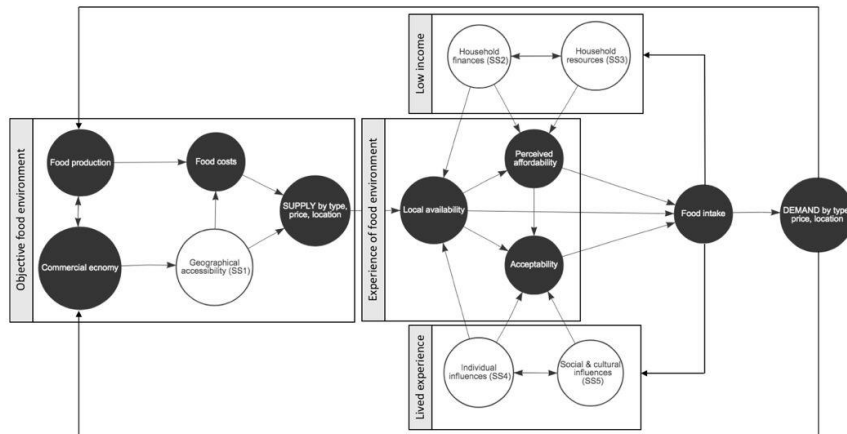
Analysis plan inspired by Intervention Level Framework⁸



8. Johnston LM, Matteson CL, Finegood DT. Systems science and obesity policy: a novel framework for analyzing and rethinking population-level planning. Am J Public Health. 2014; 104(7):1270-1278.

RESULTS: STRUCTURE AND PARADIGM

Paradigm: Supply-demand loop operating in an economic paradigm



THE ACTIONS SCALE MODEL

Table 2
Leverage points – alignment between Meadows,¹⁴ Malhi et al.,¹⁶ Senge¹⁵ and the ASM

	Meadows' 12 Points to Intervene	Intervention Level Framework	Iceberg Model	ASM
Degree of leverage + ↑ ↓ -	Power to transcend paradigms	Paradigm	Mental models	Beliefs
	Paradigm that the system arises out of			
	Goals of the system	Goals	System structures	Goals
	Power to add, change, evolve, or self-organise system structure			
	Rules of the system	System structures	System structures	Structures
	Structure of information flow			
	Gain around driving positive feedback loops			
	Strength of negative feedback loops	Feedback loops and delays	Patterns	
	Length of delays			
	Structure of material stocks and flows	Structural elements	Events	Events
	Size of buffers and other stabilising stocks			
	Constants, parameters and numbers			

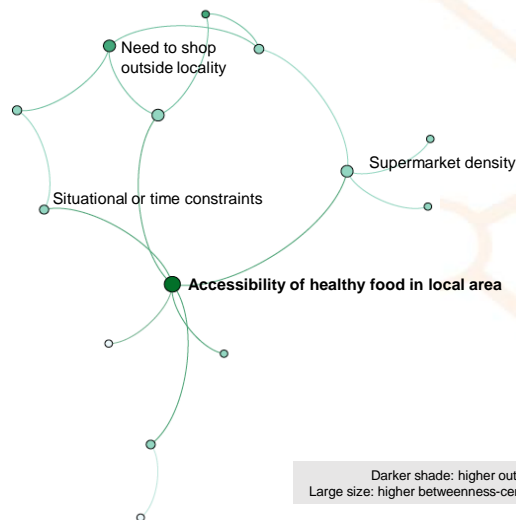
ASM: Action Scales Model.
The alignment between the three models is not as distinct as presented here. For example, Malhi et al.¹⁶ suggest that 'the rules of the system' and 'information flows' may also be viewed as 'structural elements' if they relate to a particular sub-system or actor within the system.

Nobles et al., 2021

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SS1: Geographical accessibility

Leverage point determined by level of **influence** on the system (out-degree) with consideration for **integration** in system (betweenness-centrality)

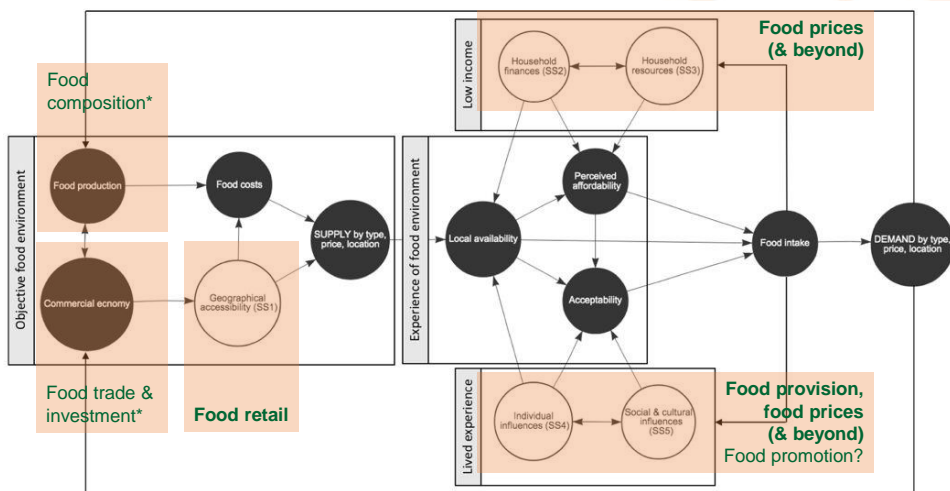


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USING POLICY TO STIMULATE SYSTEMS CHANGE

Sub-system	Goal	Leverage point	Food-EPI policy domain
Accessibility	Economic growth / commercial efficiency	Accessibility of healthy food in local area	Food retail
Household finance	Mitigation of limited finances	Insufficient food budget; cost-determined purchases	Food prices
Household resources	Mitigation of limited resources	Insufficient food budget; household food insecurity	Food prices
Individual influences	Acceptable cost-determined purchasing based on preferences cultivated by exposure	Household food insecurity; availability of healthy food in household	Food provision, food prices
Social & cultural influences	Alignment with social cultural models of consumption	Household food insecurity	Food provision, food prices

SIMULTANEOUS AND DIVERSE ACTION



*Not captured within the mapped system

RECOMMENDATIONS

Food environment policies

- Target mechanisms around accessibility via food prices and food retail policies
- Target mechanisms around affordability and acceptability via food prices, food retail and food provision policies
- Target exposure/vulnerability of low SES and the social determinants of dietary intake via food composition, food promotion, food prices and food provision policies

Policy approach

- Support an integrated policy approach, with simultaneous and diverse policy delivery
- Use a combination of universalism, proportionate universalism and targeting in policy delivery
- Support the delivery of policies addressing living conditions and inequalities in power and resources

Monitoring and evaluation

- Increase focus on monitoring and evaluation, to address gaps in the evidence base
- Acknowledge the wider system of determinants and policies when monitoring and evaluating policies, for example, in the selection of relevant outcomes

Integrating a systems perspective

- Discuss the level of systems change that is being aimed for and understand what evidence and which stakeholders are needed to achieve this
- Conduct and synthesise different types of research in order to build a picture of the system

Interactive discussion questions

- ▶ Which opportunities do you see for using system approaches in your work?
- ▶ Which challenges do they see for using system approaches in your work?
- ▶ What do you think need to change in order for stakeholders to take a systems approach to diet, physical activity and obesity?