



European Association for the Study of Obesity

What is an effective public health intervention, and how do you measure it?

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Story telling from history



1771-1772 famine in Europe, Josephine patents - Contributing granaries

Outline

- Part 1: What is an effective Public Health Intervention?
- Part 2: Methodology of Public Health intervention
- Part 3: How can we measure the effectiveness of Public Health interventions
- Future vision?



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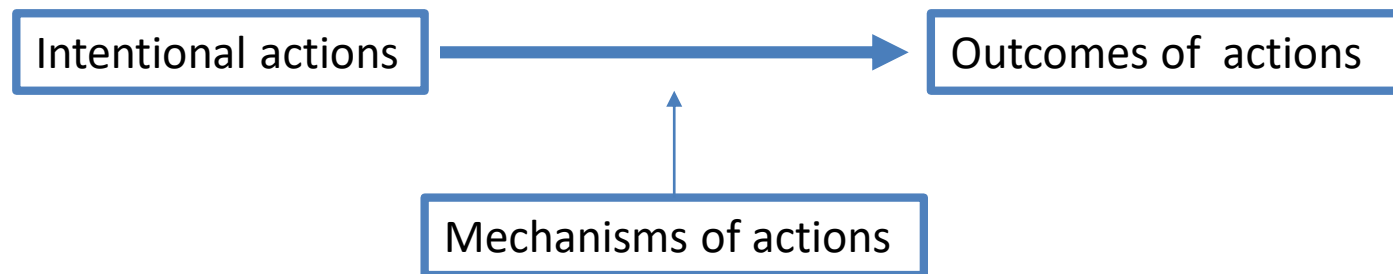
What is an effective public health intervention?

Part 1

HEALTH INTERVENTIONS - definition

Interventions can be generally defined as activities, techniques, or strategies intended to effect positive change by modifying determinants of targeted outcomes

Source: **Grant S. 2014.** *Development of a CONSORT Extension for Social and Psychological Interventions.* Oxford, UK.



PUBLIC HEALTH INTERVENTIONS

- to improve health outcomes **among large population groups**

Rehfuess EA, Akl EA. BMC Public Health 2013

- policies, initiatives, services, and activities that „may be“ important for population health

McGill E et al. Soc Sci Med 2021

AN EFFECTIVE PUBLIC HEALTH INTERVENTIONS

- policies, initiatives, services, and activities that PROMOTE or **sustainably** IMPROVE population health or health among large population groups
- Public health
 - is concerned with the promotion of population`s health, the prolongation of life, the prevention of ill health through the organized efforts of society.
 - supports the integration of health across all sectors and policy areas.
- Optimal methodology and process of implementation increase the likelihood that Interventions will be ultimately effective, sustainable and scalable

An effective PHI from the history reversing public health crisis

Have been met with Intervention targeted both: at the individual and all society.

Communicable diseases

- Eradication of variola
- Cholera
- STD, HIV
- Coronavirus...

NCD and other problems

- Iodine deficiency....
- CHD (salt, SFA, smoking – North Karelia Project)

Challenge: Obesity, DMT2, CVD, mental disorders

Unhealthy nutrition?

Sedentary lifestyle?

Mental stress and social isolation? Social inequalities?

Other environmental factors? Endocrine disruptors?

Regulatory intervention

- Iodine deficiency (salt iodisation)..
- Vitamin D supplementation in children..(in some location in Scandinavian countries)



- Tobacco – The WHO Framework convention on tobacco control → reduction in cigarette consumption and reduction of lung cancer
- Alcohol – individual countries have passed their own public health regulatory efforts with clear improvements (Room R. et al. Drug alcohol Rev, 2006)

Reducing availability of a substance reduces consumption, which reduces health harms (Room R et al: Lancet 2005)

Criteria for Public Health regulation

Public health officials have identified the four criteria met in order to be considered for Public Health regulation (Source: Room R. et al. Br. Med J 2008)

- Abuse (why can't you stop?)
- Toxicity (why do you get sick?)
- Ubiquity (why can't you escape it?)
- Externalities (why does your consumption harm me?)

Ultraprocessed Food Additive, Toxic, and ready for Regulation
Lustig RH: Nutrients, 2020

Regulatory intervention – the most effective strategies in public health crisis

In public health crisis

- Individual healthier choice do not seem to work very well voluntarily, unless made mandatory by authorities (wearing masks during Covid 19 pandemic...)
- Unless healthier choice is easier and more available than unhealthy choice by government regulation of environment (iodised salt vs no iodised salt in market)
- However public education and EBM data about cause –effect are necessary prerequisites for public readiness for regulatory intervention explanation and acceptability

Ineffective intervention targeting obesity

- Policies largely make high demands on individual agency, they rely on individuals to make behaviour changes rather than shaping external influences such as the environment or economy
- They are less likely to be effective or equitable
- „Soft policies“
 - agentic – individuals required to make independent choices
 - agente – structural changes facilitate healthier choices
- We should to learn from policy failure.....

Source: Theis DRZ and White M: The Milbank Q, 2021

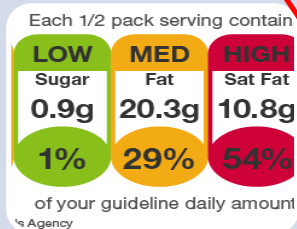
Strategies in primary prevention of OW and OB implemented non-regulatory and regulatory initiatives



Healthy eating
mass media
campaigns



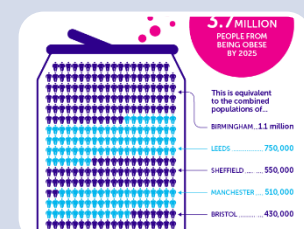
Nutritional
education
and skills



Simplified
food
labelling



Better
nutritional
value of food
Agreement
with food
industry



Taxes on
energy-
dense, food
and drinks

OECD report 2021

To increase the likelihood of policies being implemented

governments should accompany policy proposals with information ensuring they can readily lead to implementation,

- a clearly identified responsible agent,
- evaluation plan, and time frame;

and to increase the likelihood of effectiveness and equitability, governments should increasingly focus obesity strategies on “**low agency (structural)**” population intervention policies that more comprehensively address the most powerful levers for system change, e.g.

- Micro-level**
 - School canteen policies restricting unhealthy food
 - Increase in PE time at school
 - Removal of vending machine containing unhealthy food and drinks at workplaces
- Macro-level**
 - Restriction on marketing of unhealthy food
 - Food procurement policies based on nutritional standards in government settings
 - Food reformulation

Source: Theis D.R.Z and White M: The Milbank Q, 2021
Backholer K et al: Am J Public Health, 2014



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Metodology of public health intervention

Part 2

PUBLIC HEALTH INTERVENTIONS - mechanisms of action

○ Linear cause-and-effect relationships

- Upstream determinants (distal social environment and macro environmental factors)
 - e.g. regulation of fast-food outlets in geographic catchment areas
- Downstream determinants (individual characteristics and proximal social environment)
 - e.g. group-based healthy cooking training programs

○ Non-linear intervention relationships

- **Complex**
 - Complexity of the Intervention (Both upstream and downstream)
 - Complexity of the system

Complexity of the intervention

- the number of interacting intervention components
- the number and difficulty of behaviours required by those delivering and receiving interventions
- the number of groups or organizational levels targeted
- the number and variability of outcomes targeted
- the permitted degree of flexibility or tailoring of interventions.



Community capacity building intervention

Source: Tanner Smith EE ; Grant S: Ann Rev Public Health 2018

Public Health intervention: seven main areas of activities



**Healthy public
policy**



Economic and
regulatory
activities



Environmental
health
measures



Preventive
health services



Organisational
development



Community
based work



Health
education
programmes

Complexity of the System

- from important features of the contexts or systems in which interventions are implemented.
- **health issues with diverse etiological origins, which are often produced by an interplay of biological, psychological, sociological, and ecological processes**
- the complexity of the systems into which public health interventions are implemented and integrated—often ultimately modifying the systems themselves.



System oriented intervention

Source: Tanner Smith EE ; Grant S: Ann Rev Public Health 2018

Public Health Intervention

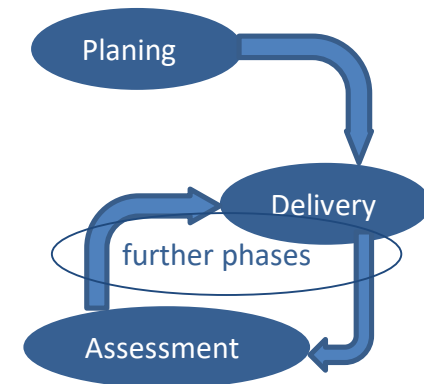
- Planned
- Naturally occurred

Planning of Public Health Intervention

Linear cause-and-effect relationship

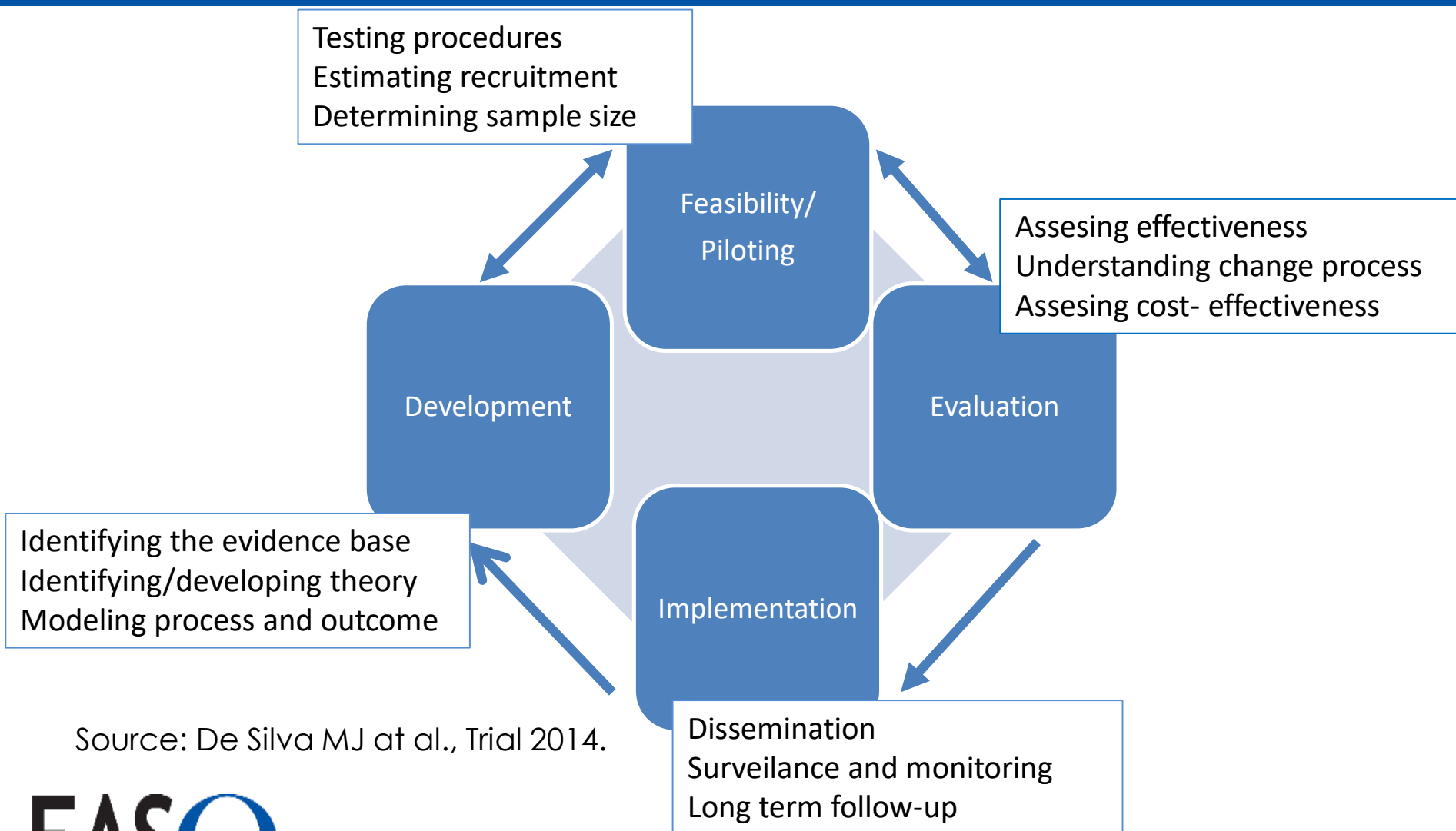
- Identifying Needs (Community analysis) and Priorities (Goals)
- Setting aims and objectives
- Target population
- **Deciding Strategy (strategies, activities)**
- Personal responsibility
- Identifying resources (personal, material)
- Scheduling
- Budget
- **Strategy of Evaluation**

Realisation:
Intention (planing)
Implementation (delivery)
Evaluation (assessment)



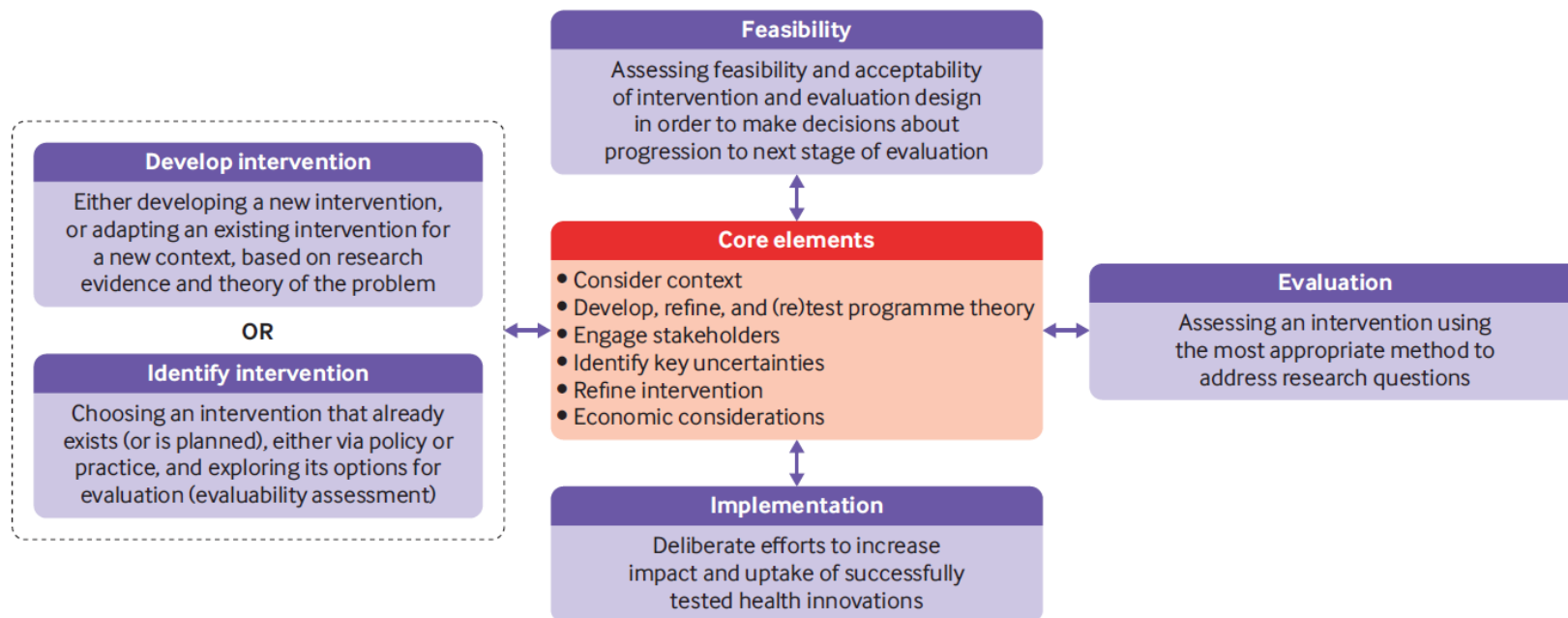
Complex intervention

The UK Medical Research Council's Framework



Source: De Silva MJ et al., Trial 2014.

A new framework for developing and evaluating complex interventions: update of Medical Research Council guidance



Source: Skivington et al. BMJ 2021

Four critical questions in planning of complex intervention

- Are the interventions adequate for their strategic focus?
- Are their measures included?
- Do they have basis in theory and evidence?
- Do they have an implementation plans?

The four repliers: answered by Complex intervention research

- An efficacy
 - To what extent does the intervention produce the intended **outcomes in experimental or ideal settings?**
- Effectiveness
 - To what extent does the intervention produce the intended **outcomes in real world settings?**
- Theory based
 - **What works in which circumstances and how?**
- Systems perspective
 - How do the system and intervention **adapt to one another?**

Source: Skivington et al. BMJ 2021

System thinking

- To IDENTIFY the most important CAUSE and
- EFFECT the RELATIONSHIPS within a specific system boundary that
- CREATE a FEEDBACK and so
- AMPLIFY or STABILISE CHANGE across a system



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How do you measure an effective public health intervention?

Part 3

Evaluation of effectiveness of intervention

- any research intended to increase understanding of an intervention's impacts, mechanisms for impact, context, or implementation

Complex system: Methodological approaches

- system mapping
 - To map the causal relationships between the variables identified
- network analysis
 - To identify quality of relationships and quantify the strenght and importance of relationships inside network of variables
- system modelling
 - To simulate the impacts of intervention, how an intervention may impact on and interacts within a wider complex system
- system framing
 - To identify barriers, the concepts of closed and open systems, and feedback, to explore how the programme interacted and was influenced by its location in the broader context of a community
- new approaches are developed

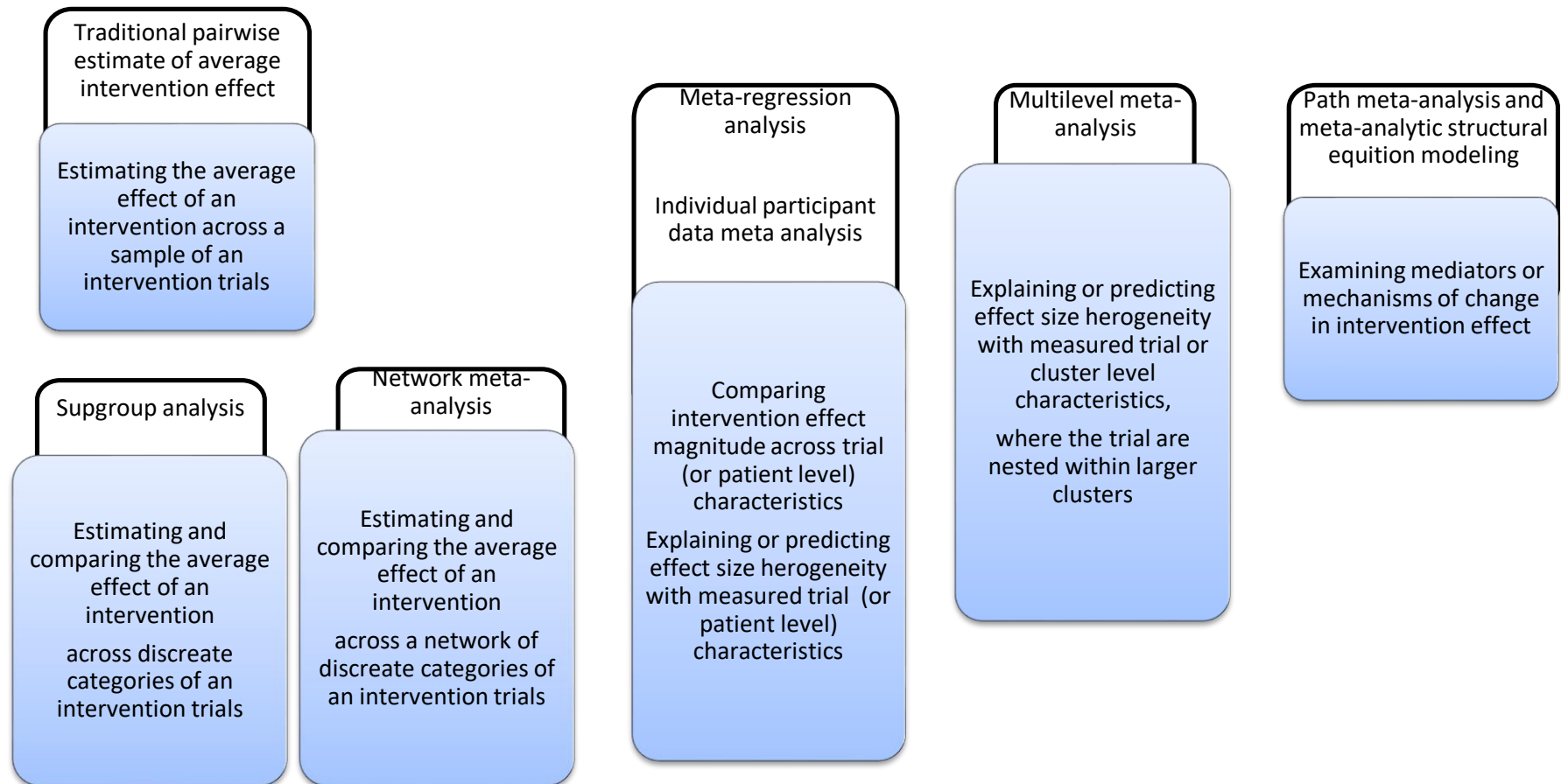
Evaluation of complex interventions

Stages of evaluation	Aim	S M	N A	S Mo	S F
Theorising	Identify and compare stakeholder understandings of a complex system.	x			x
	Identify and compare stakeholder understandings of how a planned/hypothesised intervention might interact within a complex system.	x			x
Prediction (simulation)	Hypothesise and simulate how an intervention may impact on and interact with a complex system.			x	
	Hypothesise and simulate how agents within a complex system react and interact in response to an intervention.			x	
Process evaluation	Understand how an implemented intervention has impacts within a complex system in the real world, including impacts of variation in local context.	x	x	x	x
Impact evaluation	Quantify the impacts of an implemented intervention on key system parameters in the real world.		x		x
Further prediction (simulation)	Hypothesise and simulate how an intervention may impact on and interact with a complex system over a longer time horizon or in a different context.			x	
	Hypothesise and simulate how agents within a complex system might react and interact in response to an intervention over a longer time horizon or in a different context.			x	

Statistical methods used for PHI evaluations

- Traditional evaluation: an intervention –effect measurement
 - Randomised Controlled Trials RCT, Systematic Review, Metaanalyse, An Umbrella Review of Meta-analyses of RCT
- Mixed methods
 - qualitative data from implementers and users, and quantitative data on intervention delivery
 - Interrupted time series analysis
- Complex system evaluation methods
 - Supgroup analysis, Meta-regression analysis, Individual participant data meta-analysis, Network meta-analysis, Multilevel meta-analysis, Path meta-analysis and meta-analytic structural equation modelling
 - critical system heuristics, microsimulation, and strategic assumption surfacing and testing...

Summary of meta-analysis approaches for synthesizing evidence on complex public health intervention - a menu of statistical options



META-ANALYTIC TECHNIQUES FOR ESTIMATING EFFECTS OF COMPLEX PHI

Fixed effect

Traditional pairwise
estimate of average
intervention effect

Random (mixed) effect

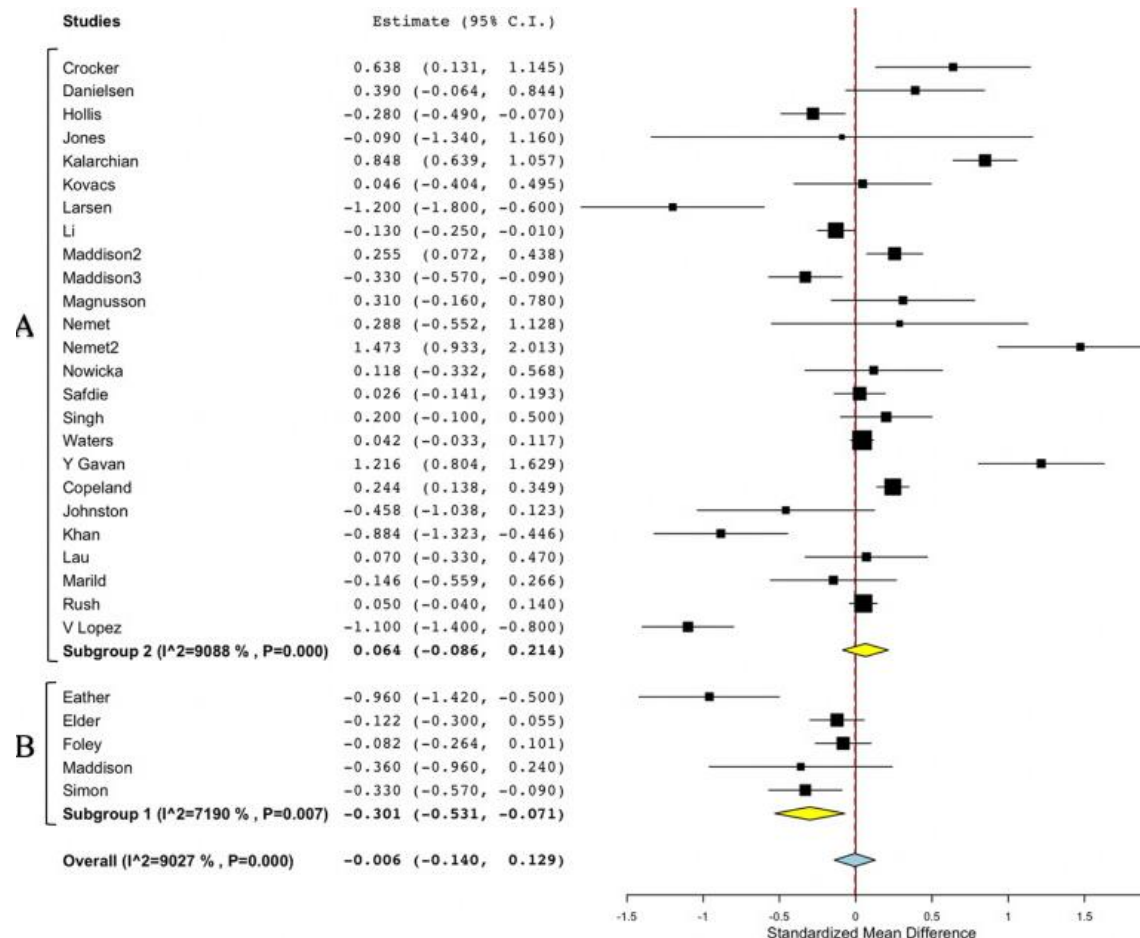
Multiple true effect sizes
in the population and
heterogeneity around the
average of those
population effect sizes can
be quantified and
potentially explained with
measured study
characteristics

Effectiveness and process evaluation in obesity and type 2 diabetes prevention programs in children: a systematic review and meta-analysis

Forest plot of process evaluation on studies using BMI.

Subgroup A
No process evaluation

Subgroup B
Process evaluation





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A large, thick blue arc that starts from the top right and curves downwards and to the left, framing the right side of the slide.

Conclusion and future vision

Conclusion

- An effective Public Health Interventions, including policies, initiatives, services, and activities, PROMOTE or sustainably IMPROVE POPULATION HEALTH or health among large population groups.
- To date implemented policies preventing OB have largely been directed towards influencing individual behaviour through „soft“ policy options, such as nutrition education program., social marketing campaigns...while regulatory structural responses have been utilised to a lesser extent, although there is a strong evidence that they are likely to be effective and cost effective ways to support OB prevention efforts at the population level.
- There are numerous established and promising approaches to address the complexity of public health interventions. Evaluation of complex interventions should no longer focus solely on examining whether an intervention works.

We would like to invite you to CECON in the Czech Republic



EASO

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Thank you for
attention!

