Population approaches to equitable behaviour change intervention

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Targeting of interventions: population vs high risk

- A **population intervention** is one delivered to a whole population, *irrespective of baseline risk* for the condition of interest (e.g. mandatory wearing of seat belts, front of pack food labelling)

- A **high-risk intervention** is one delivered to individuals (sometimes in groups) *according to their level of risk* for the condition of interest (e.g. screening and brief intervention for risky alcohol consumption, or a weight loss intervention for people with a BMI over 30)
Population interventions, reach and impact

% Population

Risk level

5 10 15 20 25 30 35
Intervention targeting, agency and equity

- Interventions targeting high-risk populations and low agency:
  - ‘Fat camps’ for obese children, restricting dietary intake
  - Healthier frying practices in hot food take-aways
  - Fortification of flour with folic acid
  - Artificial fluoridation of tap water

- Interventions targeting high-risk populations and high agency:
  - Weight loss pharmacotherapy & surgery
  - Increased health insurance premiums for obese people
  - Vouchers for free fruit and veg for low income parents
  - New supermarket in previously underserved area

- Interventions targeting low-risk populations and low agency:
  - Decreasing portion sizes of convenience foods
  - School food & nutrient standards

- Interventions targeting low-risk populations and high agency:
  - Dietary counselling for patients with type 1 diabetes
  - Referral to commercial weight loss programmes
  - Cooking classes for older, single men
  - Social marketing & mass media campaigns
  - Front-of-pack nutrition labelling

The relationship between water fluoridation and socioeconomic deprivation on tooth decay in 5-year-old children

Non-fluoridated

\[ y = 0.1902x + 1.9515 \]

\[ R^2 = 0.79 \]

Artificial fluoridation

\[ y = 0.0794x + 1.1094 \]

\[ R^2 = 0.38 \]

Natural fluoridation

\[ y = 0.0319x + 0.6619 \]

\[ R^2 = 0.41 \]
The journey of food from source to consumption: an ecological model
UK Childhood Obesity Plan (v2.0)

Key proposed regulatory measures aimed at whole population:

- Mandatory **Calorie labelling** of menu items in out of home eating outlets
- Restrictions on **in-store promotions** of unhealthy foods, either by **place** (e.g. checkouts) or **price** (e.g. multi-buy discounts)
- Further restriction of **TV advertising** of unhealthy foods (“9pm watershed”)
- Restrictions on **online advertising** of unhealthy food
- Extension of the **Soft Drinks Industry Levy** (SDIL) to milk-based drinks
- Restriction of sales of ‘**energy drinks’** to children
- Further **industry levies** on key unhealthy foods (e.g. confectionery)
- Tougher **school food/nutrition standards** to reduce sugar consumption
Evaluation of supermarket checkout policies

1. Clarify checkout food policies of major UK supermarkets
   • Desk-based research

2. Determine supermarket’s adherence to their checkout food policies

3. Compare checkout foods in supermarkets with and without policies
   • Survey of 69 supermarkets in East of England

4. Compare purchases of common ‘less healthy’ checkout foods from supermarkets with and without, and before and after introduction of policies
   • Interrupted time series analysis of household purchase data from Kantar Worldpanel
Data structure

Ejlerskov K et al, PLoS Med, 2018; 15 (12), e1002712
Purchases of checkout foods before/after introduction of policies in 9 UK supermarkets

Broken Black = intervention  \ Blue = purchases in control store  \ Red = purchases in intervention store

Broken red = estimated purchases in intervention store without intervention

Ejlerskov K et al, PLoS Med, 2018; 15 (12), e1002712
Change in purchases in 4 weeks post-implementation

<table>
<thead>
<tr>
<th>Intervention supermarket</th>
<th>Level change (in 1000) /percentage market share (95% CI)</th>
<th>% Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear and consistent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (2014)</td>
<td>-461.6 (-1016.3, 93.1)</td>
<td>2.23</td>
</tr>
<tr>
<td>2 (2015)</td>
<td>-108.7 (-137.1, -80.4)</td>
<td>41.56</td>
</tr>
<tr>
<td>3 (2015)</td>
<td>-435.8 (-690.0, -181.5)</td>
<td>8.91</td>
</tr>
<tr>
<td>Vague or inconsistent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 (2014)</td>
<td>-178.7 (-294.0, -63.3)</td>
<td>24.20</td>
</tr>
<tr>
<td>5 (2015)</td>
<td>-54.2 (-274.8, 166.4)</td>
<td>11.09</td>
</tr>
<tr>
<td>6 (2016)</td>
<td>-118.1 (-326.9, 90.7)</td>
<td>12.02</td>
</tr>
<tr>
<td>Overall (I-squared = 46.0%, p = 0.099)</td>
<td>-157.7 (-242.8, -72.7)</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Overall 157,700 fewer units purchased/% market share (95% CI: 72,700 to 242,800), a \textbf{-17.3\% change at 4 weeks}

Ejlerskov K et al, PLoS Med, 2018; 15 (12), e1002712
Change in purchases at 12 months post-intervention

Overall 185,100 fewer units purchased/% market share (95% CI: -248,500 to -121,700), a **-15.5% change at 12 months**

Ejlerskov K et al, PLoS Med, 2018; 15 (12), e1002712
The two modes of evidence generation

When research drives policy:
- Intervention development
- Feasibility and pilot trial
- Definitive trial (RCT)
- Evidence synthesis
- Policy action

When policy drives:
- Policy development
- Policy action
- Evaluability assessment
- Retrospective evaluation (quasi-experimental)
- Evidence synthesis

Epidemiological studies
Modelling studies
Observational evidence – of need & potential
Political & economic considerations

= Key point of influence for research on policy
Key principles for impactful population behaviour change

1. Focus on fundamental drivers of attributable risk and outcomes with **high population burden**
   (e.g. smoking, diet, alcohol, air pollution, etc., as causes of chronic NCDs)

2. Act on upstream **levers at population level** – aiming to reset whole system
   (e.g. overall supply of unhealthy foods, minimum unit price for alcohol, ban on advertising of tobacco)

3. Choose **low agency** interventions – and think about whose agency is required
   (e.g. regulatory measures mandated by government)
Research challenges for population interventions

- Change in exposure not manipulated by researcher – usually new policy or other intervention ‘naturally occurring’
- Understanding context and theorising intervention – mapping the system
- Timescale of policy implementation often precludes prospective evaluation
- Implementation/fidelity may be variable over time, place and persons
- May be small changes in exposure at individual level, but may yield worthwhile effect for population. Study power of ITS dependent on number of time points, not sample size
- Demands of evaluations:
  - high quality and comprehensive routinely available data on exposures, outcomes and confounders – from many sectors
  - Suitable counterfactual(s), based on time, place or persons
  - A robust statistical method to model (estimate) impacts
  - Ideally replication and synthesis
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Declaration of interests

- Director of the UK National Institute for Health Research (NIHR), Public Health Research Programme (2014-20)
- President of the UK Society for Behavioural Medicine (2017-18)

- Chief investigator of research grant 16/130/01 from NIHR to evaluate the UK Soft Drinks Industry Levy (£1.5m)
- Chief investigator of a research grant from UK Medical Research Council to develop consensus on the governance of relationships between public health scientists and the food industry (£100k)
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