The European Commission’s science and knowledge service

Joint Research Centre
Update on ongoing JRC study -
Overview of existing and proposed FOP schemes, including literature review of research regarding the development of the schemes, their impact on consumers and other effects

Joint meeting on front-of-pack nutrition labelling between Working Group of the Standing Committee on Plants, Animals, Food and Feed - Regulation (EU) No 1169/2011 on the provision of food information to consumers (FIC) & Advisory Group on the Food chain, Animal and Plant Health

Brussels, 22 October 2018
Content – part I

• **FOP labelling effects on diet & health**
  • Associations of diet quality with health outcomes
  • Effect of FOP labels on food perception
  • Effect of FOP labels on food selection in online choice tasks
  • Effect of FOP labels on food selection in offline choice tasks
  • Meal selection/preparation studies
  • Modelling studies estimating FOP labelling impact on nutrient intakes
  • Modelling studies estimating FOP labelling impact on health

• **FOP labelling effects on reformulation**
FOP labelling effects on diet & health

• **Associations of diet quality with health outcomes**

  FSA-NPS DI\(^a\) score positively associated with

  • **CVD risk** in NutriNet\(^1\) and SU.VI.MAX\(^2\) cohorts; Hazard Ratio (HR) of 1.4-1.61 in poorest compared to best diet quality quartile

  • **Cancer risk** in SU.VI.MAX\(^3\) and EPIC\(^4\) cohorts; HR of 1.07-1.34 in poorest compared to best diet quality quintile

  • **Higher BMI** in men in SU.VI.MAX cohorts 1 and 2\(^5\); Odds Ratio of 1.12 for overweight, 1.16 for obesity per 1-point increase in the FSA-NPS DI score

  NB: Study cohorts tended to be healthier than average population.

\(^a\)Food Standards Agency Nutrient Profile System Diet Index

\(^1\)Adriouch et al. 2016; \(^2\)Adriouch et al 2017; \(^3\)Donnenfeld et al. 2015;

\(^4\)Deschasaux et al. 2018; \(^5\)Julia et al. 2015
FOP labelling effects on diet & health

• **Effect of FOP labels on food perception**
  - **NL:** Highlighting reduced salt content on chicken soup either explicitly or through "healthy choice" logo – without actually changing it – reduced expected liking; no impact of label on actual liking\(^1\)
  - **AUS:** Testing regular, -15% salt, and -30% salt variants of chicken noodle soup, a "Pick the Tick" logo did not compromise expected and actual liking relative to no label control\(^2\)

NB: Attention should be paid to label features and socio-cultural context in order to achieve desired impact.

\(^1\)Liem et al. 2012a  
\(^2\)Liem et al. 2012b
FOP labelling effects on diet & health

- **Effect of FOP labels on food selection in online choice tasks – experimental data**
  - FR/AUS: Nutritionally favourable effects of Nutri-Score, HSR, and UK MTL on portion size selection; neutral to slightly negative impact for Daily Intake Guide (DIG) and ENL, respectively\(^1,2\)
  - UY: Warning labels discouraged biscuit choice in both hedonic- and health-minded consumers\(^3\)
  - NZ: TL better than DIG in helping normo- and hypertensive people identify healthier food choice; DIG rendered high-sodium option more attractive\(^4\)
  - US: "Smart Choices"-type logo tripled healthfulness of breakfast cereal choice\(^5\)

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\(^1\)Egnell et al. 2018; \(^2\)Talati et al. 2018; \(^3\)Tortora & Ares 2018; \(^4\)McLean et al. 2012; \(^5\)Bui et al. 2013
FOP labelling effects on diet & health

- **Effect of FOP labels on food selection in offline choice tasks – experimental data**
  - US: In fake supermarket, marginally beneficial effects of TL-coded Facts-Up-Front label, but only when combined with in-aisle explanation; no effect of Facts-Up-Front alone\(^1\)
  - UK: Consumers willing to pay more for shopping baskets that have no red TL for any nutrient; substantially less concern for switching from amber to green\(^2\)

NB: Importance of accompanying education measures.

\(^1\)Graham et al. 2017
\(^2\)Balcombe et al. 2010
FOP labelling effects on diet & health

- Meal selection/preparation studies (examples) – experimental data
  - DE: In subjects asked to compose a day’s food basket, **no overall difference of FOP labels** (MTL, healthy choice tick, GDA, TL-coded GDA) on energy and nutrient content; by product category, TL best on dairy products and Tick logo on breakfast cereals

  - AUS: In subjects asked to serve themselves adequate portions of breakfast cereal, fruit salad, and chocolate, and a three-component meal from a fake food buffet, **no impact of calorie or HSR labelling**

  - NL: **No impact of GDA labelling** on soft drink portion choice in cinemas

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1 Borgmeier & Westenhoefer 2009
2 Brown et al. 2017
3 Vermeer et al. 2011
FOP labelling effects on diet & health

• Modelling studies - FOP labelling impact on nutrient intakes
  
  • CA: Replacing any products with one or more red lights by similar foods not bearing any red lights where available, or otherwise by the healthiest option: Lower intake in **energy** (-5%), **total fat** (-13%), **saturated fat** intake (-14%), and **sodium** (-6%). No effect on sugar intake

  • MX: Using MCNE nutrient profile criteria, intake reductions in **energy** (-5.4%), **saturated fatty acids** (-18.9%), **trans fat** (-20%), **total sugar** (-36.8%), and **sodium** (-10.7%), plus increase in **fibre** intake (+15.5%). With COFEPRIS criteria (similar to EU Pledge), changes for **trans fat** (-20%) and **sodium** (-9.7%)

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1 Emrich et al. 2017
2 Mendoza et al. 2018
FOP labelling effects on diet & health

- **Modelling studies - FOP labelling impact on nutrient intakes**
  - FR: Shifting diets towards products with better Nutri-Score resulted in more people achieving dietary recommendations; substitution scenarios resulted in lower intakes in fat, sugars, and added sugars, and increased fibre intake; effects more pronounced in people with Western or Traditional compared to healthy diet
  
  - NL: Shifting towards Choices-labelled products, lower intake in energy (-15%), sodium (-23%), and trans fats (-63%), with other nutrients to limit (total fat, total sugar, saturated fat) falling between sodium and trans fat reduction levels. Positive nutrients increased between 5% (folic acid) and 28% (fibre)

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1Julia et al. 2016
2Roodenburg et al. 2009
FOP labelling effects on diet & health

• Modelling studies - FOP labelling impact on nutrient intakes

  • NZ: Pick the Tick programme compared to counterfactual of no programme reduced daily intakes in saturated fat (-1 g; -3.2%), sodium (-38 mg; -1.1%), and energy (-72 kJ; -0.8%)¹

  • FI: Replacing foods from four food groups majorly contributing to intakes of hard fat, sodium, and fibre with products complying with Heart Symbol criteria reduced intake of hard fat by 34.6% (14.3 -> 9.9E%), salt by 11% (7.6 -> 6.8 g/day)²

¹Wilson et al. 2014
²Raulio et al. 2017
FOP labelling effects on diet & health

- **Modelling studies - FOP labelling impact on nutrient intakes**

  Consistently switching to Keyhole products would improve daily intakes as follows:

  - **SE**:
    - total calories (-11%), fat (-29%), saturated fat (-40%), and added sugar (-9%); dietary fibre intake (+30%), wholegrain (+754%)\(^1\)

  - **DK**:
    - energy (-1000 kJ), saturated fat (-27%), salt (-1 g), wholegrain (+76%), dietary fibre (+18%)\(^2\)

  - **NO**: total fat (-11.4 g, -13%), saturated fat (-8.9 g, -26.5%), and energy (-403 kJ, -4.3%); dietary fibre intake increased (4.7 g, 19.3%)\(^3\)

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\(^1\) Amcoff et al. 2015
\(^2\) Biltoft-Jensen et al. 2015
\(^3\) Astrup et al. 2015
FOP labelling effects on diet & health

• Modelling studies - FOP labelling impact on health
  • AUS: HSR-motivated product reformulation with subsequent reductions in energy intakes could lead to **body weight reductions** and **gain in healthy life years**\(^1\)
  • AUS: **10% shift** towards healthier options with mandatory TL labelling on selected food products would change energy intake (-154 kJ/day in men, -88 kJ/d in women), with subsequent reductions in weight (-1.6 kg for men, 0.9 kg for women); if **10%** of population responded, **45,000 DALYs**\(^a\) could be averted\(^2\)
  • NL: If whole population switched to Choices-labelled products where possible, improved blood lipids would yield **1.59% reduced risk** of myocardial infarction\(^3\)

NB: Scenarios usually rely on very optimistic assumptions.

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\(^1\)Mantilla Herrera et al. 2018  \(^a\)Disability-Adjusted Life Years  
\(^2\)Sacks et al. 2011  
\(^3\)Vyth et al. 2012
FOP labelling effects on reformulation

• **Self-report data suggest... (examples)**
  - NL: Choices logo led to reformulation of 168 out of 821 products (20%) assessed\(^1\)
    - Soups category most frequently affected
    - Largest changes seen for sodium and fibre in sandwich category
  - NZ: HSR products (n=807; 5.3% of all products) higher in energy and protein but lower in saturated fat, total sugars, and sodium compared to non-HSR products\(^2\)
    - significant changes observed for overall mean energy (-29 KJ/100 g), sodium (-49 mg/100 g), and fibre (+0.5 g/100 g)
  - CL: 18% of 5,343 products evaluated in 2016 had been reformulated\(^3\)

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1. Vyth et al. 2010
2. Ni Mhurchu et al. 2017
3. Chilean Ministry of Health 2017
• **Methodological issues**
  • **Study design**
    • Experimental vs. empirical
  • **Within-label variation**
    • e.g. 5-CNL vs. Nutri-Score; variants of Multiple Traffic Lights
• **Research question**
  • FOP labels differ in their ability to answer different research questions
Content – part II

Evidence on consumer purchasing behaviour
1. Empirical versus experimental data
2. Empirical studies on consumers (retailers data)
3. Empirical studies on consumers (other facilities data)
4. Remarks/ideas for future research on consumers behaviour

Evidence on impact on supply side (reformulation)
5. FoP: empirical studies on suppliers and reformulation
6. What happened in the US, on calorie posting
7. Concrete idea(s) for future research
Main Results:

- **Significant effect in presence of a dietary goal** (Machin et al. 2018; Van Herpen & Van Trijp 2011)
- **Non-existent or marginal effect** due to:
  - More salient factors: prices and discounts (Waterlander et al. 2013); time constraint (Cohen & Babey 2012); taste (Koenigstorfer et al. 2014); habit (Boztug et al. 2015); cognitive load and fatigue (Cohen & Babey 2012)
- **No clear evidence on the best label:** Evaluative and reductive systems are related to opposite cognitive processes (Sanjari et al. 2017)
Empirical data on Purchasing Decisions

**ACTUAL PURCHASING BEHAVIOUR**
(empirical data or large scale trials)

**PROS:**
- More realistic environment (external validity)
- Choice bears consequences

**CONS:**
- It is difficult to control for confounding factors
Impact on Purchasing Decisions

- Empirical data from retailers to evaluate the impact of FOP labels on consumers' behaviour in real shopping situations.
- Study on TLs in the UK (Sacks et al. 2009)
  - Sales data indicated that TL-labelling had practically no effect on food purchases.
  - Short period (1 month) and small number of products (18).
  - Loyalty cards.
- Boztuğ et al. (2015) analysis of scanner data provided by a large UK retailer.
  - Focus on two food categories, using store-brand products with monochrome GDA
  - GDA does not affect product choice behaviour.
  - Instead, price and habit exhibit a greater impact on purchase behaviour and product choice than the GDA label introduction.
Impact on Purchasing Decisions

- Empirical data from facilities to evaluate the impact of FOP labels on consumer behaviour in real shopping situations.
- TL in sport facility (Olstad et al. 2015).
  - Positive impact of labels
  - One week before vs. one week after
  - No negative effect on revenues
- Hospital cafeteria (Sonnenberg et al. 2013; Thorndike et al. 2014)
  - Large hospital cafeteria with a mean of 6511 transactions daily.
  - After a 3-month baseline period, cafeteria items were labelled green; yellow; or red and rearranged to make healthy items more accessible.
  - Respondents who noticed labels (33%) were more likely to purchase healthier items.
  - A traffic-light and choice architecture cafeteria intervention resulted in sustained healthier choices over 2 years.
Impact on Purchasing Decisions

- Empirical data mixed with survey data to evaluate the impact of FOP labels on consumers' behaviour in real shopping situations
- Vyth et al. (2010) on Choices logo
  - validated questionnaire about motivation for food choice
  - Nine supermarkets in The Netherlands (404 respondents)
  - 62% reported familiarity with the logo
  - Food choice motive ‘hedonism’ was negatively associated with purchasing products with the logo
Remarks/ideas for future research on consumers behaviour

IDEAS for future research on consumer behaviour

1. More studies in a more realistic environment with incentives (lab experiments, field interventions, real sales data)
2. More cross-country comparisons.
3. More research with the support and data by the industry (retailers, producers)

Caveat:
• Poorly done empirical analysis may be misleading
• Causality is extremely hard to identify
Studies on food manufacturers’ responses to FOP labels are rather **scant**. There is still no systematic and comprehensive assessment of the effects of FOP labels on food reformulation and supply strategic behaviour.

- There is some evidence that FOP labels influence food composition (Netherlands, Canada, Australia, New Zealand), though based on self-reported data.
- However, better nutrition composition not always correlated with FOP label frequency (Van Camp et al. 2012)

- Potential reasons:
  - Reformulation occurs only for nutrients highlighted by FOP labels (Carter et al. 2013)
  - Low incentives within same labelling grade (Van Camp et al. 2010)
  - FoP labelling as marketing strategy for producers and retailers (Newman et al. 2014)
  - More likely to be present on private label products (Van Camp et al. 2012)
Product reformulation, how to measure it
Product reformulation, what happened in US ahead of July 2018

<table>
<thead>
<tr>
<th>Product</th>
<th>Calories</th>
<th>Pctg. changed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pizza Hut</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meat Lover’s Pizza</td>
<td>0</td>
<td>-20%</td>
</tr>
<tr>
<td>Starbucks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Butter Croissant</td>
<td>300</td>
<td>-16%</td>
</tr>
<tr>
<td>Taco Bell</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chips and Nacho Cheese Sauce</td>
<td>400</td>
<td>-33%</td>
</tr>
<tr>
<td>Panera Bread</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black Bean Soup</td>
<td>500</td>
<td>-42%</td>
</tr>
</tbody>
</table>

**Higher-Calorie Items**

<table>
<thead>
<tr>
<th>Restaurant</th>
<th>Calories</th>
<th>Pctg. changed</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Cheesecake Factory</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crispy Chicken Costoletta</td>
<td>3k</td>
<td>-33%</td>
</tr>
<tr>
<td>Ruby Tuesday</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chicken &amp; Broccoli Pasta</td>
<td>2</td>
<td>-30%</td>
</tr>
<tr>
<td>California Pizza Kitchen</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tostada Pizza</td>
<td>1</td>
<td>-21%</td>
</tr>
</tbody>
</table>

SOURCE: menustat.org, company websites, Center for Science in the Public Interest
Product reformulation, before and after

Le Nutri-Score : mieux savoir pour mieux choisir

Le Nutri-Score est un label alimentaire très clair qui vous permet de choisir plus facilement une alimentation équilibrée.

Un label alimentaire fiable

Le Nutri-Score est un label alimentaire très clair qui vous permet de choisir plus facilement une alimentation équilibrée.
Brick-and-mortar and online choices

Le Nutri-Score : mieux savoir pour mieux choisir

Grâce à notre app SmartWithFood, vous comparez d’ores et déjà le Nutri Score de 20 000 produits.

Pas encore de Nutri-Score sur l’emballage ? Téléchargez notre app SmartWithFood et trouvez facilement le Nutri Score de produits Boni Selection ainsi que des marques connues. Scannez le code-barres du produit et le Nutri-Score s’affiche directement.
What empirical information we could collect

- Brick-and-mortar shopping provide purchase data, and may allow estimating the macro impact of an intervention (e.g., the introduction of a new FoP system).

- Online shopping, instead:
  - Also allows the estimation of the impact at a micro scale.
  - Allows linking any impact to specific socio-demographic characteristics.
  - Allows linking any impact to previous actions (e.g., did the online shopper click on the label, filter or sort products by label).
  - Etc.
Key brands already committed to "nudge for good"
Should we not join forces?

- All in all, we saw that experimental online data provide precious information on consumers' perceptions, understanding and purchase intentions. However there are both gaps and inconclusive results.

- We also saw that some concerns are cast on the external validity of such results.

- We therefore make a call for researchers and the private sector to join forces to look for conclusive empirical results (regarding the effects on the demand and the supply side):
  - The previous slides offer some relatively simple ideas for future research.
Thank you