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Food labelling and reformulation tools

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Content

- Introduction: Branded food datasets
- Data collection methods - challenges and opportunities
  - data from food operators, food monitoring studies, web scrapping, crowdsourcing
- Demonstration of use of branded food datasets with FNS Cloud case studies
  - Sodium reformulation case study
  - Contry-to-country comparison case study
  - Estimation of nutritional composition of processed foods
- Recommendations
- Feedback and discussion

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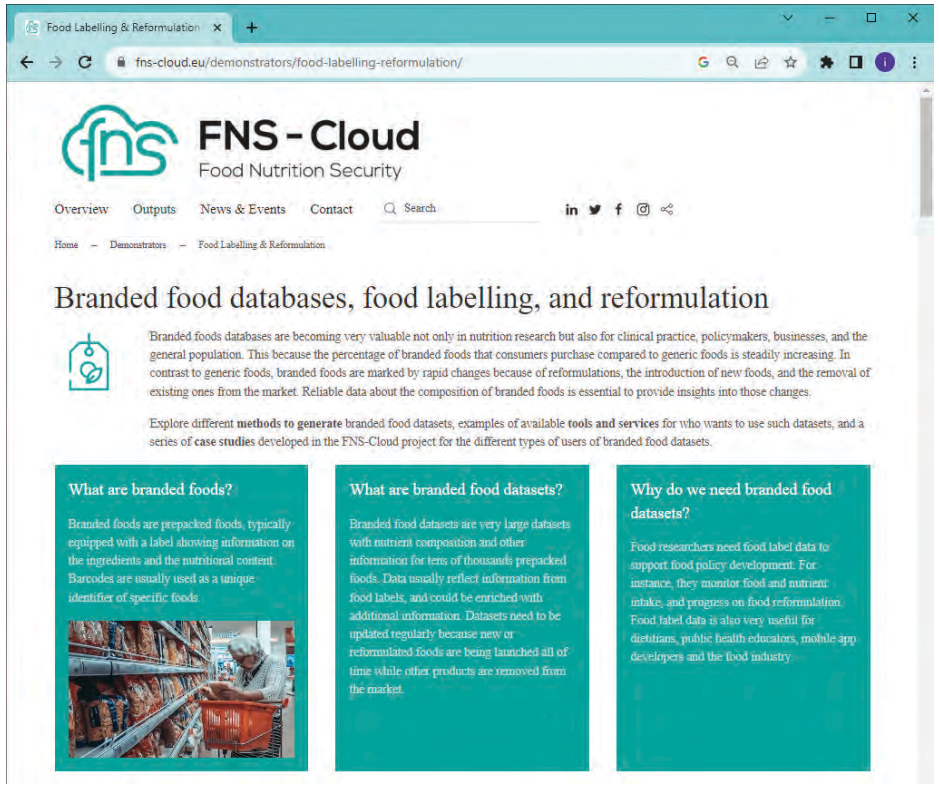
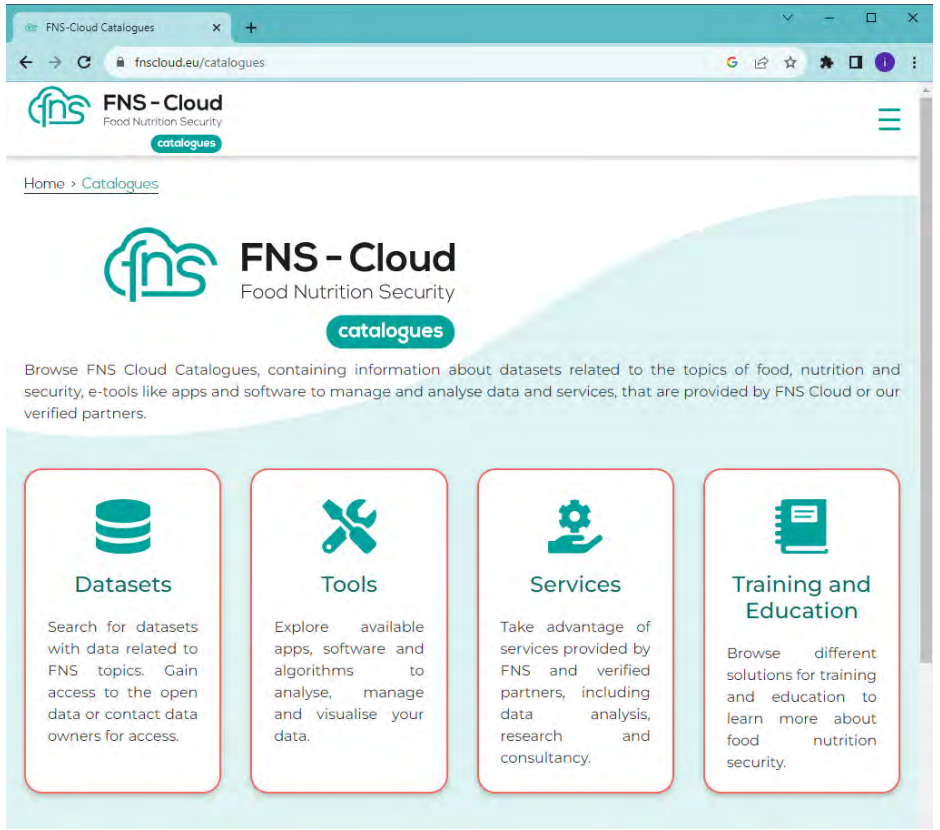
Supporting disemmination tools

FNS-Cloud web page: Branded food datasets



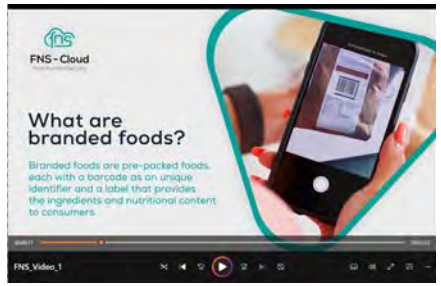
https://www.fns-cloud.eu/demonstrators/food-labelling-reformulation/

FNS-Cloud catalogues



https://fnscloud.eu/catalogues

FNS-Cloud videos



https://www.youtube.com/@fns-cloud/videos

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Introduction: Branded food datasets

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What is on food labels?

Ingredient lists: Example of complexity of the presentation of list of ingredients

Product	List of ingredients	Issue
Nutella - Ferrero - 825 g GTIN 3017620429484 	sugar, palm oil, **hazelnuts** 13%, cocoa lean to 7.4%, skimmed **milk** powder 6.6%, **whey** powder, emulsifiers: lecithins [soy], vanillin	While the content (%) of some ingredients is labelled, the content of others is not. In some constituents, raw ingredients can be also provided, i.e. due to regulation of labelling of allergens.
Siggi's Skyr - 150 g GTIN 3838800063218 	Pasteurized skimmed **milk**, strawberry fruit preparation 12% (strawberries 44%, cane sugar, starch, concentrated lemon juice), yogurt culture.	Presence of embedded complex ingredient, which has its own presentation of composition). Some constituents can be provided with described production technology, affecting their composition

Nutrition declaration with (conditionally) mandatory information for a case product: Crunchy Corn Tortilla Chips (Old El Paso - 185 g; GTIN 8410076482655)

Nutrition facts	Unit	As sold for 100 g	Mandatory information
Energy	Kcal	551 kcal	☑
Energy	kJ	2,305 kJ	
Fat	g	33.8	☑
- Saturated fat	g	4.3	☑
Carbohydrates	g	54.3	☑
- Sugars	g	0.5	☑
Fibre	g	3.9	☒*
Proteins	g	5.5	☑
Salt	g	0.97	☑
Vitamin C...	mg/...	not provided	☒

*Note: Conditionally mandatory (if fibre is mentioned in nutrition/health claim)

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TABLE 1 | Examples of the use of food composition and labeling information.





Research	Clinical practice	Policymakers	Businesses	Consumers
• Epidemiological dietary studies • Dietary intervention studies • Clinical intervention trials, where diet or foods are considered co-founding factors • Food supply studies • Assessment of exposure to food components	• Nutritional counseling in patients • Preparation of diets for patients with special dietary needs (including allergies) or medical conditions (for example, diabetes) • Identification of dietary risks	• Basis for evidence-based food policy decisions • Setting the targets for reformulation • Assessment of the efficacy of food reformulation programs • Regulatory restrictions related to specific food components (trans fats, additives)	• Identification of opportunities for improving the composition of foods • Comparisons with other foods–use of comparative nutrition claims • Promotion of foods with improved nutritional composition • Providers of IT services, where food composition data is used to support dietary, lifestyle, and health objectives	• Supporting the informed selection of foods • Enabling comparison of different foods • Supporting choices of healthier foods • Assuring food safety, particularly to those with special dietary needs (including allergies)

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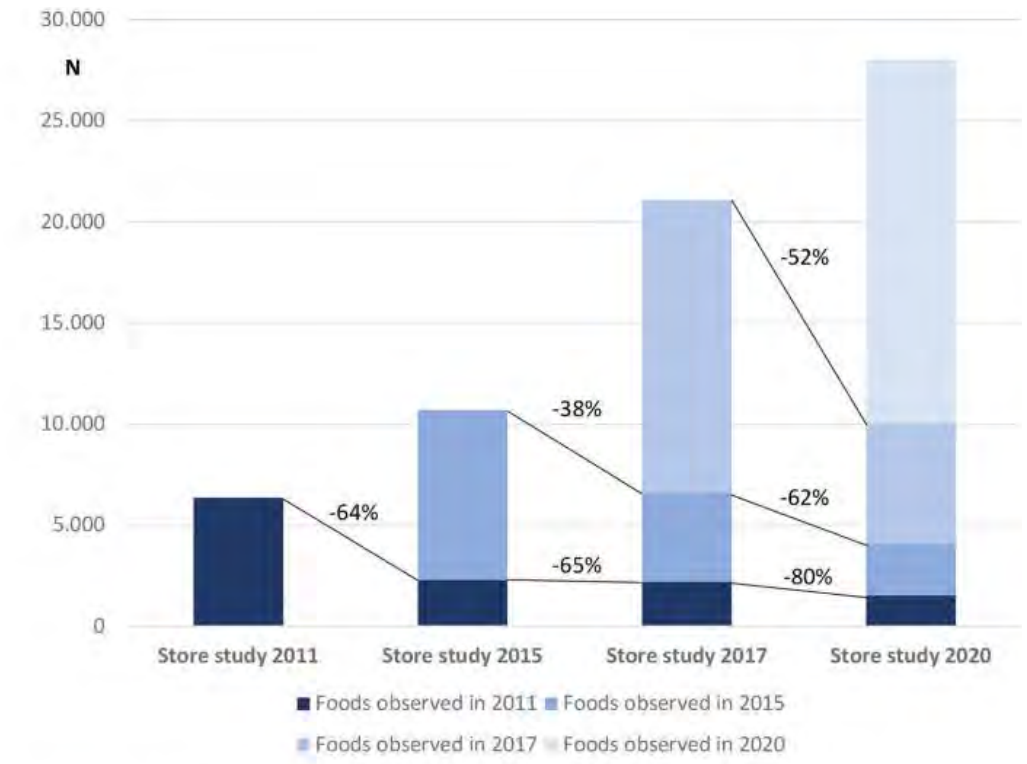
Why continuous data collection is needed?

- When you collect the data, it‘s already ‚past situation‘…



Source: Pravst et al. 2022. Branded Foods Databases as a Tool to Support Nutrition Research and Monitoring of the Food Supply: Insights From the Slovenian Composition and labelling Information System. Front. Nutr. 8:798576. doi: https://doi.org/10.3389/fnut.2021.798576

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Why continuous data collection is needed?

Reliable food composition data essential to monitor food reformulation

Example: Sugar content in market-leading soft beverage

	Year 2011	Year 2023
SLOVENIA	**10.6 g** / 100 mL	**11.2 g** / 100 mL
AUSTRIA		**10.6 g** / 100 mL

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Data collection methods

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Data can be provided by food operators

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Data provided by food operators

- Potential data sources: food manufacturers, retailers,…

- (+) reliable data
- (+) up-to-date: With appropriate infrastructure and data sharing, such data can be regularly updated
- (-) voluntary data
- (-) mostly not open access

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Example: Dutch LEDA database

- LEDA (LevensmiddelenDataBank) established in the Netherlands **in 2007**
- Food label information for over 100,000 branded foods, covering about **75% of retail food market**
- Data from data providers is **uploaded daily**.
- Database mostly covers **mandatory food label information**
- Used by the Netherlands Nutrition Centre for consumer information and by the National Institute for Public Health and the Environment for research purposes that support policy development.

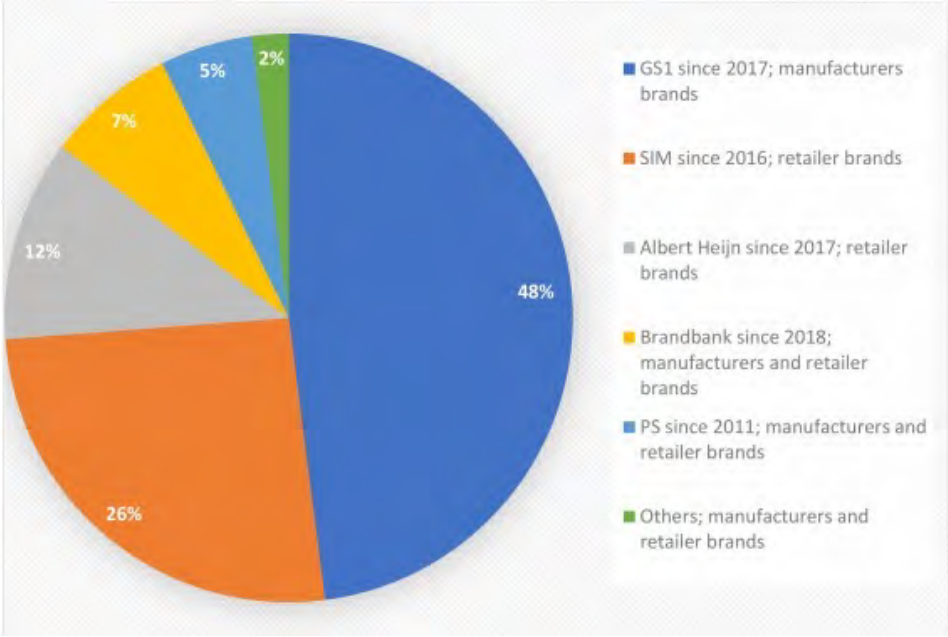

Figure: Origin of data by branded food data provider in LEDA (February 2020).

Source: Westenbrink et al. 2021. LEDA, the branded food database in the Netherlands: Data challenges and opportunities. Journal of Food Composition and Analysis. https://doi.org/10.1016/j.jfca.2021.104044

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Data can be collected in food stores from food labells

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Monitoring studies in food stores

Standard approach:

- Conduction of **monitoring studies in regular food stores**
  (store selection – photograph – data extraction)

- (+) **reliable** data
- (+) **representative**: depending on the included food stores
- (-) **approvals of retailers** needed
- (-) challenging to conduct
  - **Infrastructure**
  - man-power, **time/money-consuming**
- (-) commonly done only on **specific food categories**, and **not frequently**

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Example: CLAS - Composition and LAbelling Information System

- Composition and Labelling Information System (CLAS) was first introduced **in 2011** in Slovenia, now used also in other countries
- Slovenia: **Monitoring studies conducted in food stores** every few years (2011, 2015, 2017, 2020,…)
- Monitoring include retailers, covering over 80% of the food supply
- Data collection: The **smartphone application CLAS** is used for data collection in food stores. Data is uploaded to online **CLAS cloud** for data extraction and analyses.
- Database cover **all food label information.**
- Developed by the Nutrition Institute (NUTRIS, Slovenia) to support nutrition research and policy makers.

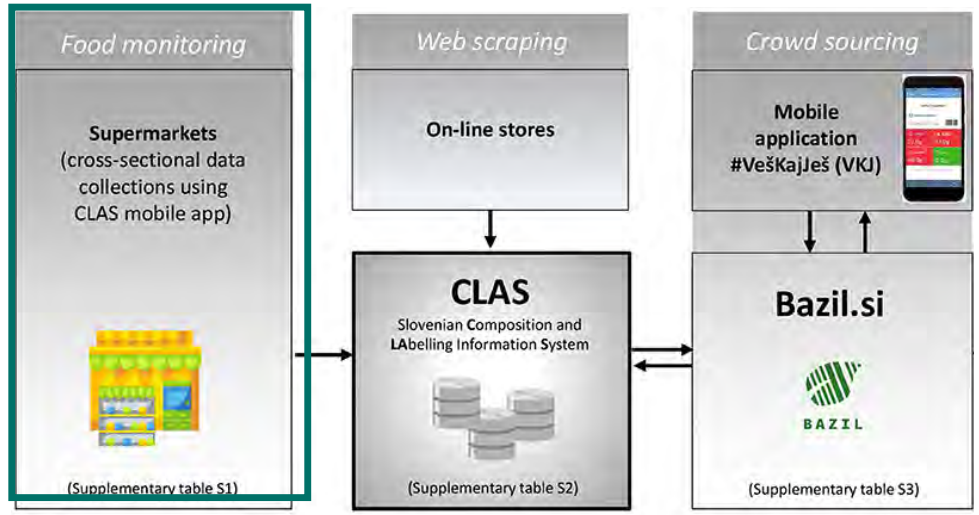

Figure: Schematic presentation of data-pathways in the Slovenian Composition and Labeling Information System (CLAS)

URL: https://www.nutris.org/en/eclas

Source: Pravst et al. 2022. Branded Foods Databases as a Tool to Support Nutrition Research and Monitoring of the Food Supply: Insights From the Slovenian Composition and labelling Information System. Front. Nutr. 8:798576. doi: https://doi.org/10.3389/fnut.2021.798576

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CLAS: Composition and Labelling Information System in Slovenia

Online monitoring studies – web scrapping

- (+) **easy accessible**: increased offers in online grocery stores after COVID-19 pandemic
- (+) can be done **frequently**
- (-) limited access to **niche products** (market leaders well covered)
- (-) limited **data quality**; data on web sites might not reflect data on the label
- (-) challenges with **product identifiers**
- (-) technical issues
  - common use of **web scrapping protection** techniques
  - each web store is a **unique case**
- (-) **legal issues** of web scrapping – data ownership

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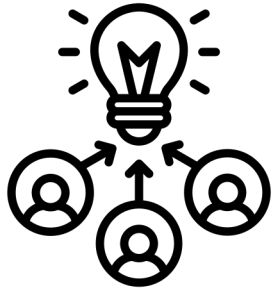

Data can be collected with crowd-sourcing

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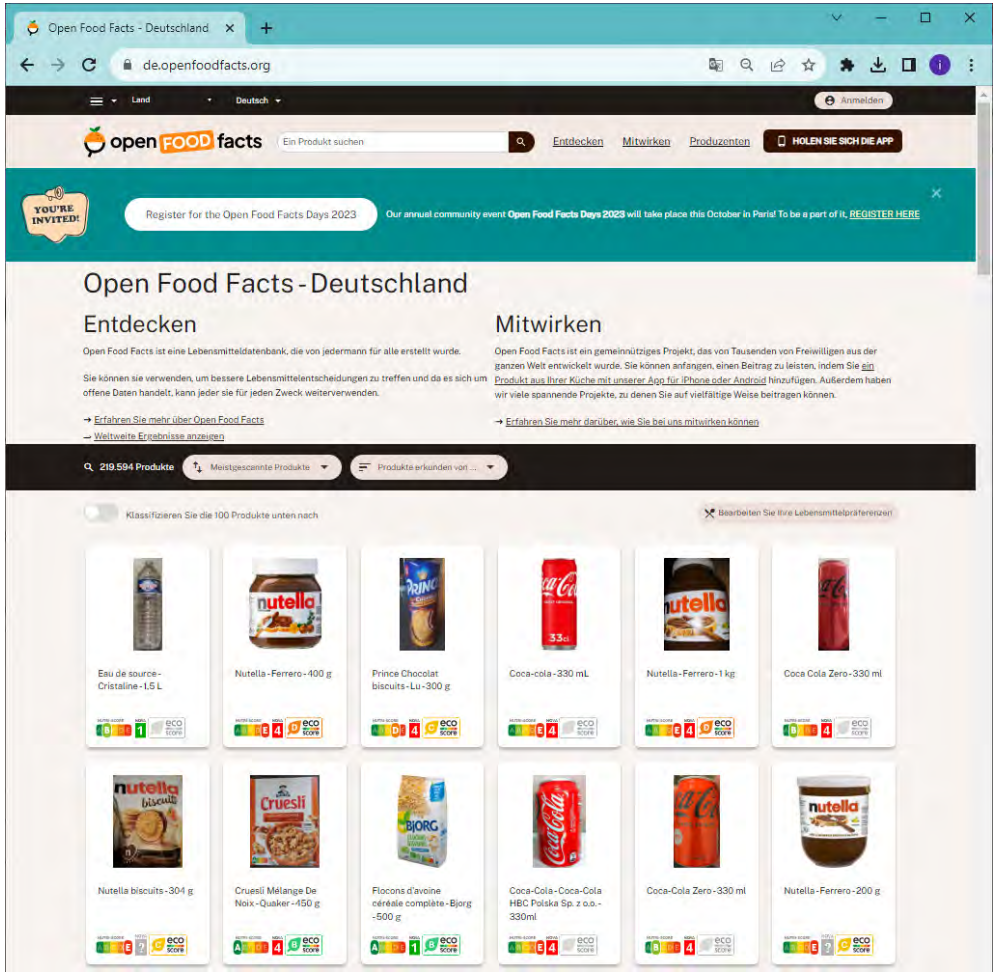
Example: Open Food Facts

- collaborative project with contributors from around the world
- the contributors are mostly volunteering citizens
- contributors send pictures of the product, and insert data on ingredients, nutrition facts etc
- datasets are available through APIs and can be also downloaded
- platform cover different countries
  (FNS Cloud explited German dataset)
- major challenge for use were missing values for parameters, that might be less important for volunteers (but are importent for research use – i.e. ingredient lists,…)



Source: https://world.openfoodfacts.org/

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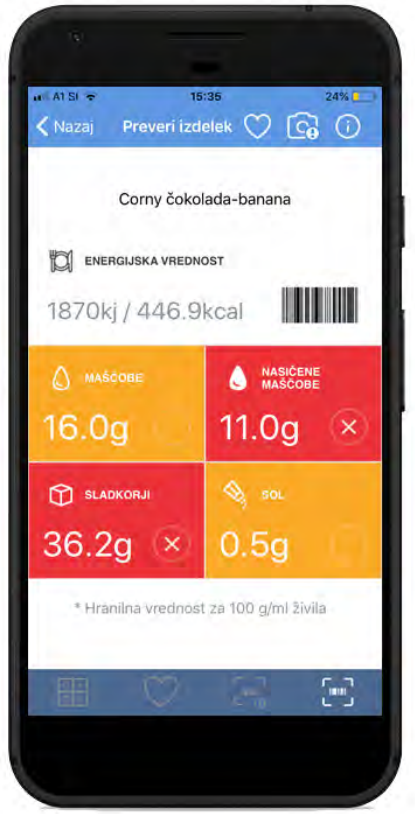
Example: VKJ – Mobile app VešKajJeš

- Free mobile application launched in within **health promotion programme** funded by SI government
- After **scanning food barcode**, app present its nutritional composition using **food traffic light profile**



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Example: VKJ – Mobile app VešKajJeš

- Functionality of the app depends on the quantity/quality of the background dataset.
- In the FNS Cloud the app was used also to **collect data (crowd-sourcing).**

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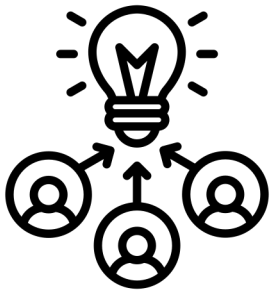
FNS-Cloud data collection case study
Potential of crowd sourcing for branded food datasets



Comparison of datasets collected using

- Standard food monitoring study in food stores (CLAS-SI, 2020)
- Crowd sourcing using mobile app (VKJ-SI, 2020)

Table: Comparison of sugar content in the selected food categories (in grams per 100 g or mL per food/drink)

	N (VKJ)	SUGAR content (g) Median	N (CLAS)	SUGAR content (g) Median
Beverages	333	7.4	1664	8.4*
Fruit and vegetable juices	133	9.8	596	9.9
Soft drinks	200	4.6	1068	6.5*
Breakfast cereals	239	15.0	546	16.8*
Yoghurt products	217	11.0	867	10.7
Flavoured yogurt	135	12.0	361	12.1
Flavoured yogurt drinks	14	11.4	191	11.3
Plain yogurt	56	4.3	273	4.3

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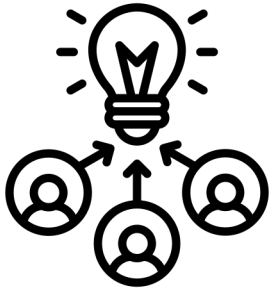
Data collected with crowd-sourcing



- (+) **quick**
- (-) challanges with **representativeness**
  - sensitive for new product arrivals
  - less sensitive for existing (old) products
- (-) **infrastructure** needed
- (-) data providers („crowd“) need some stimulation for data sharing

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FNS-Cloud demonstrator
Use case studes

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Exploitation of food composition and labelling data

Case study: Country-to-country comparison

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Case study: Country-to-country comparison

Why country-to-country comparison?

- Countries have **different public health strategies** and **food reformulation programmes**
- Comparison of the situation in the food supply **provide insights on how successful are used approaches**
  - good practices can be shared internationally
- Other factors also affect quality of the foods in the supply
  - Continuous debate about the dual quality challenges

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Selected food categories

Food category	Food products Included	Food products Excluded
Soft drinks and beverages	Water based carbonated and non-carbonated drinks with and without sugar added, with and without additives and sweeteners: Functional drinks, soft drinks, Cola type drinks, energy drinks, isotonic, sports drinks, flavoured water.	Drinking water (carbonated/non-carbonated), 100% fruit juices, fruit nectars as defined in Council Directive 2001/112/EC of 20 December 2001 relating to fruit juices and certain similar products intended for human consumption, Coffee, ingredients for coffee or tea or infusions, cocoa, herbal and other teas and infusion, milk and dairy products, fruit syrups, squashes and cordials, and powders for drinks preparation, beverage concentrates, milk and nut based drinks, alcoholic drinks, coffee replacers, chocolate containing drinks.
Breakfast cereals	Ready to eat breakfast cereals (with and without sugar and other ingredients and additives) (only milk/yoghurt/water to be added, no need for cooking/heating). Breakfast cereals plain, breakfast cereals, cereal flakes and similar, cereal rolled grains (oats and mixes), mixed breakfast cereal, muesli and similar breakfast, muesli plain, popped cereals, processed and mixed breakfast cereal, granola-type breakfast cereals, instant oatmeal, farina, corn flakes, puffed wheat or rice, multi-grain (e.g. rice, wheat and corn) breakfast cereals, mueslis, breakfast cereals made from soy or bran, and extruded-type breakfast cereals made from grain flour or powder, precooked cereals.	100% bran, whole unprocessed grains that need heat treatment e.g. millet, buckwheat, cornmeal mush, wheat semolina, breakfast cereals for infants, rice, couscous etc
Yoghurt and similar products (incl. yoghurt imitates)	Flavoured fermented milk and fermented milk drinks (cow, goat, sheep…): Yoghurt/ sour milk/ butter milk/ probiotic milk drinks (Actimel, Yakult)/ Skyr/ Quark/ Greek yoghurt with added ingredients or additives with fruit/cereals/ chocolate added as ingredient Plain yoghurt (unflavoured, no added sugar), whey drink This category also include yoghurt imitates (based on soy, rice, almond, coconut….)	Frozen items Items with breakfast cereals on top (separated - to be mixed with yoghurt) Pudding, milk rice, panna cotta Milk desserts, including cottage-cheese based milk products

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Datasets for FNS-Cloud case studies

- **SI: Slovenia**
  - Branded food dataset compiled in major food stores using CLAS infrastructure (representative sample)
- **NL: Netherlands**
  - Dutch Branded Food Database LEDA (LevensmiddelenDataBank)
- **CH: Switzerland**
  - Swiss food composition database published by BLV (The Federal Food Safety and Veterinary Office) in 2017
    [branded food data collected from food producers/retailers; mainly from Swiss own-brand retailers Migros and Coop.
- **DE: Germany**
  - Dataset collected using crowd-sourcing using Open access Open food facts (OFF) platform
    [DE dataset was exported]

SI

NL

DE

CH

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Case study: Country-to-country comparison

Goal: **determine opportunities and challenges in country-to-country comparisons, if different types of datasets are used**

Comparison of the nutritional composition was done using both a **nutrient-specific** and **nutrient profiling approach.**

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Challenges and limitations

- Different data collection methods
  - limited representativeness of some datasets
  - challenges with missing information (which would have been on the label) – [ingredient list vs. nutrition declaration]
    - if labelling pictures are accessible, additional data can be extracted
- Some data are also missing on the labels
  - Appropriate protocols need to be used to manage those situations
    [dietary fibre content; proportion of fruit/vegetables,…; micronutrients,…]
- Food categorisation challenges
  - Comparison particularly relevant for sub-groups, where reformulation can be achieved (case: beverages)
  - Homogenous groups needed; categorisation challenging due to missing data in the datasets

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Challenges and limitations

- Food supply challenges
  - some foods are also sold as non-prepacked (not included in datasets of branded foods)
    - Situation can differ notably from country to country
  - market shares differences
    - branded food database without sales/market share data only reflect food availability
    - market-leading products have more impact on consumption, but sales data is limited
- Different comparison methodologies: **specific nutrients** vs. **overall composition**
  - Different nutrients relevant for different food categories
  - Different nutrient profiling approaches possible

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Example of **nutrient-by-nutrient** comparison for **large categories**

- Different nutrients relevant in different categories
- Substantial deviations within food categories within countries

	Energy (kJ/100 g)	Sugar (g/100 g)	Saturated fat (g/100 g)	Fiber (g/100 g)
SOFT DRINKS				
SI (n= 1005)	113.4 ± 66.8 [a]	6.3 ± 3.9 [a]		
NL (n= 2529)	93.3 ± 65.7 [b]	5.2 ± 3.8 [b]		
DE (n= 1602)	109.3 ± 69.2 [a]	5.9 ± 3.9 [a]		
CH (n= 149)	119.8 ± 72.9 [a]	6.3 ± 4.1 [a]		
BREAKFAST CEREALS				
SI (n= 485)	1680.1 ± 165.9 [a]	17.8 ± 9.3 [a]		7.8 ± 4.2 [ab]
NL (n= 504)	1725.7 ± 156.6 [b]	15.1 ± 7.5 [b]		8.9 ± 4.0 [c]
DE (n= 1159)	1663.6 ± 167.0 [a]	14.1 ± 8.9 [b]		8.2 ± 3.0 [b]
CH (n= 166)	1664.9 ± 152.1 [a]	17.8 ± 10.1 [a]		7.2 ± 3.6 [a]
YOGHURT PRODUCTS				
SI (n= 844)	345.0 ± 116.7 [a]	9.3 ± 4.1 [a]	1.9 ± 1.5 [a]	
NL (n= 1031)	306.6 ± 138.2 [b]	7.7 ± 4.2 [b]	1.6 ± 1.9 [b]	
DE (n= 1185)	384.2 ± 105.6 [c]	10.0 ± 4.1 [c]	2.3 ± 1.6 [c]	
CH (n= 147)	413.0 ± 152.1 [d]	12.1 ± 4.2 [d]	1.9 ± 1.3 [ab]	

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Example of **nutrient-by-nutrient** comparison for **sub-categories**

- Comparison more relevant when we focus into sub-categories relevant for reformulation
- BUT: categorisation is challenging due to missing information in specific datasets (use of additives, ingredient lists,…)

	Energy (kJ/100 g)	Sugar (g/100 g)	Saturated fat (g/100 g)	Fiber (g/100 g)
SOFT DRINKS				
SI (n= 1005)	113.4 ± 66.8 [a]	6.3 ± 3.9 [a]		
NL (n= 2529)	93.3 ± 65.7 [b]	5.2 ± 3.8 [b]		
DE (n= 1602)	109.3 ± 69.2 [a]	5.9 ± 3.9 [a]		
CH (n= 149)	119.8 ± 72.9 [a]	6.3 ± 4.1 [a]		
> 1.5 g of sugar per 100ml				
SI (n= 840)	134.1 ± 52.0 [a]	7.5 ± 3.0 [a]		
NL (n= 1915)	121.2 ± 49.8 [b]	6.8 ± 2.9 [b]		
DE (n= 1284)	134.7 ± 52.2 [a]	7.3 ± 3.0 [a]		
CH (n= 123)	143.8 ± 55.7 [a]	7.6 ± 3.2 [a]		
BREAKFAST CEREALS				
SI (n= 485)	1680.1 ± 165.9 [a]	17.8 ± 9.3 [a]		7.8 ± 4.2 [ab]
NL (n= 504)	1725.7 ± 156.6 [b]	15.1 ± 7.5 [b]		8.9 ± 4.0 [c]
DE (n= 1159)	1663.6 ± 167.0 [a]	14.1 ± 8.9 [b]		8.2 ± 3.0 [b]
CH (n= 166)	1664.9 ± 152.1 [a]	17.8 ± 10.1 [a]		7.2 ± 3.6 [a]
No added sugar				
SI (n= 82)	1602.2 ± 173.1 [a]	9.6 ± 8.7 [a]		10.2 ± 5.7 [a]
NL (n= 91)	1629.4 ± 134.6 [a]	9.4 ± 7.8 [a]		11.0 ± 4.3 [a]
Added sugar				
SI (n= 403)	1695.9 ± 160.0 [a]	19.4 ± 8.5 [a]		7.2 ± 3.7 [a]
NL (n= 401)	1750.1 ± 152.6 [b]	16.3 ± 6.8 [b]		8.5 ± 3.8 [b]

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Example of comparison for **overall composition**

- In soft drinks only few parameters are affecting NS score – comparison results comparable as for the sugar content.
- Breakfast cereals are more complex, with both positive and negative factors.
- Importance of homogenous food (sub)categories

	NUTRI-SCORE					
	A	B	C	D	E	Mean score ± stdev
SOFT DRINKS						
SLO (n= 1005)		123 (12 %) [a]	95 (9 %) [a]	272 (27 %) [a]	515 (51 %) [a]	8.9 ± 4.8 [a]
NL (n= 2529)		451 (18 %) [b]	329 (13 %) [b]	894 (35 %) [b]	855 (34 %) [b]	7.5 ± 4.8 [b]
DE (n= 1602)		208 (13 %) [a]	222 (14 %) [b]	408 (25 %) [a]	764 (48 %) [a]	8.5 ± 4.8 [a]
CH (n= 149)		23 (15 %)	16 (11 %)	36 (24 %) [a]	74 (50 %) [a]	9.0 ± 5.2 [a]
> 1.5 g of sugar per 100 ml						
SI (n= 840)			53 (6 %) [a]	271 (32 %) [a]	516 (61 %) [a]	10.4 ± 3.8 [a]
NL (n= 1915)		2 (0 %)	164 (9 %) [b]	894 (47 %) [b]	855 (45 %) [b]	9.5 ± 3.7 [b]
DE (n= 1284)			112 (9 %) [b]	408 (32 %) [a]	764 (60 %) [a]	10.3 ± 3.6 [a]
CH (n= 123)			13 (11 %)	36 (29 %) [a]	74 (60 %) [a]	10.7 ± 4.0 [a]
BREAKFAST CEREALS						
SLO (n= 485)	138 (28 %) [a]	42 (9 %) [a]	213 (44 %) [a]	91 (19 %) [a]	1 (0 %)	5.1 ± 6.0 [a]
NL (n= 504)	182 (36 %) [b]	73 (14 %) [b]	209 (41 %) [a]	40 (8 %) [b]		3.2 ± 5.5 [b]
DE (n= 1159)	532 (46 %) [c]	111 (10 %) [a]	370 (32 %) [c]	141 (12 %) [c]	5 (0 %)	2.5 ± 6.5 [b]
CH (n= 166)	55 (33 %) [ab]	5 (3 %)	61 (37 %) [ab]	45 (27 %) [d]		5.0 ± 7.2 [a]
No added sugar						
SI (n= 82)	48 (59 %) [a]	5 (6 %)	27 (33 %)	2 (2 %)		0.7 ± 5.5 [a]
NL (n= 91)	80 (88 %) [b]	3 (3 %)	7 (8 %)	1 (1 %)		-2.1 ± 3.3 [b]
Added sugar						
SI (n= 403)	90 (22 %) [a]	37 (9 %) [a]	186 (46 %) [a]	89 (22 %) [a]	1 (0 %)	6.0 ± 5.7 [a]
NL (n= 401)	100 (25 %) [a]	67 (17 %) [b]	197 (49 %) [a]	37 (9 %) [b]		4.4 ± 5.2 [b]

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Exploitation of food composition and labelling data

Case study: Monitoring sodium reformulation

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Case study: Monitoring reformulation

Why?

- Evaluation of public health strategies and food reformulation programmes
- Checking progress within specific food groups, producers types, etc…

What?

- Monitor of the reformulation is commonly focused into nutrients of concern
- ….but also manageable for positive components (i.e. fibre) or with nutrient profiling

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Case study: Monitoring sodium reformulation

SI

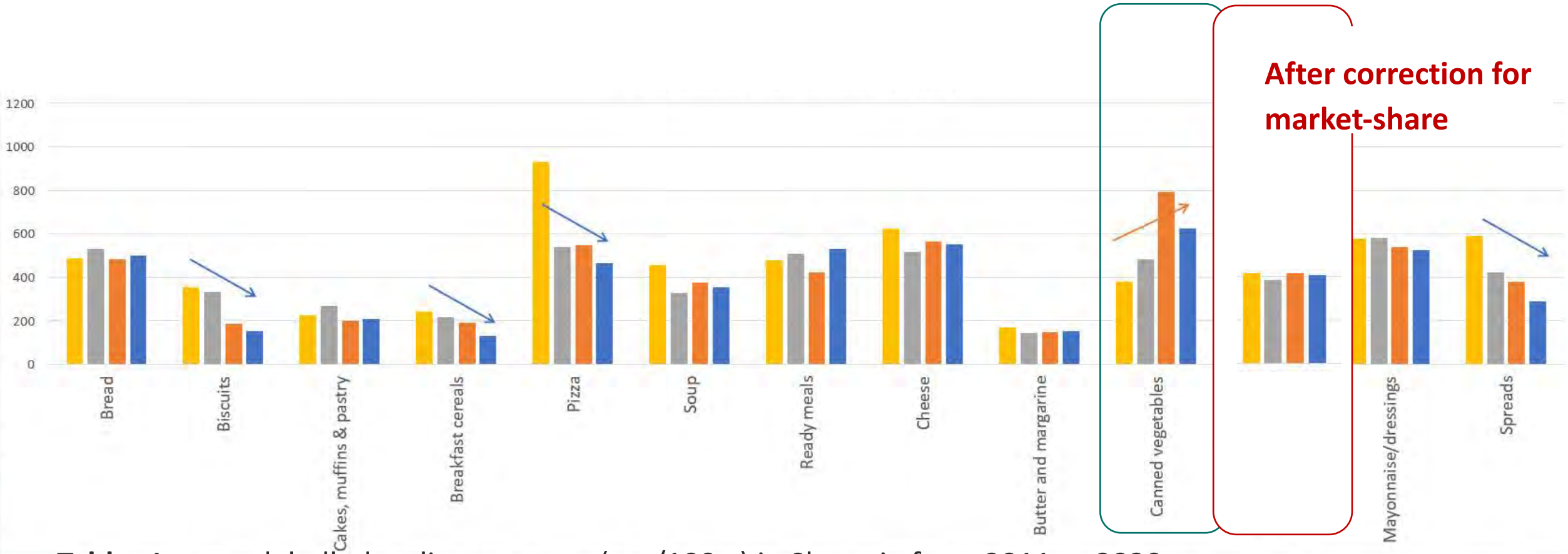

Table: Average labelled sodium content (mg/100 g) in Slovenia from 2011 to 2020

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Case studies for other constituents [SI]

Sugar/sweeteners

- HAFNER, Edvina, PRAVST, Igor. The sharp rise in the use of low- and no-calorie sweeteners in non-alcoholic beverages in Slovenia. Frontiers in nutrition 2021, DOI: 10.3389/fnut.2021.778178.
- HAFNER, Edvina, LAVRIŠA, Živa, HRIBAR, Maša, KRUŠIČ, Sanja, KUŠAR, Anita, ŽMITEK, Katja, SKRT, Mihaela, POKLAR ULRIH, Nataša, PRAVST, Igor. Verifying the use of food labelling data for compiling branded food databases: a case study of sugars in beverages. Frontiers in nutrition. 2022, DOI: 10.3389/fnut.2022.794468

Fortification with vitamin D practices

- KRUŠIČ, Sanja, HRIBAR, Maša, HAFNER, Edvina, ŽMITEK, Katja, PRAVST, Igor. Use of branded food composition databases for the exploitation of food fortification practices : a case study on vitamin D in the Slovenian food supply. Frontiers in nutrition. 2022, DOI: 10.3389/fnut.2021.775163

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Exploitation of food composition and labeling data

Case study: Comparison of tools for estimation of micronutrients in branded foods

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Automated approach to estimate ingredient proportions and nutrients of branded foods

Why: food labels contain ingredients, but limited nutrients

- Estimate ingredient amount
  → to calculate or validate nutrient profile models (e.g., NutriScore)
- Estimate amount of missing (micro)nutrients
  → for nutrient intake assessment

How: labeling legislation EU

- Ingredients listed in descending order; with incomplete details on weight percentages
- Nutritional panel with mandatory nutrients; micronutrients (and fibre) missing

Remarks

- Branded food databases are very large; automated procedures needed
- Complex script needed to take all considerations into account

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Steps to be taken

Machine learning
Optimization rules
Artificial intelligence

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Example 1; fruit salad

GTIN /EAN	Food name	ingredients
8717215002423	fruit salad strawberry-kiwi	22% pineapple, 18% yellow melon, 18% Cantaloupe melon, 18% blue grape, 13% kiwi, 11% strawberry

- Simple recipe
- Are ingredients raw – processed? Assumed to be raw without waste
- Can ingredients be matched to generic foods? Yes; what is yellow melon?
- How to estimate amounts? Relative amounts of ingredients on the label and add up to 100%

Tool needed?

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Example 2; Lasagna Bolognese

GTIN /EAN	Food name	ingredients
21121700000008	Lasagna bolognese 1pc/2710g eiu	lasagna bolognese 88,6% (bolognese sauce [vegetables (tomatoes, onion, CELERY, carrots, sweet pepper, garlic), water, minced meat (beef 8%, salt, spices, antioxidant: E300 en E301, dextrose, aroma, bread crumbs (WHEAT)), modified starch, sugar, salt, beef fat, aroma (MILK), rapeseed oil, sea salt, herbs, spices, sunflower oil, rapeseed oil, concentrated onion juice, glucose syrup, flavour enhancer: E621, acidity regulator: citric acié], bechamel sauce [MILK, water, WHEAT flour, modified starch, salt, lactose (MILK), maltodextrin, aroma, thickener: E415, fully hydrogenated palm fat, sugar, rapeseed oil, spices, spices extracts (onion, lovage, bay leaf/laurel, mace), parsnip, chili pepper, rapeseed oil], durum WHEAT, cheese [MILK, starch, salt, acidifying bacteria, rennet], water, free-range EGG), cherry tomato 6,6%, red onion, basil.

- Very complex food
- Nested ingredients
- Allergens overlap with ingredients
- Industrial ingredients difficult to match (conc onion juice)
- How to parse and estimate amounts?

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Lasagna Bolognese		Ingredients parsed manually
lasagna bolognese 88,6%		
	bolognese sauce	[vegetables (tomatoes, onion, CELERY, carrots, sweet pepper, garlic), water, minced meat (beef 8%, salt, spices, antioxidant: E300 en E301, dextrose, aroma, bread crumbs (WHEAT)), modified starch, sugar, salt, beef fat, aroma (MILK), rapeseed oil, sea salt, herbs, spices, sunflower oil, rapeseed oil, concentrated onion juice, glucose syrup, flavour enhancer: E621, acidity regulator: citric acié],
	bechamel sauce	[MILK, water, WHEAT flour, modified starch, salt, lactose (MILK), maltodextrin, aroma, thickener: E415, fully hydrogenated palm fat, sugar, rapeseed oil, spices, spices extracts (onion, lovage, bay leaf/laurel, mace), parsnip, chili pepper, rapeseed oil],
	durum WHEAT	
	cheese	[MILK, starch, salt, acidifying bacteria, rennet],
	water	
	free-range EGG),	
cherry tomato 6,6%		
red onion		
basil.		

Tool needed !

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FNS-Cloud case study

SI, CH, NL: Tools available to estimate ingredient proportions and nutrient composition

Aim: Compare 3 independently developed tools

Work done:

- Create datasets
  - 32 branded foods from Dutch branded food database; simple and complex foods
  - Dutch NEVO food composition database as reference database to match with
- Tools were used on test data
- Comparison of tools, strengths and limitations and results

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Results: Each tool had pros and cons

Parsing

- Difficulties found due to variable and inconsistent ingredient lists
  - Nested ingredients / inconsistent wording / (semi)colons/ brackets etc
- Some difficulties when other language or translations used

Matching

- Difficulties related to problems in ingredient parsing
- Difficulties related to differing naming convention between ingredient list and FCT

Estimating ingredient amounts

- Good results when parsing and matching went well

Calculating nutrient values

- No problem when parsing, matching and estimating ingredient amounts went well

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Challenges

Improvement of label data

- Consistent presentation of ingredient lists would support parsing step

Industrial ingredients

- Not in food composition tables
- Difficult to find compositional data

Incorporate preparation method?

- Ingredient lists more likely to contain raw foods due to legislation
- Incorporate use of yield and retention factors?

Rapid changes in branded food data

- Impossible to use a manual approach

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Recommendations

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Recommendations

- In addition to nutritional composition, branded food datasets should **also contain other mandatory food labelling information – particularly ingredient lists**. This is needed for nutrient profiling, assessment of the use of specific food ingredients and additives, etc.
- Branded food datasets can be only used for food monitoring, if data is **collected regularly and representatively for the food market**.
- Records should be **equipped with date-stamp**, to enable conduction of studies to monitor changes over time. Crowdsourcing platforms could consider developing date-stamped records using counting as a measure to indicate if specific foods are still present on the marketplace.
- **Policy makers should consider regulating electronic exchange of food labelling information**. More detailed food composition data could be accessible through QR codes - this could be beneficial for consumers and on would make data available for researchers, policy makers and providers of IT services.

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Recommendations

- Datasets need to be **equipped with unique product identifiers** to enable linking foods from different datasets (also linking branded food datasets with sales data). **Global Trade Item Numbers – GTIN**s are typically used and should therefore be included in the datasets.

- Very few datasets are equipped with **information on preparation of the food**; i.e if data refer to products intended for direct consumption (unprepared) or need to be prepared prior to consumption, and about manufacturer's preparation instructions. This is limiting the use of data – particularly in food categories, composed of prepared and unprepared products (i.e. dry pasta, ready-to-eat pasta; soup concentrate; ready-to-eat soup)

- Introduction of a **harmonised nutrient profiling system** would be very useful for research and policy purposes, particularly for evaluation of the food supply.

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Thank you for your attention!

Feedback and discussion

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