FNS - Cloud
Food Nutrition Security

Nutrition and lifestyle challenges for intake, consumption, and health

Eileen Gibney, UCD (IE)

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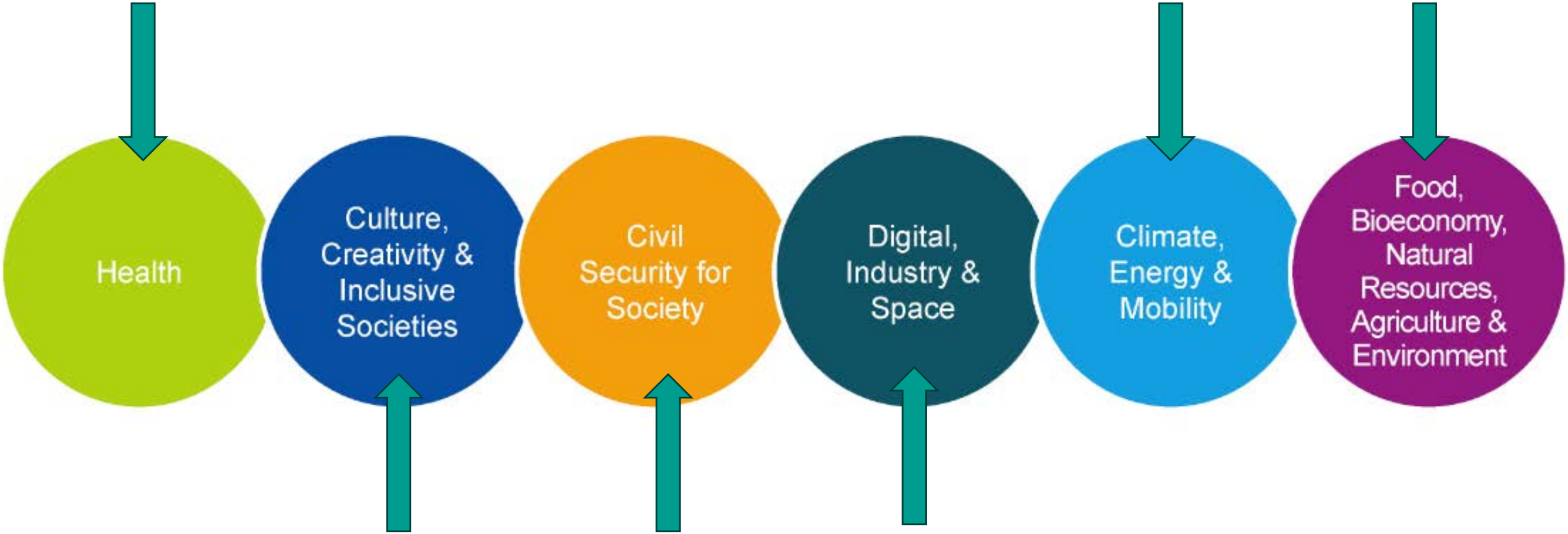
Global Challenges



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Nutrition and lifestyle challenges

If we get it right we can have an impact!

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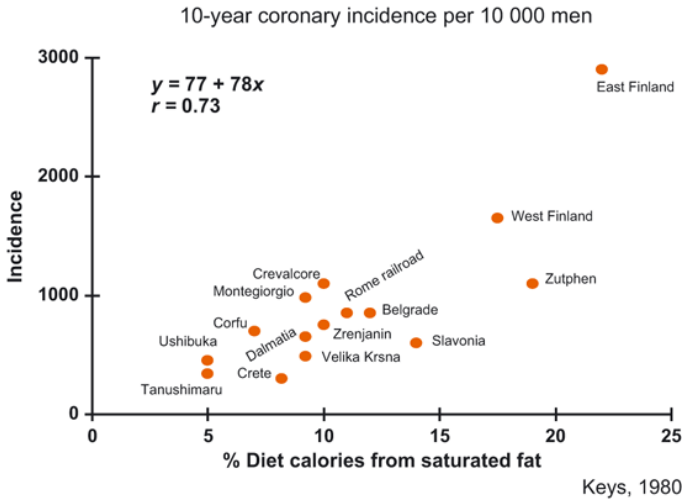
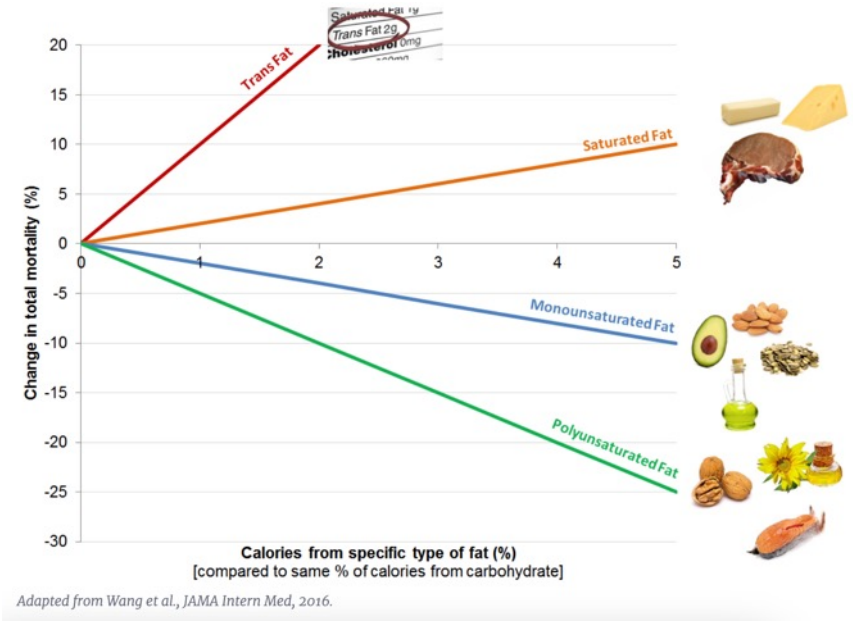
Dietary fats and coronary heart disease



Journal of Internal Medicine, Volume: 272, Issue: 1, Pages: 13-24, First published: 14 May 2012, DOI: (10.1111/j.1365-2796.2012.02553.x)



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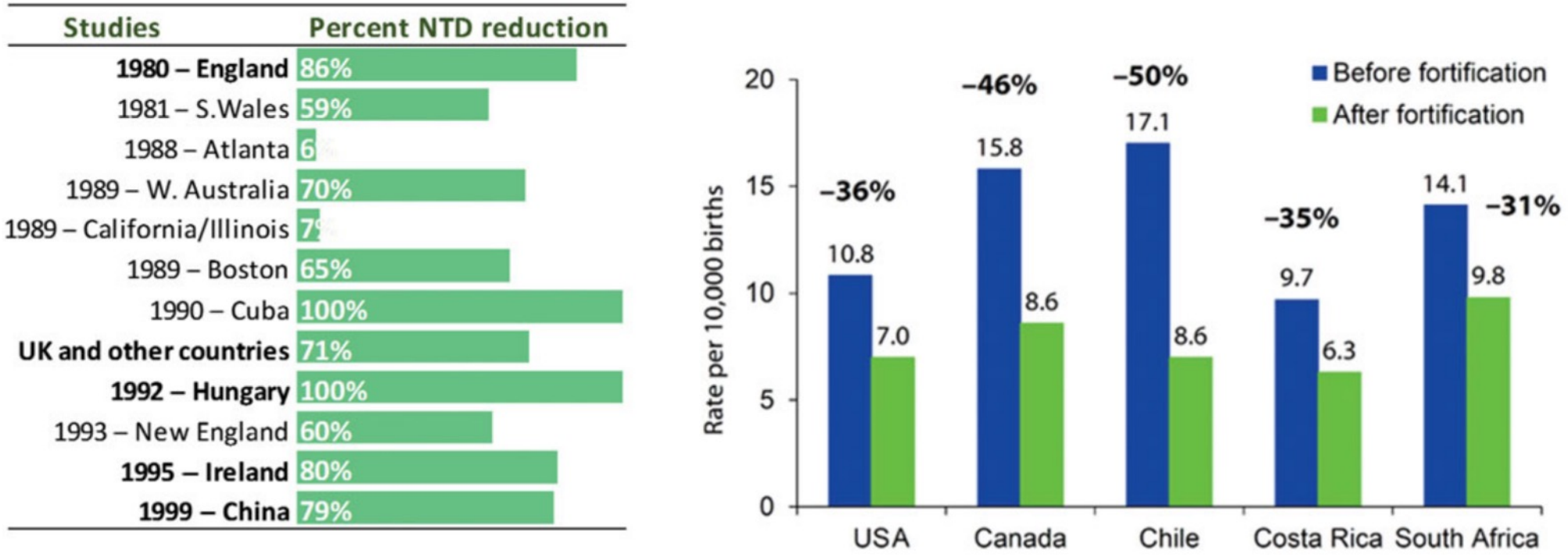

Figure 1. Left panel: percent NTD reduction with oral folic acid supplementation during the periconceptional period. Figure courtesy of Dr. J. Mulinare; redrawn and modified from Ref. 30. Right panel: NTD rate reduction (and percent reduction) after mandatory flour fortification with folic acid. Reprinted from Ref. 31.

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Nutrition and lifestyle challenges

There is a lot we are not getting right

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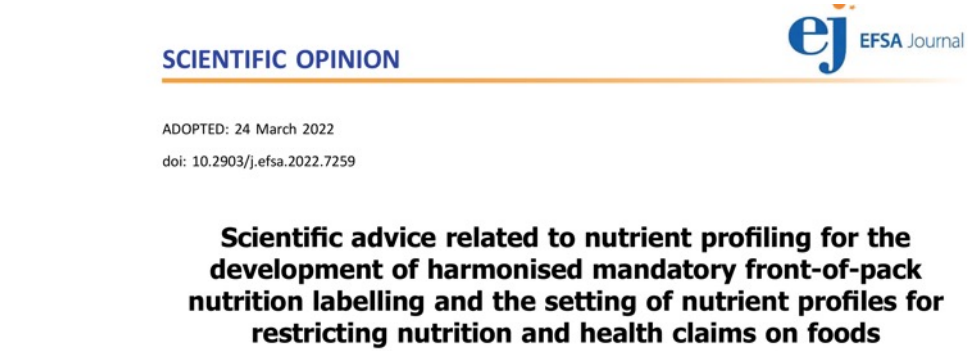
SCIENTIFIC OPINION

EFSA Journal

ADOPTED: 24 March 2022

doi: 10.2903/j.efsa.2022.7259

Scientific advice related to nutrient profiling for the development of harmonised mandatory front-of-pack nutrition labelling and the setting of nutrient profiles for restricting nutrition and health claims on foods

Saturated Fat intake

Sodium

Added Sugars

Dietary fibre,

Potassium

Energy

- Other nutrients of Public Health concern

- Vit D
- Ca
- B-vitamins
- Iodine
- ……

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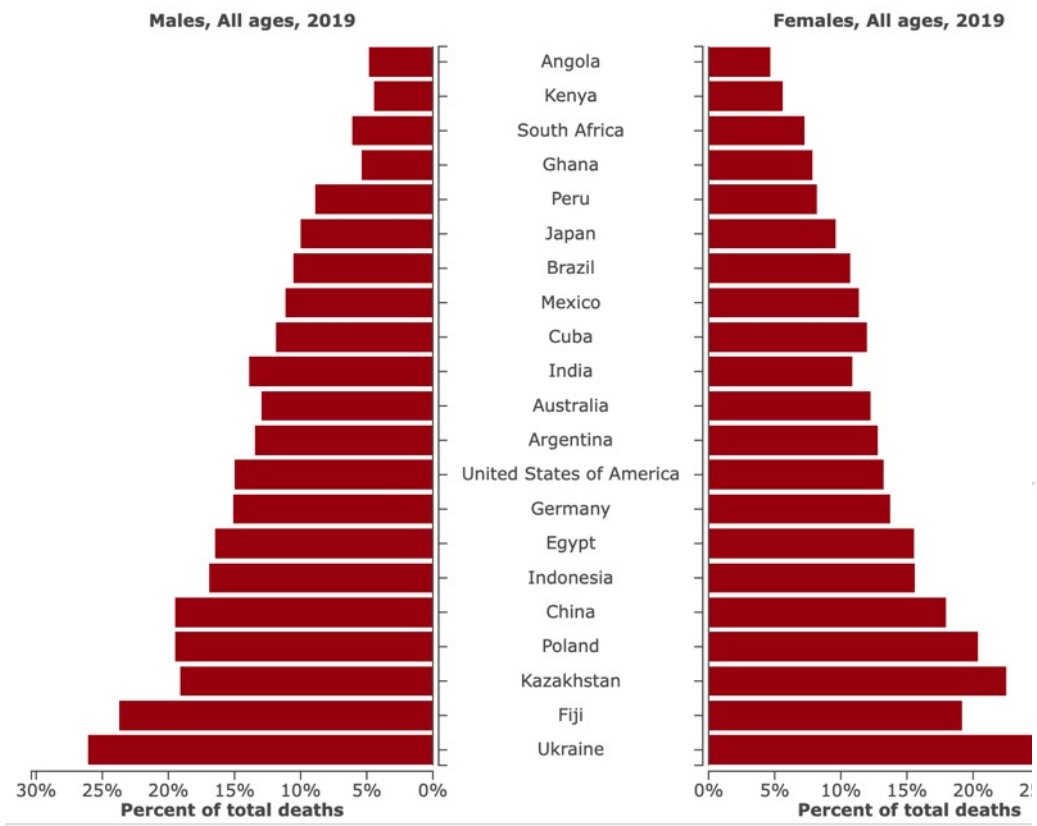
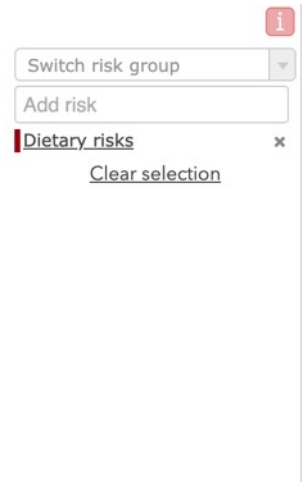
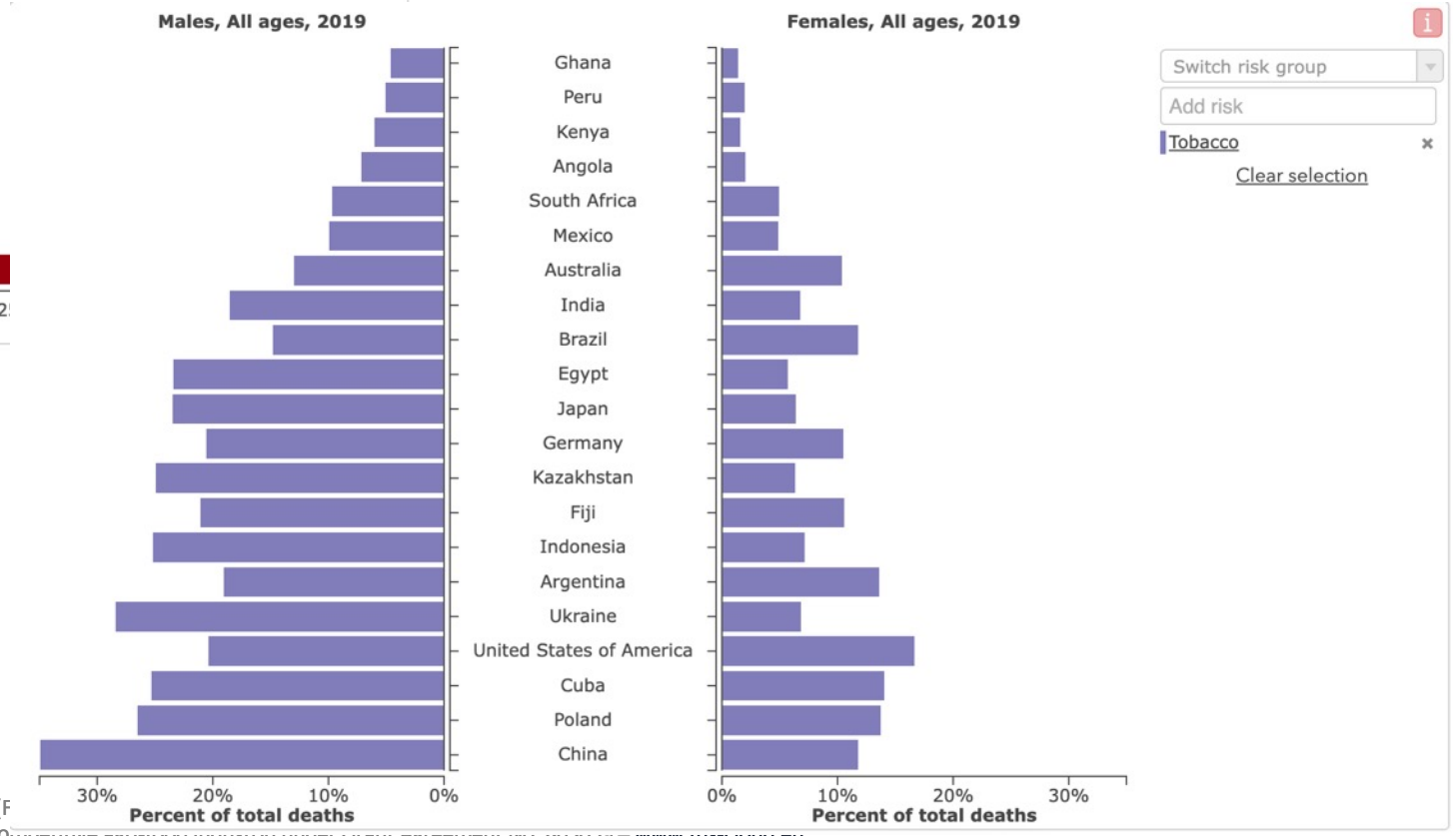
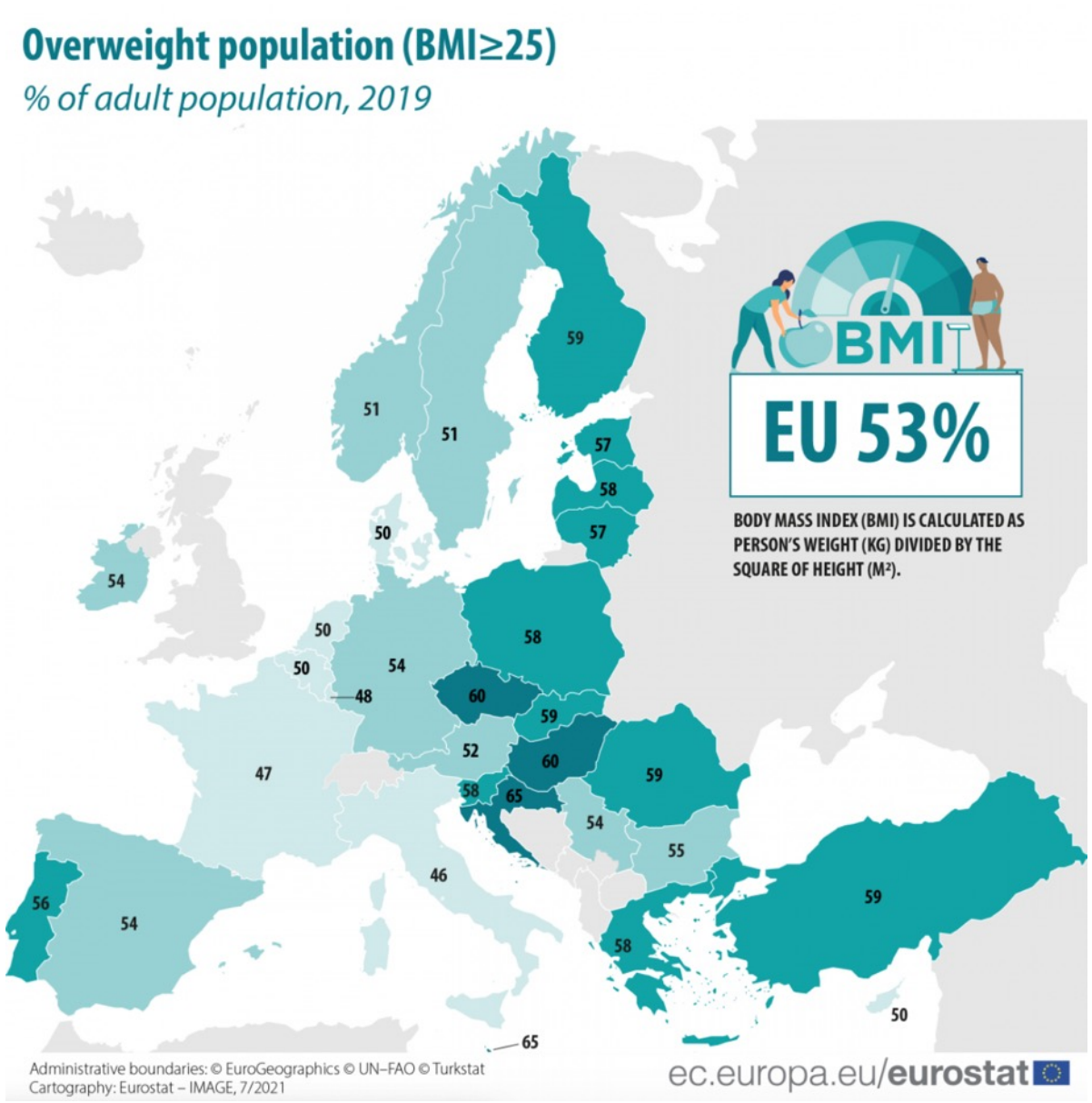
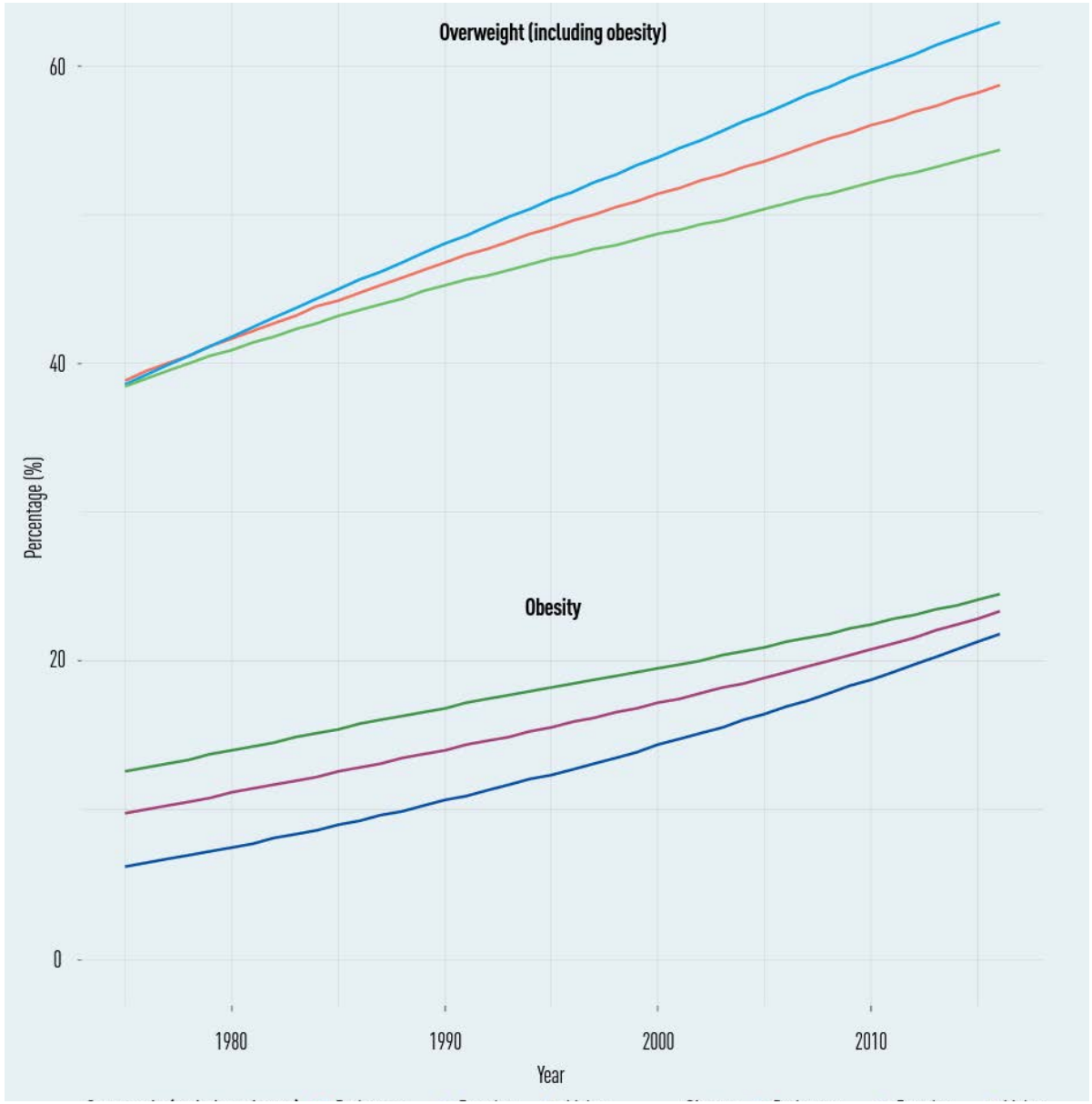






Food Nutrition Security Cloud (F
EU.3.2.2.3. – A sustainable and competitive agri-food industry) under Grant Agreement No. 863059 – www.fns-cloud.eu





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Nutrition and lifestyle challenges

Processed Foods

Sustainability

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‘Processed’ foods

Health

Ultra-processed food raises risk of heart attack and stroke, studies show

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Outcome	No. of studies	No. of participants	OR (random, 95 % CI)	P	I^2 (%)	P_{het}
Overweight/obesity[6–9,26]	5	73 169	1·39 (1·29, 1·50)	<0·00001	0	0·47
High WC[7,8,24,26]	4	31 908	1·39 (1·16, 1·67)	0·0003	49	0·12
Hyperglycaemia[12,24]	2	1113	1·10 (0·34, 3·52)	0·87	67	0·08
Hypertriacylglycerolaemia[12,24]	2	1113	0·95 (0·60, 1·50)	0·82	0	0·84
Low HDL-cholesterol[12,24]	2	1113	2·02 (1·27, 3·21)	0·003	0	0·86
Hypertension[12,24]	2	1113	1·31 (0·50, 3·43)	0·58	38	0·20
Metabolic syndrome[12,24]	2	1113	1·79 (1·10, 2·90)	0·02	0	0·49

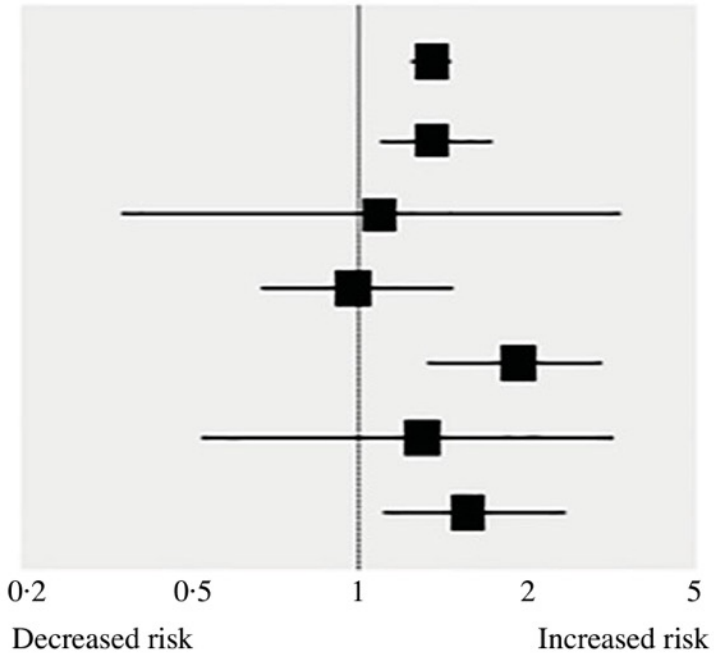

Fig. 2. Forest plot of cross-sectional studies investigating the association between ultra-processed foods consumption and different health outcomes. *P* value is for *Z* test of no overall association between exposure and outcome; P_{het} is for test of no differences in association measure among studies; I^2 estimates from heterogeneity rather than sampling error. WC, waist circumference.

Pagliai, G., Dinu, M., Madarena, M., Bonaccio, M., Iacoviello, L., & Sofi, F. (2021). Consumption of ultra-processed foods and health status: A systematic review and meta-analysis. *British Journal of Nutrition, 125*(3), 308-318.

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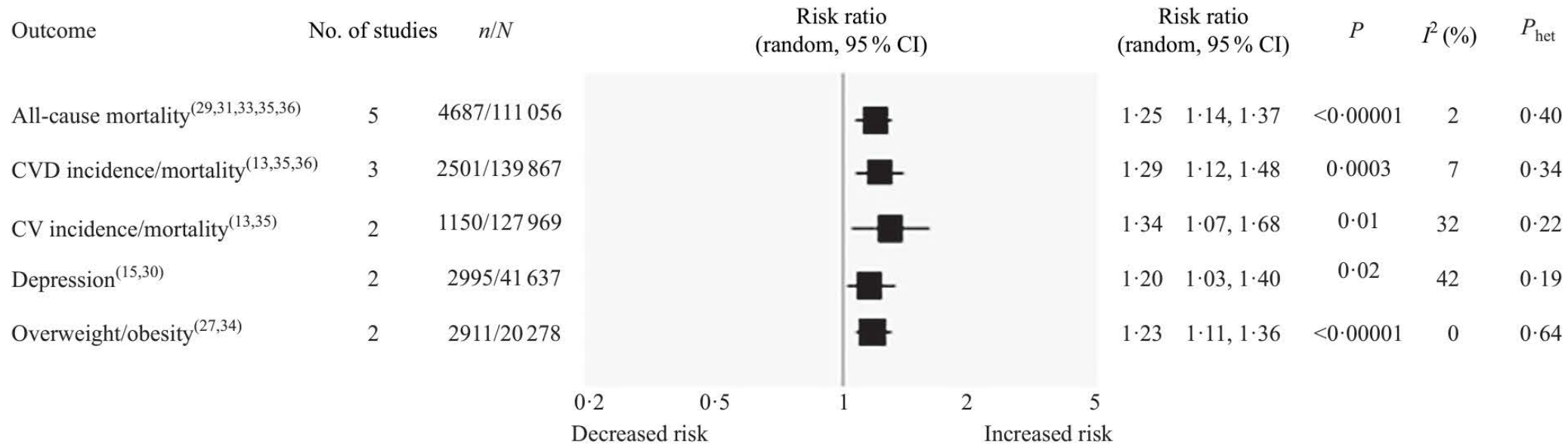

Fig. 3. Forest plot of prospective cohort studies investigating the association between ultra-processed foods consumption and different health outcomes. *P* value is for *Z* test of no overall association between exposure and outcome; P_{het} is for test of no differences in association measure among studies; I^2 estimates from heterogeneity rather than sampling error. CV, cerebrovascular.

Pagliai, G., Dinu, M., Madarena, M., Bonaccio, M., Iacoviello, L., & Sofi, F. (2021). Consumption of ultra-processed foods and health status: A systematic review and meta-analysis. *British Journal of Nutrition, 125*(3), 308-318.

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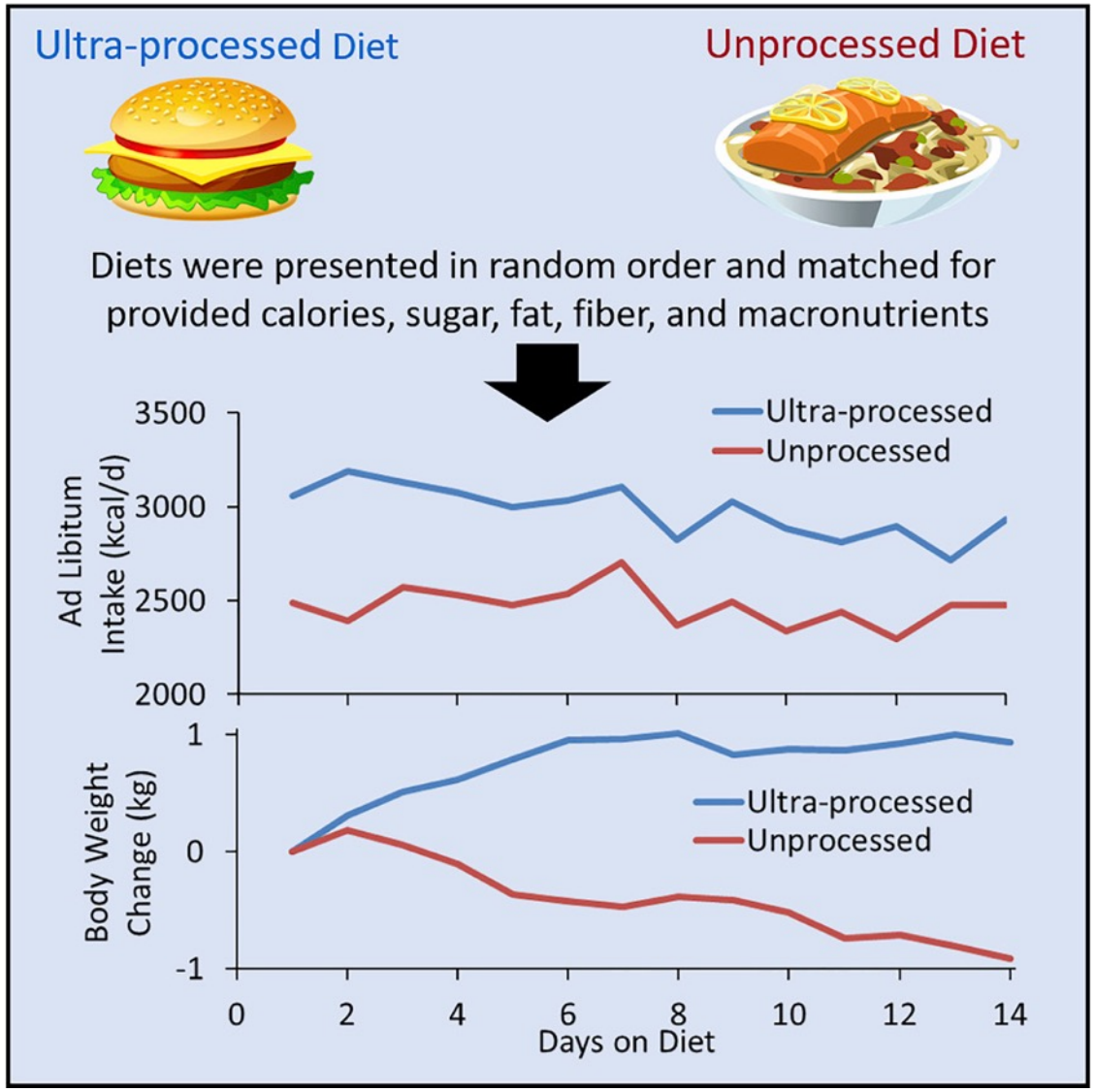

Hall KD et al Ultra-Processed Diets Cause Excess Calorie Intake and Weight Gain: An Inpatient Randomized Controlled Trial of Ad Libitum Food Intake. Cell Metab. 2019 Jul 2;30(1):67-77.e3.

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Table 1 | Food-processing classification systems and their definitions of HPF

Classification system	Categorization of foods according to the degree of processing	Definition of HPF
NOVA	1. Unprocessed or minimally processed foods 2. Processed culinary ingredients 3. Processed foods 4. Ultraprocessed foods	Formulations of several ingredients which, besides salt, sugar, oils and fats, include food substances not used in culinary preparations. In particular, flavours, colours, sweeteners, emulsifiers and other additives used to imitate sensory qualities of unprocessed or minimally processed foods and their culinary preparations, or to disguise undesirable qualities of the final product.
UNC	Processing levels 1. Less processed 2. Basic processed 3. Moderately processed 4. Highly processed Convenience levels 1. Requires cooking 2. Ready to heat 3. Ready to eat	Multi-ingredient industrially formulated mixtures processed to the extent that they are no longer recognizable as their original plant/animal source and consumed as additions (condiments, dips, sauces, toppings or ingredients in mixed dishes).
EPIC	1. Moderately/non-processed 2. Processed staple foods 3. Highly processed foods	Foods that have been industrially prepared, including those from bakeries and catering outlets, and which require no or minimal domestic preparation apart from heating and cooking (for example, bread, breakfast cereals, cheese, commercial sauces, canned foods including jams, commercial cakes, biscuits and sauces).
IFIC	1. Minimally processed foods 2. Foods processed for preservation, nutritional enhancement or freshness 3. Mixtures of combined ingredients 4. Ready-to-eat processed foods 5. Prepared foods and meals	HPF is not specified in the IFIC category but categories 3–5 can be assumed to correspond to HPFs.

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Robustness of food processing classifications

- 100 most commonly consumed foods among US children
- UNC, NOVA & IFIC- Interrater reliability, relationship between classification & nutrient composition

Lower potassium predictive of IFIC's classification (mod v min) ($p = 0.01$);

Lower Lower vitamin D predictive of UNC's classification (high v min) ($p = 0.04$).

Sodium and added sugars predictive of all systems' (high v min) ($p < 0.05$).

Current classification systems may not sufficiently identify foods with high nutrient quality commonly consumed by children in the U.S.

Bleiweiss-Sande, R. et al. Robustness of food processing classifcation systems. Nutrients 11, 1344 (2019).

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Robustness of food processing classifications

- PREDIMED-Plus trial) of 6,874 subjects
- 4 classification systems (NOVA, UNC, EPIC and IFIC)

	NOVA	UNC	EPIC	IFC
Obesity	✓			
SBP / DBP		✓		
Total Chol			✓	✓
LDL Chol				

Martinez-Perez, C. et al. Use of diferent food classifcation systems to assess the association between ultra-processed food consumption and cardiometabolic health in an elderly population with metabolic syndrome (PREDIMED-Plus Cohort). Nutrients 13, 2471–2489 (2021).

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Challenges…..

- Lack of rigor / transparency / interoperability of classification systems
- Systems are nutrient driven – lack data on processing (milling, extrusion, drying….)
- Absence of data on the occurrence/concentration of ‘processing agents’ in food composition databases
- Clarification of the role of nutrients in UPF–health outcome associations
- Clarification of the role of physical and sensory properties in UPF–health outcome associations

NATURE FOOD | VOL 3 | FEBRUARY 2022 | 104–109 | www.nature.com/natfood

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Data Fragmentation & Integration – FNS Cloud

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Sustainable Food Systems

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Sustainable dietary guidelines

UCD Institute of Food and Health

Food Group	*Country/Organization*								
	FAO	**BDA**	**Denmark**	**Germany**	**Sweden**	**Qatar**	**Canada**	**Brazil**	**Netherlands**
Whole grains			Choose whole grains	Opt for whole grains	Pick wholemeal	Choose whole grain	Consume regularly	Opt for whole	4-5 servings daily
Tubers/starchy vegetables									
Vegetables (all)			Increase	3 servings a day	Eat 'lots'	3-5 servings/day	"Plenty"/half of plate	Consume regularly	Plenty and seasonal if possible (250 g)
Fruit			increase	2 servings a day	Eat 'lots'	2-4 servings/day	"Plenty"/half of plate	Consume regularly	>2 servings and seasonal if possible
Dairy	Moderate	Moderate	Pick low fat	Daily	Choose low-fat	Daily of skimmed/low fat	Low-fat		2 dairy servings and 40 g cheese
Animal protein		Reduce	Eat less	300-600 g/week					
Red meat	Small	70 g/day			<500 g/week				
Processed meat	Small	Avoid							
Pork	Small								
Poultry	Moderate					Choose skinless or lean			
Eggs	Moderate								
Fish	Moderate	From sustainable sources	Choose more	1-2x per week	2-3x per week	2x per week			Eat sustainably
Plant protein							Choose more often than animal sources	Choose unprocessed, plant proteins	Includes vegetarian alternatives
Legumes						Eat daily			Increase
Nuts									25g unsalted/day
Fat			Choose vegetable oils		Pick healthier/ unsaturated			Limit	<40 g per day
Saturated							<10% energy intake		
Added sugar		Avoid	Eat less	Avoid	Avoid	Reduce and avoid	<10% energy intake	Limit	Reduce
High salt/fat foods		Avoid	Eat less	Avoid	Avoid	Reduce and avoid	Avoid eating regularly	Limit	Reduce

1 Regular and abundant

2 Avoid / Do not consume regularly / Reduce

3 Regular and abundant / Increase / Choose more

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UCD Institute of Food and Health

Davies, KP, Gibney, ER, O'Sullivan, AM. Moving towards more sustainable diets: Is there potential for a personalised approach in practice? *J Hum Nutr Diet*. 2023; 1–12. https://doi.org/10.1111/jhn.13218

Food Group/Nutrient	Willet *et al* (2019)	Broekema *et al* (2020)	Lassen *et al* (2020)
Whole grains	232	289	116
Tubers/starchy vegetables	50	109	100
Vegetables (all)	300	170	300
Dark green	100	65	100
Red/orange	100	38	100
Other	100	70	100
Fruit	200	99	300
Dairy	250	366	270
Cheese	--	3	20
Liquid dairy	--	363	250
Animal protein			
Red meat (beef/lamb)	7	0	15
Pork	7	10	
Poultry	29	11	30
Eggs	13	17	15
Fish	28	48	30
Plant protein			
Legumes	50	23	100
Soy	25	5	--
Nuts and seeds	50	91	46
Fat			
Unsaturated	40	10	--
Saturated	12	--	--
Sugar/confectionary	31	54	157
High salt/fat foods	--	0	
Alcoholic beverages	--	203	
Sugar sweetened beverages	--	--	
Other beverages	--	2102	2000

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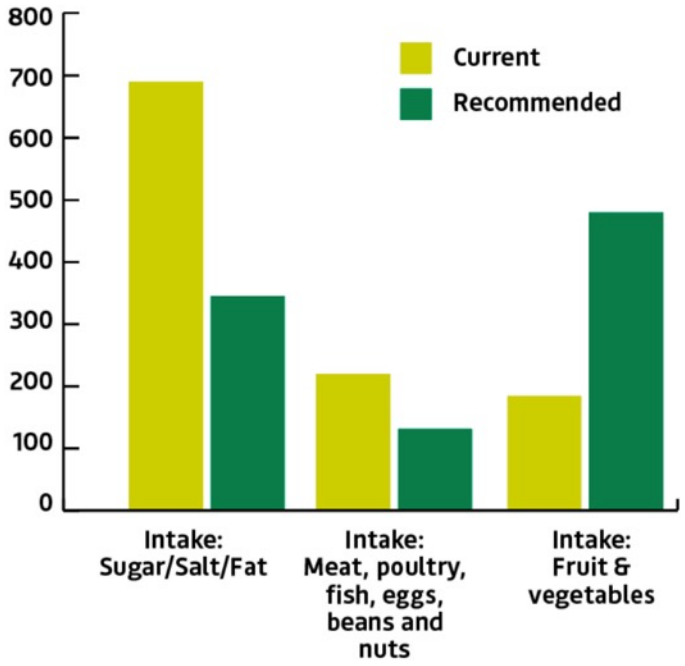
Proceedings of the Nutrition Society (2022), **81 (OCE4)**, E107 doi:10.1017/S0029665122001367

Irish Section Conference 2022, 15–17 June 2022, Impact of nutrition science to human health: past perspectives and future directions

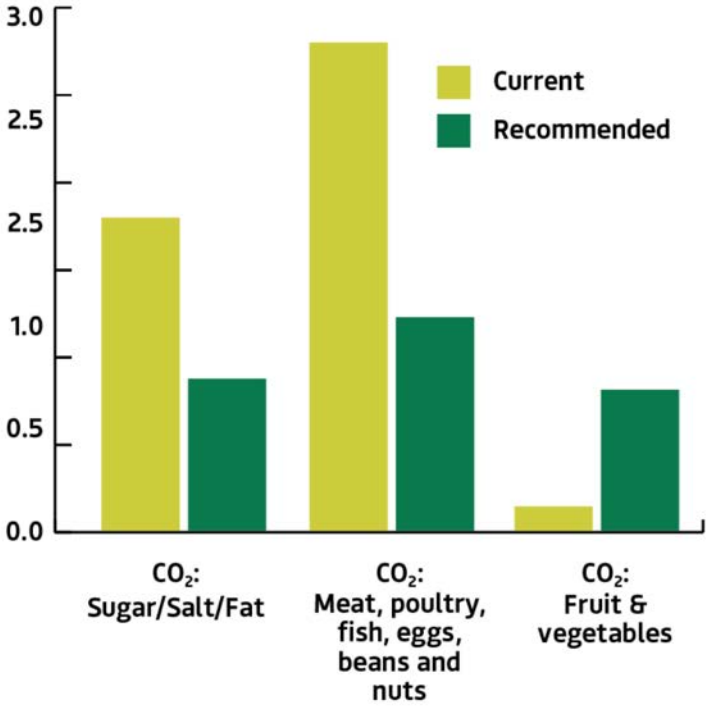
How sustainable are current dietary guidelines for Ireland – the shape of things to come

M.C. Conway[1] and S.N. McCarthy[1]
[1]*Department of Agrifood Business and Spatial Analysis, Teagasc Food Research Centre, Dublin, Ireland.*

Changes in food intake (g/day) required from current levels to achieve guidelines



Changes in CO_2 (kg CO_2/day) if guidelines are achieved



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Sustainability & Equity

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Advances in Nutrition
AN INTERNATIONAL REVIEW JOURNAL
journal homepage: https://advances.nutrition.org/

Review

Aligning Environmental Sustainability, Health Outcomes, and Affordability in Diet Quality: A Systematic Review

Clarissa L. Leydon [1,2,*], Ursula M. Leonard [3], Sinéad N. McCarthy [2], Janas M. Harrington [1]

[1] *Centre for Health and Diet Research, School of Public Health, University College Cork, Cork, Ireland;* [2] *Department of Agrifood Business and Spatial Analysis, Teagasc Food Research Centre, Ashtown, Dublin, Ireland;* [3] *Cork Centre for Vitamin D and Nutrition Research, School of Food and Nutritional Sciences, University College Cork, Cork, Ireland*

- 24 studies 2017–2023.
- Diet, BMI, Greenhouse Gas Emissions, Cost

- Healthier diets can reduce environmental impact
- Incongruities between population and planetary health can occur
- Sustainability of dietary patterns depends on choice of indicator
- Following lower impact patterns can increase cost, but be protective against risk of obesity

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Accepted manuscript

Iodine and plant-based diets – a narrative review and calculation of iodine content

Published online by Cambridge University Press: **25 August 2023**

K. Nicol, A.P. Nugent, J.V. Woodside, K. H. Hart and S.C. Bath

Show author details

- Using the EAT-Lancet reference diet
- 128 µg/day (85% of the adult recommendation of 150 µg/d
- 51-64% of the pregnancy recommendation of 200-250 µg/d).

- Milk is replaced with unfortified plant-based alternatives,
- 54 µg/day (34% and 22-27% of the recommendations for adults and pregnancy, respectively.

- Plant-based dietary recommendations might **place consumers at risk of iodine deficiency,** without a fortification programme and where animal products provide the majority of iodine intake

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Processing & Sustainability

Mulrooney et al (unpublished)

Meal Type	Healthy Plan	Unhealthy Plan	"Processed" Plant Based Plan	Less-"Processed" Plant Based Plan
Breakfast	Porridge with low-fat milk, raspberries and wholemeal/grain toast	White toast with butter, eggs, sausages, rashers, black pudding and tea with whole milk	Porridge with unsweetened soya milk, raspberries and wholemeal/grain toast	Porridge with unsweetened soya milk, raspberries and wholemeal/grain toast
Lunch	Egg, lettuce and tomato sandwich with low-fat yoghurt, oranges and water	Sandwich with butter and rashers, chocolate biscuits, sugar sweetened beverage (cola) and crisps	Vegetable burger sandwich with soya yoghurt and oranges	Tofu sandwich with soya yoghurt and oranges
Dinner	Pork and vegetable noodle stir fry and water	Roast beef, mashed potatoes, peas, carrots, tea with whole milk, and banoffee pie	Quorn pieces, carrots, mushrooms, and green beans stir fry with wholewheat noodles and water	Chickpea, carrot, green bean and mushroom stir fry with wholewheat noodles and water
Mid-morning snack ……	Pear and water	Milk chocolate and tea with whole milk	Pear and water	Pear and water

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Mulrooney et al (unpublished)

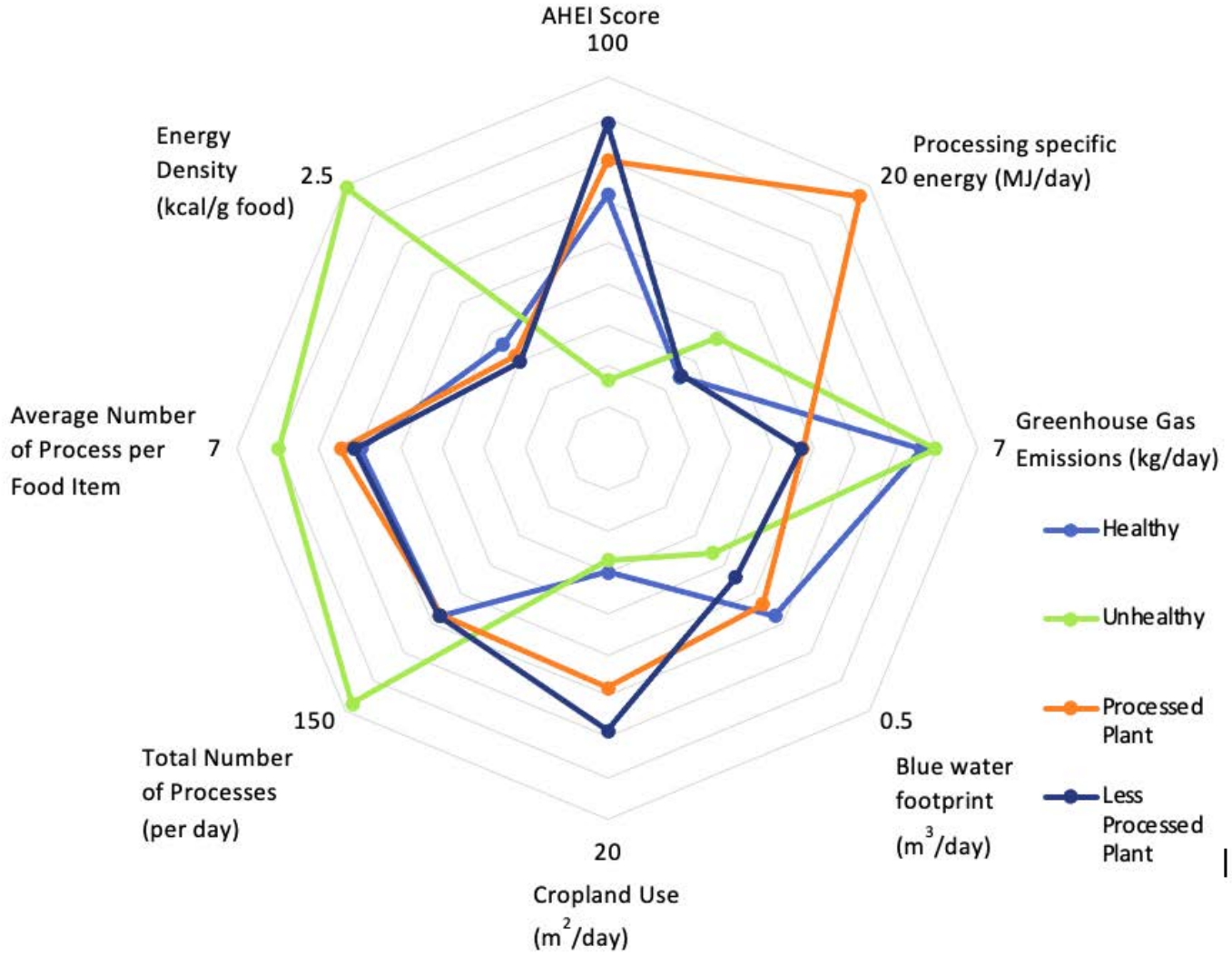

Figure 2. Radar plot displaying the four diets used in this study and their associated scores for the nutritional, processing, and environmental impact metrics.

ation programme (H2020-

Challenges…..

SUSTAINABILITY,

PROCESSING,

NUTRIENT INADEQUACIES,

FOOD INSECURITY

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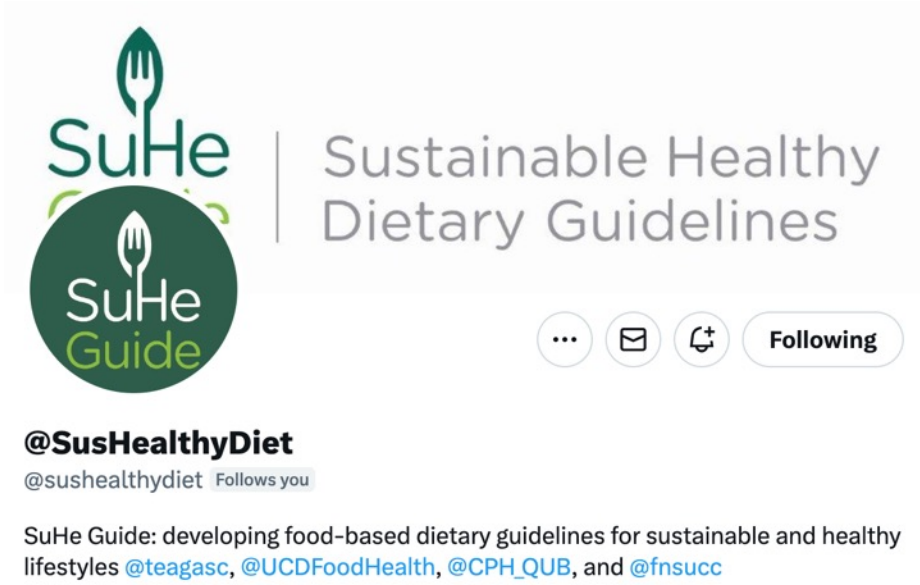
Challenges…..

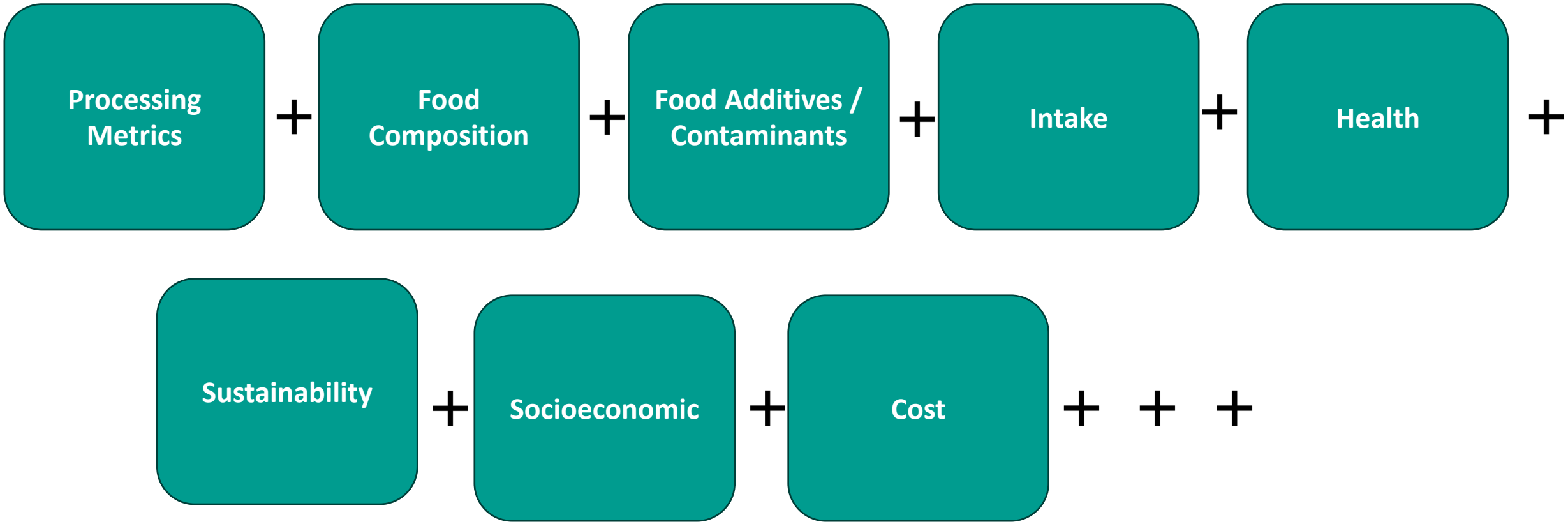
- Different metrics for sustainability – different outcomes / conclusions
- Need to ‘link’ sustainability to food
  - food group,
  - vary region/country
- Need to link to socio-economic data
  - Cost
  - Acceptability
- Need evidence of modelled nutrient intakes / RCTs



FNS - Cloud Food Nutrition Security

Food Nutrition Security Cloud (FNS-Cloud) has received funding from the European Union’s Horizon 2020 Research and Innovation programme (H2020-EU.3.2.2.3. – A sustainable and competitive agri-food industry) under Grant Agreement No. 863059 – www.fns-cloud.eu

Data Fragmentation & Integration – FNS Cloud



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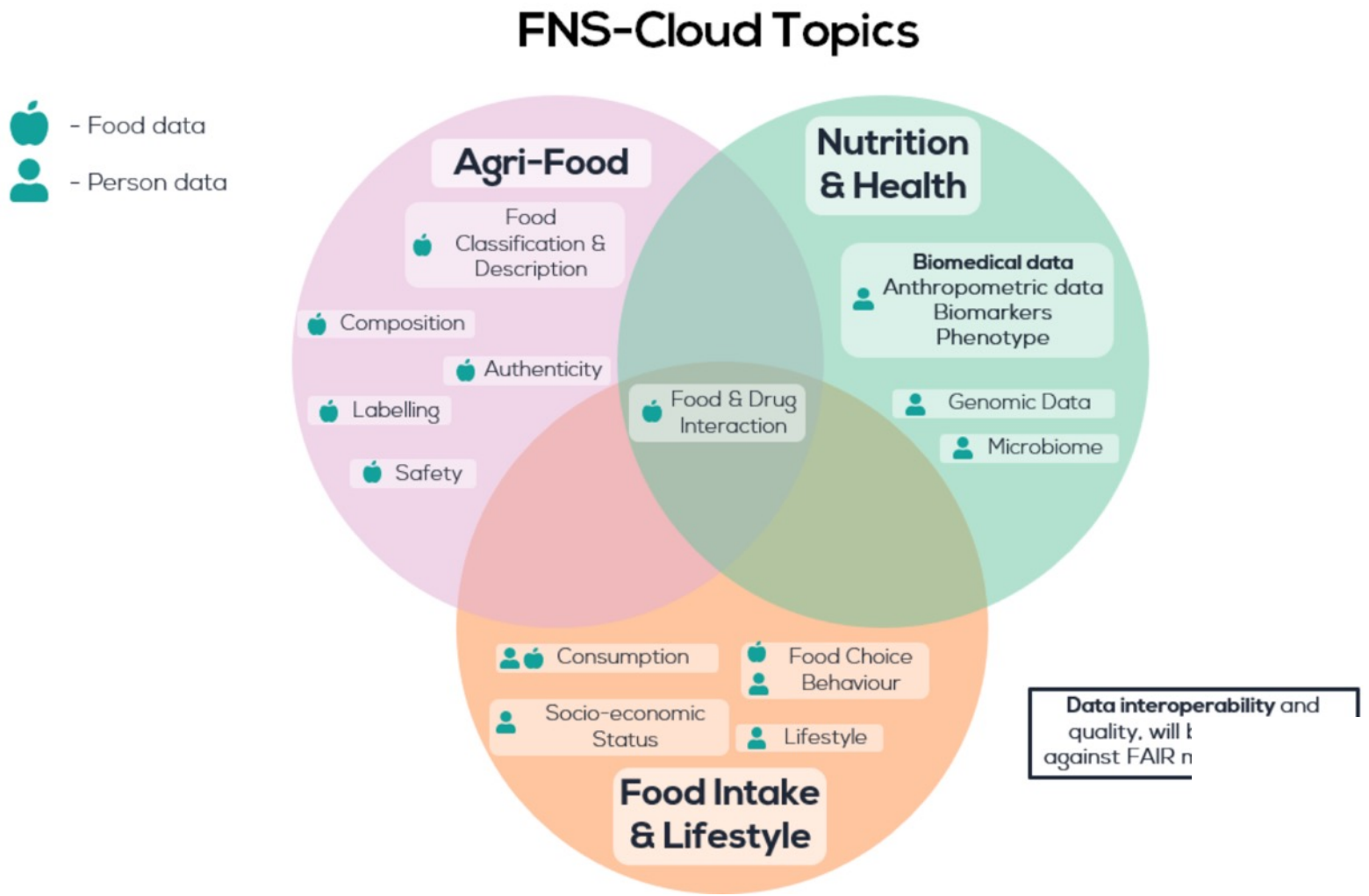
Food, Nutrition Security data



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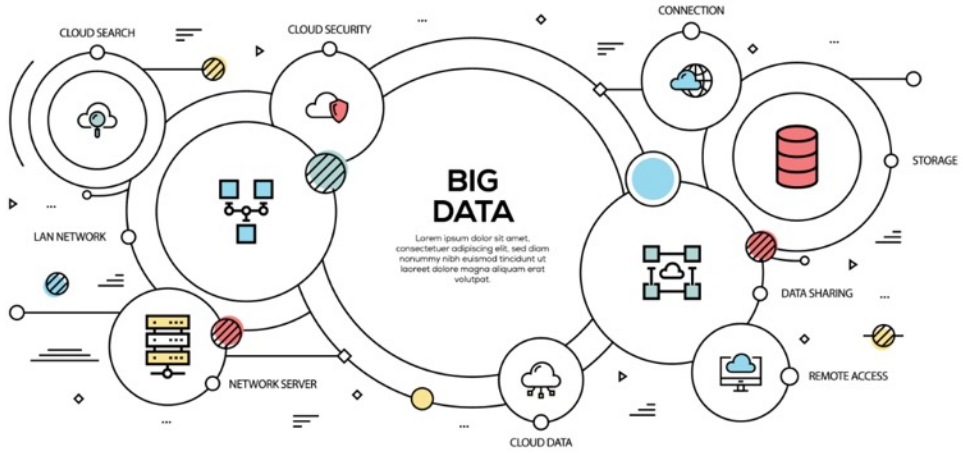
To support the use of data …. develop solutions



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FNSCloud 'Nutrition Researcher' Journey

Assess factors which influence dietary patterns & adherence to sustainable healthy eating guidelines

0

Use existing data or find data to answer the research question

1

FIND DATASETS – Use FNS catalogue to find relevant datasets for the specific research question – Catalogue search

2

IDENTIFY potential datasets containing parameters of interest

3

Determine if selected datasets are suitable for use in the specific research question

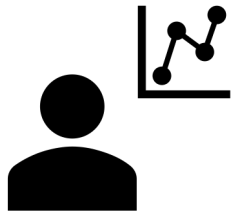
- Quality Framework

4

OBTAIN access to datasets- FoodCASE and other **data repositories,** FNS catalogue, IP permissions etc.

5

USE FNS tools & services to **MERGE & HARMONISE** datasets – FFQ mapping, StandFood, others?



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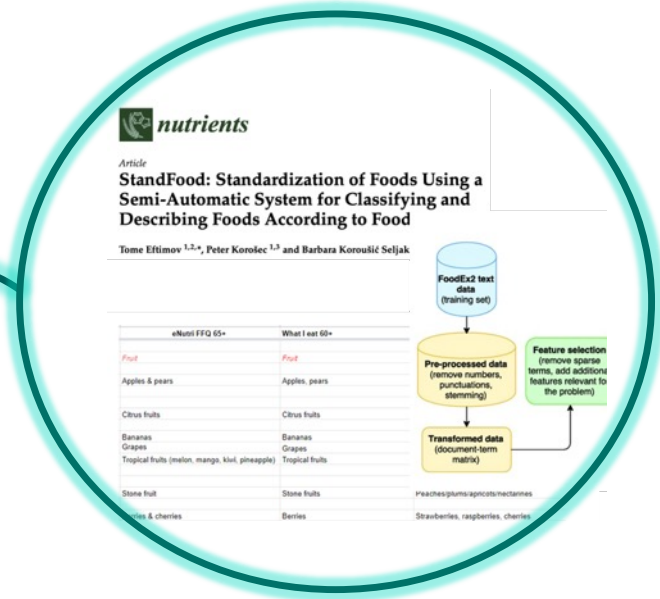
Existing datasets



Data harmonization tools

Tools for collecting intake data

Consumer apps

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Final thoughts……

- Challenges ahead
- Cannot be answered by one domain
- Quality datasets
- FAIR
- FNSCloud has some solutions…… but needs a community to use it!!

Don’t forget to follow us: @FNSCloudEU FNSCloudEU FNS-Cloud @FNSCloudEU2019

www.fns-cloud.eu
www.fnscloud.eu
www.myfnscloud.eu

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