Ultra-processed food: what does it mean and how do we deal with it?

NUTRITION 2025

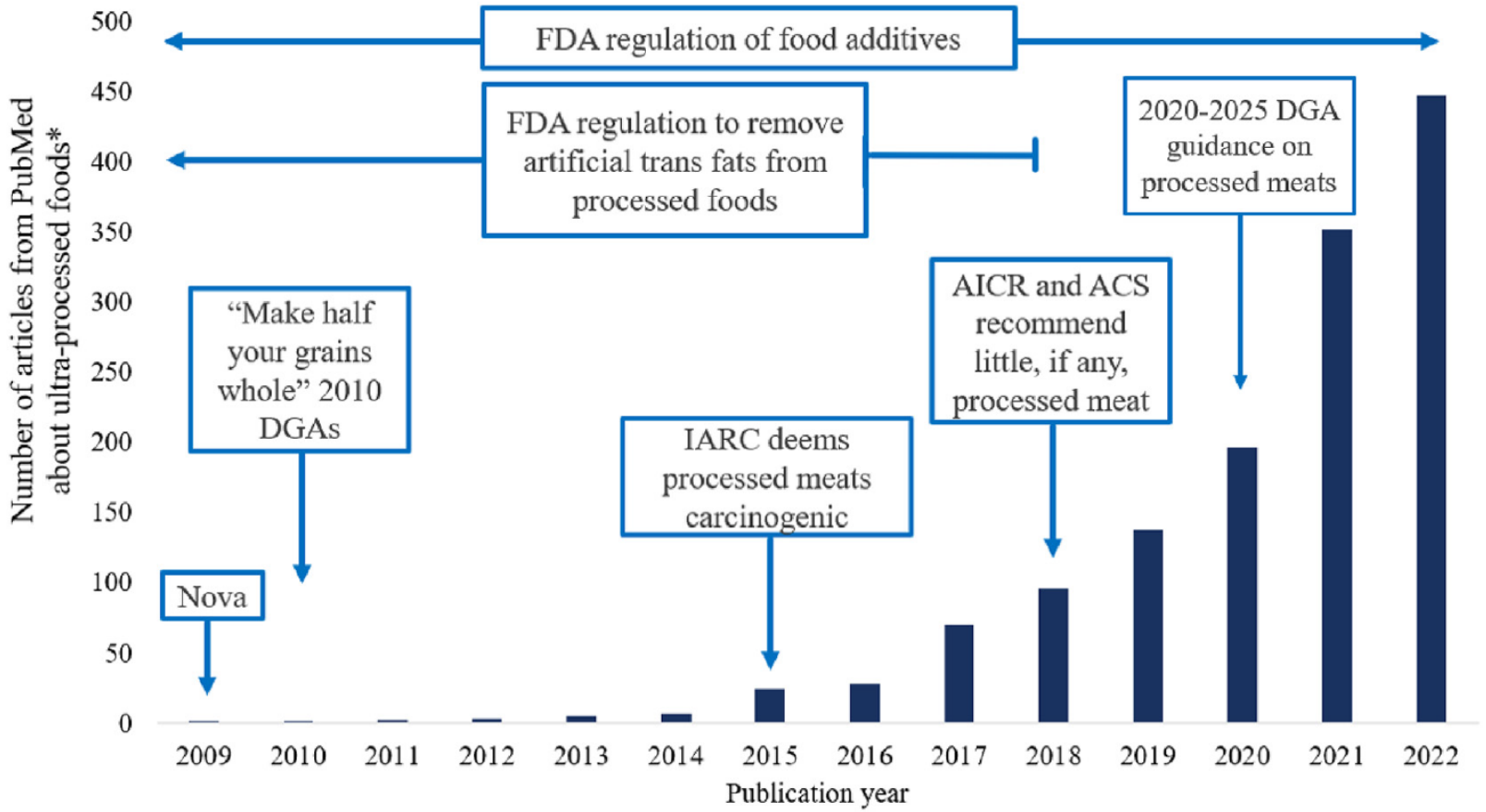
Prof. Dr. med David Fäh

Ultra-Processed Food (UPF): Definition

- No legally (legally) binding definition
- Industrially produced foods made from substances obtained from different raw materials
- Highly processed products, usually resulting from various chemical, biological and/or physical processes
- Original food matrix destroyed to the maximum and thus also properties
- Contain no fresh ingredients, but several "cosmetic" or “promotional” additives such as flavorings, colorings, aromas, sweeteners,
- Term first appears in 2009, proposal for categorization by Monteiro et al. 2015, addition/modification, e.g. by Coyle et al. 2022 → NOVA
- Increasing criticism of the NOVA classification

https://www.reuters.com/business/healthcare-pharmaceuticals/how-novo-nordisk-foundation-funded-project-sparked-ultra-processed-food-fight-2025-03-12/, https://datashare.tu-dresden.de/s/dowSAeSZStoANY6

Monteiro CA, et al.: NOVA – The star shines bright. World Nutrition 2016; 7(1–3): 28–38. Monteiro CA, Cannon G, Moubarac J-C: The UN Decade of Nutrition, the NOVA food classification and the trouble with ultra-processing. Cambridge University Press 2018; 21 (Special Issue 1): 5–17. Coyle et al. International Journal of Behavioral Nutrition and Physical Activity volume 19, Article number: 148 (2022)

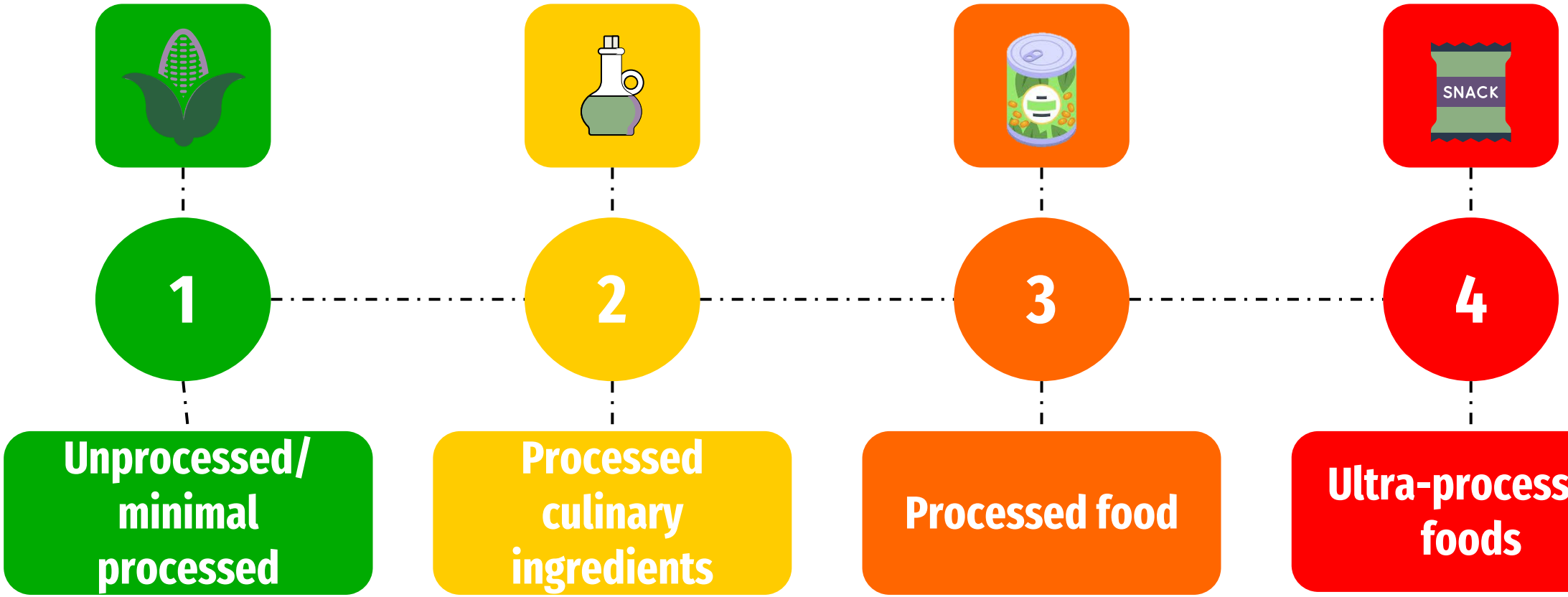


Advances in Nutrition 14 (2023) 1255–1269

Ultra-processed foods (UPF): Definitions & classifications

Behsnilian D, Bröder J, Tauer J, Mayer-Miebach E: Einordnung von Lebensmitteln nach dem Verarbeitungsgrad und Bewertung gängiger Klassifizierungssysteme in der Ernährungsforschung. In: Deutsche Gesellschaft für Ernährung (Hrsg.): 15. DGE-Ernährungsbericht. Vorveröffentlichung Kapitel 8. Bonn (2023) V1-V37 (https://www.dge.de/15-dge-eb/vvoe/kap8)

Classification of processing degree according to NOVA



- Predominantly natural
- Removal of unwanted parts of the raw material (peeling)

- NOVA 1 derivatives.
- Part of the culinary preparation.

- NOVA 2 ingredients in NOVA 1 foods.
- Can be prepared at home
- Usually 2 or 3 ingredients.

- Industrial formulations.
- Mostly derivatives
- Ingredients not commonly used in the household.
- Focus on palatability.

Gibney, 2019; EduChange, 2018; Monteiro et al., 2017; Adams et al., 2020

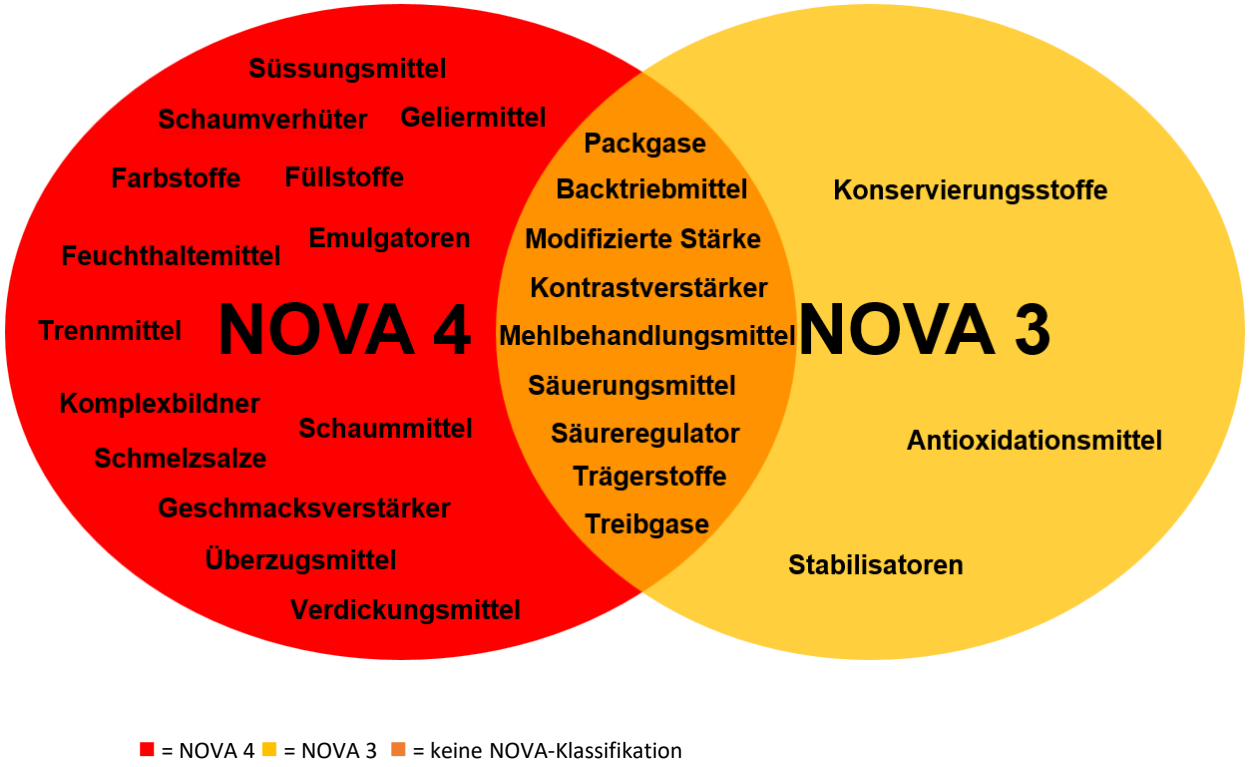
Characteristics of UPF with examples

Processed foods	Relatively simple industrially manufactured food products made by adding at least one group 2 ingredient (such as salt, sugar, oil or fat) to group 1 foods, using preservation methods such as canning and bottling, and, in the case of breads and cheeses, using non-alcoholic fermentation and boiling or baking. Processes and ingredients here aim to increase the durability of group 1 foods and make them more enjoyable by modifying or enhancing their sensory qualities. Processed foods often contain additives that prolong product duration, protect original properties or prevent proliferation of microorganisms (such as preservatives and antioxidants), but not additives with cosmetic functions (see next group).	All canned or bottled vegetables and legumes in brine; salted or sugared nuts and seeds; fruits in syrup; and dried or canned fish. Breads, cheese, pastries, cakes, cookies (biscuits); sweet or savoury snacks; cured meats; and ready-to-heat products such as burgers, and pre-prepared pies and pasta and pizza dishes when these products are made exclusively from group 1 foods and salt, oil, sugar or other Nova group 2 ingredients and do not contain classes of additives with cosmetic function.
Ultra-processed foods	Industrially manufactured food products made up of several ingredients (formulations) including sugar, oils, fats and salt (generally in combination and in higher amounts than in processed foods) and food substances of no or rare culinary use (such as high-fructose corn syrup, hydrogenated oils, modified starches and protein isolates). Group 1 foods are absent or represent a small proportion of the ingredients in the formulation. Processes enabling the manufacture of ultra-processed foods include industrial techniques such as extrusion, moulding and pre-frying; application of additives including those whose function is to make the final product palatable or hyper-palatable such as flavours, colourants, non-sugar sweeteners and emulsifiers; and sophisticated packaging, usually with synthetic materials. Processes and ingredients here are designed to create highly profitable (low-cost ingredients, long shelf-life, emphatic branding), convenient (ready-to-(h)eat or to drink), tasteful alternatives to all other Nova food groups and to freshly prepared dishes and meals. Ultra-processed foods are operationally distinguishable from processed foods by the presence of food substances of no culinary use (varieties of sugars such as fructose, high-fructose corn syrup, 'fruit juice concentrates', invert sugar, maltodextrin, dextrose and lactose; modified starches; modified oils such as hydrogenated or interesterified oils; and protein sources such as hydrolysed proteins, soya protein isolate, gluten, casein, whey protein and 'mechanically separated meat') or of additives with cosmetic functions (flavours, flavour enhancers, colours, emulsifiers, emulsifying salts, sweeteners, thickeners and anti-foaming, bulking, carbonating, foaming, gelling and glazing agents) in their list of ingredients.	All carbonated soft drinks; reconstituted fruit juices and 'fruit' drinks; 'cocoa' and other dairy drinks, and energy drinks; flavoured yogurt; candies (confectionery); margarines; poultry and fish 'nuggets' and 'sticks', sausages, hot dogs, luncheon meats and other reconstituted meat products; plant-based meat substitutes; extruded breakfast 'cereals'; powdered 'instant' soups, noodles and desserts; infant formulas and 'follow-on' milks; and 'health' and 'slimming' products such as meal-replacement shakes and powders. Breads, pastries, cakes, cookies (biscuits); sweet or savoury snacks; cured meats; and ready-to-heat products such as burgers, and pre-prepared pies and pasta and pizza dishes when these products are made up of food substances of no culinary use and or contain classes of additives with cosmetic function.

Alcoholic drinks are not immediately classifiable by Nova. By analogy with the nature of processed and ultra-processed foods, they may be counted in group 3 if they are produced by fermentation of group 1 foods, and in group 4 if they are produced by fermentation of group 1 foods and distillation of the resulting alcohol.

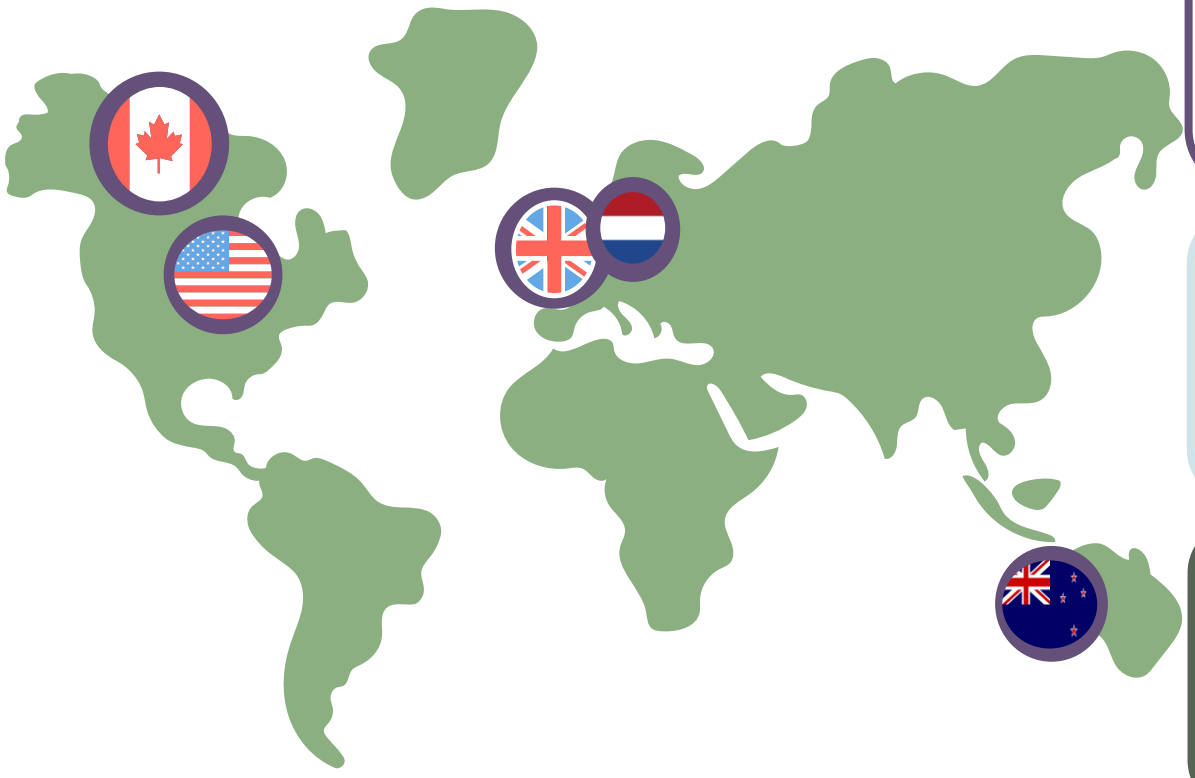
Naturefood Volume 4 | June 2023 | 445–448 | 446

NOVA: Substances not intended for classification



Bachelor-Thesis von Stéphanie Speck, EuD20. https://www.rosenfluh.ch/ernaehrungsmedizin-2024-02/der-schluessel-zu-einer-gesuenderen-ernaehrung-monitoring-von-hochverarbeiteten-nahrungsmitteln-beim-einkauf

UPF: Global significance



40-60%

High proportion of calorie intake

USA, Canada, Netherlands, United Kingdom

Increasing frequency

Consumer society, urbanization, working conditions, long commutes, loss of food culture

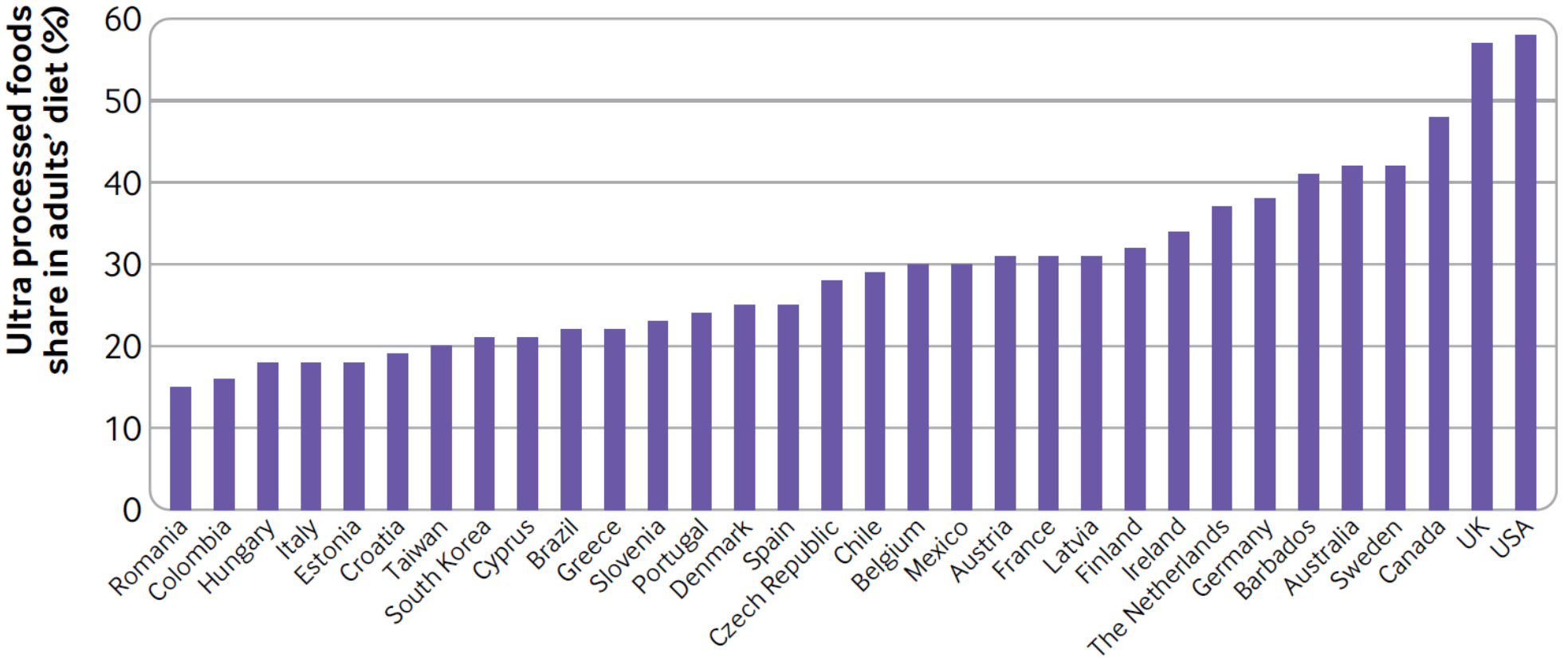
Demography

High consumption among young people (especially men), urbanization, single households

Monteiro et al., 2017; Gibney, 2019; Dicken et al., 2023; Bertoni Maluf et al., 2022; Mackay et al., 2019

Mean proportion of ultra-processed foods in the diet of adults

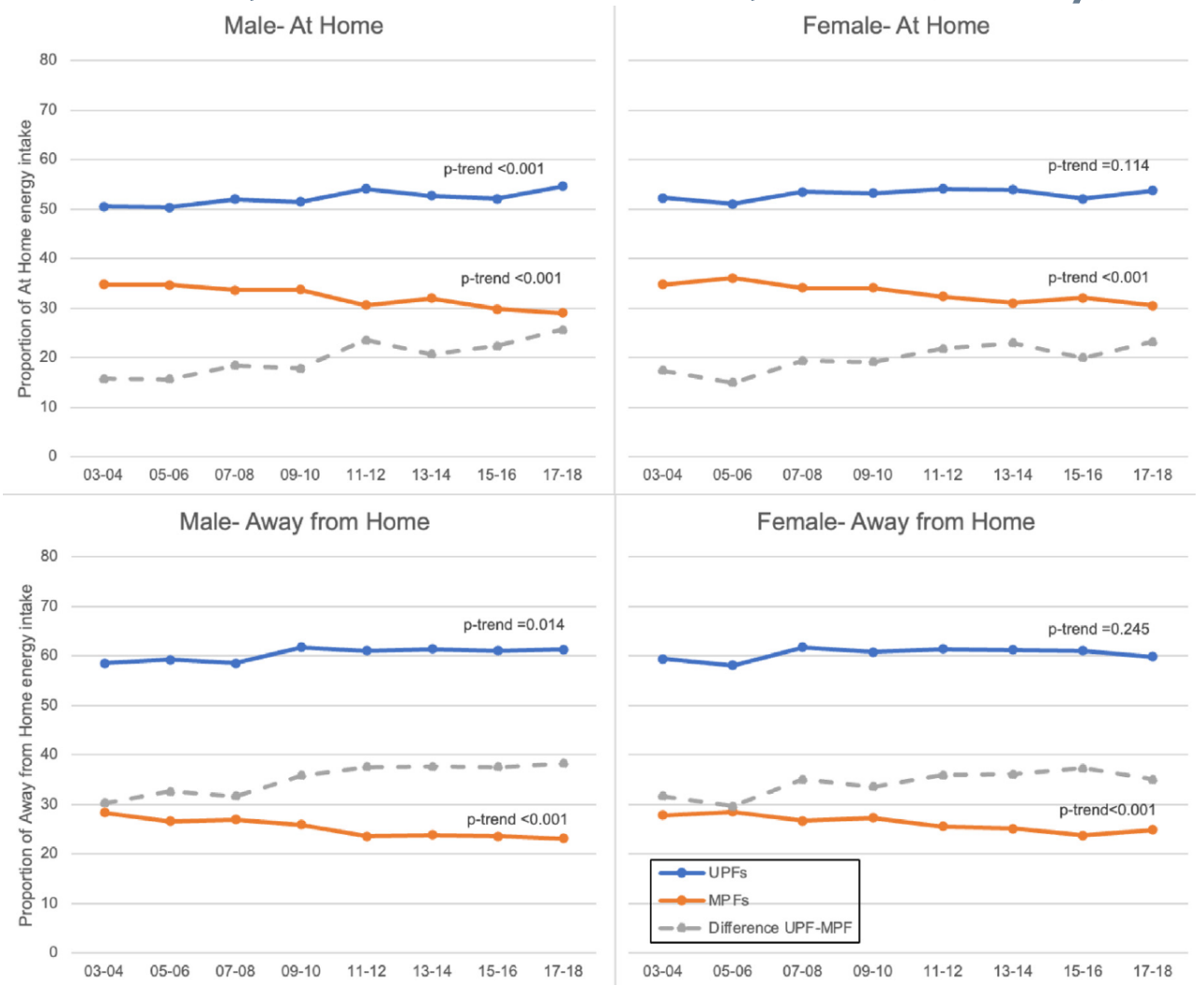
- Schweiz: 26%*



BMJ 2023;383:e075294 | doi: 10.1136/bmj-2023-075294

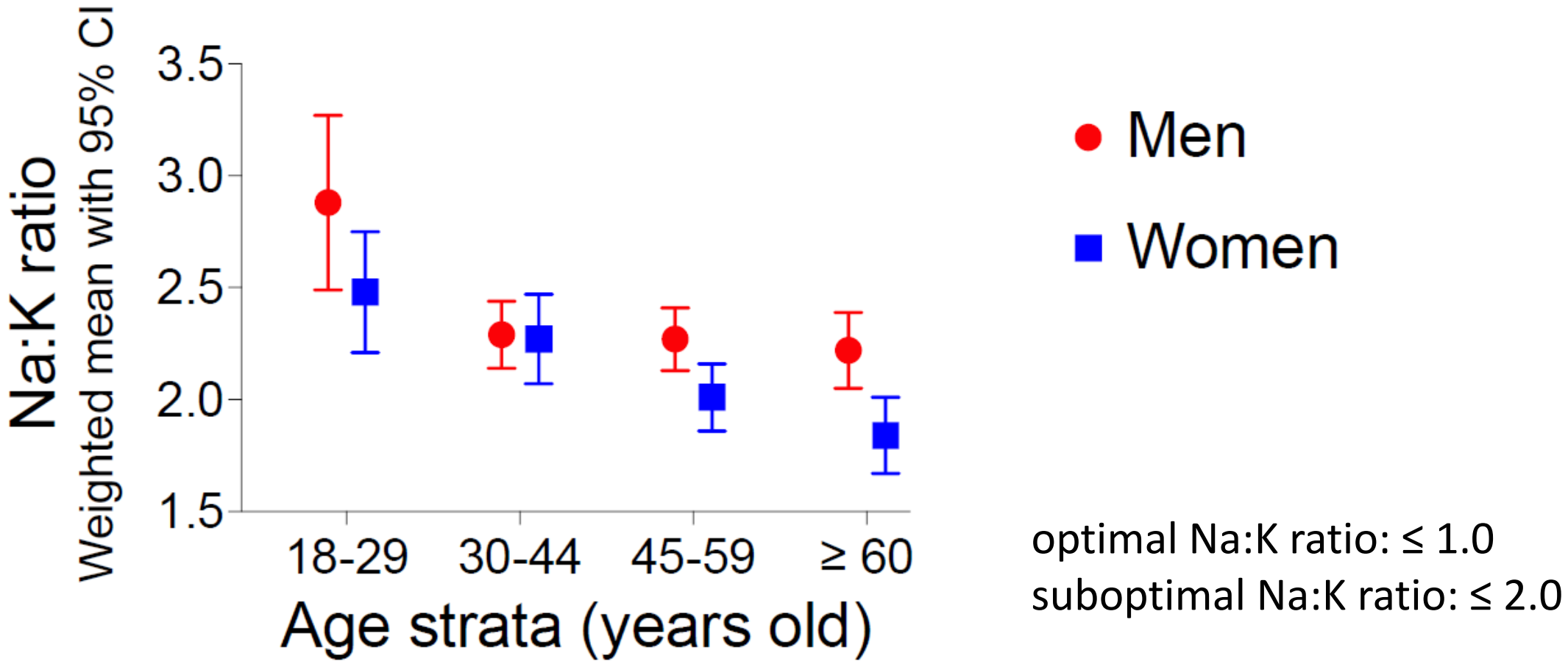
*Pestoni et al. Obesity 29(3):601-609

Proportion of minimally processed (MPF) and ultra-processed (UPF) foods, USA, 2003 - 2018, NHANES n=34,628 (>20y)



The Journal of Nutrition 155 (2025) 280–292

Mean urinary sodium:potassium ratio (Na:K) with 95% confidence interval by age and gender



optimal Na:K ratio: ≤ 1.0
suboptimal Na:K ratio: ≤ 2.0

Swiss Salt Study 2, second survey on salt consumption in Switzerland: Main results. First published: 03 June 2024 https://doi.org/10.2903/fr.efsa.2024.FR-0031

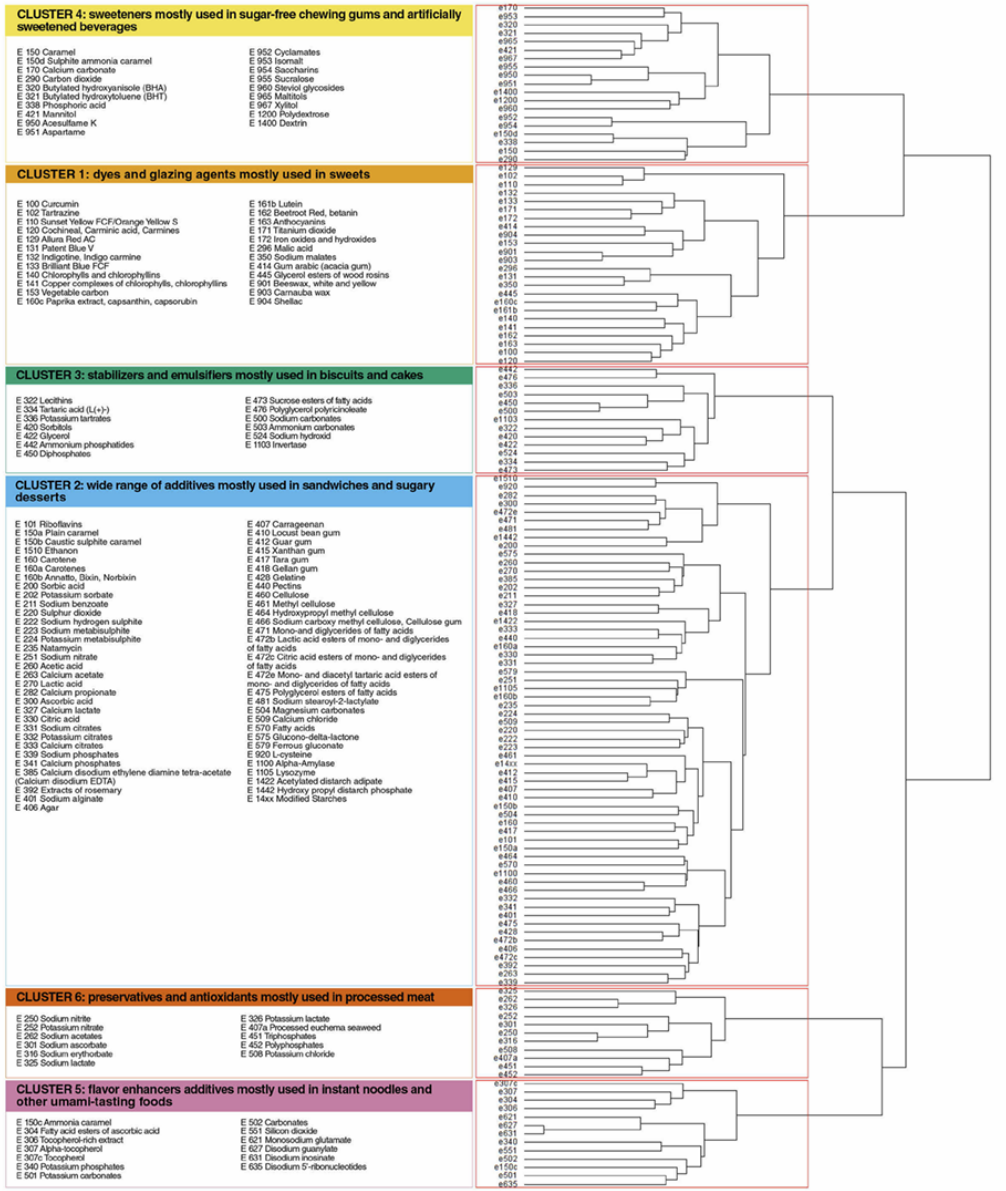
Proportion of products with problematic additives

NOVA food groups and subgroups	Total sample		Presence of (%)			
	n	(%)	At least one critical nutrient in excess*	At least one cosmetic additive	Flavors or colors	At least one critical nutrient in excess or cosmetic additive*
Unprocessed or minimally processed foods	1,178	12.0	–	5.1	4.9	–
Milk	154	1.6	–	0.6	–	–
Pasta	144	1.5	–	38.2	38.2	–
Others[1]	213	2.2	–	1.9	1.4	–
Processed culinary ingredients	237	2.4	–	0.4	0.4	–
Animal fats	38	0.4	–	2.6	2.6	–
Processed foods	1,352	13.7	90.9	3.7	1.4	89.1
Bread	60	0.6	83.3	1.7	1.7	83.3
Cheese	226	2.3	99.1	0.4	–	98.7
Salted/dried/smoked meat	88	0.9	98.9	1.1	–	98.9
Others[2]	978	9.9	88.7	4.8	1.8	86.4
Ultra-processed food products	7,084	71.9	97.1	82.1	71.4	98.8
Cold cuts and sausages	611	6.2	99.5	88.7	76.3	99.7
Sweet cookies	602	6.1	99.7	93.4	89.5	100.0
Salted biscuits	459	4.7	99.1	80.6	66.2	100.0
Margarine	53	0.5	100.0	94.3	92.5	100.0
Cakes and sweet pies	247	2.5	100.0	95.5	91.5	100.0
Bread	283	2.9	96.8	71.4	22.6	98.2
Sweets in general	1,232	12.5	97.6	75.8	68.4	98.6
Carbonated beverages	105	1.1	95.1	95.2	95.2	99.0
Chocolate	233	2.4	100.0	98.3	91.0	100.0
Pizza, lasagna or pastry	356	3.6	94.9	69.9	56.7	97.2
Ready meals	387	3.9	95.8	69.5	59.7	97.7
Other sugary drinks	767	7.8	87.4	90.4	86.2	96.3
Dairy beverages	451	4.6	99.8	96.0	83.6	100.0
Ice cream	240	2.4	100.0	93.8	84.6	100.0
Sauces and spreads	632	6.4	97.3	81.5	64.6	98.9
Others[3]	381	3.9	99.5	53.5	45.4	99.2

nature Scientific Reports. (2023) 13:13698. https://doi.org/10.1038/s41598-023-40650-3

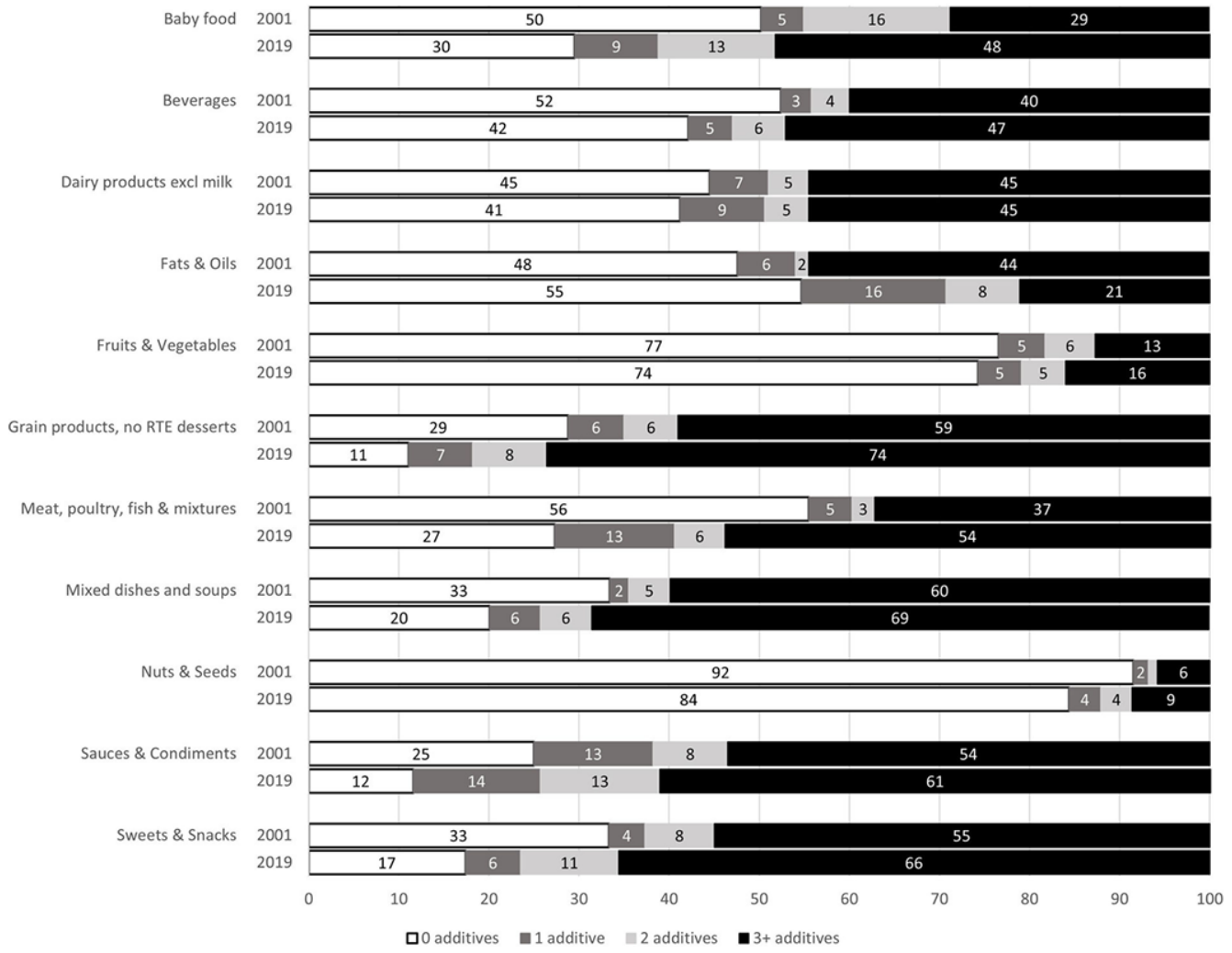
Additives Cluster (Aggregates)

- Cluster 1: **colorants and glazing agents** mainly used in confectionery (n=24 food additives)
- Cluster 2: a **wide range of additives** mainly used in sandwiches and sugary desserts (n=61 food additives)
- Cluster 3: **stabilizers and emulsifiers** mainly used in cookies and cakes (n=13 food additives).
- Cluster 4: **Sweeteners** mainly used in sugar-free chewing gum and artificially sweetened beverages (n = 19 food additives).
- Cluster 5: **Flavor enhancers** mainly used in instant noodles and other umami-flavored foods (n=13 food additives).
- Cluster 6: **Preservatives** and antioxidants mainly used in processed meat (n=11 food additives).



nature Scientific RepoRtS. https://doi.org/10.1038/s41598-020-60948-w

Proportion of products with additives USA, 2001→2019



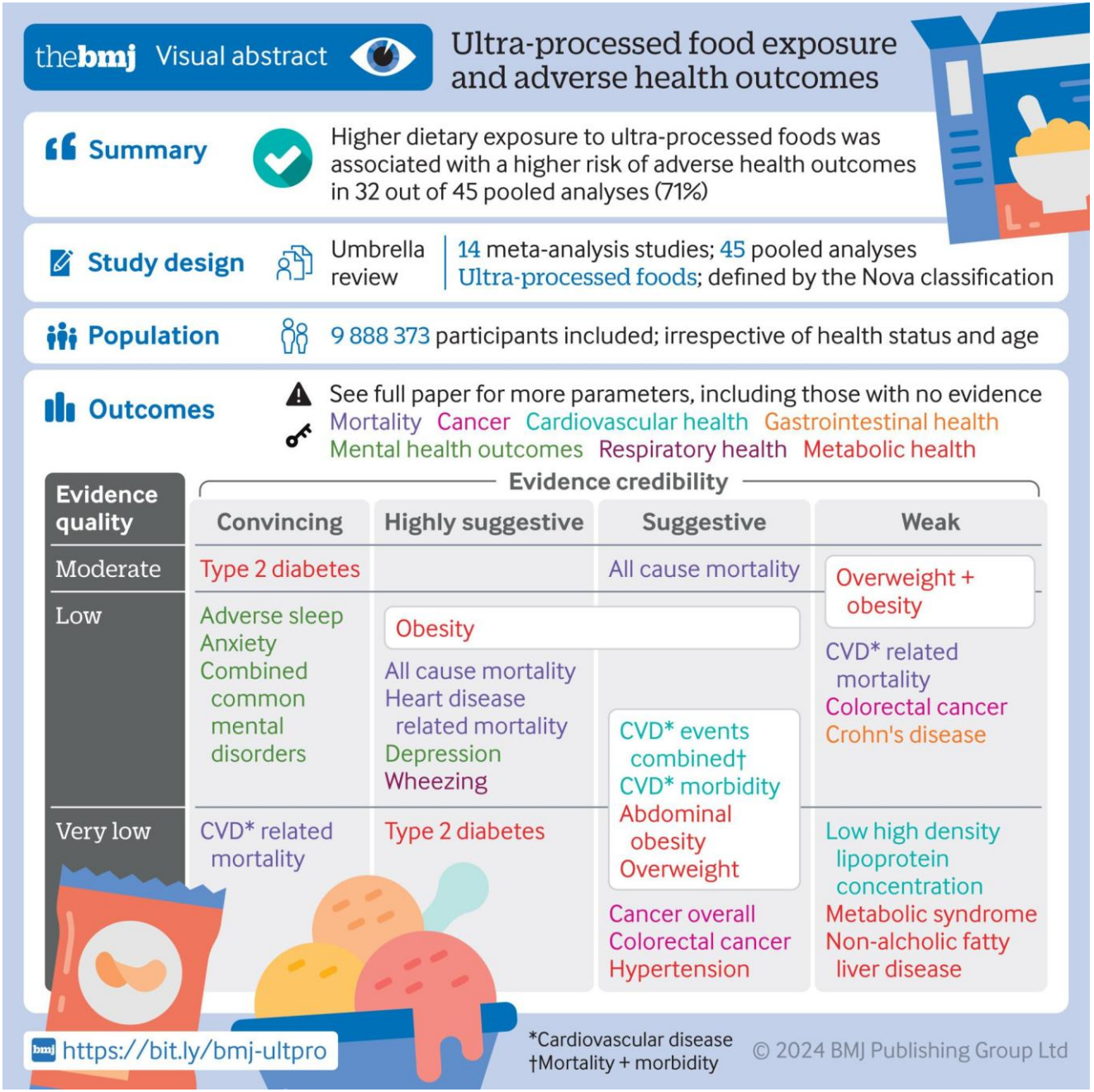
J Acad Nutr Diet. 2023 June ; 123(6): 889–901. doi:10.1016/j.jand.2022.11.007.

Relationships between the consumption of ultra-processed foods and cardiometabolic outcomes

Study	Risk increase (highest versus lowest exposure categories)
Chen et al (2023)[19]	Type 2 diabetes (40% higher risk)
Yuan et al (2023)[20]	Cardiovascular events (35% higher risk)
Wang et al (2022)[21]	Hypertension (23% higher risk)
Taneri et al (2022)[22]	All-cause mortality (29% higher risk)
Moradi et al (2021)[23]	Abdominal obesity (41% higher risk) Overweight (36% higher risk) Obesity(55% higher risk)
Lane et al (2021)[24]	Metabolic syndrome (81% higher odds)
Suksatan et al (2021)[25]	Cardiovascular mortality (50% higher risk) Cardiac mortality (66% higher risk)

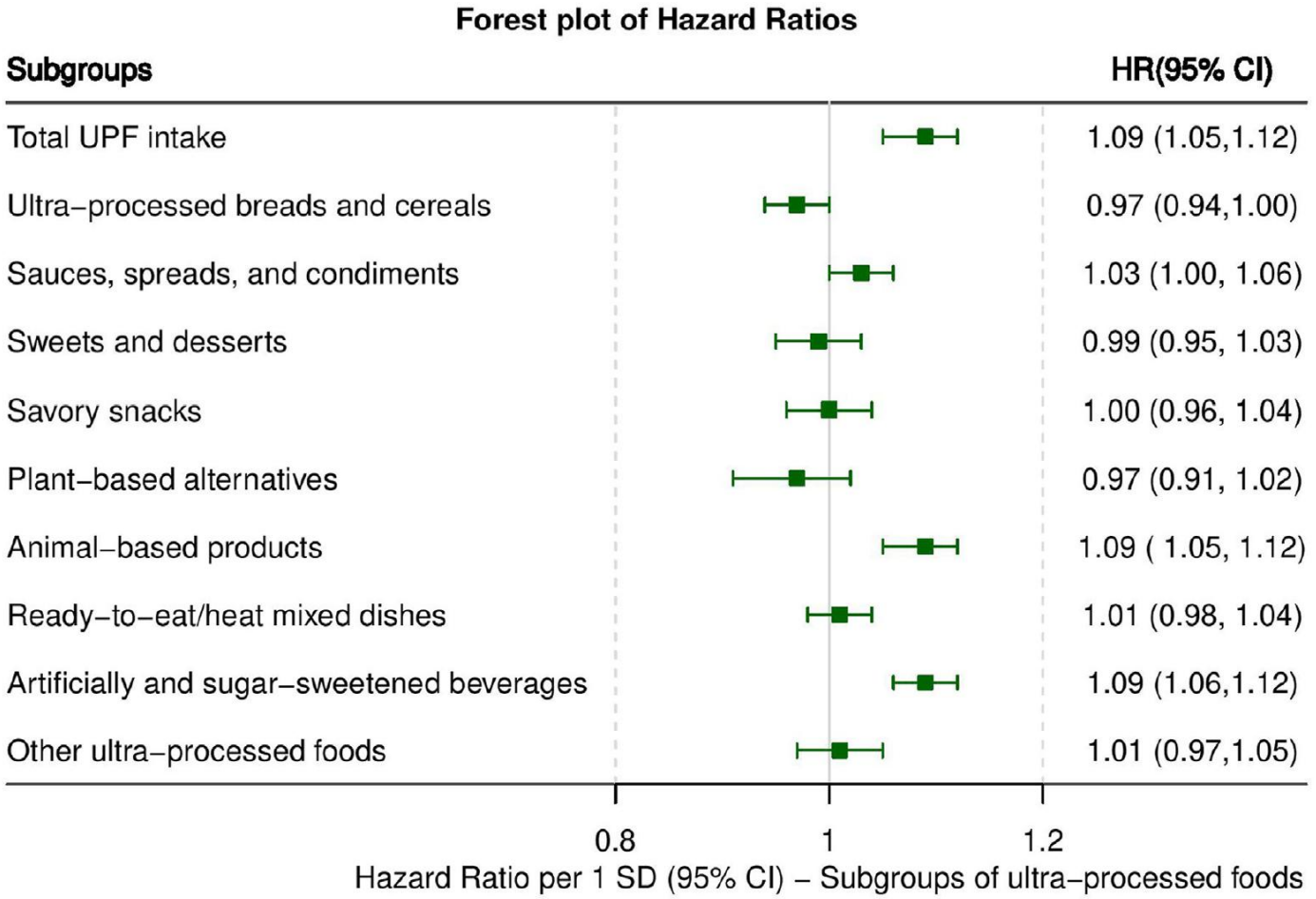
BMJ 2023;383:e075294 | doi: 10.1136/bmj-2023-075294

UPF and health: observational study



BMJ2024;384:e077310 http://dx.doi.org/10.1136/ bmj-2023-077310

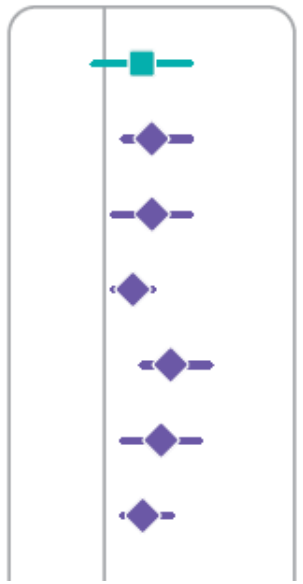
Association between consumption of ultra-processed foods and the risk of cancer and cardiometabolic multimorbidity



The Lancet Regional Health – Europe 2023; 100771 https://doi.org/10.1016/j.lanepe.2023.100771

Ingestion of emulsifiers from UPF and cardiovascular risk

	Hazard ratio (95% CI)	Hazard ratio (95% CI)	P value
Total CVD			
E339 Trisodium phosphate		1.04 (0.99 to 1.09)	0.1
Total celluloses		1.05 (1.02 to 1.09)	0.004
E460 Cellulose		1.05 (1.01 to 1.09)	0.007
E466 Carboxymethylcellulose		1.03 (1.01 to 1.05)	0.004
Total mono- and diglycerides of FAs		1.07 (1.04 to 1.11)	<0.001
E472b Lactic acid ester of mono- and diglycerides of FAs		1.06 (1.02 to 1.10)	0.004
E472c Citric acid esters of mono- and diglycerides of FAs		1.04 (1.02 to 1.07)	0.002

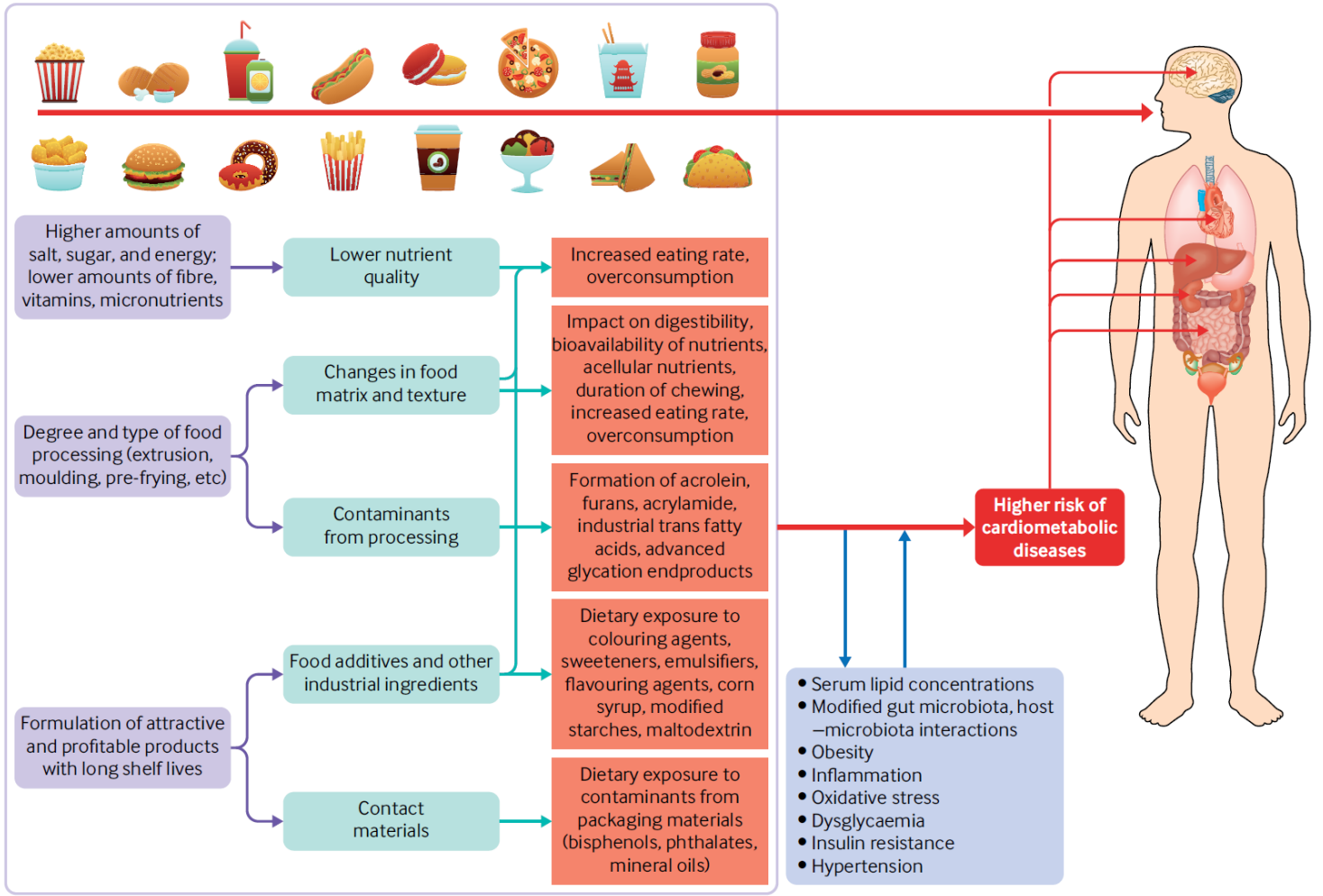


Hazard ratio significance

P<0.05 P≥0.05

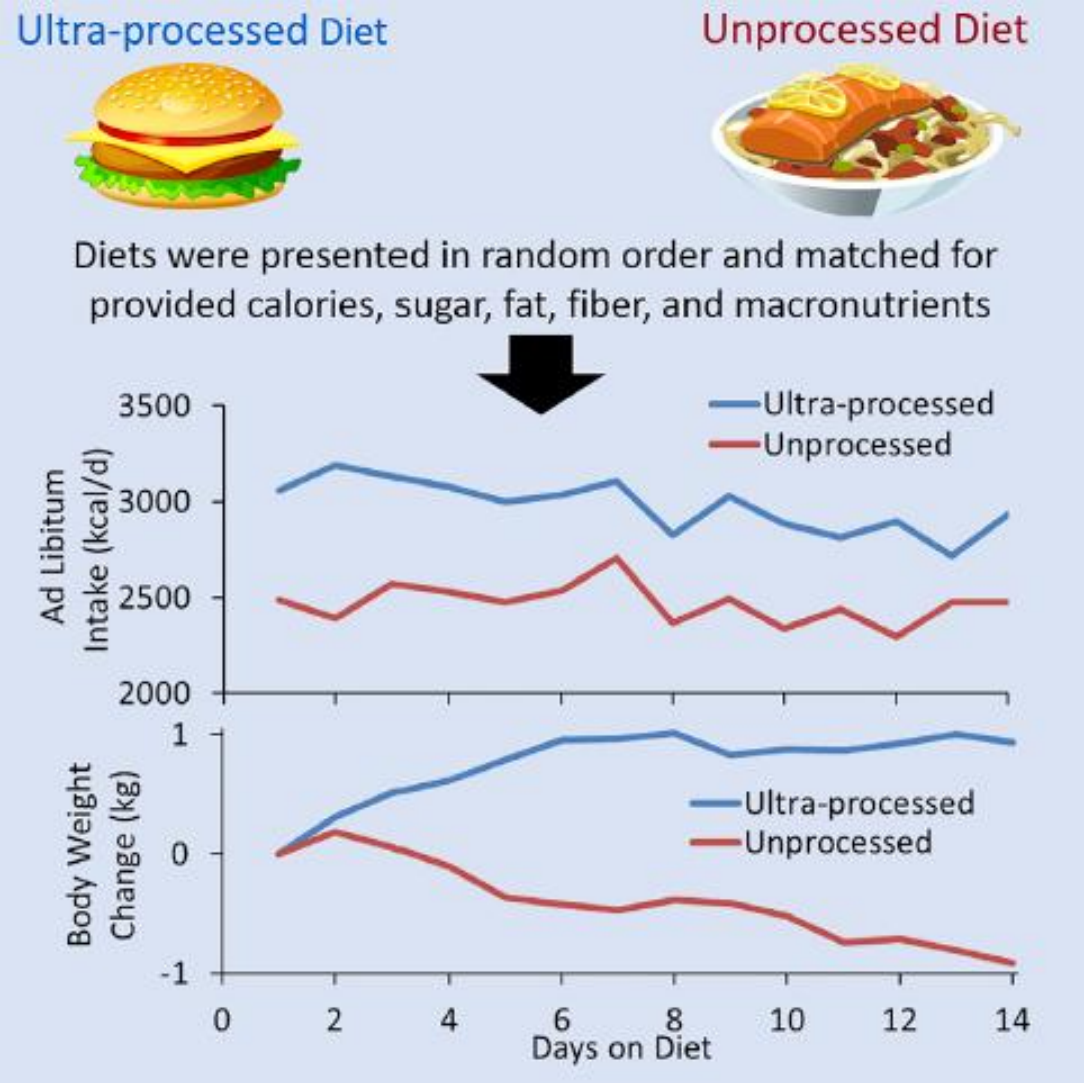
BMJ 2023;382:e076058 | doi: 10.1136/bmj-2023-076058

Possible factors/mechanisms associating the consumption of ultra-processed foods with cardiometabolic outcomes



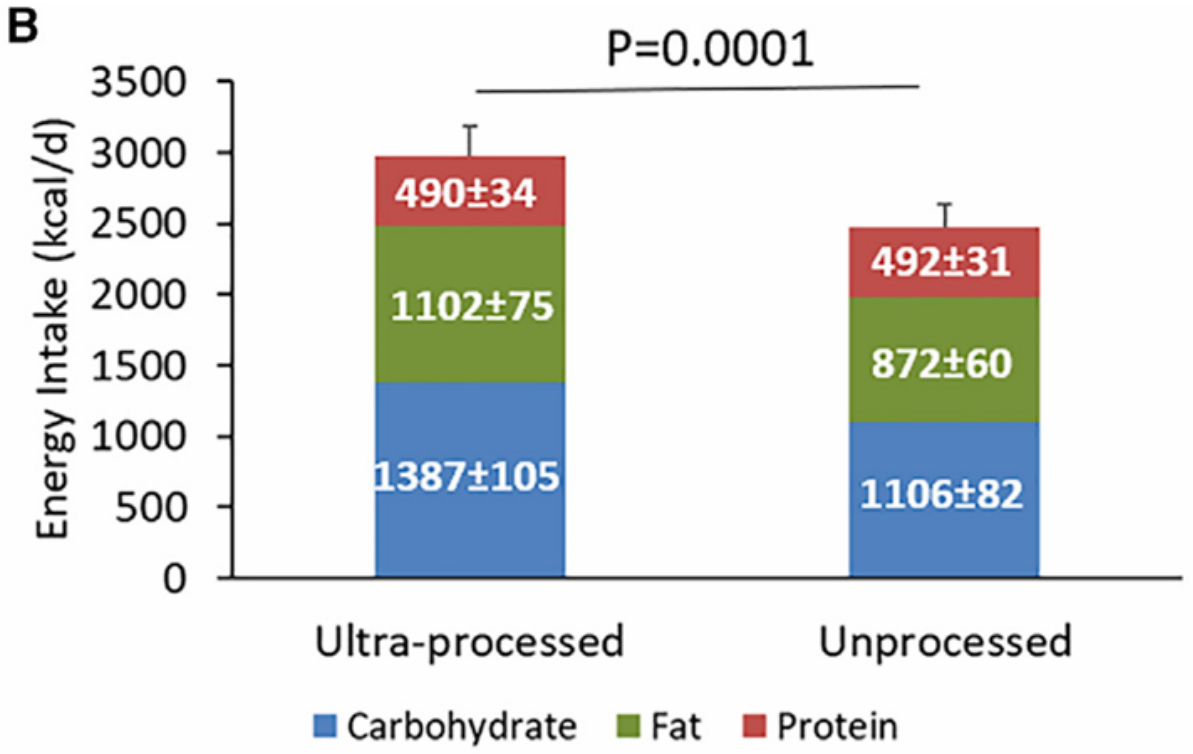
BMJ 2023;383:e075294 | doi: 10.1136/bmj-2023-075294

Ultra-processed food and body weight



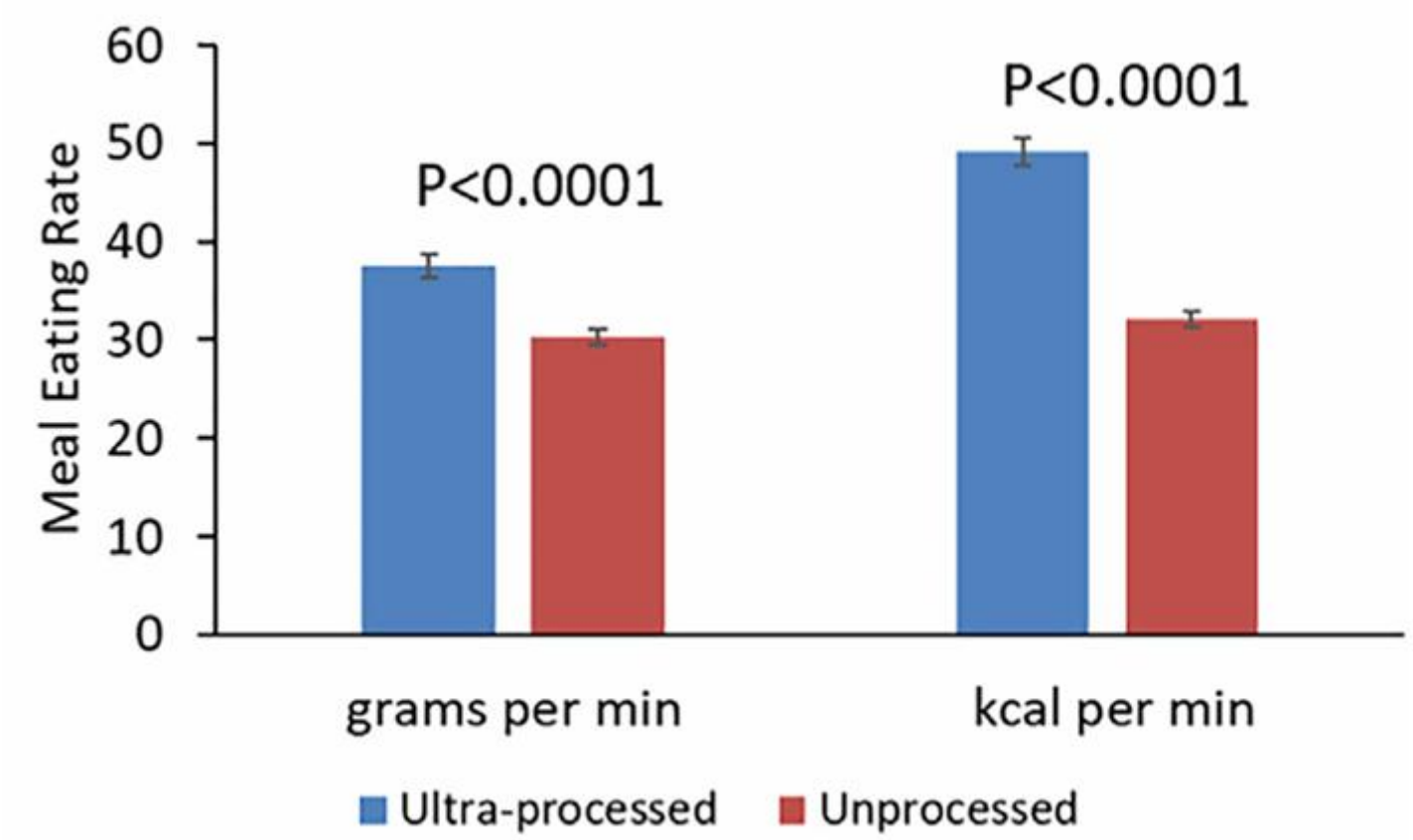
Hall et al., 2019, Cell Metabolism 30, 67–77

Intake of energy and macronutrients with ad libitum



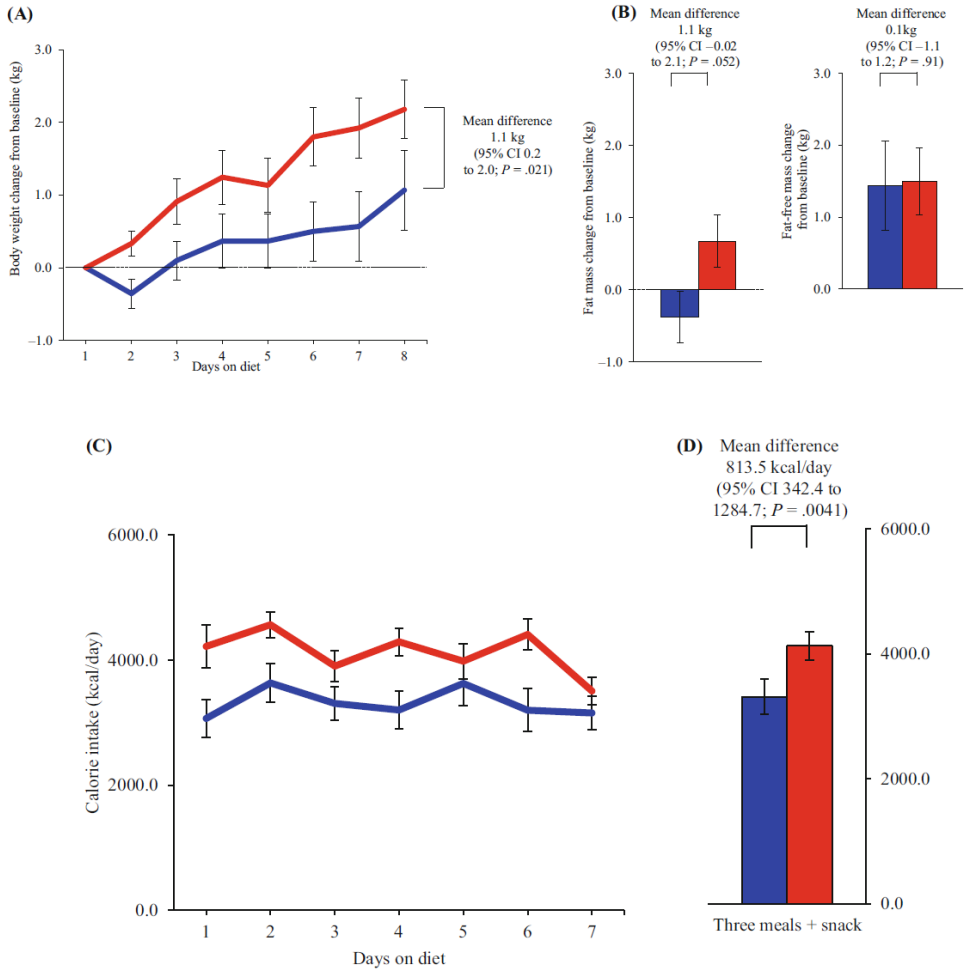
Hall et al., 2019, Cell Metabolism 30, 67–77

Eating speed and degree of processing



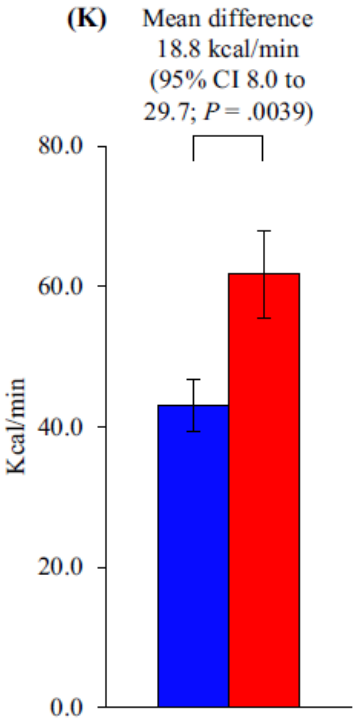
Hall et al., 2019, Cell Metabolism 30, 67–77

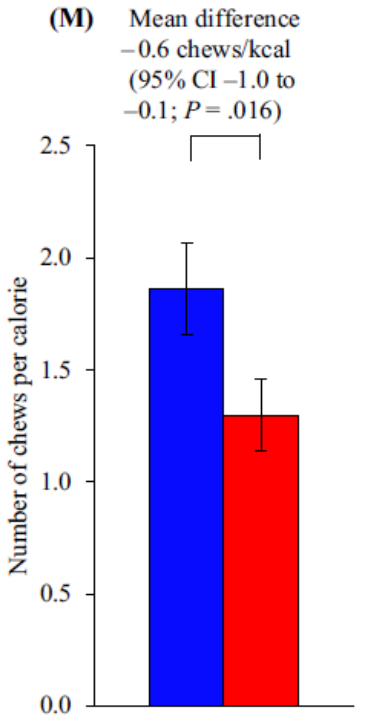
Body weight/composition, calorie intake, eating speed



Blau: minimal verarbeitet

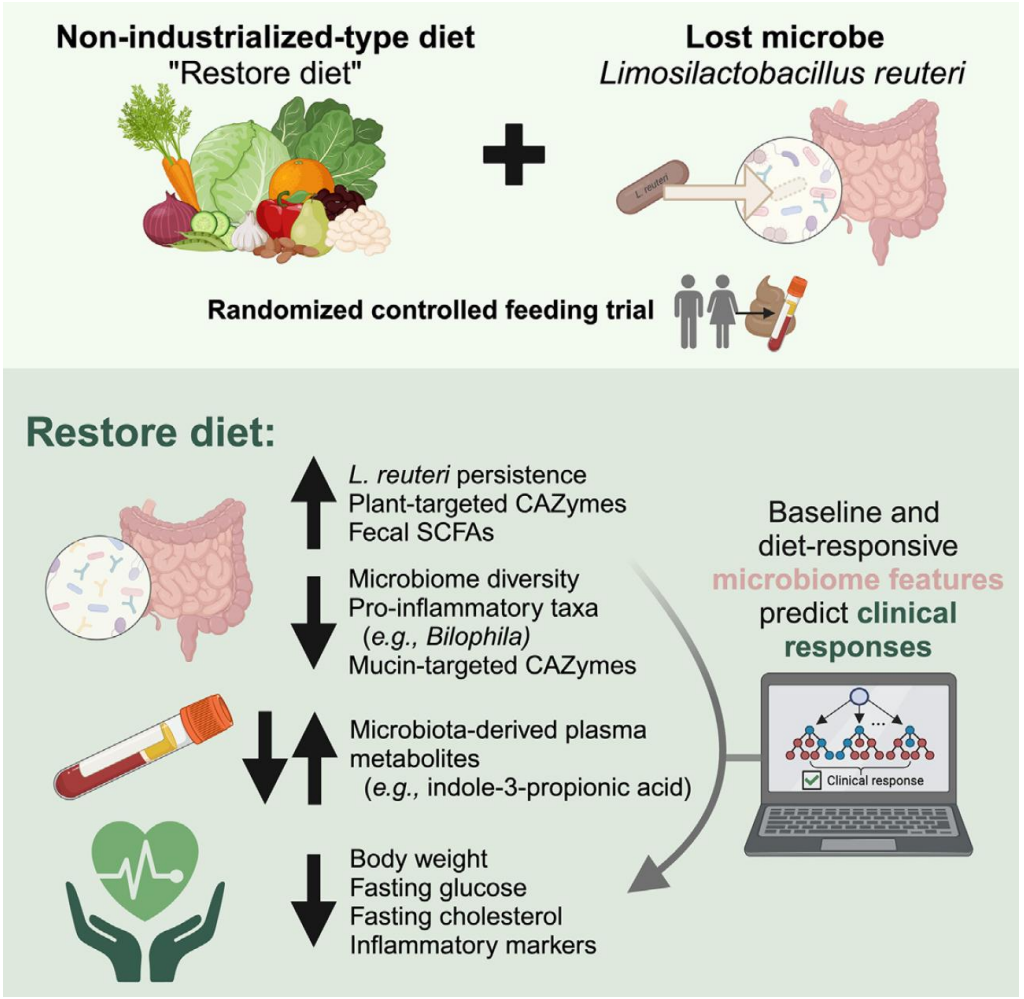
Rot: UPF





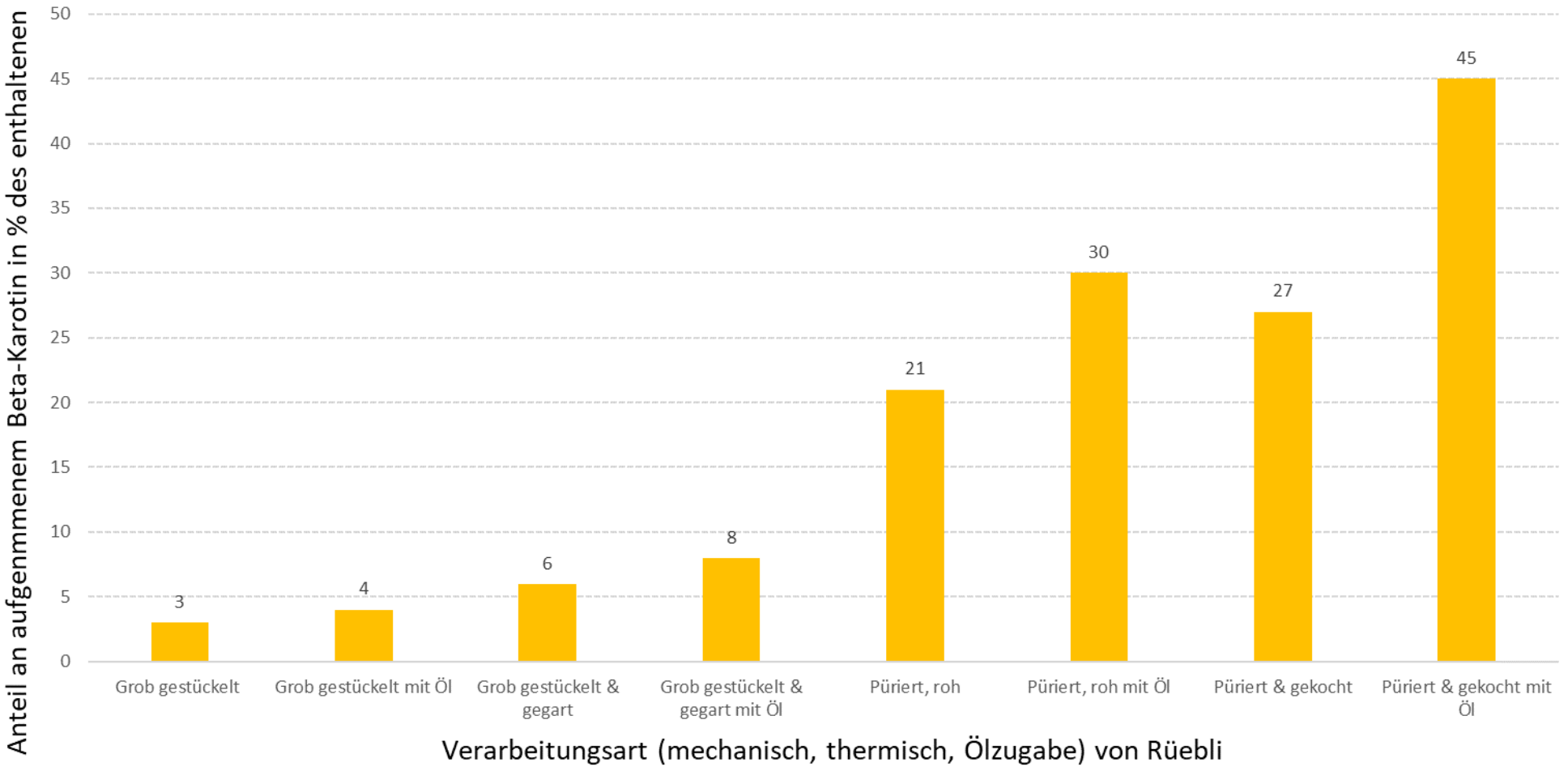
Diabetes Obes Metab. 2024;26:5431–5443.

Cardiometabolic benefits of a non-industrialized diet are associated with modification of the gut microbiome



Li et al., 2025, Cell 188, 1–22. https://doi.org/10.1016/j.cell.2024.12.034

Proportion (%) of beta-carotene absorbed from carrots depending on the type of processing



https://impuls.migros.ch/de/ernaehrung/ernaehrungswissen/umgang-mit-lebensmitteln/naehrstoffe-gemuese;
European Journal of Clinical Nutrition volume 56, pages425–430 (2002); European Journal of Nutrition volume 42, pages338–345 (2003)

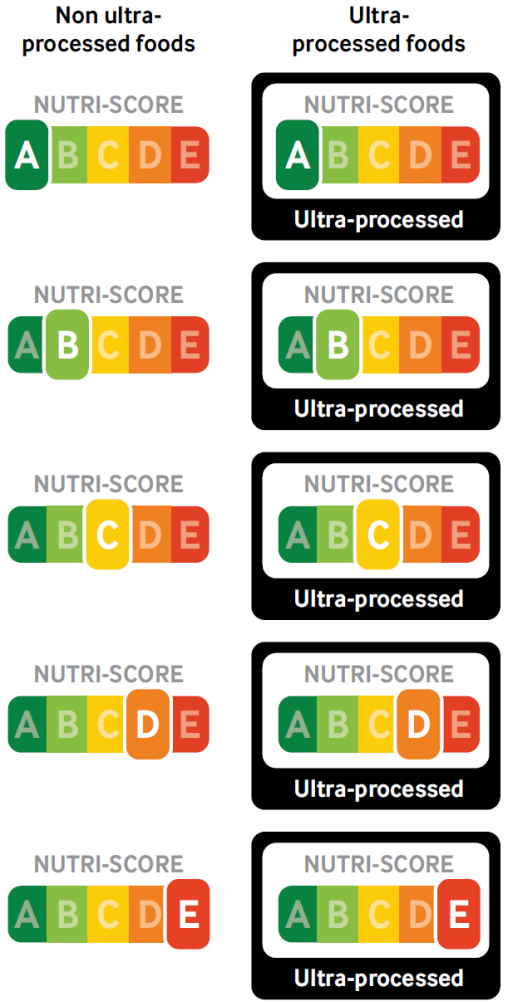
Advantages and disadvantages of food processing

Advantages	Disadvantages
• Faster transit through the digestive system; processing = "pre-digestion" • More calories and nutrients become available to the body per unit of time • Higher tolerance, as problematic substances are "neutralized" or removed, e.g. lactose • Carbohydrates become more available, targeted dosage of quantity and composition • Proteins: Composition of amino acids according to requirements • Dietary fibers can be (selectively) removed • Micronutrients with high bioavailability • Large selection of products Personalization • Convenience: available everywhere and for a long time • Manufacturers can "design" a product for a label	• Poorer satiety capacity → More calories needed → Risk of weight gain • Possible increased risk of chronic diseases (NCD) • For drinks: Deviation from water slows gastric emptying • Benefits of whole proteins (e.g. milk) are lost • Oversupply of micronutrients • Problems with digestion: microbiome changes, constipation • Problematic eating behavior, knowledge and skills for shopping/preparation are not acquired • Loss of control over processing & content • Potentially harmful ingredients & substances from packaging (endocrine disruptors) • Expensive, harmful to the environment

How can I reduce the amount of processing in my diet?

- Buy food whose origin and production I know
- When shopping, choose products that have been around for a long time and don't need advertising
- Don't be tempted to buy by labels or special claims
- Pay attention to a short list of ingredients (ideally < 5 ingredients), should be easy to understand
- Long shelf life without refrigeration = an indication of heavy processing
- Fermented products are often unproblematic
- Basis of the diet: little or unprocessed products (e.g. fruit, vegetables, nuts, pulses, quinoa,...)
- If processing, then preferably do it yourself. This way you stay in control
- When eating out, give preference to cuisines that require little processing, e.g. Thai, Vietnamese, Japanese

UPF: Label addition to Nutriscore?



BMJ 2023;383:e075294 | doi: 10.1136/bmj-2023-075294

BLV: Nutri-Score (admin.ch)

Check nutritional information

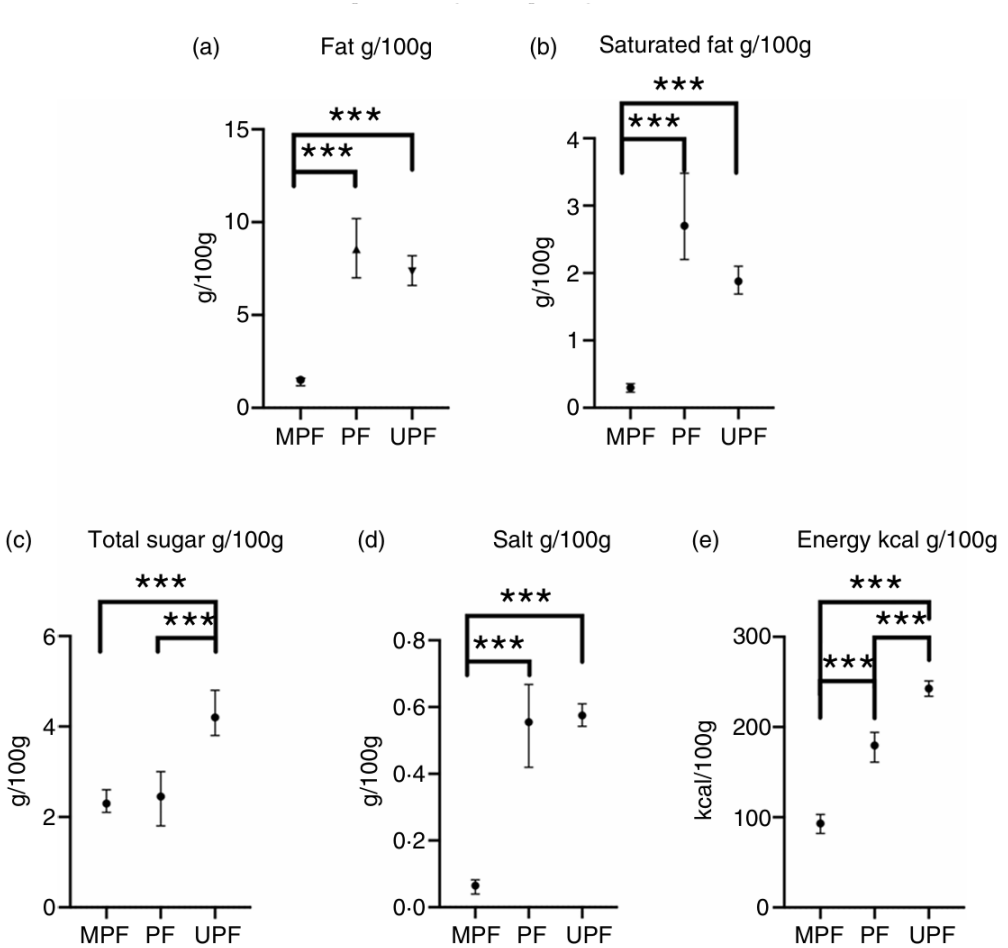
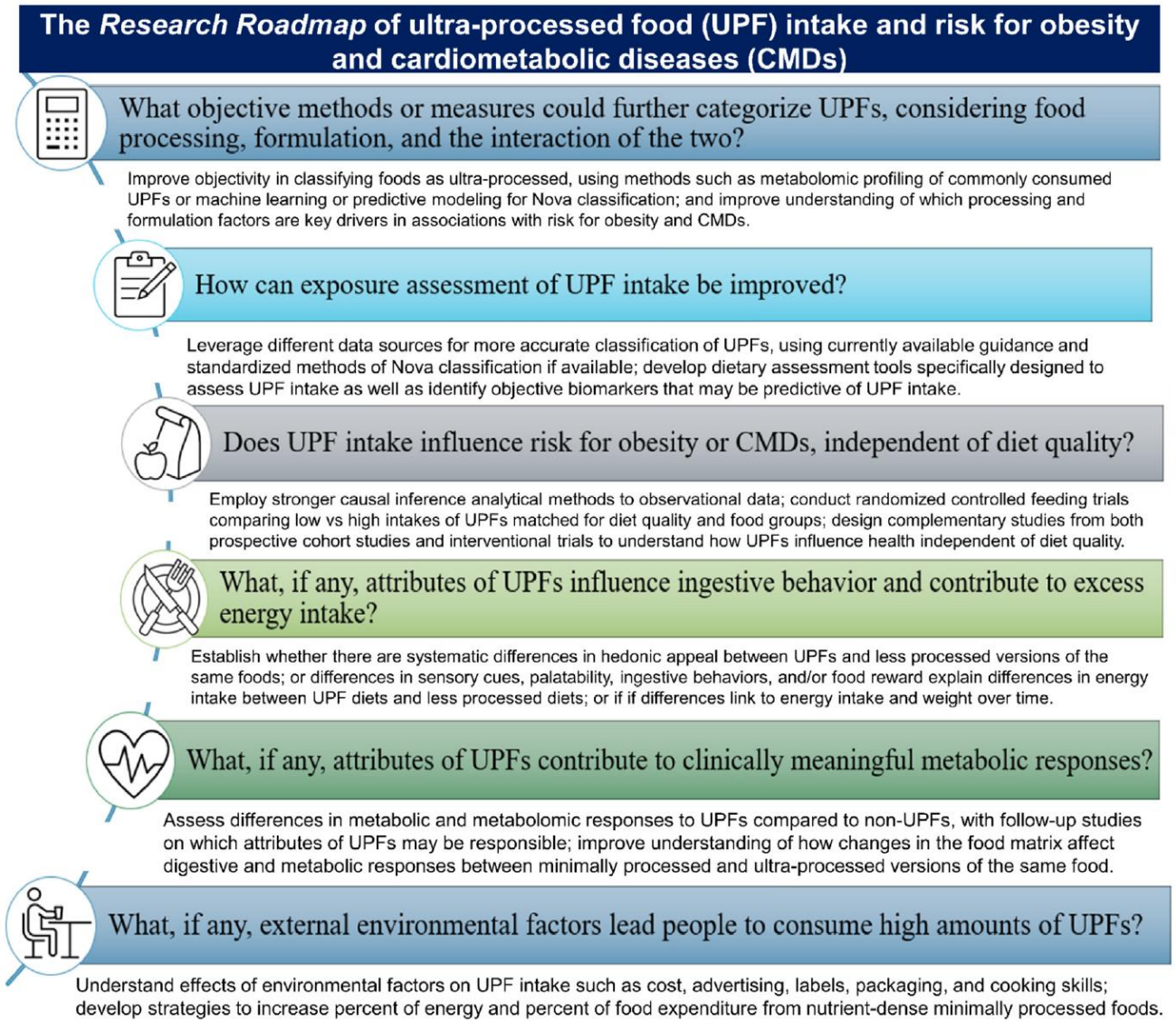


Fig. 1. Average fat (a), saturated fat (b), total sugar (c), salt (d) and energy (e) content across NOVA food groups (*n* 2980). Median with 95 % CI. ***denotes significance at $P < 0{\cdot}001$ conducted from Kruskal–Wallis ANOVA with Bonferroni correction for multiple comparisons. MPF, minimally processed food; PF, processed food; UPF, ultra-processed food.

British Journal of Nutrition (2024), 131, 1619–1632. https://doi.org/10.1017/S0007114524000096



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Fazit

- UPF: great (increasing?) importance, more additives
- Indications of health risks (especially cardiometabolic) → Need for countermeasures?
- No labeling for UPF → At least eliminate disincentives / increase pressure for reformulation?
- More research for...
  - a more stringent identification and classification of UPF (e.g. focus on "cosmetic“/ “promotional” additives, manufacturing processes)
  - Data on consumption and occurrence by product group
  - reformulation to reduce the degree of processing & elimination of potentially problematic ingredients
  - Alternative processing (fermentation) or biofortification
  - More transparency regarding UPF when shopping & eating out → Amendments to the Food Act?

Bleiben Sie informiert

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