**Supplemental table 1.** NOVA food classification based on the extent and purpose of industrial processing. Adapted with permission from Martinez-Steele at al. 2017.(1)

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| Food processing level and definitions | Examples | | Subgroups |
| 1. Unprocessed or minimally processed foods  Unprocessed foods are those obtained directly from plants or animals (such as green leaves and fruits, or eggs and milk) and purchased for consumption without having undergone any alteration following their removal from nature.  Minimally processed foods are natural foods that have been submitted to cleaning, removal of inedible or unwanted parts, fractioning, grinding, drying, fermentation, pasteurization, cooling, freezing, or other processes which do not add substances to the original food.  The purpose of minimum processes is to preserve and store foods; decrease stages of food preparation (cleaning and removing inedible parts); facilitate digestion or increase palatability (e.g. grinding or fermentation). | Natural, packaged, cut, chilled or frozen vegetables, fruits, potatoes, cassava, and other roots and tubers; bulk or packaged white, parboiled and wholegrain rice; whole or separated corn; grains of wheat and other cereals that are dried, polished, or ground as grits or flour; dried or fresh pasta made from wheat flour and water; all types of beans; lentils, chickpeas, and other legumes; dried fruits, fresh or pasteurized fruit juices without added sugar or other substances; nuts, peanuts, and other oilseeds without salt or sugar; fresh and dried mushrooms and other fungi; fresh and dried herbs and spices; fresh, frozen, dried beef, pork, poultry and other meat and fish; pasteurized, ‘long-life’ and powdered milk; fresh and dried eggs, yoghurt without sugar; and tea, herbal infusions, coffee, and tap, spring and mineral water. | 1. Legumes 2. Roots and tubers 3. Vegetables 4. Fruits and 100% juices 5. Meat and poultry 6. Fish and seafood 7. Eggs 8. Milk and plain yoghurt 9. Grains 10. Pasta 11. Other unprocessed/minimally processed foods: unsalted nuts and seeds; yeast; dried fruits (without added sugars) and vegetables; non- presweetened, non-whitened, non-flavored coffee and tea; coconut water and meat; flours; tapioca | |
| 2. Processed culinary ingredients  Substances extracted from natural foods or from nature itself by processes such as pressing, grinding, crushing, pulverizing, and refining. The purpose is to obtain ingredients to season and cook natural or minimally processed foods. | Plant oils; coconut and animal fats (including butter and lard); table sugar, maple syrup (100%), molasses and honey; and table salt. | 1. Sugar 2. Plant oils 3. Animal fats 4. Other processed ingredients: cacao powder, maple syrup, agave, evaporated milk, leavening agents, corn starch | |
| 3. Processed foods  Simple products manufactured with the addition of salt or sugar or other substance of common culinary use, such as oil or vinegar, to natural or minimally processed foods. This group also includes alcoholic drinks produced by the fermentation of group 1food items.  The purpose of processing is to prolong duration and modify the palatability of foods. | Canned and bottled vegetables, legumes or fruits; salted nuts or seeds; salted, smoked or cured meat or fish; canned sardine and tuna; cheeses, and breads made of ingredients used in culinary preparations (i.e. wheat flour, yeast, water, salt, butter or sugar), wine, beer and cider. | 1. Cheese 2. Salted, smoked or canned meat or fish 3. Vegetables, fruits, other plant foods preserved in brine, sugar or syrup 4. Other processed foods: Salted or sugared nuts and seeds; nut butters; beer and wine. | |
| 4. Ultra-processed foods  Food and drink products whose manufacture involves several stages and various processing techniques and ingredients, many of which are used exclusively by industry. This group also includes drinks produced by fermentation of minimally processed food items followed by distillation and eventual addition of sugars or other substances, such as rum, whiskey, vodka, gin, and liqueurs.  The purpose of processing is to create durable, accessible, convenient, and highly palatable, ready-to-drink, ready-to-eat, or ready-to-heat products typically consumed as snacks or desserts or as fast meals, which replace dishes prepared from scratch. | Confectionery, soft drinks, sweetened juices and dairy drinks, powdered fruit drinks, sausages, chicken and fish nuggets or sticks and other pre-prepared frozen dishes, dried products such as cake mix, powdered soup, instant noodles, ready-seasonings, and an infinity of new products including packaged snacks, morning cereals, cereal bars, and ‘energy’ drinks. Sugar substitutes, sweeteners and all syrups (excluding 100% maple syrup). Breads and baked goods become ultra-processed products when, in addition to wheat flour, yeast, water, and salt, their ingredients include substances nut used in culinary preparations such as hydrogenated vegetable fat, whey, emulsifiers, and other additives. | 1. Desserts and other sugary products 2. Breakfast cereals 3. Salty snacks 4. Sweet snacks 5. Frozen, canned and shelf-stable prepared meals 6. Sauces, dressings and gravies 7. Milk-based drinks 8. Soft drinks, carbonated 9. Other sweet beverages (including fruit drinks) 10. Ready-to eat prepared meals such as deli or bakery 11. Other ultra-processed foods: Frozen chicken patties, Fish sticks, frozen vegetables with sauce added, microwave dinners, bagged complete dinners, pizza; canned soups, chili, Spaghetti’s; and dry soups, macaroni and cheese | |

**Supplemental table 2.** Relative energy contribution (%kcal) of purchased foods within each NOVA processing level, among households with high UPF purchases/high HEI-2015, high UPF purchases/low HEI-2015, low UPF purchases/high HEI-2015, low UPF purchases and low HEI-2015, respectively, in USDA's National Household Food Acquisition and Purchase Survey (2012-2013). High and low UPF purchases defined as ≥67.9 and <48.4%kcal from UPF, respectively; High and low HEI-2015 defined as total score ≥60 and <40, respectively.

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| **NOVA subgroups** | **All groups** | |  | **High UPF**  **High HEI-2015**  N=163 | | **High UPF**  **Low HEI-2015**  N=385 | | ***P A*** | **Low UPF**  **High HEI-2015**  N=515 | | **Low UPF**  **Low HEI-2015**  N=135 | | ***P*** B |
|  | **Mean** | **SE** |  | **Mean** | **SE** | **Mean** | **SE** |  | **Mean** | **SE** | **Mean** | **SE** |  |
| **Unprocessed/minimally processed foods (%kcal)** | 28.4 | 0.4 |  | 18.6 | 0.7 | 10.6 | 0.8 | <0.001 | 46.8 | 1.4 | 33.7 | 4.6 | 0.012 |
| Legumes | 0.4 | 0.1 |  | 0.1 | 0.1 | 0.01 | 0.0 | 0.056 | 1.1 | 0.3 | 0.02 | 0.0 | <0.001 |
| Roots and tubers | 1.6 | 0.1 |  | 1.2 | 0.3 | 0.3 | 0.1 | 0.009 | 2.6 | 0.4 | 0 .9 | 0.3 | <0.001 |
| Vegetables | 1.8 | 0.1 |  | 1.5 | 0.1 | 0.4 | 0.1 | <0.001 | 3.2 | 0.3 | 1.1 | 0.4 | 0.003 |
| Fruits and 100% fruit juices \* | 4.9 | 0.2 |  | 6.4 | 0.6 | 1.4 | 0.3 | <0.001 | 9.6 | 0.5 | 0.9 | 0.2 | <0.001 |
| Meat/poultry | 6.7 | 0.4 |  | 2.6 | 0.4 | 3.2 | 0.4 | 0.368 | 8.2 | 0.8 | 13.2 | 2.7 | 0.114 |
| Fish and sea food | 0.7 | 0.1 |  | 0.2 | 0.7 | 0.1 | 0.9 | 0.336 | 2.1 | 0.5 | 0.1 | 0.1 | 0.001 |
| Eggs | 1.3 | 0.1 |  | 0.7 | 0.2 | 0.9 | 0.2 | 0.561 | 1.5 | 0.2 | 1.1 | 0.3 | 0.238 |
| Milk and plain yoghurt | 4.4 | 0.1 |  | 3.5 | 0.3 | 2.3 | 0.4 | 0.016 | 5.8 | 0.5 | 4.5 | 1.3 | 0.387 |
| Grains | 1.6 | 0.2 |  | 0.4 | 0.2 | 0.2 | 0.1 | 0.395 | 3.1 | 0.4 | 1.9 | 0.8 | 0.218 |
| Pasta | 1.4 | 0.2 |  | 0.5 | 0.2 | 0.4 | 0.1 | 0.896 | 1.2 | 0.2 | 3.7 | 1.3 | 0.073 |
| Other unprocessed/minimally processed foods † | 3.5 | 0.3 |  | 1.6 | 0.4 | 1.3 | 0.5 | 0.737 | 8.3 | 1.0 | 6.2 | 1.4 | 0.270 |
| **Processed culinary ingredients (%kcal)** | 6.6 | 0.3 |  | 0.5 | 0.3 | 1.6 | 0.4 | 0.06 | 8.9 | 0.7 | 19.2 | 2.5 | 0.001 |
| Sugar | 2.5 | 0.2 |  | 0.2 | 0.2 | 0.7 | 0.4 | 0.271 | 2.3 | 0.6 | 8.5 | 1.3 | <0.001 |
| Plant oils | 2.4 | 0.2 |  | 0.2 | 0.1 | 0.1 | 0.1 | 0.445 | 5.4 | 0.8 | 5.6 | 0.9 | 0.948 |
| Animal fats | 1.6 | 0.0 |  | 0.1 | 0.0 | 0.8 | 0.2 | <0.001 | 1.0 | 0.2 | 5.0 | 1.5 | 0.015 |
| Other processed culinary ingredients | 0.2 | 0.0 |  | 0.1 | 0.0 | 0.03 | 0.0 | 0.585 | 0.2 | 0.1 | 0.1 | 0.1 | 0.448 |
| **Processed foods (%)** | 9.2 | 0.3 |  | 4.8 | 0.7 | 4.2 | 0.5 | 0.370 | 12.9 | 1.1 | 12.8 | 2.6 | 0.986 |
| Cheese | 3.2 | 0.1 |  | 1.3 | 0.2 | 2.1 | 0.3 | 0.019 | 3.7 | 0.3 | 5.1 | 0.9 | 0.158 |
| Ham; salted, smoked or canned meat/fish | 1.5 | 0.1 |  | 0.8 | 0.3 | 1.1 | 0.2 | 0.506 | 1.4 | 0.2 | 6.1 | 2.5 | 0.067 |
| Vegetables, fruits, other plant foods preserved in brine, sugar or syrup | 0.7 | 0.1 |  | 0.7 | 0.2 | 0.3 | 0.1 | 0.035 | 0.7 | 0.2 | 0 .5 | 0.1 | 0.432 |
| Other processed foods ‡ | 3.8 | 0.3 |  | 2.0 | 0.4 | 0.7 | 0.1 | 0.002 | 7.0 | 0.8 | 1.1 | 0.5 | <0.001 |
| Commercial baby foods (non-ultra-processed) | 0.01 | 0.2 |  | 0.001 | 0.0 | 0.04 | 0.0 | 0.298 | 0.01 | 0.0 | 2.0e-12 | 0.0 | 0.175 |
| **Ultra-processed foods (%)** | 55.8 | 0.6 |  | 78.1 | 0.6 | 83.7 | 0.9 | <0.001 | 31.5 | 0.8 | 34.3 | 1.8 | 0.115 |
| Reconstituted meat or fish products | 2.6 | 0.2 |  | 2.0 | 0.3 | 4.4 | 0.5 | <0.001 | 1.2 | 0.2 | 1.8 | 0.4 | 0.217 |
| Breads | 8.7 | 1.2 |  | 10.1 | 1.2 | 10.9 | 1.0 | 0.604 | 5.8 | 0.3 | 5.5 | 1.1 | 0.736 |
| Cakes, cookies and pies | 6.3 | 1.4 |  | 7.7 | 1.4 | 13.1 | 1.6 | 0.017 | 3.5 | 0.3 | 2.8 | 0.6 | 0.272 |
| Ice cream, frozen yogurt | 2.2 | 0.1 |  | 2.1 | 0.5 | 4.5 | 0.7 | 0.008 | 0.8 | 0.2 | 1.3 | 0.4 | 0.268 |
| Desserts and other sugary products | 1.9 | 0.1 |  | 1.7 | 0.6 | 3.2 | 0.5 | 0.060 | 0.7 | 0.1 | 1.9 | 0.4 | 0.003 |
| Breakfast cereals | 2.9 | 0.1 |  | 7.3 | 1.6 | 1.9 | 0.4 | 0.002 | 2.5 | 0.3 | 0.7 | 0.2 | <0.001 |
| Salty snacks | 5.6 | 0.2 |  | 9.8 | 1.1 | 7.1 | 1.0 | 0.065 | 3.6 | 0.5 | 1.5 | 0.3 | 0.001 |
| Sweet snacks | 3.2 | 0.2 |  | 6.9 | 1.9 | 5.0 | 0.6 | 0.240 | 1.5 | 0.2 | 1.2 | 0.4 | 0.507 |
| Frozen, canned and shelf-stable prepared meals § | 7.6 | 0.2 |  | 8.6 | 1.8 | 11.9 | 1.2 | 0.007 | 3.7 | 0.4 | 4.0 | 0.8 | 0.711 |
| Sauces, dressings and gravies | 3.1 | 0.2 |  | 3.7 | 0.7 | 3.0 | 0.5 | 0.497 | 2.4 | 0.4 | 2.3 | 0.8 | 0.866 |
| Milk-based drinks | 1.8 | 0.1 |  | 3.0 | 0.5 | 0.8 | 0.2 | 0.001 | 1.7 | 0.3 | 0.6 | 0.4 | 0.013 |
| Soft drinks, carbonated | 2.6 | 0.2 |  | 1.3 | 0.2 | 6.8 | 1.2 | <0.001 | 0.7 | 0.1 | 1.7 | 0.5 | 0.048 |
| Other sweetened beverages (including fruit drinks) | 2.8 | 0.1 |  | 3.7 | 0.4 | 4.4 | 0.9 | 0.557 | 1.0 | 0.2 | 3.7 | 1.3 | 0.057 |
| Other ultra-processed foods|| | 3.3 | 0.2 |  | 5.8 | 1.2 | 4.9 | 0.9 | 0.585 | 1.6 | 0.2 | 4.8 | 2.4 | 0.200 |
| Ready-to-eat prepared meals | 1.2 | 0.1 |  | 2.5 | 0.6 | 1.1 | 0.3 | 0.068 | 0.9 | 0.2 | 0.6 | 0.4 | 0.482 |

UPF, Ultra-processed food; HEI-2015, Healthy Eating Index total score; SE, Standard error.

High UPF defined as ≥67.9%kcal from UPF; low UPF defined as <48.4% from UPF; High HEI-2015 defined as total score ≥60; Low HEI-2015 defined as total score <40.

A P-values for differences between "High UPF/High HEI-2015" and "High UPF/Low HEI-2015" households estimated through unadjusted linear regression.

B P-values for differences between "Low UPF/High HEI-2015" and "Low UPF/Low HEI-2015" households estimated through unadjusted linear regression.

\* Including 100% fruit juices and baby food juices.

† Nuts and seeds (unsalted); yeast; dried fruits (without added sugars) and vegetables; non- presweetened, non-whitened, non-flavored coffee and tea; coconut water and meat; flours; tapioca.

‡ Salted or sugared nuts and seeds; peanut, sesame, cashew and almond butter or spread; beer and wine. ǀ Legumes, vegetables, meats and/or entrees, fruits

§ Frozen chicken patties, Fish sticks, frozen vegetables with sauce added, microwave dinners, bagged complete dinners, pizza; canned soups, chili, Spaghetti’s; and dry soups, macaroni and cheese, taco kits, dry salad kits, etc.

|| Meatless patties and fish sticks; margarine; sugar substitutes, sweeteners and all syrups (excluding 100% maple syrup); distilled alcoholic drinks.

References

1. Martinez Steele E, Baraldi LG, Louzada ML, Moubarac JC, Mozaffarian D, Monteiro CA. Ultra-processed foods and added sugars in the US diet: evidence from a nationally representative cross-sectional study. *BMJ Open*. 2016;6(3):e009892.