

# Sugars Factsheet

## Introduction

Noncommunicable diseases (NCDs) are the world's leading cause of death, responsible for 71% of all deaths globally (1). Of the six WHO Regions, the WHO European Region is the worst affected by NCD-related morbidity and mortality at almost 90% of all deaths (2). An unhealthy diet is one of the four main behavioural risk factors for NCDs (1). Obesity is a disease in its own right, but at the same time it is a major risk factor for a number of NCDs, including cardiovascular diseases, type 2 diabetes and certain types of cancer. Overweight and obesity affects over 59% of adults and an increasing proportion of children in the Region (3). Excessive intake of free sugars threatens the nutrient quality of the diet by providing significant energy with little other nutritional benefits, leading to unhealthy weight gain and increased risk of overweight and obesity and other NCDs. Excessive sugar intake can also lead to dental caries and its associated health impacts (4). This factsheet will provide information about sugars and their different forms, reformulation and reduction policies and recommendations in the Region.

## Different types of sugars

Fig. 1. Classification at molecular level



### TYPES OF CARBOHYDRATES

#### Monosaccharides

(one sugar molecule)

Glucose

Fructose

Galactose

#### Disaccharides

(two sugar molecules)

Sucrose

Lactose

Maltose

#### Oligosaccharides

(two to ten sugar molecules)

Raffinose

Stachyose

#### Polysaccharides

(ten or more sugar molecules)

Starch

Glycogen







Cellulose

Simple carbohydrates include single sugars (monosaccharides) and disaccharides, oligosaccharides and polysaccharides.

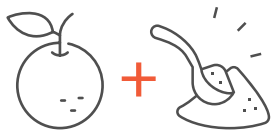
Source: Aryal, S. (2021). Carbohydrates- definition, structure, types, examples, functions (5).

Carbohydrates can be divided into monosaccharides, disaccharides, oligosaccharides and polysaccharides. Monosaccharides contain one sugar molecule, while disaccharides contain two monosaccharide sugar molecules. Oligosaccharides contain three to ten monosaccharides, and polysaccharides are complex molecules containing more than ten sugar molecules. Disaccharides, oligosaccharides and polysaccharides can all be broken down into monosaccharides.

# Examples of common sugars

Monosaccharides	Disaccharides
 <ul style="list-style-type: none"><li>• <b>Glucose</b> functions as an important energy source in living organisms and is the main sugar found in the blood.</li></ul>	 <ul style="list-style-type: none"><li>• <b>Sucrose</b> is composed of glucose and fructose. Commonly known as table sugar, it is one of the major contributors to free sugar consumption (6). It occurs naturally in sugar cane and sugar beet, and to a lesser degree in fruits and vegetables.</li></ul>
 <ul style="list-style-type: none"><li>• <b>Fructose</b> is typically found in fruits and is one of the sweetest occurring sugars in nature.</li></ul>	 <ul style="list-style-type: none"><li>• <b>Maltose</b> is composed of two glucose molecules. It is commonly used in beer production.</li></ul>
 <ul style="list-style-type: none"><li>• <b>Galactose</b> is typically found in nature combined with other sugars; for example, in lactose.</li></ul>	 <ul style="list-style-type: none"><li>• <b>Lactose</b> is composed of glucose and galactose. It is also known as milk sugar, as it is found in milk and other milk-based dairy products. In those who are lactose intolerant, the enzyme (lactase) needed to break down the lactose into digestible monosaccharides is lacking.</li></ul>

# Different definitions of sugars



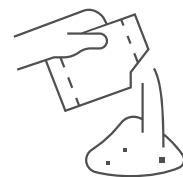
## Total sugars

Total sugars include intrinsic (naturally occurring) sugars, such as sugars in the structure of intact fruit and vegetables, milk sugar (lactose) and all added sugars in foods and beverages (7).



## Free sugars

Free sugars include monosaccharides and disaccharides added to foods and beverages by the manufacturer, cook or consumer and sugars naturally present in honey, syrups, fruit juices and fruit juice concentrate (7).

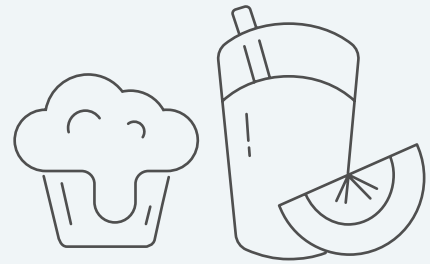


## Added sugars

Added sugars include sugars added to food during food processing, sugars used as sweeteners and sugars from honey and concentrated fruit or vegetable juices. Added sugars do not include naturally occurring sugars, such as sugars in the intact cell walls of fruit and vegetables, or sugars present in milk.

## Major sources of sugar in the diet

There are many sources of sugar in the diet. Studies of total, added and free sugars intakes among children, adolescents and adults from across Europe have shown that beverages and sweet products including confectionery, chocolates, cakes and biscuits make the most significant contribution to sugar intake across these age groups (8,9).



## Functions of sugars in the diet and in food manufacture

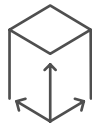
Sugars have different functions both in diet and manufacture.

### Functions in the diet

Sugars are energy sources providing 4 kcal of energy per gram. However, sugars are classed as a nonessential nutrient, as they do not provide other nutritional benefits.

  
kcal/gram

### Functions in food manufacture



#### Flavour

Sugars are added to food, cooking and baking processes to impart a sweet flavour, such as in confectionery, sugar-sweetened beverages (SSBs) and sauces.

#### Texture and volume

Sugars are added to drinks, syrups and sweet sauces to improve the texture. They are added during baking to increase the volume of products such as cake and biscuits. Sugars can also decrease the freezing point and increase the boiling point of foodstuffs, which is important for making ice creams and some confectionery.

#### Colour

The Maillard reaction and caramelization are the two main processes in which sugars interact with other ingredients to add colour to food to make it more visually appealing.

#### Preservation and safety

Sugars are used to prolong the shelf-life of food by limiting the growth of bacteria, mould and yeast.

#### Fermentation

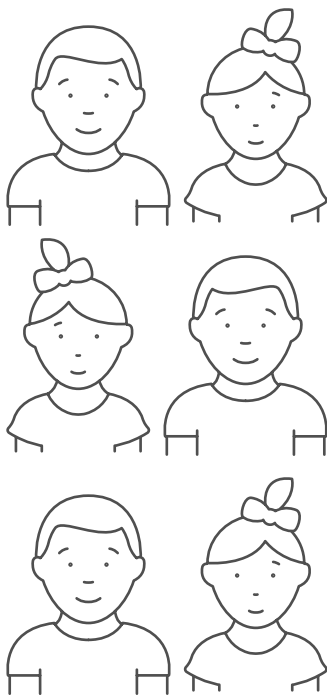
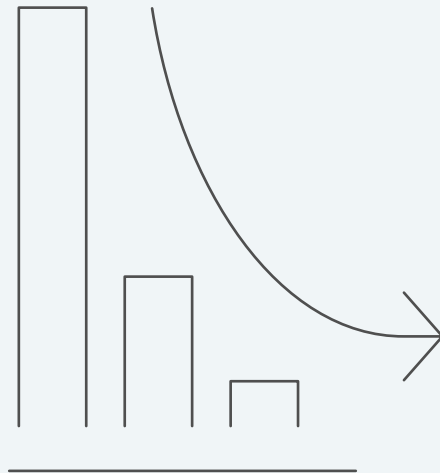
Sugars are broken down by enzymes of microorganisms under the absence of oxygen during fermentation. Common products created by fermentation are beer, wine, some breads, yoghurt, cheese and sauerkraut.

## WHO recommendations on free sugars

WHO has issued recommendations to reduce intake of free sugars throughout the life course. In both adults and children, WHO recommends reducing the intake of free sugars to less than 10% of total energy intake (4). This is a strong recommendation, which means that the effects of following the recommendation clearly outweigh any undesired outcomes (4). Furthermore, WHO suggests the reduction of free sugars intake to less than 5% of total energy intake as a conditional recommendation (4). A conditional recommendation is issued when the evidence around the benefits and risks of an intervention are less certain. Conversations with stakeholders are encouraged prior to policy-making and implementation to discuss the balance between the benefits and undesired outcomes of further reduction (4).

Reducing the intake of free sugars to less than

# 10%



# >10%

Children consumed more than 10% of their total energy intake from added sugars

## Reformulation and reduction

The majority of national dietary surveys conducted by WHO European Member States concerning sugar provide information on added sugar, rather than free sugar, intake (10). Of the countries that reported adult daily sugar intakes from a study within the WHO European Region, all reported exceeding 5% of total energy intake, although only Estonian and Finnish women were over the 10% recommendation (10). Another study on nutrient intakes for children and adolescents suggested that in countries where data on sugar intake were present, most children, particularly those aged 10 years or over consumed more than 10% of their total energy intake from added sugars (11).

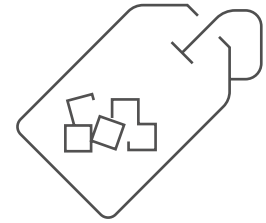
The literature to date shows that high sugar and low complex carbohydrate consumption increases the risk of overweight/obesity and NCDs, including diabetes and cardiovascular diseases (11). To reduce the intake of free sugars to less than 5% of total energy intake, WHO advocates in various ways for the promotion of a healthy diet (12). The WHO best buys action plan lists the most cost-effective and overarching initiatives that can help to prevent NCDs. These include reducing sugar intake through measures such as effective taxation on SSBs and reducing intake of nutrients that should be avoided, including sugars, through food labelling and mass media campaigns advocating healthy diets (12). This guidance serves as a helpful reference for policy-makers to implement effective sugar reformulation and reduction policies.

# Sugar reduction policies in the WHO European Region

## Food labelling

**Food labels in the European Union (EU) should include information on total sugars (14).**

In the EU the amount of total sugars must be declared on food labels below carbohydrates, stating the number of grams of sugar per 100 grams of product. However, this is not the case for non-EU countries in the Region, where there is no mandatory regulation to declare total sugar content on labels.



## Taxation

**Excise duty on sugar-sweetened products in European countries (12,13).**

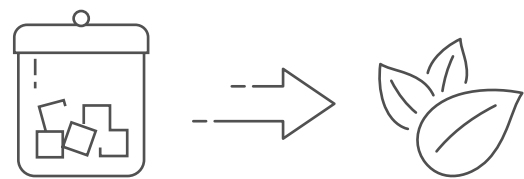
Various countries across the WHO European Region have successfully implemented taxes on products including SSBs, confectionary and ice cream.



## Other sugars reduction actions

**Products containing non-sugar sweeteners and artificial flavour enhancers are not allowed to be distributed to schools in many European countries (20).**

Non-sugar sweetened beverages are any low-calorie or diet beverage that contain non-sugar sweeteners. The evidence base continues to grow on the health impacts of non-sugar sweeteners, such as potential effects on glucose metabolism (21–23) and risk of weight gain (24,25) and a consensus is yet to be reached. Therefore, some countries have imposed measures to limit consumption of non-sugar sweeteners. In Greece, non-sugar sweeteners are prohibited within junior high school and high school canteens. In Hungary, schoolchildren under 6 years old are prohibited from drinking beverages sweetened with non-sugar sweeteners. In Malta and Spain, non-sugar sweeteners are not allowed in schools at all.



## Sugar Reformulation

**Replace sugars with non-sugar sweeteners (15,16).**

Sugar used in food and beverages can be reduced by partially or completely replacing sugars with non-sugar sweeteners. In the EU, non-sugar sweeteners such as stevia, luo han guo (monk fruit), erythritol, mannitol, saccharin, aspartame, cyclamate, sucralose and acesulfame potassium are permitted for use within food industry under specific regulations. These can be up to 3000 times sweeter than sugar, but do not replace the functional qualities that sugars can also provide.

**Replace sugars with herbs and spices (17).**

Herbs and spices can be used to partially or fully replace sugars. The addition of herbs and spices can enhance the flavour of food without using either sugars or non-sugar sweeteners. This approach can be particularly effective in savoury products such as sauces and chutneys.

**Public health campaigns advocating for the gradual reduction of added sugar intake in the diet (18).**

Sugar reduction without substitution for any other ingredients is recommended as an effective method for sugar reformulation. Food-based dietary guidelines from many European countries such as Austria, Denmark, Hungary, Portugal, Sweden and the United Kingdom recommend the gradual reduction of sugars added to food until taste preferences adjust to lower sweetness levels (18,19).

# References<sup>1</sup>

1. Fact sheet: noncommunicable diseases. Geneva: World Health Organization; 2021 (<https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases>).
2. Overweight. In: European Health Information Gateway [online database]. Copenhagen: WHO Regional Office for Europe; 2020 ([https://gateway.euro.who.int/en/indicators/h2020\\_6-overweight/visualizations/#id=17077](https://gateway.euro.who.int/en/indicators/h2020_6-overweight/visualizations/#id=17077)).
3. Noncommunicable diseases country profiles 2018. Geneva: World Health Organization; 2018 (<https://apps.who.int/iris/handle/10665/274512>).
4. WHO calls on countries to reduce sugars intake among adults and children. Geneva: World Health Organization; 2015 (<https://www.who.int/news/item/04-03-2015-who-calls-on-countries-to-reduce-sugars-intake-among-adults-and-children>).
5. Aryal S. Carbohydrates: definition, structure, types, examples, functions. Kathmandu: Microbe Notes; 2021 (<https://microbenotes.com/carbohydrates-structure-properties-classification-and-functions/>).
6. The science behind the sweetness in our diets. *Bull World Health Org.* 2014;92(11):780–1. doi: 10.2471/BLT.14.031114.
7. Guideline: sugars intake for adults and children. Geneva: World Health Organization; 2015 (<https://apps.who.int/iris/handle/10665/149782>).
8. Azaïs-Braesco V, Sluik D, Maillot M, Kok F, Moreno LA. A review of total & added sugar intakes and dietary sources in Europe. *Nutr J.* 2017;16(1):6. doi: 10.1186/s12937-016-0225-2.
9. Graffe MIM, Pala V, De Henauw S, Eiben G, Hadjigeorgiou C, Iacoviello L et al. Dietary sources of free sugars in the diet of European children: the IDEFICS Study. *Eur J Nutr.* 2020;59(3):979–89. doi: 10.1007/s00394-019-01957-y.
10. Rippin H, Hutchinson J, Evans C, Jewell J, Breda J, Cade J. Adult nutrition intake from current national dietary surveys of European population. *Nutrients.* 2017;9(12):1288. doi: 10.3390/nu9121288.
11. Rippin H, Hutchinson J, Jewell J, Breda J, Cade J. 2018. Child and adolescent nutrition intakes from current national dietary surveys of European populations. *Nutr Res Rev.* 2019;32:38–69. doi: 10.1017/S0954422418000161.
12. Tackling NCDs: ‘best buys’ and other recommended interventions for the prevention and control of noncommunicable diseases. Geneva: World Health Organization; 2017 (<https://apps.who.int/iris/handle/10665/259232>).
13. Food taxes and their impact on competitiveness in the agri-food sector. Rotterdam: European Competitiveness and Sustainable Industrial Policy Consortium; 2014 (<https://ec.europa.eu/docsroom/documents/5827/attachments/1/translations/en/renditions/native>).
14. Labelling of sugars in the EU. In: Health promotion and disease prevention knowledge gateway [website]. Brussels: European Commission; 2021 ([https://knowledge4policy.ec.europa.eu/health-promotion-knowledge-gateway/sugars-sweeteners\\_en#nav\\_Tocch2](https://knowledge4policy.ec.europa.eu/health-promotion-knowledge-gateway/sugars-sweeteners_en#nav_Tocch2)).
15. Mahato D, Keast R, Liem D, Russell C, Cicerale S, Gamlath S. Sugar reduction in dairy food: an overview with flavoured milk as an example. *Foods.* 2020;9(10):1400. doi: 10.3390/foods9101400.
16. Tandel KR. Sugar substitutes: health controversy over perceived benefits. *J Pharmacol Pharmacother.* 2011;2(4):236–43. doi: 10.4103/0976-500X.85936.
17. Peters J, Marker R, Pan Z, Breen J, Hill J. The influence of adding spices to reduced sugar foods on overall liking. *J Food Sci.* 2018;83:814–21. doi: 10.1111/1750-3841.14069.
18. The Eatwell guide: Helping you eat a healthy, balanced diet. London: Public Health England; 2018 ([https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/742750/Eatwell\\_Guide\\_booklet\\_2018v4.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/742750/Eatwell_Guide_booklet_2018v4.pdf)).
19. Summary of FBDG recommendations for sugars for the EU, Iceland, Norway, Switzerland and the United Kingdom. In: Health Promotion and Disease Prevention Knowledge Gateway [website]. Brussels: European Commission; 2021 ([https://knowledge4policy.ec.europa.eu/health-promotion-knowledge-gateway/food-based-dietary-guidelines-europe-table-14\\_en#BG](https://knowledge4policy.ec.europa.eu/health-promotion-knowledge-gateway/food-based-dietary-guidelines-europe-table-14_en#BG)).
20. Examples of implemented policies to address sweeteners intake. In: Health Promotion and Disease Prevention Knowledge Gateway [website]. Brussels: European Commission; 2021 ([https://knowledge4policy.ec.europa.eu/health-promotion-knowledge-gateway/sugars-sweeteners-11\\_en](https://knowledge4policy.ec.europa.eu/health-promotion-knowledge-gateway/sugars-sweeteners-11_en)).
21. Young RL, Isaacs NJ, Schober G, Wu T, Cvijanovic N, Pezos M et al. Impact of artificial sweeteners on glycaemic control in healthy humans. Paper presented at 53rd Annual Meeting of the European Association for the Study of Diabetes, Lisbon, Portugal. Düsseldorf: European Association for the Study of Diabetes; 2017 (<https://www.abstractsonline.com/pp8/#!/4294/presentation/4521>).
22. Ahmad SY, Fried J, Mackay D. The effects of non-nutritive artificial sweeteners, aspartame and sucralose, on the gut microbiome in healthy adults: secondary outcomes of a randomized double-blinded crossover clinical trial. *Nutrients.* 2022;12(11):3408. doi: 10.3390/nu12113408
23. Ahmad SY, Friel JK, Mackay DS. The effect of the artificial sweeteners on glucose metabolism in healthy adults: a randomized, double-blinded, crossover clinical trial. *Nutrients.* 2020;12(11):3408. doi: 10.3390/nu12113408.
24. Swithers SE. Artificial sweeteners produce the counterintuitive effect of inducing metabolic derangements. *Trends Endocrinol Metab.* 2013; 24:431–41. doi: 10.1016/j.tem.2013.05.005.
25. Pang MD, Goossens GH, Blaak EE. 2020. The impact of artificial sweeteners on body weight control and glucose homeostasis. *Front Nutr.* 2021;7. doi: 10.3389/fnut.2020.598340.

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<sup>1</sup> All references were accessed on 17 June 2022.