

SUSTAINABLE PRODUCTION & HEALTHY EATING

FACT SHEET



This fact sheet is one of a series compiled by the Food Innovation Centre at the University of Nottingham, providing clear, concise and scientifically reliable information on key topics for SMEs

Sugar Reduction in foods & drinks

Why sugar reduction

Sugar – excessive intake causes public health issues:

- **Diabetes:** Long term sugar over-indulgence can cause type 2 diabetes which is linked to obesity. This can cause symptoms like excessive thirst, tiredness and an increased risk of serious illness and death from Covid-19. The body becomes unable to convert excessive glucose (sugar) in blood to energy or store it.
- **Obesity:** In the UK, around 63% adults and 30% of children (aged 2-15) are overweight or obese (Health Survey for England 2015), these numbers are expected to increase due to the Covid-19 pandemic. Obesity increases the risk of dying prematurely, developing type 2 diabetes and contracting other health conditions (e.g. heart diseases and/or depression).
- **Dental problems.** Sugars in food and drinks play a major role in the development of dental cavities. Sugar feeds oral bacteria causing tooth decay, releasing acid to gradually dissolve tooth enamel and cause dental cavities.

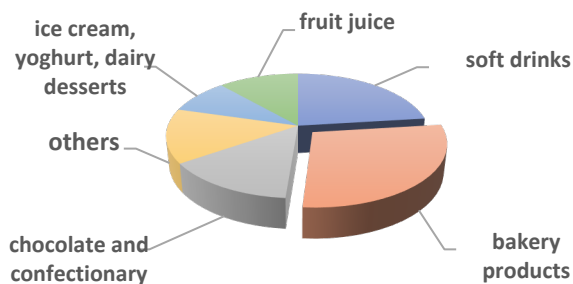
Other factors:

- **UK government policy (e.g. 'sugar tax'):** Public Health England initiated a sugar reduction program which started in 2015, this was followed by the introduction of a Soft Drink Industry Levy ('sugar tax') in 2018 aiming to reduce sugar consumption and encourage industry to reduce sugar content in food.
- **UK's National Food Strategy Part 2 (updated July 2021):** Proposes sugar and salt tax on all processed products, except ingredients for home cooking, and on food sold through foodservice channels ([Reference: click here](#)).
- **Increased market demand:** With the increase preference of healthy eating, consumers demand more healthier foods.

Which products ?

- Soft drinks and bakery products are the major contributors to excessive sugar intake. The soft drink industry successfully achieved 40% reduction in sugar since 2020, however, reducing sugar in baked goods is more complex, as sugar reacts with almost every ingredient in it.

Contributors to sugar intake in the UK (children aged 4-18 years)



Which type of sugar needs to be cut/limited?

- **Intrinsic sugars:** Contained in cellular structure of whole fruits and vegetables, naturally present in dairy products (e.g. milk lactose) – there is no need to limit them, as they are digested and absorbed in the body slowly.
- **Free sugars:** This is the worst type of sugar that WHO has recommended to cut down (i.e. limited to: $\leq 5\%$ of daily total calories). These include sugars added to foods and drinks during manufacturing or home cooking, and sugars naturally present in honey, syrups, and fruit juice.

Sugar reduction market and trends

- According to WiseGuy Market report 2021, the global sugar reduction technologies market is expected to grow at a CAGR of 9% during the forecast period (2020-2025). The main market drivers include, consumers increased awareness of sugar intake reduction due to increased number of health issues, a growing interest in healthy eating which is encouraging food & drink industries to introduce sugar substitutes into products. These pressures as well as stringent government guidelines, are leading to reduction of high sugar content in food products. The key market segments are artificial sweeteners and natural derived sweeteners.
- In the UK, food sweeteners are estimated to grow at a slower pace (CAGR of 1.59%) during 2020-2025, within this, sugar substitutes are the fastest growing market. Especially Xylitol, as the key market trend accounts for the largest market share of around 20%, primarily due to extensive applications in food sector. The major players for innovation in sweetener market in the UK includes: Tate & Lyle, Cargill, DuPont, Ingredion etc.,

Can sugars be replaced ?

- Traditional sugar (sucrose) used in foods and drinks can be replaced by sugar replacers/alternatives. There are many types of sugar replacers available on the market.
- Some substitutes are not sweet but mainly contribute to the body structure (bulk) property of the product when sugar is reduced. For example, non-sweet bulk agents such as starches, maltodextrin, hydrocolloids and dietary fibers etc.
- Some alternatives are very sweet (i.e. high intensive sweeteners), and have very few or no calories (also called non-nutritive sweeteners) and do not cause dental cavities. However they are only used to replace some or all of sweetness and cannot replace the volume or browning property of sugar.
- Others such as polyols (sugar alcohol), replace some of the sweetness and structure (bulk), however, do not perform in the same way in the finished products in most of cases.
- A mixed solution is needed for sugar replacement.

What are the challenges around reducing sugar ?

- **Technical challenges (taste and consumers acceptance):** Reducing sugar in Food & Drinks is complex. **1)**, non-sugar sweeteners don't have the same sweetness intensity as sucrose, and may also introduce other flavours (I.e. bitterness) into final product. **2)**, currently there is no single ingredient can replace all functional roles of sugar in every product, thus product quality in terms of sensory attributes such as appearance/colour, texture, volume and microbial shelf life, is affected by lowering or removing sugar, which may change consumers' choice and acceptance.
- **Social-economic challenge (cost and consumer expectation):** Reformulation for an existing product with reduced sugar, or innovation and promotion for a new food product with reduced or no sugar, requires knowledge and investment input. It could increase industries' cost and product price, thereby may affect consumers' purchase behavior and expectations. Especially as sugar is the number one ingredient consumers look for when checking a nutritional label.
- **Regulatory challenges:** Food SMEs should be aware that any 'on-pack' claim around sugar reduction must comply with legislations and is not misleading. Moreover, sweeteners are food additives, if use, SMEs should follow relevant regulations and use appropriate amount to improve product taste; however, there are still some legislation discrepancies among the EFSA, FSA and FDA concerning sweeteners.

Healthy Eating Fact: Sugar related nutritional claims including 'Low sugars', 'Sugar-free', 'With no added sugars'.

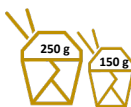
All sugars: 1g = 4 calories (kcal), Reference intake (RI) for total sugars per day is 90g (included 30g free sugar).

Functional role of sugars in foods:

Functionality	In bakery products	In dairy products
Flavour	Provides sweetness taste; flavours from Maillard reactions	Provides sweetness taste, flavour from Maillard reactions
Bulk agent	Contributes volume (solid state)	Contributes solid/viscosity
Viscosity control ; mouthfeel	Sugar solution gives viscosity in aqueous phase in batter, help trap air	Dissolved sugar alters (increases) viscosity in dairy beverages
Shelf-life	Extend shelf-life ($a_w \downarrow$)	Extend shelf-life
Structure formation	Affecting starch, protein set/network development during baking	e.g. affecting structure(e.g. ice crystal) formation in ice cream
Texture	Soften texture	Contribute mouthfeel
Colour	Contributes browning colour due to Maillard reaction and/or caramelisation	Maillard reaction and/or caramelisation in dairy desserts
Emulsification	Emulsification enhancement	Emulsification enhancement

How to reduce sugar for food businesses?

Government policy: Public Health England guidelines



1). Reformulating – food manufacturers could change the recipe of a product to lower the levels of sugar.

2). Reduce the portion size, and/or the number of calories in single-serve products.

3). Shifting consumer purchasing towards lower/no added sugar products, introducing healthier alternatives and incentivizing people to buy them.

Strategies of re-formulation: sugar reduction in bakery products

- **1: Use of sweet bulk agents.** The most commonly used sweet bulk agents for sugar reduction is polyols (also called sugar alcohol) it includes xylitol, mannitol, sorbitol, maltitol, erythritol, lactitol etc. as sugar replacers, these nutritive sweeteners have different levels of sweetness and have various advantages to partially or fully replace sugars in foods depending on specific type, however, it also contributes calorie, thus, may not preferred for products those are with reduced calorie.
- **2: Use of non-sweet bulk agents in combination with high intensive sweeteners:** Non-sweet bulk agents (e.g. maltodextrin, starches etc) can perform as functional ingredient which can compensate the loss of volume and texture/bulk property due to sugar reduction, however, they don't contribute sweetness, therefore, they are usually used in combination with high intensive sweeteners (i.e. naturally or artificially) as sugar substitutes.
- **3: Other novel approaches: Sweet protein as potential sugar replacer, as well as sourdough technology.**
- **4: Stealth reduction:** Like the salt gradual reduction strategy (successfully implemented in the UK), a slow and progressive cut sugar from products (up to 5-30% depending product) can be a strategy where consumers can gradually adapt to a lower sugar content without impacting their sensory recognition.
- **5: Food matrix (structure) design & use of multisensory interactions:** As an example, double emulsion technology has been attempted for salt and sugar reduction (e.g. controlling sugar/salt release); this combined with using multisensory method would further enhance sweetness perception to achieve sugar reduction.
- **6: Solutions for clean label sugar reduction.** Adopt natural sugar from fruits and natural food ingredients to bring sweetness. Naturally sourced sweeteners (i.e. monk fruit, thaumatin, stevia) are seen as clean label. However, SMEs need to keep a close eye on food & drink regulations as there may be restrictions as to which countries and which product applications they can be used in.

Resources

Wentao Liu(2021) 'Sugar Reduction in foods'. In: Wentao Liu (2021) 'Healthy Eating'.

Contacts & further information

Written by Dr Wentao Liu (Jan 2021).

✉ SB-FoodInnovationCentre@exmail.nottingham.ac.uk

To download this document, the main reference guide and more:

🌐 <https://www.nottingham.ac.uk/biosciences/facilities/food-innovation-centre/research-healthy-eating.aspx>

If you want to know more and have issues you wish to discuss, contact the Food Innovation Team who may be able to help