

FD Food
Drink
Ireland

Ibec

The evolution of food and drink in Ireland 2005-2017

Reformulation and innovation: supporting
Irish diets



Foreword

By Linda Stuart-Trainor, Director of Prepared Consumer Foods, Ibec

"Reformulation has been ongoing in the food and drink industry for decades and is one of the most effective ways in which the sector can contribute to reducing obesity and improving public health".

Food and drink companies are constantly innovating in response to changing consumer lifestyles, tastes and demands. This innovation includes reformulation – the process by which food companies change product recipes to reduce fat, salt and sugar – adaptation of pack sizes and new product development.

Reformulation has been ongoing in the food and drink industry for decades and is recognised in a major study by the McKinsey Global Institute as an effective way in which the sector can contribute to reducing obesity and improving public health¹.

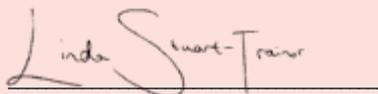
Food Drink Ireland (FDI) member companies have been at the cutting edge of reformulation, working to reduce nutrients without compromising taste or product safety. They have also made significant changes to their product portfolios, introducing a host of new products to the market and offering consumers a choice of lower calorie alternatives to their favourite products.

FDI member companies participating in this research project have undertaken a significant data gathering initiative to collect nutrient and sales volume data for 2005 and 2017. This report uses an innovative modelling approach to assess the impact of industry efforts on the daily diet of four population groups in Ireland: adults, teenagers, children and pre-schoolers. By incorporating changes in sales volume over those years, it also captures changes in what consumers actually chose to purchase.

With this report, the food and drink industry makes a major contribution to the store of public knowledge on the impact of reformulation and other food industry activities on changes in intakes of sugar, salt, saturated fat, total

fat and energy at the level of the daily diet. This has been made possible by the efforts of the 15 participating FDI member companies. Independent predictive modelling experts, Creme Global, developed the methodology and carried out the analysis. It is also important to acknowledge the advice that FDI has received from the Food Safety Authority of Ireland (FSAI) throughout this process.

It is widely acknowledged that no single intervention can reverse obesity or improve eating patterns^{1,2}. This report demonstrates the food and beverage industry's commitment to the societal effort to tackle obesity and to make progress towards meeting nutritional targets for the Irish population. Combined with consumer education and other initiatives outlined in the Government's *A Healthy Weight for Ireland: Obesity Policy and Action Plan*, the efforts of industry can help to take steps towards improving public health².



Linda Stuart-Trainor
Director of Prepared Consumer Foods, Ibec



Member company profiles

The 15 companies that provided data for the research outlined in this report represent many of the biggest food and beverage brands in Ireland, ensuring that some of the most consumed and loved products in the country have been analysed.



Britvic

Britvic Ireland is well-known for its iconic Irish brands such as Ballygowan, MiWadi, Club, TK and Cidona and has become the number one no/low sugar soft drinks business on the island of Ireland. It also has exclusive agreements to make and distribute global brands such as Pepsi, 7UP and Mountain Dew on behalf of PepsiCo.

Britvic Ireland is a verified member of Origin Green, the only sustainability programme in the world operating on a national scale, that unites government, the private sector and food and drink producers through Bord Bia, the Irish Food Board.

They are committed to making a positive difference to the health of their consumers by improving the nutritional value of their drinks, reducing calories and sugar levels, marketing them responsibly and providing clear nutritional information and guidance.



Coca-Cola Ireland; Coca-Cola Hellenic Bottling Company Ireland and Northern Ireland

Coca-Cola Ireland responsibly markets a full range of some of the world's leading drinks brands including Coca-Cola, Coca-Cola Zero Sugar, Diet Coke, Sprite, Fanta, and Schweppes. The Coca-Cola Company's operations in Ireland include concentrate manufacturing, financial, marketing and corporate services located in Dublin, Ballina, Drogheda and Wexford, employing approximately 1,000 people.

Coca-Cola Hellenic Bottling Company (Coca-Cola HBC) is The Coca-Cola Company's local bottling partner responsible for the manufacturing, distribution, sales and trade marketing of Coca-Cola products across the island of Ireland. Coca-Cola HBC Ireland and Northern Ireland also owns and produces some additional local brands, including Deep RiverRock, Fruice and Vegified and has multiple sites across the Republic of Ireland and Northern Ireland, employing over 750 people.

Working together, The Coca-Cola Company and Coca-Cola Hellenic Bottling Company are fully committed to WHO recommendations that people should limit their intake of added sugar. Globally, Coca-Cola has reduced sugar content in more than 200 of their sparkling drinks, provided more information to consumers to help them control their sugar intake, and brought more low and zero sugar products to the market.

In recent years Coca-Cola has worked proactively to reduce the sugar and calorie content across its portfolio through reformulation, innovation and increased marketing investment in the promotion of low and no-sugar beverages. As a result, in Ireland Coca-Cola now sells more low and no-sugar beverages than any other company. More than 60% of Coca-Cola's portfolio in Ireland comprises drinks with less than 5g of sugar per 100ml. Coca-Cola will continue to evolve in this manner in its journey to be a total beverage company.



Danone

Dedicated to bringing health through food to as many people as possible, Danone is a leading global food company built on four business lines: Fresh Dairy and Plant Based Products, Early Life Nutrition, Waters and Medical Nutrition. Through its mission and dual commitment to business success and social progress, the company aims to build a healthier future, thanks to better health, better lives and a better world, for all its stakeholders—its 100,000 employees, consumers, customers, suppliers, shareholders and all the communities with which it engages.

To maintain continuous nutritional improvement of its products, Danone has deployed comprehensive internal nutritional targets since 2005. The Danone Nutrition Targets, revised in 2016, serve as reference for Commitment #1 of the Danone Nutrition Commitments. These commitments were part of the 2020 strategy and it's recently revised Danone 2030 goals. These targets cover product categories that Danone manufactures and sells today. They are operational objectives for product renovation and innovation. They are based on nutrition science and take into account both technical feasibility and the consumer acceptance journey.



Glanbia

Glanbia Ireland is Ireland's leading dairy and agri-business company and owns celebrated consumer and agri brands such as Avonmore, Kilmeaden Cheese, Premier Milk, Wexford, mymilkman.ie and GAIN Animal Nutrition. Drawing from a 2.4 billion litre milk pool supplied by 4,800 family farms, Glanbia Ireland produces dairy products from grass fed, pasture raised dairy herds. Combined with locally produced grains and state of the art milling, this unique agri platform provides for fully traceable and sustainably produced products. Established in July 2017, Glanbia Ireland combines Glanbia Ingredients Ireland, Glanbia Consumer Products and Glanbia Agribusiness. With annual revenue of €1.5 billion, Glanbia Ireland has 11 processing plants, 53 agri branches and over 1,800 employees in Ireland.



Kellogg's

Kellogg's is Ireland's largest cereal and second largest crisp company, home to brands well-loved by generations of people such as Kellogg's Corn Flakes, Coco Pops, Special K and Pringles. The company's commitment to helping people in Ireland make healthier choices in the morning is reflected in the recent overhaul of its cereal portfolio including significant sugar reduction, salt reformulation, the removal of artificial colours and the launch of new no added sugar and vegan foods. Ireland is also home to the company's European headquarters, which is based in North Dublin.



Kepak

Kepak Group is a family owned innovative meat company with a rich heritage of over 50 years of meat craft. From the establishment of a butcher shop in Dublin in 1966, Kepak has grown significantly and today the group has a turnover of €1.5bn and employs over 5,000 people. Kepak has 15 manufacturing facilities throughout Ireland and the UK, with sales offices in Europe, the US, Asia and Africa.

The Group markets a broad range of fresh and value-added meat products serving the foodservice and retail markets. The company emphasises sustainability and animal welfare as part of its corporate identity and is a founding member of Origin Green, a voluntary programme led by Bord Bia, that brings together the food industry – from farmers to food producers, retailers to foodservice operators – with the common goal of sustainable food production.



Kerry Foods

Kerry Foods is a leading manufacturer and marketer of added value branded and customer branded chilled foods to the UK & Irish and selected international consumer foods markets. Kerry Foods supply products to major supermarket chains, convenience stores and independent retailers across the UK, Ireland and selected international markets. Kerry Foods manufacture food products across three major sectors: Everyday Fresh (meat and dairy), Convenience Meal Solutions and Food-to-go. Included in their portfolio of consumer branded products are over 20 high profile brands, many of which are category leaders in the chilled cabinet. Kerry Foods are also a leading producer of supermarket private label products, ranging from chilled and frozen ready meals, cooked meats, cheese and dairy products.

Kerry Foods has 14 manufacturing facilities throughout Ireland and the UK, with an extensive distribution network in both countries. Kerry Foods are committed to supplying outstanding quality, value and service to customers. Underpinning this focus is their commitment to promoting product innovation to respond creatively and competitively to the needs of consumers as a category leader in the chilled foods sector.



Largo Foods

Largo Foods is an indigenous Irish company employing 500 people nationwide, producing Ireland's favourite snack brands including Tayto, Hunky Dorys and King, in Ashbourne, Co.Meath. Improving product formulations has and will continue to be a focus for the Largo business. Largo has spent over 20 years working collaboratively with key suppliers to significantly enhance their achievements in this area. In the past five years alone, Largo Foods has invested over €10 million in the adaptation and refinement of processing technology to enable the reduction of naturally occurring potato sugars, sodium reduction and the delivery of consistent product quality across their range. They are committed to maintaining this momentum into the future, investing in resource, capability and ingredients that will help achieve the challenging targets they have set themselves to improve the credentials of their entire product portfolio.

The Suntory Group - Lucozade Ribena Suntory Ireland



The Suntory Group, founded in 1899 by Shinjiro Torii as a family-owned business in Osaka, Japan, put quality and craftsmanship at the company's core and the consumer at the heart of everything it does. Globally, its portfolio of products includes brewed teas, bottled water, carbonated soft drinks, ready-to-drink coffee, energy drinks, premium spirits, beer and wine.

Lucozade Ribena Suntory Ireland (LRSI) was formed in 2014 as part of Suntory Beverage & Food Europe. LRSI is one of Ireland's leading soft drinks businesses, owning the No. 2 soft drink brand, 'Lucozade Energy' and also 'Lucozade Sport', 'Ribena', 'Orangina' 'Merchant's Heart', 'Tru Nopal' and 'Highland Spring Water'.

In 2016, with Suntory's "Yatte Minahare" ("Go for It") attitude and vision to "Enrich drinking-experiences to be more natural, healthy, convenient, and fulfilling, by leading the next drinks revolution," they began the process of reformulating all their existing and new drinks, so that by mid-2017 they were well on their way to:

- Reducing the average sugar content of their portfolio by 50%, meaning added sugar is less than 4.5g of total sugar per 100ml
- Making zero and low-calorie alternatives available for each brand
- Ensuring any new added sugar drinks are less than 4.5g total sugar per 100ml
- Clearly displaying calories on front of pack to help consumers make informed choices
- Committing €5 million over the next three years to help get the nation moving more

Their relentless pursuit of perfection is evident in everything they create. In 2018 and beyond, they continue to refine their techniques and introduce new innovations to create new value for their customers globally and in Ireland.



Mars

Their commitment to support the health and wellbeing of their consumers stems from over a decade's worth of steady progress, during which time they have introduced industry-leading initiatives to support consumers in achieving their health and wellbeing goals. They were among the first to:

- Introduce a Global Marketing Code to guide the responsible marketing communications of all their human food products, including not marketing to children under 12
- Provide clear front-of-pack nutrition information through their GDA Labelling commitment
- Limit their chocolate and confectionery products to no more than 250 kcal per portion
- Publicly support World Health Organisation (WHO) guidance that consumers limit their intake of added sugars
- Develop nutrition criteria based on World Health Organisation nutrition recommendations, to guide development and reformulation of healthier Mars Food dinnertime products and on-pack recipe suggestions

They are working to meet the changing demands of their consumers by evolving their products, improving the nutritional content of their portfolio, and how they label them, at the same time as working to improve the health, safety and wellbeing of their employees. They are taking positive action on portion sizes and cross-promotions, licensing and retail bundling strategies to further help consumers in managing daily intake of added sugars, while continuing to enjoy chocolate and confectionery products as the occasional treats they are intended to be.



Nestlé

Nestlé Ireland is a subsidiary of Nestlé SA, the world's largest food company. Nestlé has over 70 brands across seven categories in the Irish market ranging from global icons to local favourites and spanning beverages, confectionery, ice cream, breakfast cereals, food, pet care, dairy and infant nutrition. It employs over 750 people locally who work tirelessly to enhance people's quality of life through the products they make, and to contribute to a healthier future by researching and innovating to develop healthier and even tastier products.

Globally, Nestlé invests over €1.3 billion in Research and Development every year, more than any other food company. It operates the largest Research and Development network with 40 R&D Centres (one of which is in Ireland) and over 5,000 people involved in R&D worldwide.

Alongside launching exciting new products, over the last three years Nestlé has removed over 2.4 billion teaspoons of sugar and 60 billion calories from its UK and Irish products alongside the reduction of salt and saturated fat across many products whilst maintaining the quality and taste people love. Some of the examples of new and improved products recently brought to market are Milkybar® Wowsomes®, with 30% less sugar than similar chocolate products, Rowntree's® Fruit Pastilles® and Randoms with 30% less sugar, Milkybar with increased milk content, making milk the first ingredient, increased milk and cocoa content in KitKat®, and new improved recipes that have been developed with less sugar and more wholegrain for Cheerios® and Shreddies®.

These developments are just the latest in Nestlé's long history of reformulation and initiatives designed to improve products and contribute to a healthier future.



PepsiCo

PepsiCo products are enjoyed by consumers more than one billion times a day in more than 200 countries and territories around the world. PepsiCo generated more than US\$63 billion in net revenue in 2017, driven by a complementary food and beverage portfolio that includes Frito-Lay, Gatorade, Pepsi-Cola, Quaker and Tropicana. PepsiCo's product portfolio includes a wide range of enjoyable foods and beverages, including 22 brands that generate more than US\$1 billion each in estimated annual retail sales.

At the heart of PepsiCo is Performance with Purpose – the fundamental belief that the success of the company is inextricably linked to the sustainability of the world around us. They believe that continuously improving the products they sell, operating responsibly to protect the planet and empowering people around the world enables PepsiCo to run a successful global company that creates long-term value for society and their shareholders.

PepsiCo's presence in Ireland comprises sites located in Cork and Dublin, employing over 800 people. The headquarters of PepsiCo's global concentrate division is located in Cork, alongside three manufacturing facilities and their R&D hub. PepsiCo Ireland's Sales and Marketing team is located in Dublin, managing the sales and marketing activity of the PepsiCo brands across the island of Ireland, as well as the finance and supply chain operations with their primary franchise bottler, Britvic Ireland.

Unilever



Unilever is one of the world's leading suppliers of Beauty & Personal Care, Home Care, and Foods & Refreshment products with sales in over 190 countries and reaching 2.5 billion consumers a day. It has 161,000 employees and generated sales of €53.7 billion in 2017. Over half (57%) of the company's footprint is in developing and emerging markets. Unilever has more than 400 brands found in homes all over the world, including Persil, Dove, Knorr, Domestos, Hellmann's, Lipton, Wall's, PG Tips, Ben & Jerry's, Magnum and Lynx.

Unilever's Sustainable Living Plan (USLP) underpins the company's strategy and commits to:

- Helping more than a billion people take action to improve their health and well-being by 2020.
- Halving the environmental impact of their products by 2030.
- Enhancing the livelihoods of millions of people by 2020.

The USLP creates value by driving growth and trust, eliminating costs and reducing risks. The company's sustainable living brands are growing 46% faster than the rest of the business and delivered 70% of the company's growth in 2017.

Unilever was ranked as an industry leader in the 2018 Dow Jones Sustainability Index. In the FTSE4Good Index, it achieved the highest environmental score of 5. It led the list of Global Corporate Sustainability Leaders in the 2017 GlobeScan/SustainAbility annual survey for the seventh year running, and achieved four A ratings across Climate Change, Water, Forests and Supplier Engagement in CDP's 2018 Global Supply Chain report. Unilever has pledged to become carbon positive in its operations by 2030, and to ensure 100% of its plastic packaging is fully reusable, recyclable or compostable by 2025.

Valeo Foods



One of Europe's fastest-growing consumer foods producers, with a portfolio of category leading brands, Valeo Foods produces and sells over six hundred million units a year from its state-of-the-art manufacturing facilities across Ireland, the UK and Continental Europe. Since inception in 2010, Valeo Foods has increased its number of employees to more than 1000.

Valeo Foods through some of their leading brands such as Batchelors, Chef, Jacobs, and Kelkin are committed to introducing healthier options for consumers with reduced sugar, salt and fats, as well fortifying foods through wholesome nutrients being some of the key drivers of innovation.

Also, along with initiatives to promote a healthier product portfolio, Valeo Foods is committed to participating in Bord Bia's sustainability programme as a member of Origin Green.

About Creme Global

Creme Global is a data science technology company that has 15-years experience in the food and nutrition sector providing technical and scientific services to the commercial and regulatory authorities. Creme Global also provides off-the-shelf software to allow users to conduct their own research and analyses.

Creme Global is unique in having expertise in food science, nutrition, data science and software engineering under one roof. Creme Global collaborates with multiple stakeholders to publish the methodologies it employs in its models in order to ensure transparency and acceptance among the scientific community (academic, government and industry).

Creme Global software models support both deterministic and probabilistic input data. Probabilistic data can be represented by parametric or empirical distributions, and these datasets are then combined in the model using monte carlo simulations. This allows uncertainty and variability to be handled in the calculations.

Creme Global is proud to have worked with food safety authorities globally. Its models have been used and accepted by those authorities. Furthermore, Creme Global has been providing training and scientific advice and has built multiple models. Some examples include:

- Multiple sector association/institute modelling tool and application project success stories including research institute for fragrance materials (rifm) aggregate exposure tool, packaging industry exposure tool (facet) and the crop sciences cumulative and aggregate risk evaluation system (cares ng) tool.
- Global clients across the public and private sector with services provided in predictive intake modelling, exposure assessment and associated health outcomes as well as scientific data gathering, management and analysis across the food supply chain.
- Expertise in gathering, integrating, protecting and modelling proprietary data from project and/or consortium members, e.g. ingredient, formulation, occurrence and market share data.
- Vast experience in deployment of cloud-based applications which allow combinations of proprietary and publicly available datasets to be used in a robust and transparent model without the need to disclose sensitive raw data.



Executive summary



Introduction

Discussion points:

- This report contains new research conducted on behalf of 15 Food Drink Ireland (FDI) member companies. Company data on voluntary product reformulation and innovation was collected and – using innovative modelling techniques – its impact on Irish diets was assessed.
- Of the products analysed, those on the market in both 2005 (baseline) and 2017 showed average reductions in all of the nutrients of interest: energy (1.6%), total fat (0.3%), saturated fat (10%), sodium (28%) and sugar (8%).
- Modelling the impact of food industry activities (reformulation, new product launches, removal of products), as well as the impact of consumer choice on purchasing within product categories, shows that overall, between 2005 and 2017, sugar and saturated fat intake in the average Irish diet has decreased, while sodium, total fat and energy intake remained stable. In higher consumers of the food categories sold by FDI members, between 2005 and 2017 energy intake also decreased for all ages except teens.
- The most significant reductions were in intakes of sugar, which was largely driven by reductions in the beverage category through direct reformulation and consumers switching to low and no sugar variants. Reductions in sugar intake were also observed in high consumers of breakfast cereals and milk and dairy products.
- Reducing sugar content can present challenges from a technical, sensory, and safety perspective. However, decreased sugar levels did not lead to overall increases in dietary intakes of salt, fat, saturated fat or energy – a welcome result.
- The lack of change in modelled sodium intake may seem puzzling, given the 28% direct reduction in sodium between 2005 and 2017. A recent independent monitoring report by FSAI also found sodium reduction across multiple food categories³. One possible explanation is that the products submitted by the participating companies do not include many of the biggest contributors to salt intake in Irish diets.
- Despite significant commitment and investment, industry initiatives alone cannot change dietary habits. Changing consumer behaviour is notoriously difficult and requires significant combined effort from all stakeholders over many years.

There is a significant bank of evidence that supports the importance of reformulation to public health.

The World Health Organisation (WHO) *Global action plan for the prevention and control of non-communicable diseases 2013-2020* highlights the importance of healthy diets with a focus on the reduction of sugars, sodium and saturated fat in particular⁴. A shift away from energy dense diets to more nutrient dense diets also offers a means to improve dietary quality, as well as potentially helping to address the rise in obesity⁵. Product reformulation has been identified in the report by the McKinsey Global Institute as an effective initiative in global efforts to reduce obesity and non-communicable disease¹.

For many years, the food industry has been reformulating products, usually through small gradual reductions in nutrients of public health concern. The key benefit of reformulation is that it does not require a change in consumer behaviour. Ensuring consumers accept the changes, however, is key to a successful transition. If a single nutrient is removed from a product too quickly, and it noticeably impacts taste, consumers will simply choose a different, often less nutritious alternative. The reformulation of products through gradual nutrient reductions helps to positively support consumer lifestyles and health.

As the practice of product reformulation has evolved, most reformulation now considers the broader nutrient profile of a product. The addition of positive ingredients and nutrients is an important element. The changes in one nutrient should not come at the expense of other nutrients of public health concern. As well as providing a source of energy or nutrients, ingredients like salt, sugar and fat often fulfil a wider technical role within a product. Therefore, it needs to be highlighted that reformulation often involves a very complex technical balancing act. This can take significant time and investment and differs greatly depending on the category/product.

In addition to product reformulation, companies have pursued other complementary initiatives to provide healthier options to consumers. These include bringing a range of new products to the market that are lower in calories, saturated fat, salt or sugar, compared to standard; offering new products, pack sizes and formats; and designing marketing activities to promote these.

Monitoring is vital to demonstrate the impact of any interventions targeted at improving public health where many factors are involved and can interact. It helps to identify whether the interventions work in real life situations and to determine where future actions can most effectively be targeted. Assessing the impact of food industry efforts on the observed (or modelled) changes in sugar, sodium, fat, saturated fat and energy intake in the general population

is fundamental to understanding progress. In this regard, participating FDI members have demonstrated their commitment to monitoring and have made a significant body of data publicly available in the form of this report.

Ireland has led the way in measuring the impact of product reformulation on nutrient intake. This is the second Irish publication to show the effects of reformulation. In 2016, FDI published a report entitled *Estimating the impact of reformulation by 14 FDI members on the Irish population*, which investigated reformulation efforts between 2005 and 2012⁶. This analysis was the first of its kind in the world and outlined conclusive evidence of the positive impact industry efforts have had on intakes of a range of nutrients in Ireland.

The food environment is dynamic. Alongside reformulation of existing products, some product recipes remain constant. New products are introduced onto the market, while others are delisted. Volume sales increase or decrease as market share is lost or gained. For this report, the methodology used in the previous FDI report (comparing 2005-2012)⁶ was updated by Creme Global to incorporate such variables. This is reflected in the number of products put forward for analysis by participating member companies during this analysis (1780) versus those provided by the members who participated in the previous report (600). It therefore presents a more sophisticated assessment of the food and beverage market than focusing solely on products that have changed since 2005.

Changing a product's ingredients and nutritional profile while maintaining quality and the taste that consumers love and expect can be a challenge. However, the food industry in Ireland is committed to reformulation, utilising scientific knowledge and technological expertise to produce enjoyable, tasty and nutritious foods. Whilst reformulation is a key lever for certain products, for others it is not appropriate thus, portion size reduction can be an effective approach to support consumers in managing their nutrient intake.

It is important to highlight that industry efforts alone cannot provide a solution to the challenge of improving dietary habits – though they are an important contributor^{7,8}. The food and drink industry's role is just one of many, and stakeholders in the private, policy, and public health sectors as well as consumers themselves, must play their part for meaningful change to occur.

Research aims

In 2017, FDI commissioned Creme Global to develop a research methodology that would:

- Capture the voluntary undertakings of participating food and drink companies, including:
 - Product reformulation
 - Innovation and new product development
 - Removing products from the market
- Model the impact of these changes on Irish dietary intakes of five nutrients:
 - Energy
 - Total fat
 - Saturated fat
 - Sugar
 - Sodium

The methodology developed by Creme Global focuses

primarily on the second point, i.e. the dietary impact at the level of the individual, as this has the most direct bearing on health outcomes. By incorporating 2005 and 2017 sales volume data as weightings, the model accounts for the impact of consumer choice on overall intakes which may have changed over time in response to food and beverage industry activities like marketing and promotion.

Between 2017 and 2018, the participating FDI member companies submitted product data from 2005 (baseline) and 2017. In addition to nutritional information, sales volumes were collected and each product was categorised into a specific food/beverage category. Creme Global also drew on the four Irish University Nutritional Alliance (IUNA) dietary intake surveys⁹⁻¹².

These IUNA surveys recorded the food and nutritional intakes of four defined age groups: pre-schoolers (1-4 years), children (5-12 years), teenagers (13-17 years) and adults (18-90 years). Nutrition information for the rest of the market was obtained from the IUNA data as described in section 3.2.

Nutritional information from participating FDI member products, weighted by market share, was substituted for the corresponding product categories in the IUNA surveys. This was done using both 2005 and 2017 product nutrition information and the resulting changes in nutrient intakes were calculated.

The difference in the nutrient intakes between 2005 and 2017 can be interpreted as a result of the voluntary undertakings of the food industry, namely food product reformulation, the promotion of healthy options and new product development and, of course, changes in consumers purchasing choices in those food categories over that period.

Changes in portion sizes of products were not accommodated in this model which is based on consumption values derived from the IUNA survey. Reformulation in the wider sense also includes the addition of beneficial nutrients which are often lacking in the diet e.g. fibre, vitamin D. Neither of these factors could be accommodated in this research although many FDI members are also involved in these activities.

A full description of the methodology is available in section 3.

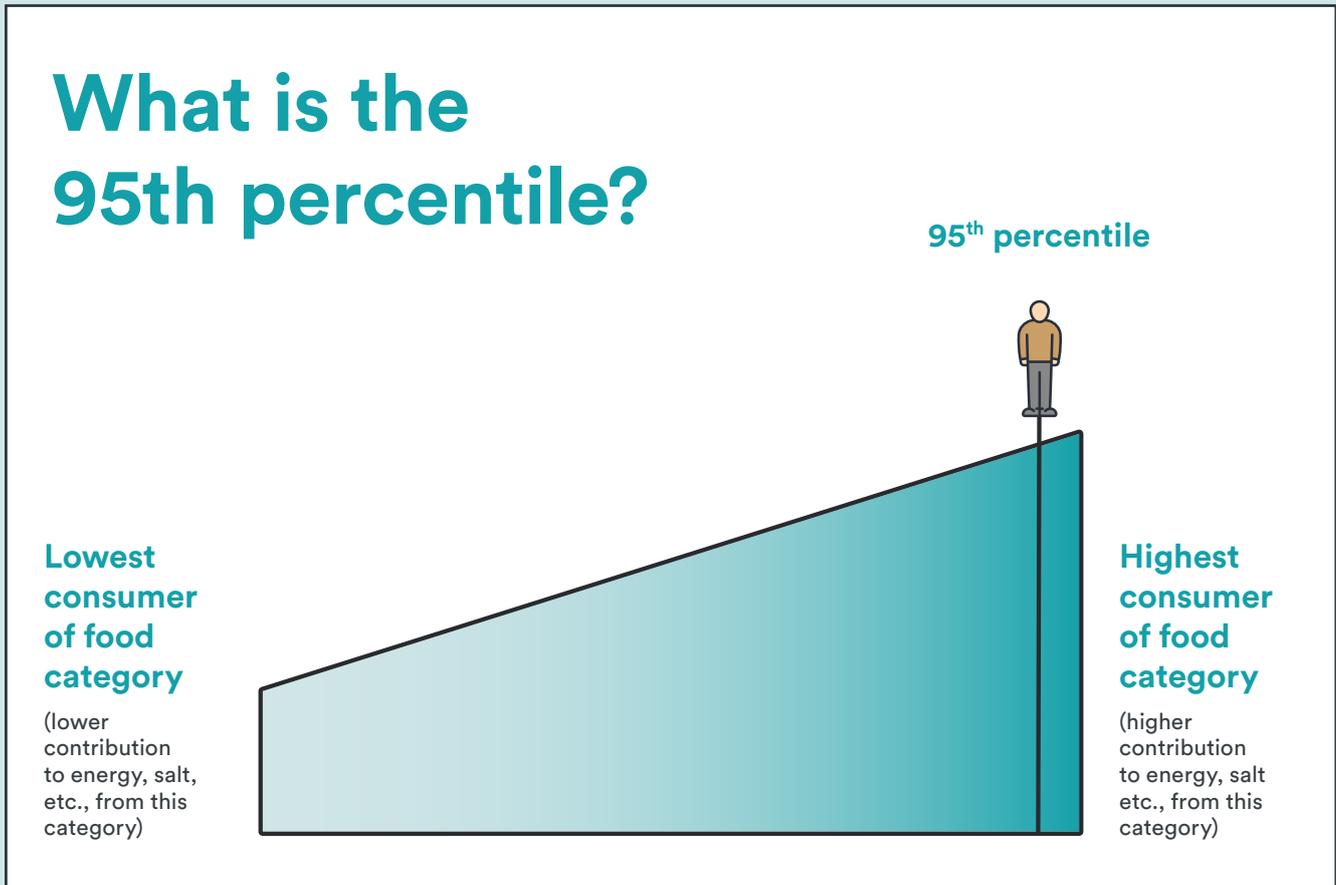
Total population and high consumers

This study looked at intakes in two ways. Firstly, it considered the **mean intakes in the total Irish population** – including people who consumed and people who did not consume the products in the study.

Secondly, it looked at high consumers, which are defined as the 95th percentile of the consumers of the foods in question. The **95th percentile refers to the average intake for a person who consumes more of the food category than 95% of the population** but less than the highest consuming 5% of the population (Figure 1). It is important to look at the 95th percentile because this is the group more heavily impacted, within this analysis, by the nutritional makeup of these products and any industry undertakings to change them.

Looking at intakes in both ways provides an insight into the impact that these food industry efforts have had on the entire population as well as the people who consume these products the most.

Figure 1: What is the 95th percentile?



Conservative and optimistic scenarios

While the 15 companies participating in this research are many of the biggest food and drink brands in Ireland, it is clear that they represent only a portion of the market in each category. In addition, not all companies provided data for all products on the market during each time period. Detailed data corresponding to that collected from participating companies was not available for the companies/products that make up the rest of the market. Given this gap in the data, two scenarios were modelled to demonstrate how the missing data could impact on the overall results. The first set of results is labelled conservative and the second is referred to as optimistic.

For the **conservative estimate**, it was assumed that no reformulation occurred in the Irish market other than that by participating FDI members within the products included in the analysis. For this purpose, food and beverage sales

data from Euromonitor (an independent market research company) was used to quantify the rest of the market.

For the **optimistic estimate**, it was assumed that all companies selling in the Irish market exhibited the same reformulation and innovation patterns as the participating companies in the foods submitted. The nutritional changes reported by the participating FDI member companies based on the included products were applied to the entire market.

The real impact on Irish diets most likely lies somewhere in the middle of these two estimates, with the second showing what could be possible given full industry participation.

Throughout this report, we primarily discuss the conservative results. Some of the optimistic results are spotlighted in the results analysis, and they are always clearly labelled where used.

Results at a glance

Figure 2: Direct reformulation of 235 products on the market in both 2005 and 2017

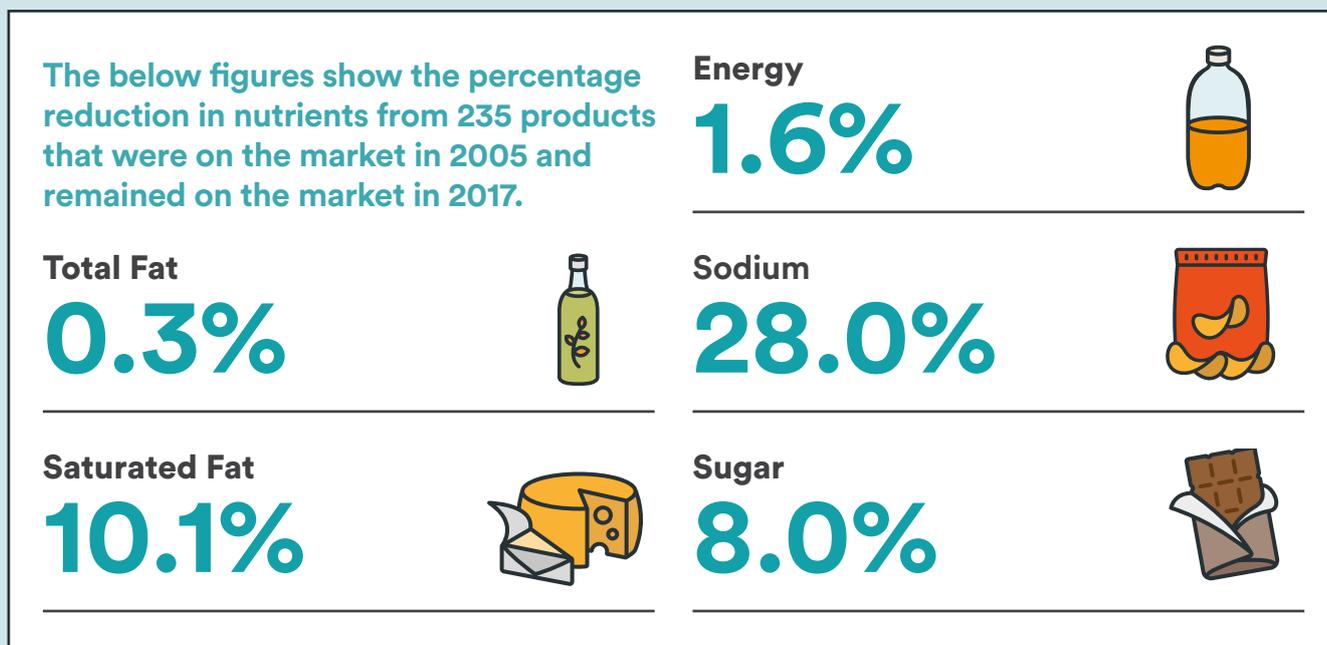


Table 1: Percentage reduction in mean nutrient intakes among the total population, ranging from conservative to optimistic

Nutrient	Adults	Teens	Children	Pre-schoolers
Energy (% Reduction)	NC to NC	NC to NC	NC to NC	NC to NC
Total fat (% Reduction)	NC to 2.3	NC to 1.2	NC to 0.7	NS to 1.6
Saturated fat (% Reduction)	1.6 to 6.8	0.5 to 4.7	NS to 3.6	NS to 4.0
Sodium (% Reduction)	NC to NC	NS to NS	NS to 3.1	NS to NS
Sugar (% Reduction)	0.9 to 4.6	2.5 to 9.7	3.1 to 9.3	2.5 to 6.6

*NC indicates no change was observed.

*NS indicates result not statistically significant.

Table 2: Percentage reduction in nutrient intakes observed among high consumers, ranging from conservative to optimistic

Nutrient	Adults	Teens	Children	Pre-schoolers
Energy (% Reduction)	0.4 to -0.5	-0.1 to 0.0	0.8 to 0.9	0.6 to -2.4
Total fat (% Reduction)	0.5 to 3.0	-0.7 to 0.6	0.3 to 0.6	NS to 2.4
Saturated fat (% Reduction)	1.2 to 6.6	2.3 to 6.4	NS to 3.3	NS to 4.3
Sodium (% Reduction)	-0.7 to -1.0	0.3 to -1.6	0.4 to 1.5	0.0 to 2.5
Sugar (% Reduction)	0.5 to 4.3	2.4 to 9.4	4.1 to 11.2	1.4 to 5.1

*NS indicates result not statistically significant.

*A negative (-) figure refers to an increase in a nutrient.

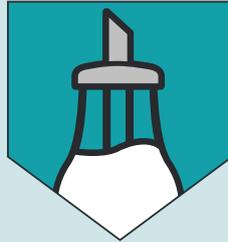
Sugar

Sugar intake has decreased for all age groups since 2005



1.2kg

of sugar has been removed from the average Irish child's annual diet



Sodium

Minimal impact on sodium levels



from food changes in Irish diets between 2005-2017

4,219

kcal removed from Irish high consumer adults' annual diet



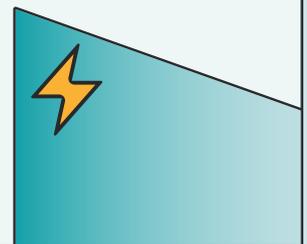
Energy

Stable 2005-2017



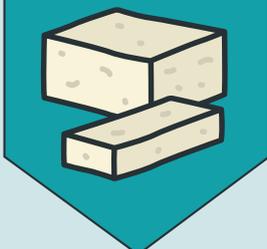
High consumers,

however, benefited from a **reduced energy intake** overall as a result of industry efforts



Saturated fat

0.5g/day & 0.2g/day



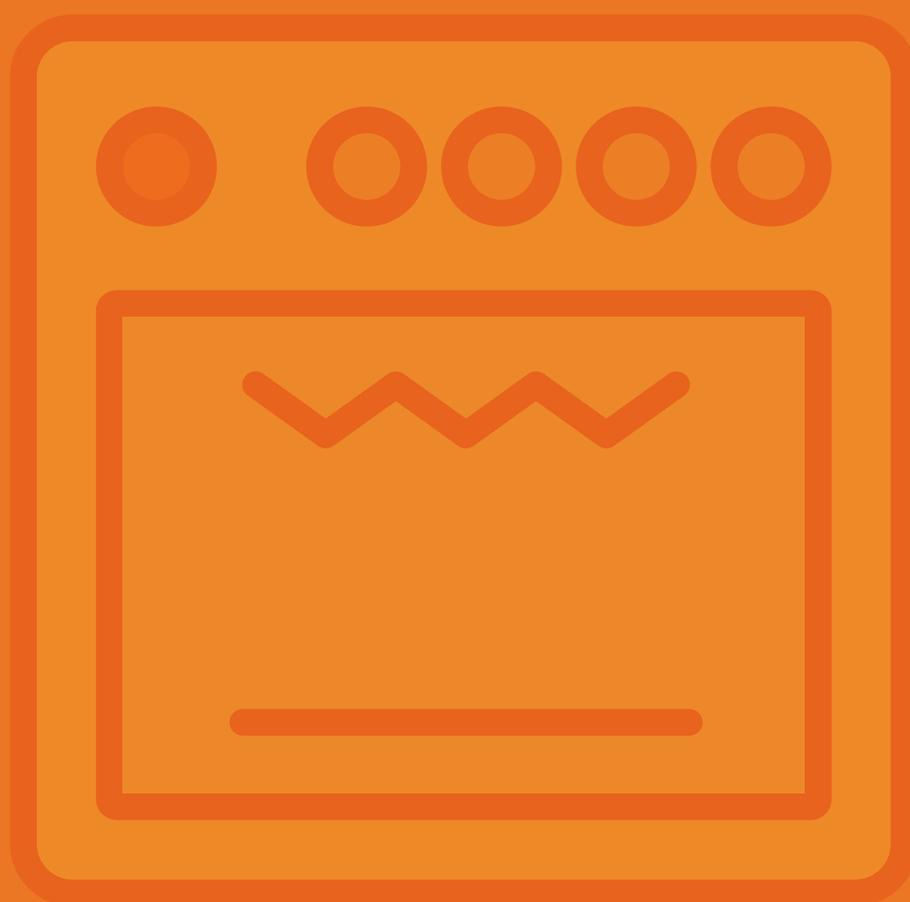
decrease in Irish adult and teen diets respectively, as a result of food and drink industry efforts

Total fat

Stable 2005-2017



Reformulation and innovation



Reformulation at a glance



Challenges

Food industry reformulation and innovation is not new. Food and beverage companies are constantly looking for ways to improve their products, respond to consumer desires and help consumers make balanced choices. What changes over time and affect the type and extent of reformulation and innovation taking place are consumer needs, the availability of suitable nutrient and ingredient replacements and available technology.

Reformulation does not happen overnight. It is often a lengthy process that usually requires multiple changes to the original recipe, reducing certain nutrients or adding new ingredients to balance taste while maintaining the integrity and safety of the product. Reducing a nutrient gradually in small incremental steps can be vital to reformulation's success, to ensure the consumer also adapts to the new recipe. This 'health by stealth' approach has worked well for nutrients like sodium in particular.

Barriers to widespread reformulation have been identified internationally¹³ from an industry perspective, including:

- The need to bring consumers along the reformulation journey so they accept changes in a product's taste, appearance or size
- The large amount of time needed for gradual reformulation to occur, so that consumers do not experience a sudden change in taste or quality
- Risk that consumers may switch to other products if they notice a difference in taste or appearance, particularly if they try a brand that has not reformulated and prefer the taste
- The functional role that certain nutrients may play in a product (beyond its taste)
- Potential increased production costs for ingredients or new machinery
- Safety-related and technological barriers mean it is currently very difficult to reformulate some products beyond a certain point, particularly on a nutrient per 100g basis
- A product's shelf-life may be affected (salt, for example, acts as a preservative, as does sugar)

Regulatory considerations also exist relating to the composition of certain products. For example, chocolate is subject to specific compositional standards in the Cocoa and Chocolate Directive (2000/36/EC) which stipulates levels of ingredients that can be included and specifies minimum fat/cocoa butter content depending on the type of chocolate. In addition, the Nutrition and Health Claims Regulation (EC 1924/2006) specifies the nutrition claims that can be made on a product including the criteria required to make a reduced nutrient claim.

For example, a claim that a food is 'energy-reduced' (and any claim likely to have the same meaning for the consumer) may only be made where the energy value is reduced by at least 30% when compared to other foods in that category. If the 30% energy reduction can only be

partially achieved in a product, this may affect a company's decision to invest in reformulation as the company cannot directly communicate the benefit to consumers. There is also a risk that significant recipe changes will cause consumers to switch products, either to a competitor or to something entirely different which may have even higher levels of salt, sugar, fat or calories. Gradual reformulation and careful changes can therefore ensure both improved nutritional composition and customer retention.

What is reformulation?

Reformulation occurs when a food or beverage company decides to change a product's recipe.

This may be to reduce or remove certain nutrients, like fat, salt or sugar; to lower calorie count; or to improve taste. It can also refer to fortification – the addition of new or more readily absorbed nutrients or the addition of ingredients with positive health benefits such as wholegrain and fruit and vegetables.

In this report, we look at the reformulation efforts made by 15 participating FDI member companies to reduce the levels of sugar, salt, fat, saturated fat and calories in their products without adversely affecting any other nutrient intake.

Sodium: more than just flavour

Salt is one of the main sources of sodium, which is essential to the body. However, too much sodium in the diet is linked to an increase in blood pressure, one of the major modifiable causal factors in the development of cardiovascular disease. The WHO has recommended salt reduction as one of its three top priority actions to tackle the global burden of non-communicable disease⁴, and salt reduction programmes have been adopted by national authorities including the Food Safety Authority of Ireland (FSAI).

To ensure consumers do not notice a significant and sudden taste difference, the removal of ingredients high in sodium or salt must be done gradually. If salt levels dropped suddenly in savoury snacks, for example, consumers may add salt back in independently, possibly to even higher levels than contained in the original product before reformulation (undesirable for consumer health).

Furthermore, sodium is not just about flavour – it creates a hard bite texture in savoury snacks and acts as a preservative by reducing water activity. Salt in crisps affects not only flavour but also texture, hard bite, and shelf life.

In cheese products, sodium regulates the activity of the starter culture and affects water content of the finished product. Without salt, cheese would not form a sufficient rind and more bacteria would be able to enter the product.

Because of the varied ways that salt and sodium affect the end product, whether that is stabilisation, texture or flavour, there comes a point beyond which it is difficult to reduce sodium further.

Take for example a savoury snack, such as a bag of crisps. Salt levels in crisp ranges were reduced by between 20-58% from 2005 to 2012, a significant change¹⁴.

This was a hugely positive shift for consumers, resulting in reduced sodium intake. Many products reformulated within the savoury snack category are now nearing the limit on the amount of sodium that can be removed while still maintaining acceptable shelf life, flavour and hard bite texture.

Reducing sodium levels in each food category therefore has its own unique set of circumstances and challenges.

The challenge of reducing sugar

The reduction of sugar is also more complicated than simply removing added sugar from a product. Sugar has its own functional properties, including providing bulk and textural qualities, so the possibility and extent of removing sugar depends largely on the type of product. Investments in innovation, R&D, technology and design development by food companies have resulted in several new advances for sugar reductions in certain product categories in recent years.

Some categories (such as deserts, cakes, ice cream and confectionery) face particular challenges when working to reduce sugar content due to these products containing a higher proportion of sugar by their nature.

There are different routes by which manufacturers can achieve sugar reduction in this category. Certain companies have, for example, committed to developing

single-serving sizes of confectionery and ice cream products of less than 250kcal (or 100kcal in children's products). Others are investing into new technologies and R&D to reformulate recipes and reduce sugar on a per 100g basis with some initial successes.

Innovation and advances in recipe development have made possible the use of several low-calorie sweeteners in foods and drinks.

There are eleven different low-calorie sweeteners approved for use in Europe, and they have been used in Ireland since 1983.

Sweeteners have been confirmed as safe by European and international authorities, including the Food Safety Authority of Ireland (FSAI), European Food Safety Authority (EFSA), the Joint Food and Agriculture Organisation (FAO) and the World Health Organisation (WHO) Expert Committee on Food Additives (JECFA). Research supports the benefits of the replacement of sugar with low-calorie sweeteners as a useful tool for weight management¹⁵.

There are also many examples of where a company has reduced sugar without the use of low-calorie sweeteners.

Sugar reduction is not all about taste. The bulk that sugar provides to confectionery products is difficult to replace, even if the same sweetness can be replicated with alternatives. This is one reason why reducing package sizes is a suitable complementary option to removing sugar from a confectionery product. Reducing the sugar content of confectionery products is possible to a certain extent – but comes with some complexities.

There are several different ways to achieve sugar reduction in confectionery products; for example, removing small amounts of sugar without affecting taste/ texture, recipe rebalance through ingredient substitution and the use of new technology.

Reformulation can have an impact on many elements of foods and drinks. Understanding the science behind this is key to successful reformulation.

This section has outlined some of the challenges that companies face when reformulating their products. It has focused on some of the particular issues relating to sodium and sugar, but each nutrient has its own complexities. These complexities take time and investment to overcome. The food and drink industry have invested heavily to overcome these challenges.

11
different low-calorie sweeteners are approved for use in Europe, and they have been used in Ireland since 1983



Research methodology



Research methodology

This research sought to estimate the impact that voluntary undertakings by 15 food and beverage companies have had on dietary intakes in the Republic of Ireland. These voluntary undertakings include:

- Food product reformulation
- Promotion of healthy options within the industry’s product portfolios
- Innovation and new product development

The specific dietary intakes estimated as part of this work were sugar, sodium, saturated fat, total fat and energy (kilocalories). These were estimated in 2005 and 2017. The Irish diet, captured by national food consumption survey data, was grouped into food and beverage categories and the dietary intake changes are reported per category. By incorporating 2005 and 2017 sales volume data as weightings, the model also accounts for the impact of consumer choice on overall intakes which may have changed over time in response to food and beverage industry activities like marketing and promotion.

Data collection

Participating FDI member data

Food companies and producers associated with FDI were invited to submit data related to their full product portfolio in 2005 and 2017. Fifteen companies submitted data. This data included sales volumes and nutritional information and was used to define the market of each food category for both years.

Data templates were shared with each participating FDI member, which included cells on product name, unit size, whether the product is sold as a multipack and how many units are within a multipack, as well as amount sold, from which the total volume sales was then calculated. Companies categorised their products into pre-determined template categories.

Creme Global used the data as follows to calculate volume sales which are used to represent a product’s nutrient weighting relative to other products in that template category (Table 4).

If multipack

A product’s sales volume in 2005 (kg/year) = ((product’s unit size (g) in 2005) x (number of units in a multipack in 2005) x (number of multipack units sold in 2005))/1000.

A product’s sales volume in 2017 (kg/year) = ((product’s unit size (g) in 2017) x (number of units in a multipack in 2017) x (number of multipack units sold in 2017))/1000.

If not a multipack

A product’s sales volume in 2005 (kg/year) = ((product’s unit size (g) in 2005) x (number of product units sold in 2005))/1000.

A product’s sales volume in 2017 (kg/year) = ((product’s unit size (g) in 2017) x (number of product units sold in 2017))/1000.

IUNA data

Four Irish University Nutritional Alliance (IUNA) dietary intake surveys were used in this project⁹⁻¹². These surveys recorded what people consumed, the nutritional compositions of what they consumed and details of who those people were (pre-schoolers, children, teens and adults) (see Table 3).

The foods were grouped into the appropriate food categories based on the FDI-submitted products. All other foods were grouped into the food category ‘Other’.

IUNA food composition data for the relevant food categories was replaced with nutrition information provided by FDI members in 2005 and 2017. For the ‘rest of market’, the average nutrient concentrations in each category were taken from the merged IUNA diary table. These were weighed relative to one another based on the consumed amounts as recorded in the food consumption database. These weighted averages were assigned as concentration values to the ‘rest of market’ (in the conservative estimate) and remained the same between 2005 and 2017.

Table 3: Irish national food consumption surveys utilised to investigate dietary intakes with the Irish sub-populations

Survey	Year of survey	Age group	Number of participants	Methodology
National Pre-School Nutrition Survey (NPNS)	2010 to 2011	1 to 4 years	N = 500	4-day weighed food record
National Children’s Food Survey (NCFS)	2003 to 2004	5 to 12 years	N = 594	7-day weighed food diary
National Teens’ Food Survey	2005 to 2006	13 to 17 years	N = 441	7-day semi-weighed food diary
National Adult Nutrition Survey (NANS)	2008 to 2010	18 to 90 years	N = 1500	4-day weighed food diary

Euromonitor data

Euromonitor data was used to provide volume sales (kg/year) for the template categories to determine the rest of market. The data related to product sold through retail channels (excl. food service) in Ireland in 2005 and 2017. All template categories selected by participating FDI members for their products were matched with the best available categories from Euromonitor. Where food and beverage categories available from Euromonitor were slightly different from those available in the IUNA surveys, in some cases, template categories had to be summed to match with Euromonitor categories, and in other cases, the sales data assigned to Euromonitor categories had to be summed or subtracted to match with template categories (see Table 4).

Table 4: Categorisations of foods and beverages used and the number of products submitted per category

Euromonitor categorisation	Template categorisation	Report categorisation	Number of products submitted
Carbonates Coffee Low calorie cola carbonates Other hot drinks Concentrates Tea	Carbonated beverages Coffees Diet carbonated beverages Other beverages Squashes, cordials and fruit juice drinks Teas	Beverages (excl. milk)	315
Sweet biscuits and savoury biscuits Chocolate confectionery Frozen desserts, ice cream desserts Ice cream Confectionery minus chocolate confectionery Dairy desserts	Biscuits including crackers Chocolate confectionery Desserts Ice creams Non-chocolate confectionery Rice puddings and custard	Desserts, biscuits, cakes, ice cream and confectionery	511
Shelf stable processed red meat, chilled processed red meat, frozen process red meat, 50% of ready meals	Meat products	Meat products	76
Cheese Cream Semi skimmed fresh milk, fat-free fresh milk, semi skimmed shelf stable milk Condensed milk, milk alternatives, powder milk, goat milk, flavoured milk drinks Yoghurt	Cheeses Creams Low-fat, skimmed and fortified milks Other milks and milk-based beverages Yoghurts	Milk and dairy products	238
Ready to eat (RTE) cereals	Ready to eat (RTE) cereals	Breakfast cereals	232
Bread Rice, pasta and noodles 50% of ready meals	Other gluten free breads Rice and pasta, flours, grains and starch Savouries	Rice, pasta, savouries and gluten free bread	15
Savoury snacks	Savoury snacks	Savoury snacks (incl. crisps)	170
Oil Fresh beans, fresh peas, pulses Soup, table sauces	Oils (not including those used in recipes) Peas, beans and lentils Soups, sauces and miscellaneous foods	Soups, sauces, pulses and misc. foods	203
Butter Health and wellness margarine and spreads Cooking fats, margarine and spreads	Butter (over 80 percent fat) Low-fat spreads (under 40 percent fat) Other fat spread (40-80 percent fat)	Spreading fats	20

Total: 1,780 products

Scenario modelling

The assignment of nutrient levels to foods consumed in the IUNA surveys was conducted in two ways using 2005 data and two ways using 2017 data, resulting in two sets of results for both 2005 and 2017. The first is referred to as the **conservative** estimate and the second is referred to as the **optimistic** estimate.

Both estimates used probability distributions to assign nutrient concentrations to the foods recorded in the diaries which is statistically more robust than assigning one average nutrient value. Each participating FDI member submitted information on their products' total fat, saturated fat, sugar, sodium and energy values. These values were included for the relevant template category (see Table 4) associated with that product and were weighted according to market share (volume) values. For example, the fat value for a cheese that has the higher market share was represented more than the fat value for the cheese with the lower market share.

Conservative estimate

In addition to the above FDI member data, the conservative estimate also accounts for the 'rest of market' which does not include products submitted by the participating FDI companies. Therefore in addition to FDI members' nutrition and market share data (volume), a nutrient concentration is also assigned to represent the 'rest of market' and market share data (volume) obtained from Euromonitor. The nutrient concentration for the rest of market is taken from the original IUNA food value used in the surveys as described in the IUNA section above.

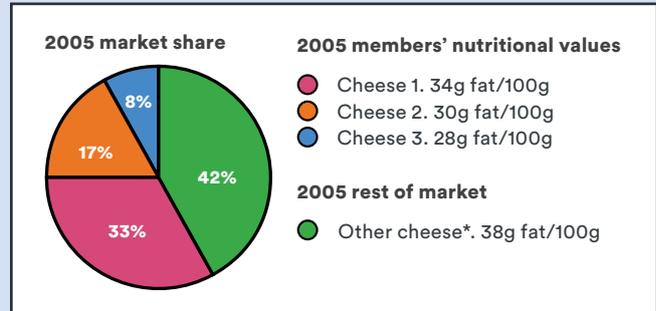
The conservative estimate assumes that no reformulation has occurred other than that of the participating FDI companies, insofar as the nutrition data used for the rest of market does not change between 2005 and 2017. The optimistic estimate is modelled on the basis that all products have been reformulated in a similar manner to those of FDI companies.

Using fat intakes from cheese as an example, members submitted fat data from 2005 and 2017 on individual products and market share (volume) was calculated for each product. The fat concentration probability distribution was common to all cheeses (template category) that were consumed as part of the survey. For example, any survey diary entry which recorded a 'cheese' consumption occasion (e.g. 30g cheddar cheese) was then assigned a 'cheese' fat value based on probability. Figure 1 shows a simplified version of how percentage market share (volume) was used to assign fat values to the individual diary entries for 'cheese' to support a probability distribution in 2005.

Data submitted on
1,780
products



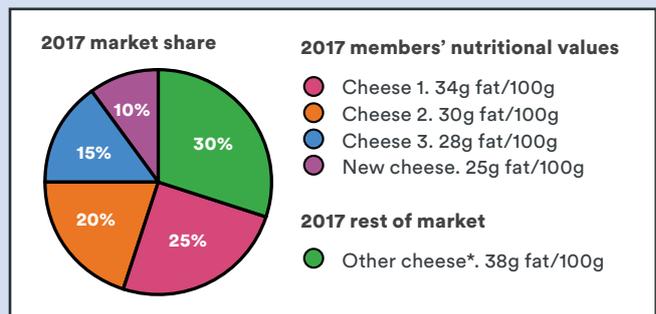
Figure 3. Example of assignment of nutrition values for products 2005 market share



*The nutrition value for rest of market is taken from figures in actual dietary survey weighted against type/volume of cheeses consumed

By 2017, many new products had entered the market, and market shares of existing products changed relative to one another. Figure 2 shows that as before, the same model was used and market share and nutrition data added for the new cheese(s) were considered in 2017. For the conservative 2017 estimate, the rest of the market was again taken into account.

Figure 4. Example of assignment of nutrition values for products 2017



*The nutrition value for rest of market is taken from figures in actual dietary survey weighted against type/volume of cheeses consumed

Optimistic estimate

The optimistic estimate assumes that all foods in the selected food categories are reformulated according to the pattern of reformulation exhibited by the participating FDI members. The concentration probability distributions in the optimistic estimate only include foods that were provided to Creme Global by the participating FDI members and their relative market share within the given group. The 'rest of market' does not feature in terms of either nutrition value or market share.

Nutrient assessments - Merging nutrient distribution and consumption data

The merged nutrients tables containing probability distributions of concentrations (in place of single concentrations per food) for distinct template categories were linked to the IUNA survey merged diary table and used as input data in the Creme Nutrition module on the Expert Models software platform (Creme Global, Ireland). The intakes of the nutrients of interest were calculated for subjects aged 1 to 90 years (n=3035). The individual daily intakes were used to generate distributions of the intakes of

the nutrients of interest for the entire population of 1-90 year old subjects in the IUNA surveys.

The model simulated the diary consumption events fivefold which resulted in the effective simulation of a larger sample of 15,175 subjects. This simulation improves the reproducibility of results and ensures a more accurate representation of the population distribution.

Limitations

It is important to remember that while the model takes into account changes in energy density (kcal/g) in products, one of the limitations is that it does not account for instances when the energy value remains the same but unit portion size decreases. This is because the model is based on a single consumption occasion at one point in time (from the dietary survey) and the figure is common across 2005 and 2017. It therefore will not reflect the impact of small changes in individual portion sizes that may result in reductions of the intakes of the nutrients of interest in this report. However, it would not have been appropriate to assume as part of this model that there were no compensatory increases in energy intake so actual dietary changes as a result of portion size reductions may be greater than demonstrated in this research. Only up to date actual dietary surveys will be able to reveal the full impact on energy and nutrient intake in these categories as a result of any change in portion size.

Data analysis

The Wilcoxon signed-rank test (sometimes called the paired Wilcoxon test) is a statistical test to determine whether the population means of two samples differ. It is applied in cases where the two samples are related (e.g. repeated measurements on the same subjects, matched subjects, etc). The Pratt modification makes the test more robust for measurements on an ordinal scale (i.e. ordered, discrete values). The p-values obtained from these statistical tests give an indication on the likelihood that the observed differences in intakes are down to random chance.

The paired Wilcoxon-Pratt statistical tests were conducted on the differences of individuals' intakes between 2005 and 2017. For this analysis, a significance level of 0.05 was chosen. A p-value less than 0.05 was deemed to be statistically significant.



Summary statistics of mean and P95 (95th percentile) intakes in the population were obtained from the model output distributions for each combination of age group, food group and nutrient of interest.

Four robustness checks were conducted on the data:

Test 1: Statistical significance

Where results had p values <0.05, these changes were deemed highly unlikely to be due to chance. The results

that failed this test are in light green in the results table (Appendix 3). This test was done on all results generated and appears in all of the tables in the appendix.

Test 2: Model Statistical Confidence

The variances of the changes were quantified. Where the interquartile range of the changes included zero, we could not conclude whether these changes are increases or decreases, hence should not be focused on. The results that failed this test are in light green in the results table (Appendix 3). This test was conducted on all of the mean results generated because it relied on the mean of the distribution.

The P95 results were not subjected to this test.

Test 3: Was the size of the nutrient change notable in the context of the overall diet?

Where the nutrient change represented less than 0.5% of the intake of that nutrient from the total diet, these groups were unlikely to be major sources of that nutrient. In the bigger picture of intakes from the total diet, these are not impactful and hence should not be focused on. The results that failed this test are marked as 'no change'. This test was only conducted on the mean intakes generated from the total population. This was only applicable to the total population because it is known that the same consumers' intakes are represented in the total diet value and the individual category, therefore there is a like-for-like comparison. Where results are generated for consumers only, the people that are represented as consumers of the total diet value and those represented as consumers in the individual categories are two different populations (the list of consumers of a given category is generally a subset of the consumers of the total diet), hence this test was not suitable and was not conducted.

Test 4: Was there enough data to draw conclusions from?

Where the number of products in 2005 was less than 10, the probability distributions generated using the data were deemed to be unlikely to be representative of the market, hence the changes are unreliable and should not be focused on. The results that failed this test are marked as n/a and are in light green in the results table (Appendix 3). This test was only applicable to the optimistic estimate, and not to the conservative estimate because the optimistic estimate only considers the submitted products. Where a small number of products were submitted for a category, this would mean that the sample size from which results can be generated would be too small. Conservative estimate results generated using only a few participating company products are not problematic because the products will only be considered in a small capacity, relative to the rest of the market concentration.

Note: not all tests were applied for each scenario.

The tests were conducted in sequence (1 to 4), however a fail in test 4 (where the results could not be determined) takes precedence over a fail in any other of the tests. A fail in test 3 meant that no change could be detected, and 'no change' was entered into the results tables (Appendix 3). A fail in test 1, 2 or 4 led to the result row being highlighted in a lighter colour. Where a specific results row is lighter because it failed a test, the reader can see which test it failed by looking at the test columns in the dataset, where the word "FAIL" appears.

Research results and discussion



Research results and discussion

This report set out to capture the voluntary undertakings of 15 participating FDI member companies to reformulate their products and model the impact of these changes on Irish dietary intakes of five nutrients.

Reformulation is one of the industry initiatives that forms part of the report. It is useful to examine the results of direct reformulation first, before broadening the analysis and modelling population intakes. As a simple point of reference, the average difference in nutrient concentrations (g/100g) in those products on the market in both 2005 and 2017 has been calculated, assuming equal weighting for all products within each category.

Reductions were observed in all nutrients when all food and beverage categories were averaged:

- 1.6% reduction in energy
- 0.3% reduction in total fat content
- 10.1% reduction in saturated fat
- 28% reduction in sodium content
- 8% reduction in sugar

Of the 1780 products used in the analysis, only 235 referred to products that were on the market in both 2005 and 2017 - but they are likely to represent popular products due to their longevity. The reductions above provide a positive starting point and reflect the direct results of product reformulation when examined in isolation.

Modelling the impact on the population, however, involves combining this direct reformulation with a multitude of other factors, such as consumption and product selection. The rest of this section analyses the changes in nutrient intakes of each population group between 2005 and 2017.

There are two distinct sets of results for this research:

1) Conservative estimate: This study combines the data provided by the 15 participating companies with external Euromonitor data to estimate the impact of food industry undertakings on Irish diets. It is a conservative estimate because it assumes no reformulation has occurred other than that of the 15 companies participating in this study.

2) Optimistic estimate: This study uses the data provided by the 15 participating companies and applies the same results to the rest of the food industry, assuming that other companies selling in the Irish market have made similar reformulation efforts. It is an optimistic estimate because it cannot be said with certainty that every company has made similar efforts.

This report's analysis focuses primarily on the conservative estimate, exploring the impact of the undertakings of participating companies on the diets of the total Irish population (measured by the mean), as well as examining the impact on the 95th percentile of consumers. Where significant results were found as part of the optimistic estimate, these have been spotlighted in the report to show what could be possible.

It is important to look at the 95th percentile as well as the total population because this is the group more heavily impacted by the nutritional makeup of these products and any industry undertakings to change them. The 95th percentile refers to the average intake for a person who consumes more of the food category than 95% of the population but less than the highest consuming 5% of the population. In this analysis, consumers who comprise the 95th percentile are referred to as 'high consumers'.

The collective impact of the efforts the companies have made on the total Irish diet is considered, as well as the impact of nine separate categories. These are:

- Beverages (excl. milk)
- Desserts, biscuits, cakes, ice cream and confectionery
- Breakfast cereals
- Meat products
- Milk and dairy products
- Rice, pasta, savouries and gluten free bread
- Savoury snacks (including crisps)
- Soups, sauces, pulses and misc. food
- Spreading fats

Full results are available in Appendix 3 (datasets).

Overview: impact on total diet

The tables below provide a summary overview of the absolute reductions in energy and nutrient intakes arising from the modelling of nutrients between 2005 to 2017, ranging from the conservative to optimistic estimates in both the average Irish person (Table 5) and in high (95th percentile) consumers of these food products (Table 6).

Energy: The model shows no meaningful change in energy intake for the mean total population across any age groups. In high consumers, the conservative estimates show that there was a reduction in energy intake in children, adults and pre-schoolers and a small increase in teens.

Total fat: The research shows no change in fat intakes in the mean total population using conservative estimates, but reductions in fat using the optimistic estimates across all the age groups. For high consumers of these foods, there was a decrease in total fat intake using the optimistic scenario.

Saturated fat: The research shows statistically significant reductions in saturated fat intake in the mean total population for adults and teens. In high consumers of products, saturated fat intakes decreased amongst adults and teens using both conservative and optimistic scenarios, whereas saturated fat intakes in children and pre-schoolers reduced only using the more optimistic estimates.

Sugar: The research shows significant overall reductions in sugar intake across all age groups in both mean total population and high consumers of products. In many cases, the reductions in sugar using the optimistic scenarios are 2-3 times that achieved using the more conservative estimates.

Sodium: The research shows no meaningful change in sodium intake across the age groups but a reduction for children using the optimistic scenario in the mean population. In high consumers there was a decrease in sodium intake in teens and children using the conservative estimates, but there was a small increase in adults.

The lack of change in general in average fat, sodium and energy figures demonstrates that the reductions in sugar and saturated fat were accomplished without overall compensatory increases in other nutrients of concern. Bearing in mind the technical challenges involved in the replacement of nutrients, particularly for some categories, this is positive news.

Table 5: Reduction in nutrient intake for the mean total population between 2005-2017, ranging from conservative to optimistic estimates

	Adults	Teens	Children	Pre-schoolers
Energy (kcal/day)	NC to NC	NC to NC	NC to NC	NC to NC
Total fat (g/day)	NC to 1.7	NC to 0.9	NC to 0.4	NS to 0.7
Saturated fat (g/day)	0.5 to 2.0	0.2 to 1.5	NS to 1.0	NS to 0.8
Sugar (g/day)	0.8 to 4.2	2.7 to 10.6	3.2 to 9.6	2.0 to 5.2
Sodium (g/day)	NC to NC	NS to NS	NS to 0.06	NS to NS

*NC indicates no change was observed.

*NS indicates the result was not statistically significant.

Table 6: Reduction in nutrient intake for high consumers between 2005-2017, ranging from conservative to optimistic estimates

	Adults	Teens	Children	Pre-schoolers
Energy (kcal/day)	12 to -16	-2 to 0	18 to 22	10 to -38
Total fat (g/day)	0.6 to 3.7	-0.9 to 0.7	0.3 to 0.6	NS to 1.6
Saturated fat (g/day)	0.6 to 3.4	1.3 to 3.6	NS to 1.4	NS to 1.3
Sugar (g/day)	0.9 to 7.4	4.5 to 17.4	6.7 to 18.3	1.6 to 5.9
Sodium (g/day)	-0.03 to -0.05	0.01 to -0.06	0.01 to 0.04	0.0 to 0.05

*NS indicates the result was not statistically significant.

**A negative (-) figure refers to an increase in a nutrient.

Sugar

Total population

Between 2005 and 2017, food industry undertakings such as reformulation and new product development helped to decrease the total amount of sugar consumed daily by the Irish population.

This change was most pronounced among children and teens, whose sugar intakes fell by 3.2g/day and 2.7g/day respectively. Adults and pre-schoolers also saw notable decreases of 0.8g/day and 2g/day respectively.

Over the course of an entire year, this decrease amounts to the removal of approximately 1.2kg of sugar from the average Irish child's diet and 1kg from the average Irish teen's diet.

Table 7: Total population mean sugar intake from total diet, 2005 v. 2017

Age	2005 intake (g/day)	Reduction (g/day, 05 v. 17)	Reduction (% , 05 v. 17)
Adult	91.5	0.8	0.9
Teen	108.0	2.7	2.5
Child	104.9	3.2	3.1
Pre-schooler	80.3	2.0	2.5

See Appendix 3 (datasets) for full results by category.

These decreases were driven primarily by beverages (excl. milk), which caused sugar intake to decrease for every age group. Children and teens were most affected, with average reductions from beverages of 3.2g/day and 2.4g/day respectively. Adults and pre-schoolers also saw significant reductions of 0.7g/day and 1.8g/day respectively.

During the period covered by this study, several beverage companies in Ireland made commitments to consumers to reduce the sugar in their products. These results demonstrate that they have followed through on these commitments. These companies continue to reformulate, fortify and innovate, but there will come a time when the point of diminishing returns kicks in.

Importantly, this research pre-dates the introduction of the sugar-sweetened drinks tax by the Irish Government. In fact, between 2005 and 2012, beverage companies removed 10 billion calories from the country's annual diet and reduced the amount of sugar consumed from beverages by 10%¹⁶.

Given the significant amount of time and investment that goes into reformulation and new product development, it is safe to assume that the strong positive outcomes in this research are the result of voluntary industry efforts to help consumers manage sugar in their diets and not a reaction to fiscal measures.

High consumers

Analysing the general population provides a snapshot of the impact that industry efforts have had on the average diet (including non-consumers). Analysing high consumers tells a different part of the story. Because this group is consuming greater quantities of the food in the category than the average person, their diets will be more affected than the general population by changes occurring in the levels of nutrients.

Among high consumers, the decrease in sugar intake in Irish diets was greater than among the general population. Children and teens again benefited the most, with their respective sugar intakes decreasing by 6.7g/day and 4.5g/day. Adults and pre-schoolers also saw significant reductions of 0.9g/day and 1.6g/day respectively.

Table 8: High consumer (95th percentile) sugar intake from total diet, 2005 v. 2017

Age	2005 intake (g/day)	Reduction (g/day, 05 v. 17)	Reduction (% , 05 v. 17)
Adult	170.0	0.9	0.5
Teen	185.4	4.5	2.4
Child	163.5	6.7	4.1
Pre-schooler	119.9	1.6	1.4

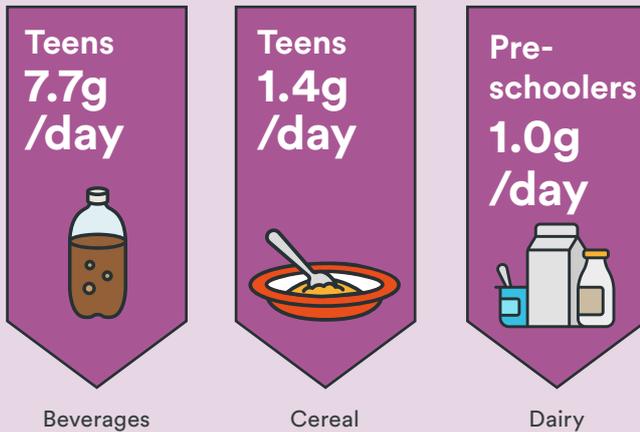
See Appendix 3 (datasets) for full results by category.

These high consumers benefitted most from reduced sugar levels in beverages (excl. milk), breakfast cereals and milk and dairy products.

Sugar intake from beverages (excl. milk) decreased for high consuming adults by 3.3g/day, for teens by 7.7g/day, for children by 6.3g/day, and for pre-schoolers by 4.4g/day.

Changes to beverages, breakfast cereals and milk and dairy had the biggest impacts on sugar intakes in high consumers of those categories

Decrease in high consumer sugar intake per day



Changes to breakfast cereals have caused sugar intake to decrease for high consuming adults by 0.8g/day, for teens by 1.4g/day, for children by 1.2g/day and for pre-schoolers by 0.4g/day.

Changes in dairy products decreased sugar intake for adults by 0.5g/day, for teens by 0.9g/day, for children by 0.7g/day, and for pre-schoolers by 1g/day. Reduced sugar intake from the desserts, biscuits, cakes, ice cream and confectionery category also benefited high consumer teens and pre-schoolers, albeit to a lesser extent. Respective reductions amounted to 0.6g/day and 0.2g/day.

At first glance it may seem like the impact made by changes in desserts, biscuits, cakes, ice cream and confectionery is smaller but the unique difficulties in reformulating these products (see ‘Challenges’ section) makes this a notable achievement.

It should be noted that changes in portion size of a product and any resulting impact on energy or nutrients intakes were not captured in this model which is based on a single consumption point from the IUNA surveys. Therefore, portion size initiatives may make an additional contribution to decreasing dietary intakes of energy and nutrients of concern.

There were a few minor increases in sugar consumption for high consumers resulting from certain food categories, such as meat products and savoury snacks. Increases caused by meat products ranged from 0.2-0.4g/day and increases by savoury snacks were up to 0.2g/day.

These minor increases may be attributed to the rising popularity of more convenience driven sub-categories of these food categories which may contain more sugar versus other products in this category.

Overall, the reduced sugar intake observed across the entire Irish population is a major success for the food and beverage industry. These figures show that undertakings in the areas of reformulation and new product development, especially within the beverage, breakfast cereals and milk and dairy categories, are having an impact on Irish diets.

Spotlight



If all foods in the selected food categories reformulated according to the pattern exhibited by the 15 participating companies, we could expect:

- Greater overall sugar reductions in the Irish diet for all age groups
 - Reduction from each adult’s diet of 4.2g/day
 - Reduction from each teen’s diet of 10.6g/day
 - Reduction from each child’s diet of 9.6g/day
 - Reduction from each pre-schooler’s diet of 5.2g/day
- Even greater impact by beverages (excl. milk), breakfast cereals and milk and dairy products
- Decreased sugar intake from milk and dairy products for all pre-schoolers of 1.7g/day
- A reduction of sugar intake from beverages (excl. milk) for high consumer children of 24.5g/day
- Greater reduction of sugar intake from breakfast cereals for high consumer teens of 7.7g/day

Sodium

Total population

There were no changes observed in sodium intake among any age group. A result is classified as 'no change' if the change was less than 0.5% of the total intake of that nutrient from the overall diet, meaning it was unlikely to have a meaningful impact.

Table 9: Total population mean sodium intake from total diet, 2005 v. 2017

Age	2005 intake (g/day)	Reduction (g/day, 05 v. 17)	Reduction (% , 05 v. 17)
Adult	2.53	No change	No change
Teen	2.37	Not statistically significant	Not statistically significant
Child	1.94	Not statistically significant	Not statistically significant
Pre-schooler	1.27	Not statistically significant	Not statistically significant

See Appendix 3 (datasets) for full results by category.

It is indisputable that sodium reduction has taken place across multiple food categories in Ireland, having been confirmed in a recent independent monitoring report by FSAI ⁵. Major sodium reduction (28%) was also evident in the examination of the direct reformulation of products in this study that were on the market in both 2005 and 2017.

The data needs to be investigated further to understand why sodium intake in the model did not decrease. One possible explanation is that the products submitted by the 15 FDI member companies do not include many of the biggest contributors to salt intake in Irish diets. In this interpretation, the ability of the product portfolio used in the report to affect sodium intake to any major extent is limited.

High consumers

Analysing the high consumer population shows that sodium levels in the total diet remained relatively stable.

Beverages (excl. milk) and savoury snacks caused small reductions of sodium in high consumer diets



Table 10: High consumer (95th percentile) sodium intake from total diet, 2005 v. 2017

Age	2005 intake (g/day)	Reduction (g/day, 05 v. 17)	Reduction (% , 05 v. 17)
Adult	4.24	-0.03	-0.7
Teen	3.64	0.01	0.3
Child	2.88	0.01	0.4
Pre-schooler	2.04	0	0

*A negative (-) figure refers to an increase in a nutrient. See Appendix 3 (datasets) for full results by category.

Within individual food categories, minimal reductions in sodium intake were observed as a result of changes within the beverages (excl. milk) category. These reductions were consistent at 0.01g/day among all four age groups. Small reductions also occurred for adults and children as a result of changes in the savoury snacks category of 0.02g/day and 0.01g/day respectively.

Reducing salt presents its own unique challenges and must be approached carefully. Aside from flavour, salt contributes much to a product, including acting as a preservative. This is particularly important for savoury snacks, which are expected to have a long shelf life. The gradual removal of salt has been ongoing for decades and must be an incremental process. However, research shows that even modest daily reductions in salt consumption have a positive effect on health.

Spotlight



If all foods in the selected food categories reformulated according to the pattern exhibited by the 15 participating companies, we could expect:

- Sodium intake reduced from total diet for all children by 0.06g/day
- Changes to savoury snacks reduced sodium intake for adults by 0.03g/day, for teens by 0.06g/day, for children by 0.05g/day and for pre-schoolers by 0.02g/day
- Even more impactful among high consumers, ranging from 0.17-0.25g/day

Saturated fat

Total population

As a result of work by manufacturers, the modelling showed that between 2005 and 2017, saturated fat intake within the Irish population's total diet dropped for adults and teens by 0.5g/day and 0.2g/day respectively. No statistically significant changes were observed for children or pre-schoolers during this time frame.

Table 11: Total population mean saturated fat intake from total diet, 2005 v. 2017

Age	2005 intake (g/day)	Reduction (g/day, 05 v. 17)	Reduction (% , 05 v. 17)
Adult	29.8	0.5	1.6
Teen	31.3	0.2	0.5
Child	26.9	Not statistically significant	Not statistically significant
Pre-schooler	18.8	Not statistically significant	Not statistically significant

See Appendix 3 (datasets) for full results by category.

Analysing individual food categories reveals that spreading fats (e.g. butter, margarine or other low-fat spreads) have driven the reduction observed for adults. Adult intake of saturated fat from spreading fats decreased by 0.2g/day.

This is a significant result given the key role that saturated fat plays for spreadable butters. Saturated fat provides the firmness to butter, making it responsible for the melt-in-your-mouth sensation. Reducing saturated fat content can cause spreading butters to soften if packaged in a wrapper. Margarine and plant oil spreads contain less saturated fat as they are made from a range of plant oils such as rapeseed and linseed oils. Liquid fats, more widely used in Europe, also have a lower saturated fat content but require a bigger shift in consumer behaviour to be accepted. Changes in packaging and consumer acceptance of liquid fats may be contributing factors in helping reduce Irish people's saturated fat intake.

Beverages (excl. milk) caused a decrease in saturated fat intake for adults of 0.2g/day. This result may seem somewhat surprising given that beverages are normally considered to be sugar sweetened beverages such as carbonates and squashes with low-to-zero levels of saturated fat. This result is attributable to coffee mixes, which contain milk and therefore saturated fat.

High consumers

Among high consumer adults and teens, the reduction of saturated fat becomes more pronounced, increasing to 0.6g/day for adults and 1.3g/day for teens. Again, no statistically significant changes were observed for children or pre-schoolers.

Table 12: High consumer (95th percentile) saturated fat intake from total diet, 2005 v. 2017

Age	2005 intake (g/day)	Reduction (g/day, 05 v. 17)	Reduction (% , 05 v. 17)
Adult	52.1	0.6	1.2
Teen	55.4	1.3	2.3
Child	41.3	Not statistically significant	Not statistically significant
Pre-schooler	29.8	Not statistically significant	Not statistically significant

See Appendix 3 (datasets) for full results by category.

Spreading fats were again the greatest drivers of saturated fat reductions among high consumers, decreasing intake for adults by 0.6g/day, for teens by 0.3g/day and for pre-schoolers by 0.4g/day.

Savoury snacks also caused favourable saturated fat intake reductions among high consumers, with decreases ranging from 0.1-0.3g/day for adults, teens and children. Fats are intrinsic to savoury snacks, and the fat absorbed during the frying process acts as a preservative by reducing water activity, thereby extending shelf life. Some companies in the savoury snack category have taken a step to change the frying oil used in production to high oleic sunflower oil. The reduction observed in saturated fat intake from savoury snacks is likely attributable to this oil, which is lower in saturated fat and has cholesterol-lowering benefits.

Rice, pasta, savouries and gluten free bread were particularly impactful for pre-schoolers, whose saturated fat intake decreased by 1.9g/day from that category alone, while the greatest reduction for children was caused by the desserts, biscuits, cakes, ice cream and confectionery category with a 0.5g/day reduction.

High consumer children consumed 0.5g/day less saturated fat from desserts, biscuits, cakes, ice cream and confectionery in 2017 than they did in 2005



The same result for beverages (excl. milk) caused by coffee drinks that appeared for the mean total population is amplified among high consumers, with adults benefiting from a 1.9g/day reduction of saturated fat intake in the category. Small increases in saturated fat intake for adults and teens were caused by meat products of 0.3g/day and 0.1g/day

respectively, while pre-schoolers were affected by a slight increase in saturated fat from desserts, biscuits, cakes, ice cream and confectionery of 0.3g/day. The increase from desserts, biscuits, cakes, ice cream and confectionery may be attributable to the rising popularity of cereal bars, whose sales increased between 2005 and 2017 and may make up a larger proportion of pre-schooler diets.

Spotlight



If all foods in the selected food categories reformulated according to the pattern exhibited by the 15 participating companies, we could expect:

- More significant reductions of saturated fat from the diets of all age groups
 - Adult intake reduced by 2.0g/day
 - Teen intake reduced by 1.5g/day
 - Child intake reduced by 1.0g/day
 - Pre-schooler intake reduced by 0.8g/day
- Greater impact by spreading fats on total population, ranging from reductions of 0.5-1.5g/day
- Savoury snacks causing reduction of saturated fat for all ages ranging from 0.7-1.1g/day
- Reduced saturated fat intake for high consumer children and pre-schoolers from milk and dairy products by 0.3g/day and 0.2g/day respectively

Total fat

Total population

An analysis of the entire population for total fat intake shows that no meaningful changes occurred for any age group nor within individual food categories.

Table 13: Total population mean total fat intake from total diet, 2005 v. 2017

Age	2005 intake (g/day)	Reduction (g/day, 05 v. 17)	Reduction (% , 05 v. 17)
Adult	75.6	No change	No change
Teen	76.6	No change	No change
Child	62.7	No change	No change
Pre-schooler	41.6	Not statistically significant	Not statistically significant

See Appendix 3 (datasets) for full results by category.

High consumers

Analysing high consumers, however, reveals moderate changes. Food industry undertakings caused minor reductions in total fat intake for adults and children, with decreases of 0.6g/day and 0.3g/day respectively. A modest increase was observed for teens of 0.9g/day, while no statistically significant change was found for pre-schoolers.

Table 14: High consumer (95th percentile) total fat intake from total diet, 2005 v. 2017

Age	2005 intake (g/day)	Reduction (g/day, 05 v. 17)	Reduction (% , 05 v. 17)
Adult	127.4	0.6	0.5
Teen	123.3	-0.9	-0.7
Child	92.5	0.3	0.3
Pre-schooler	64.7	Not statistically significant	Not statistically significant

*A negative (-) figure refers to an increase in a nutrient. See Appendix 3 (datasets) for full results by category.

The greatest impacts varied between age groups - desserts, biscuits, cakes, ice cream and confectionery having the biggest benefit for children with a reduction of 1.5g/day; and rice, pasta, savouries and gluten free bread doing the same for pre-schoolers with a reduction of 1.4g/day.

The total fat reduction from desserts, biscuits, cakes, ice cream and confectionery for children is notable given the limitations for this category. Confectionery products are naturally higher in total fat content, and some ingredient changes are constrained by legislation. The EU Cocoa and Chocolate Directive, for example, specifies a minimum fat content for chocolate products and limits changes to its composition.

Beverages (excl. milk) had the greatest reduction of total fat for adults at 2.7g/day. The same result was reflected in the saturated fat category and is attributable to coffee drinks containing dairy creamers, which contain fat and saturated fat.

Modest reductions were also seen from spreading fats among adults and children of 0.6g/day and 0.9g/day respectively, and from milk and dairy products among teens of 0.4g/day. Spreading fats and milk and dairy products are naturally high in total fat content, meaning these reductions are likely the result of significant effort on the part of the food industry to adapt these product recipes. The promotion of low-fat fortified milks could also be contributing to fat reduction in this category.

Minor increases were observed in some categories, with the biggest contributor being meat products, followed by savoury snacks. Adults, teens and children all experienced increased total fat intake as a result of meat products, ranging from 0.3-0.6g/day, while all ages were affected by increases from savoury snacks, ranging from 0.3-0.4g/day.

The increases caused by meat products may be attributable to the rising popularity of convenience

food. Between 2005 and 2017, sales of ready meals increased by 13.1 million kilograms. When a food's total sales increase, the share of that food within the total diet rises, and therefore the impact that its nutrient content has on the total diet will increase concurrently.

The increase in total fat intake from savoury snacks may appear to sit in opposition to the decrease in saturated fat content from this category. The reality is that the switch to high oleic sunflower oil for frying has led to a change in the overall fat profile of savoury snacks, lowering saturated fat levels and increasing total fat levels. This shift is a positive change for the overall nutritional makeup of the savoury snack category.

Overall, there was greater than average variation between age cohorts in the total fat category, with some standout success in reduced intake from spreading fats, desserts, biscuits, cakes, ice cream and confectionery, and rice, pasta, savouries and gluten free bread.

Spotlight



If all foods in the selected food categories reformulated according to the pattern exhibited by the 15 participating companies, we could expect:

- Meaningful total fat reductions among the entire population
 - Adult intake reduced by 1.7g/day
 - Teen intake reduced by 0.9g/day
 - Child intake reduced by 0.4g/day
 - Pre-schooler intake reduced by 0.7g/day
- Significantly larger reductions caused by spreading fats among high consumers, ranging from 0.8-3.5g/day
- Reduced intake of total fat caused by desserts, biscuits, cakes, ice cream and confectionery for high consumer adults and teens of 0.8g/day and 0.9g/day respectively
- Modest reductions by milk and dairy products for high consumer children and pre-schoolers of 0.8g/day and 0.5g/day respectively

Energy

Total population

No meaningful change in energy intake occurred as a result of these undertakings for the total population for any age group in this study between 2005 and 2017.

The lack of reduction in calories in the average consumer is not unexpected. Modelled daily energy intakes for average adults in both 2005 (2014kcal; 8460kJ) and 2017 (2009kcal; 8440kJ) are similar and close to the reference intake for adults of 2000kcal/day (8400kJ/day). However, shifts in where people consume their energy from may be positive. If energy from soft drinks is replaced by energy from foods with

a broader nutritional profile, that may well benefit the overall dietary quality of the individual depending on the choices they make. This would be particularly important for children who have lower energy needs but require nutrient dense diets.

The energy profile of a product is affected by its nutrient makeup, so we might wonder why we don't see a more notable energy reduction given the reduced levels of sugar intake already discussed. It is important to keep in mind that each of these nutrients plays multiple roles in the products they are in and replacing them entails finding a substitute with a similar energy level.

Take for example sugar in breakfast cereals. Sugar can be reduced, but the bulk it provides must be replaced. The most common replacement in this instance is with another carbohydrate, starch, which contains the same level of calories as sugar (4kcal/g). So, while sugar level will be lowered to the benefit of the consumer, the energy level may remain stable. Fibre can almost provide part replacement for sugar but also has an energy value (2kcal/gram).

Table 15: Total population mean energy intake from total diet, 2005 v. 2017

Age	2005 intake (kcal/day)	Reduction (kcal/day, 05 v. 17)	Reduction (kcal/day)
Adult	2015	No change	No change
Teen	1981	No change	No change
Child	1676	No change	No change
Pre-schooler	1144	No change	No change

See Appendix 3 (datasets) for full results by category.

Within individual categories, there was a reduction in energy intake caused by the beverages (excl. milk) category for children and pre-schoolers of 12kcal/day and 6kcal/day respectively. This could be a direct result of the decreased sugar intake for the beverages (excl. milk) category.

High consumers

The group termed 'high consumers' are not all de facto overweight or obese and may well contain individuals that have high energy requirements due to various factors including higher levels of physical activity. However, in the current climate with Irish rates of obesity, it is also realistic to assume some individuals in this group will be consuming excess energy. This is therefore the group that may most benefit from a reduction in energy intake as a result of food changes and indeed where we see energy reductions in the model.

Changes in energy intake are more noticeable within the total diet of high consumers. Energy intake from the total diet decreased for high consumer adults by 12kcal/day, for children by 18kcal/day and for pre-schoolers by 10kcal/day. Teens experienced a minimal increase of 2kcal/day.

For adults who are high consumers of FDI product categories, this is the equivalent of the removal of 4,219kcal from the annual diet. This equates to more than two days' worth of calories a year. For high consumer children, 6,537kcal have been removed from each child's annual diet, largely as a result of a reduction in total sugar intake.

Table 16: High consumer (95th percentile) energy intake from total diet, 2005 v. 2017

Age	2005 intake (kcal/day)	Reduction (kcal/day, 05 v. 17)	Reduction (kcal/day)
Adult	3237	12	0.4
Teen	3037	-2	-0.1
Child	2324	18	0.8
Pre-schooler	1641	10	0.6

*A negative (-) figure refers to an increase in a nutrient. See Appendix 3 (datasets) for full results by category.

Reductions were driven by the beverages (excl. milk) category, which impacted high consumer diets by removing between 13-21 kcal/day



The reductions were driven by beverages (excl. milk), which saw decreases at every age group ranging from 13-21kcal/day.

The largest energy intake reduction for any age was caused by the category rice, pasta, savouries (e.g. pizza, noodles) and gluten free breads, which resulted in a decrease for pre-schoolers of 50kcal/day and a minor reduction for adults of 5kcal/day.

Modest reductions were also seen as a result of spreading fats for adults and children at 8kcal/day and 9kcal/day respectively; and milk and dairy products for adults, teens and pre-schoolers at 5kcal/day, 7kcal/day and 7kcal/day respectively. Bearing in mind lower calorie dairy products and spreads have been on the market since well before 2005, these further reductions in energy show an ongoing commitment in this area.

Increases in energy intake were affected by the category desserts, biscuits, cakes, ice cream and confectionery, which saw increases for adults, children and pre-schoolers of 6kcal/day, 14kcal/day and 13kcal/day respectively. However, as discussed earlier in this report, this sector is also using portion size reduction/calorie capping as a strategy to reduce the intake of energy and nutrients of

public health interest and this could not be accommodated in this model. Future national dietary surveys will be able to reveal the full impact on energy intake in these categories in the intervening years as a result of downsizing portions. A minor energy increase was observed in adults of 5kcal/day.

Overall, reductions in energy intake were only significant in higher consumers, which is to be expected. As higher consumers of these categories they have the most to gain from food industry changes. The consistency demonstrated by beverages (excl. milk) across ages shows the real, lasting progress in that category and its impact in particular on high consumers. The significant reduction in energy for high consumer pre-schoolers from rice, pasta, savouries and gluten free bread indicates considerable progress in that category for very young people.

Spotlight



If all foods in the selected food categories reformulated according to the pattern exhibited by the 15 participating companies, we could expect:

- Significant energy reductions for high consumers of beverages (excl. milk)
 - Adult intake reduced by 90kcal/day
 - Teen intake reduced by 118kcal/day
 - Child intake reduced by 93kcal/day
 - Pre-schooler intake reduced by 36kcal/day
- Notable reductions from milk and dairy products ranging from 16-30kcal/day
- Reduced energy intake caused by spreading fats ranging from 6-35kcal/day
- Modest reduction caused by savoury snacks for adults, teens and children ranging from 11-16kcal/day

Conclusion

This study aimed to calculate the impact on Irish diets of efforts in the food and beverage industry to reformulate recipes and develop new products, using an innovative modelling tool to compare product data from 2005 to 2017.

It is worth highlighting that, unless specified, the data in this report relates to the modelled impact of efforts by the 15 member companies and their products only. The Irish diet is made up of a much wider selection of manufactured food products as well as foods prepared and consumed both in and outside the home. For this reason, the overall choices consumers make will also continue to impact greatly on the overall dietary intake and ultimate success in reaching national targets for sugar, sodium and saturated fat and addressing obesity.

It is important to remember that while the model takes into account changes in energy density (kcal/g) in products, one of the limitations is that it does not account for instances when the energy value remains the same but unit portion size decreases. It therefore will not reflect the impact of

small changes in individual portion sizes that may result in energy reduction and the reduction also of nutrients like sugar, fat and saturated fat. However, it would not have been appropriate to assume as part of this model that there were no compensatory increases in energy intake so actual dietary changes as a result of portion size reductions may be greater than demonstrated in this research. Only up to date actual dietary surveys will be able to reveal the full impact on energy and nutrient intake in these categories as a result of any impact on portion size.

The results of this model show that between 2005 and 2017, sugar and saturated fat intake in particular decreased in the average Irish diets, while sodium, total fat and energy intake remained relatively stable.

The most striking change for a single nutrient was the significant reduction of consumers' sugar intake. This was largely driven by changes in the beverage category, but also supported by sugar reductions in breakfast cereals, milk and dairy products and desserts, biscuits, cakes, ice cream and confectionery. This reduction occurred without overall increases in fat, saturated fat or sodium demonstrating that the industry is taking a longer-term view of reformulation and is focused on the wider nutrition profile of products.

This reduction in sugar is a significant achievement for the food and beverage industry and shows that ongoing voluntary efforts to improve products in line with government recommendations are having a real impact on consumers. Considering this research outlines industry efforts that pre-date the Irish Government's sugar-sweetened drinks tax, it is clear that the evidence base for voluntary reformulation is strong.

The lack of impact of sodium reformulation on modelled intakes may reflect the complex nature of the model, which accommodates not only changes in the nutrient profiles of FDI members products but the introduction of new products onto the market and changes in consumer

purchasing patterns reflected in volume sales. This result actually highlights the benefits of monitoring, which can help target future areas of focus for the food industry and wider initiatives for greatest impact.

It is of significance that the changes are generally more impactful on high consumers versus the average person – this being the group most likely to need to reduce intakes of nutrients of concern like sugar, sodium, saturated fat and energy.

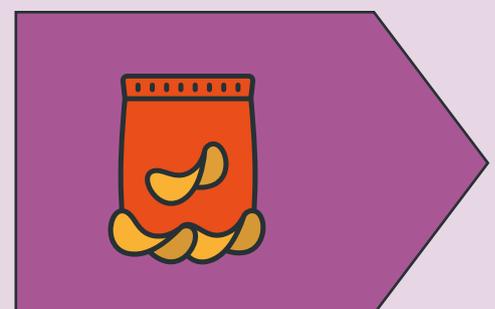
Between 2005 and 2017, sugar, saturated fat, total fat and energy levels decreased in high consumer Irish diets, while sodium levels remained relatively stable.

Specific food categories that have seen positive reductions for high consumers across multiple nutrient categories include:

- Beverages (excl. milk) for sugar and energy
- Milk and dairy for sugar and energy
- Rice, pasta, savouries and gluten free bread for fat and energy
- Savoury snacks for saturated fat and energy
- Spreading fats for saturated fat and energy

While the changes at the level of individual dietary intakes may appear modest against the overarching targets for both obesity prevention and nutrient goals, each step in the right direction counts. As outlined in the Irish Government's *2016 Obesity Policy and Action Plan* there is no one solution to the problem of obesity and a multi-sector approach is required for success. Single population interventions in themselves are likely to deliver small impacts against overall goals but each single successful intervention when combined may well be what helps us turn the tide on obesity and non-communicable diseases. Along with the food and beverage industry, government, the health service, and consumers themselves all have an essential part to play.

Between 2005 and 2017, sugar, saturated fat, total fat and energy levels decreased in high consumer Irish diets, while sodium levels remained relatively stable



Appendices



Appendix 1: glossary of terms

Conservative results: The conservative results in this report were estimated using both participating FDI member company data and Euromonitor data to create a full picture of the entire food market in Ireland. It is a conservative estimate because it assumes that no reformulation has occurred by any other companies selling in the Irish market other than the participating FDI members. These figures indicate the direct impact of product reformulation by the participating FDI members on the Irish population's dietary intake

Creme Global: Creme Global is an independent, Irish-based research company specialising in predictive modelling in the food and nutrition sectors

Energy: Energy in this report is measured in kilocalories

Euromonitor: Euromonitor is an independent market research company that provides volume sales data on food consumption in Ireland

Food Drink Ireland (FDI): Food Drink Ireland is the main trade association for the food and drink industry in Ireland. It represents the interests of over 150 food, drink and non-food grocery manufacturers and suppliers

Food Safety Authority of Ireland (FSAI): The Food Safety Authority of Ireland is a statutory, independent and science-based body dedicated to protecting public health and consumer interests in the area of food safety and hygiene

High consumer: The 95th percentile (P95) of consumers of FDI products. The 95th percentile refers to the value of intake below which 95% of the analysed population falls. 95% of the population consumes less than these consumers, and 5% of the population consumes more than these consumers

Ibec: Ibec is Ireland's largest lobby group representing Irish business both domestically and internationally

Irish Universities Nutrition Alliance (IUNA): The Irish Universities Nutrition Alliance is a formal alliance bringing together the nutrition expertise of University College Cork, University College Dublin, Ulster University and Trinity College Dublin. IUNA developed the national databases of dietary intake and health status in the Republic of Ireland

Mean: The average of all intake values calculated for individuals within the target population

Mean total population: The mean average of all intake values calculated for the total population of Ireland, regardless of whether they are consumers of the product in question

Optimistic results: The optimistic results in this report were estimated using only the participating FDI member company data. This data was applied to the rest of market, assuming that all companies selling in the Irish market have reformulated in a similar way to the participating FDI members. These figures indicate what could be possible if the entire food and drink industry in Ireland reformulated according to the same pattern exhibited by this report

P95: The value of intake below which 95% of the analysed population falls. In this analysis, P95 represents high consumers of products

P95 error: Standard deviation of the distribution of 95th percentile (P95) intake values. The distributions of P95 intake values are calculated using bootstrapping

Reformulation: In this analysis, reformulation refers to foods that have altered nutrition composition in order to reduce levels of energy, total fat, saturated fat, sodium and/or sugar

Statistical significance: Statistical significance refers to the probability (p-value) that the observed result is due to natural variability



Appendix 2: references

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Dataset 1: Conservative estimate for mean total population

Total Diet

Nutrient	Age	2005 mean intake	2017 mean intake	Absolute reduction	% Difference	P-value	Test 1	Test 2	Test 3
Energy (kcal/day)	Adult	2014.91	2009.93	no change	no change	8.18E-37	PASS	PASS	FAIL
	Teen	1981.28	1973.57	no change	no change	7.27E-20	PASS	PASS	FAIL
	Children	1676.03	1669.38	no change	no change	2.91E-20	PASS	PASS	FAIL
	Preschool	1143.93	1139.87	no change	no change	4.17E-10	PASS	PASS	FAIL
Saturated Fat (g/day)	Adult	29.78	29.31	0.47	1.57%	2.26E-45	PASS	PASS	PASS
	Teen	31.3	31.14	0.16	0.51%	7.02E-06	PASS	PASS	PASS
	Children	26.94	26.79	0.15	0.57%	5.03E-02	FAIL	PASS	PASS
	Preschool	18.8	18.77	no change	no change	3.73E-01	FAIL	FAIL	FAIL
Sodium (g/day)	Adult	2.53	2.55	no change	no change	1.63E-09	PASS	PASS	FAIL
	Teen	2.37	2.38	no change	no change	2.61E-12	PASS	FAIL	FAIL
	Children	1.94	1.94	no change	no change	1.90E-26	PASS	FAIL	FAIL
	Preschool	1.27	1.28	no change	no change	7.70E-06	PASS	FAIL	FAIL
Sugar (g/day)	Adult	91.54	90.73	0.81	0.89%	1.90E-39	PASS	PASS	PASS
	Teen	108.02	105.36	2.66	2.47%	2.22E-54	PASS	PASS	PASS
	Children	104.91	101.67	3.24	3.09%	1.00E-80	PASS	PASS	PASS
	Preschool	80.29	78.3	1.99	2.48%	7.45E-54	PASS	PASS	PASS
Total Fat (g/day)	Adult	75.55	75.19	no change	no change	3.42E-09	PASS	PASS	FAIL
	Teen	76.61	76.76	no change	no change	1.63E-03	PASS	PASS	FAIL
	Children	62.69	62.78	no change	no change	3.30E-05	PASS	PASS	FAIL
	Preschool	41.61	41.68	no change	no change	6.07E-02	FAIL	PASS	FAIL

Beverages (Excl. Milk)

Nutrient	Age	2005 mean intake	2017 mean intake	Absolute reduction	% Difference	P-value	Test 1	Test 2	Test 3
Energy (kcal/day)	Adult	59.75	56.44	no change	no change	1.15E-121	PASS	PASS	FAIL
	Teen	130.44	122.25	no change	no change	4.81E-52	PASS	PASS	FAIL
	Children	125.19	113.6	11.59	9.26%	5.88E-90	PASS	PASS	PASS
	Preschool	57.97	51.66	6.31	10.89%	8.89E-74	PASS	PASS	PASS
Saturated Fat (g/day)	Adult	0.36	0.15	0.21	57.50%	2.87E-235	PASS	PASS	PASS
	Teen	0.05	0.05	no change	no change	7.41E-62	PASS	PASS	FAIL
	Children	0.02	0.02	no change	no change	4.67E-76	PASS	PASS	FAIL
	Preschool	0.06	0.06	no change	no change	5.33E-70	PASS	FAIL	FAIL

Sodium (g/day)	Adult	0.02	0.02	no change	no change	7.40E-98	PASS	PASS	FAIL
	Teen	0.03	0.03	no change	no change	1.71E-43	PASS	PASS	FAIL
	Children	0.03	0.03	no change	no change	4.70E-82	PASS	PASS	FAIL
	Preschool	0.02	0.01	no change	no change	2.21E-67	PASS	PASS	FAIL
Sugar (g/day)	Adult	13.57	12.9	0.68	5.00%	4.26E-69	PASS	PASS	PASS
	Teen	31.3	28.94	2.36	7.55%	2.26E-61	PASS	PASS	PASS
	Children	29.52	26.37	3.15	10.69%	8.28E-97	PASS	PASS	PASS
	Preschool	13.94	12.17	1.76	12.66%	2.60E-79	PASS	PASS	PASS
Total Fat (g/day)	Adult	0.56	0.26	no change	no change	6.34E-191	PASS	PASS	FAIL
	Teen	0.16	0.15	no change	no change	5.30E-62	PASS	PASS	FAIL
	Children	0.14	0.13	no change	no change	5.56E-83	PASS	PASS	FAIL
	Preschool	0.18	0.18	no change	no change	4.37E-73	PASS	PASS	FAIL

Desserts, Biscuits, Cakes, Ice Cream and Confectionery

Nutrient	Age	2005 mean intake	2017 mean intake	Absolute reduction	% Difference	P-value	Test 1	Test 2	Test 3
Energy (kcal/day)	Adult	125.95	126.87	no change	no change	6.85E-20	PASS	PASS	FAIL
	Teen	206.85	209.46	no change	no change	1.23E-06	PASS	PASS	FAIL
	Children	219.31	225.58	no change	no change	2.94E-20	PASS	PASS	FAIL
	Preschool	100.86	104.37	no change	no change	5.74E-17	PASS	PASS	FAIL
Saturated Fat (g/day)	Adult	3.26	3.21	no change	no change	1.64E-18	PASS	PASS	FAIL
	Teen	5.28	5.31	no change	no change	4.39E-01	FAIL	PASS	FAIL
	Children	5.61	5.6	no change	no change	2.29E-03	PASS	FAIL	FAIL
	Preschool	2.49	2.61	no change	no change	2.43E-07	PASS	PASS	FAIL
Sodium (g/day)	Adult	0.06	0.06	no change	no change	1.86E-113	PASS	PASS	FAIL
	Teen	0.08	0.08	no change	no change	7.04E-39	PASS	PASS	FAIL
	Children	0.09	0.09	no change	no change	2.25E-23	PASS	PASS	FAIL
	Preschool	0.05	0.05	no change	no change	1.03E-15	PASS	PASS	FAIL
Sugar (g/day)	Adult	11.19	11.16	no change	no change	1.51E-06	PASS	PASS	FAIL
	Teen	21.21	21.14	no change	no change	1.20E-02	PASS	FAIL	FAIL
	Children	22.29	22.48	no change	no change	7.28E-01	FAIL	PASS	FAIL
	Preschool	9.15	9.24	no change	no change	5.28E-04	PASS	PASS	FAIL
Total Fat (g/day)	Adult	5.74	5.7	no change	no change	3.80E-11	PASS	PASS	FAIL
	Teen	9.19	9.29	no change	no change	5.64E-02	FAIL	PASS	FAIL
	Children	9.69	9.73	no change	no change	1.44E-04	PASS	PASS	FAIL
	Preschool	4.38	4.55	no change	no change	4.65E-08	PASS	PASS	FAIL

Breakfast Cereals

Nutrient	Age	2005 mean intake	2017 mean intake	Absolute reduction	% Difference	P-value	Test 1	Test 2	Test 3
Energy (kcal/day)	Adult	75.8	76.51	no change	no change	1.63E-190	PASS	PASS	FAIL
	Teen	112.76	113.79	no change	no change	5.65E-62	PASS	PASS	FAIL
	Children	113.64	114.68	no change	no change	1.31E-86	PASS	PASS	FAIL
	Preschool	70.19	70.85	no change	no change	9.62E-74	PASS	PASS	FAIL
Saturated Fat (g/day)	Adult	0.15	0.15	no change	no change	6.29E-88	PASS	PASS	FAIL
	Teen	0.23	0.22	no change	no change	8.50E-17	PASS	PASS	FAIL
	Children	0.23	0.23	no change	no change	3.22E-14	PASS	PASS	FAIL
	Preschool	0.14	0.14	no change	no change	4.19E-22	PASS	FAIL	FAIL
Sodium (g/day)	Adult	0.08	0.08	no change	no change	1.64E-24	PASS	PASS	FAIL
	Teen	0.12	0.12	no change	no change	3.02E-01	FAIL	FAIL	FAIL
	Children	0.12	0.12	no change	no change	9.59E-04	PASS	FAIL	FAIL
	Preschool	0.07	0.07	no change	no change	3.62E-01	FAIL	FAIL	FAIL
Sugar (g/day)	Adult	4.02	3.79	no change	no change	3.34E-109	PASS	PASS	FAIL
	Teen	6	5.62	no change	no change	3.11E-43	PASS	PASS	FAIL
	Children	6.04	5.66	no change	no change	1.51E-62	PASS	PASS	FAIL
	Preschool	3.71	3.51	no change	no change	8.62E-34	PASS	PASS	FAIL
Total Fat (g/day)	Adult	0.51	0.52	no change	no change	1.31E-25	PASS	PASS	FAIL
	Teen	0.76	0.79	no change	no change	1.20E-01	FAIL	PASS	FAIL
	Children	0.77	0.78	no change	no change	1.38E-01	FAIL	PASS	FAIL
	Preschool	0.48	0.48	no change	no change	1.84E-02	PASS	PASS	FAIL

Meat Products

Nutrient	Age	2005 mean intake	2017 mean intake	Absolute reduction	% Difference	P-value	Test 1	Test 2	Test 3
Energy (kcal/day)	Adult	99.05	98.23	no change	no change	8.98E-30	PASS	PASS	FAIL
	Teen	90.01	89.1	no change	no change	2.03E-11	PASS	PASS	FAIL
	Children	71.99	71.39	no change	no change	2.37E-13	PASS	PASS	FAIL
	Preschool	49.65	49.29	no change	no change	1.71E-07	PASS	PASS	FAIL
Saturated Fat (g/day)	Adult	1.97	2.02	no change	no change	4.28E-55	PASS	PASS	FAIL
	Teen	1.79	1.83	no change	no change	2.28E-16	PASS	PASS	FAIL
	Children	1.43	1.46	no change	no change	2.65E-20	PASS	PASS	FAIL
	Preschool	0.99	1.01	no change	no change	6.41E-18	PASS	PASS	FAIL
Sodium (g/day)	Adult	0.37	0.36	no change	no change	2.29E-28	PASS	PASS	FAIL
	Teen	0.33	0.33	no change	no change	1.02E-11	PASS	PASS	FAIL
	Children	0.27	0.26	no change	no change	3.80E-18	PASS	PASS	FAIL
	Preschool	0.18	0.18	no change	no change	5.42E-13	PASS	PASS	FAIL
Sugar (g/day)	Adult	0.33	0.4	no change	no change	7.02E-135	PASS	PASS	FAIL
	Teen	0.3	0.37	no change	no change	1.11E-51	PASS	PASS	FAIL
	Children	0.24	0.29	no change	no change	8.06E-77	PASS	PASS	FAIL
	Preschool	0.17	0.2	no change	no change	1.19E-46	PASS	PASS	FAIL

Total Fat (g/day)	Adult	5.96	6	no change	no change	5.78E-10	PASS	PASS	FAIL
	Teen	5.42	5.46	no change	no change	3.46E-04	PASS	PASS	FAIL
	Children	4.33	4.38	no change	no change	2.28E-09	PASS	PASS	FAIL
	Preschool	2.99	3	no change	no change	3.11E-05	PASS	FAIL	FAIL

Milk and Dairy Products

Nutrient	Age	2005 mean intake	2017 mean intake	Absolute reduction	% Difference	P-value	Test 1	Test 2	Test 3
Energy (kcal/day)	Adult	129.56	128.04	no change	no change	1.44E-44	PASS	PASS	FAIL
	Teen	88.93	88.08	no change	no change	1.72E-08	PASS	PASS	FAIL
	Children	80.36	79.63	no change	no change	1.18E-09	PASS	PASS	FAIL
	Preschool	115.58	114.3	no change	no change	7.94E-10	PASS	PASS	FAIL
Saturated Fat (g/day)	Adult	4.04	4.05	no change	no change	2.69E-01	FAIL	FAIL	FAIL
	Teen	3.04	3.01	no change	no change	1.27E-02	PASS	FAIL	FAIL
	Children	2.37	2.33	no change	no change	2.39E-07	PASS	PASS	FAIL
	Preschool	3.11	3.04	no change	no change	1.80E-09	PASS	PASS	FAIL
Sodium (g/day)	Adult	0.17	0.17	no change	no change	4.39E-17	PASS	PASS	FAIL
	Teen	0.13	0.12	no change	no change	2.72E-02	PASS	FAIL	FAIL
	Children	0.1	0.1	no change	no change	5.10E-17	PASS	PASS	FAIL
	Preschool	0.12	0.13	no change	no change	1.36E-19	PASS	PASS	FAIL
Sugar (g/day)	Adult	9.34	9.05	no change	no change	7.90E-104	PASS	PASS	FAIL
	Teen	5.81	5.64	no change	no change	1.30E-15	PASS	PASS	FAIL
	Children	6.79	6.65	no change	no change	3.57E-20	PASS	PASS	FAIL
	Preschool	10.95	10.74	no change	no change	2.91E-17	PASS	PASS	FAIL
Total Fat (g/day)	Adult	6.54	6.51	no change	no change	2.87E-03	PASS	PASS	FAIL
	Teen	4.89	4.84	no change	no change	3.12E-04	PASS	PASS	FAIL
	Children	3.8	3.73	no change	no change	7.05E-10	PASS	PASS	FAIL
	Preschool	4.96	4.88	no change	no change	3.34E-08	PASS	PASS	FAIL

Rice, Pasta, Savouries and Gluten Free Bread

Nutrient	Age	2005 mean intake	2017 mean intake	Absolute reduction	% Difference	P-value	Test 1	Test 2	Test 3
Energy (kcal/day)	Adult	13.66	13.43	no change	no change	3.63E-244	PASS	PASS	FAIL
	Teen	27.7	27.1	no change	no change	1.82E-71	PASS	PASS	FAIL
	Children	14.48	14.25	no change	no change	1.97E-96	PASS	PASS	FAIL
	Preschool	6.66	6.54	no change	no change	1.26E-83	PASS	PASS	FAIL
Saturated Fat (g/day)	Adult	0.22	0.22	no change	no change	3.69E-244	PASS	PASS	FAIL
	Teen	0.54	0.54	no change	no change	1.98E-71	PASS	FAIL	FAIL
	Children	0.27	0.27	no change	no change	2.65E-95	PASS	PASS	FAIL
	Preschool	0.12	0.12	no change	no change	2.49E-82	PASS	PASS	FAIL
Sodium (g/day)	Adult	0.02	0.02	no change	no change	4.00E-244	PASS	PASS	FAIL
	Teen	0.04	0.04	no change	no change	3.80E-64	PASS	FAIL	FAIL
	Children	0.02	0.02	no change	no change	2.39E-91	PASS	FAIL	FAIL
	Preschool	0.01	0.01	no change	no change	1.26E-83	PASS	PASS	FAIL

Sugar (g/day)	Adult	0.11	0.11	no change	no change	6.99E-221	PASS	PASS	FAIL
	Teen	0.16	0.17	no change	no change	1.69E-71	PASS	PASS	FAIL
	Children	0.09	0.09	no change	no change	4.58E-94	PASS	PASS	FAIL
	Preschool	0.05	0.05	no change	no change	2.41E-82	PASS	FAIL	FAIL
Total Fat (g/day)	Adult	0.48	0.48	no change	no change	7.69E-243	PASS	PASS	FAIL
	Teen	1.12	1.09	no change	no change	5.47E-74	PASS	PASS	FAIL
	Children	0.56	0.55	no change	no change	1.13E-97	PASS	PASS	FAIL
	Preschool	0.25	0.25	no change	no change	2.45E-82	PASS	PASS	FAIL

Savoury Snacks (Including Crisps)

Nutrient	Age	2005 mean intake	2017 mean intake	Absolute reduction	% Difference	P-value	Test 1	Test 2	Test 3
Energy (kcal/day)	Adult	24.65	24	no change	no change	2.86E-65	PASS	PASS	FAIL
	Teen	56.24	54.95	no change	no change	1.34E-06	PASS	PASS	FAIL
	Children	47.87	46.52	no change	no change	1.68E-11	PASS	PASS	FAIL
	Preschool	15.04	14.73	no change	no change	6.42E-15	PASS	PASS	FAIL
Saturated Fat (g/day)	Adult	0.19	0.16	no change	no change	2.86E-234	PASS	PASS	FAIL
	Teen	0.44	0.37	no change	no change	1.46E-72	PASS	PASS	FAIL
	Children	0.37	0.32	no change	no change	1.58E-94	PASS	PASS	FAIL
	Preschool	0.12	0.1	no change	no change	3.54E-80	PASS	PASS	FAIL
Sodium (g/day)	Adult	0.03	0.03	no change	no change	1.52E-132	PASS	PASS	FAIL
	Teen	0.07	0.07	no change	no change	1.07E-34	PASS	PASS	FAIL
	Children	0.06	0.06	no change	no change	1.27E-43	PASS	PASS	FAIL
	Preschool	0.02	0.02	no change	no change	4.22E-44	PASS	PASS	FAIL
Sugar (g/day)	Adult	0.07	0.09	no change	no change	3.62E-138	PASS	PASS	FAIL
	Teen	0.17	0.21	no change	no change	5.49E-46	PASS	PASS	FAIL
	Children	0.14	0.18	no change	no change	1.83E-62	PASS	PASS	FAIL
	Preschool	0.04	0.06	no change	no change	5.15E-46	PASS	PASS	FAIL
Total Fat (g/day)	Adult	1.4	1.44	no change	no change	3.06E-160	PASS	PASS	FAIL
	Teen	3.2	3.29	no change	no change	7.71E-46	PASS	PASS	FAIL
	Children	2.72	2.8	no change	no change	2.28E-59	PASS	PASS	FAIL
	Preschool	0.85	0.88	no change	no change	8.72E-51	PASS	PASS	FAIL

Soups, Sauces, Pulses and Misc. Foods*

Nutrient	Age	2005 mean intake	2017 mean intake	Absolute reduction	% Difference	P-value	Test 1	Test 2	Test 3
Energy (kcal/day)	Adult	59.56	61.83	no change	no change	9.78E-76	PASS	PASS	FAIL
	Teen	47.37	49.29	no change	no change	4.80E-36	PASS	PASS	FAIL
	Children	32.34	33.86	no change	no change	3.12E-53	PASS	PASS	FAIL
	Preschool	21.26	22.04	no change	no change	4.48E-26	PASS	PASS	FAIL
Saturated Fat (g/day)	Adult	0.77	0.76	no change	no change	1.18E-04	PASS	PASS	FAIL
	Teen	0.59	0.58	no change	no change	5.59E-01	FAIL	FAIL	FAIL
	Children	0.37	0.37	no change	no change	5.25E-02	FAIL	FAIL	FAIL
	Preschool	0.23	0.23	no change	no change	1.15E-01	FAIL	FAIL	FAIL

Sodium (g/day)	Adult	0.3	0.33	no change	no change	7.29E-12	PASS	PASS	FAIL
	Teen	0.25	0.28	no change	no change	1.82E-04	PASS	FAIL	FAIL
	Children	0.17	0.19	no change	no change	3.43E-01	FAIL	PASS	FAIL
	Preschool	0.11	0.13	no change	no change	9.00E-02	FAIL	PASS	FAIL
Sugar (g/day)	Adult	2.63	2.95	no change	no change	4.51E-69	PASS	PASS	FAIL
	Teen	2.26	2.45	no change	no change	1.98E-18	PASS	PASS	FAIL
	Children	1.58	1.73	no change	no change	9.36E-13	PASS	PASS	FAIL
	Preschool	1.05	1.09	no change	no change	3.13E-03	PASS	PASS	FAIL
Total Fat (g/day)	Adult	3.4	3.56	no change	no change	2.70E-36	PASS	PASS	FAIL
	Teen	2.51	2.62	no change	no change	8.16E-17	PASS	PASS	FAIL
	Children	1.59	1.69	no change	no change	6.73E-23	PASS	PASS	FAIL
	Preschool	1.02	1.06	no change	no change	1.53E-12	PASS	PASS	FAIL

Spreading Fats

Nutrient	Age	2005 mean intake	2017 mean intake	Absolute reduction	% Difference	P-value	Test 1	Test 2	Test 3
Energy (kcal/day)	Adult	85.29	82.94	no change	no change	5.72E-91	PASS	PASS	FAIL
	Teen	67.9	66.46	no change	no change	7.86E-17	PASS	PASS	FAIL
	Children	52.2	51.21	no change	no change	1.29E-20	PASS	PASS	FAIL
	Preschool	29.57	28.94	no change	no change	4.14E-17	PASS	PASS	FAIL
Saturated Fat (g/day)	Adult	4.33	4.12	0.21	4.83%	1.42E-77	PASS	PASS	PASS
	Teen	3.39	3.27	no change	no change	6.15E-14	PASS	PASS	FAIL
	Children	2.58	2.5	no change	no change	1.47E-16	PASS	PASS	FAIL
	Preschool	1.55	1.48	no change	no change	5.91E-18	PASS	PASS	FAIL
Sodium (g/day)	Adult	0.09	0.09	no change	no change	7.11E-172	PASS	PASS	FAIL
	Teen	0.07	0.07	no change	no change	2.13E-60	PASS	PASS	FAIL
	Children	0.05	0.05	no change	no change	2.16E-74	PASS	PASS	FAIL
	Preschool	0.03	0.03	no change	no change	9.51E-50	PASS	PASS	FAIL
Sugar (g/day)	Adult	0.1	0.1	no change	no change	1.49E-79	PASS	PASS	FAIL
	Teen	0.08	0.08	no change	no change	5.46E-24	PASS	PASS	FAIL
	Children	0.06	0.07	no change	no change	5.90E-24	PASS	FAIL	FAIL
	Preschool	0.03	0.04	no change	no change	1.68E-21	PASS	PASS	FAIL
Total Fat (g/day)	Adult	9.37	9.16	no change	no change	1.69E-79	PASS	PASS	FAIL
	Teen	7.47	7.35	no change	no change	5.18E-11	PASS	PASS	FAIL
	Children	5.75	5.66	no change	no change	9.59E-18	PASS	PASS	FAIL
	Preschool	3.26	3.18	no change	no change	6.06E-12	PASS	PASS	FAIL

Dataset 2: Conservative estimate for consumer 95th percentile

Total Diet

Nutrient	Age	2005 P95 intake	2017 P95 intake	Absolute reduction	% Difference	P-value	Test 1
Energy (kcal/day)	Adult	3237.34	3225.78	11.56	0.36%	8.18E-37	PASS
	Children	2324.41	2306.5	17.91	0.77%	7.27E-20	PASS
	Preschool	1640.51	1630.49	10.02	0.61%	2.91E-20	PASS
	Teen	3037.36	3039.31	-1.95	-0.06%	4.17E-10	PASS
Saturated Fat (g/day)	Adult	52.1	51.49	0.61	1.17%	2.26E-45	PASS
	Children	41.28	41.26	0.02	0.05%	7.02E-06	FAIL
	Preschool	29.82	29.95	-0.13	-0.44%	5.03E-02	FAIL
	Teen	55.37	54.08	1.29	2.33%	3.73E-01	PASS
Sodium (g/day)	Adult	4.24	4.27	-0.03	-0.71%	1.63E-09	PASS
	Children	2.88	2.87	0.01	0.35%	2.61E-12	PASS
	Preschool	2.04	2.04	0	0.00%	1.90E-26	PASS
	Teen	3.64	3.63	0.01	0.27%	7.70E-06	PASS
Sugar (g/day)	Adult	169.95	169.05	0.9	0.53%	1.90E-39	PASS
	Children	163.48	156.82	6.66	4.07%	2.22E-54	PASS
	Preschool	119.9	118.26	1.64	1.37%	1.00E-80	PASS
	Teen	185.36	180.85	4.51	2.43%	7.45E-54	PASS
Total Fat (g/day)	Adult	127.41	126.79	0.62	0.49%	3.42E-09	PASS
	Children	92.54	92.27	0.27	0.29%	1.63E-03	PASS
	Preschool	64.68	64.32	0.36	0.56%	3.30E-05	FAIL
	Teen	123.25	124.1	-0.85	-0.69%	6.07E-02	PASS

Beverages (Excl. Milk)

Nutrient	Age	2005 P95 intake	2017 P95 intake	Absolute reduction	% Difference	P-value	Test 1
Energy (kcal/day)	Adult	234.37	219.78	14.59	6.23%	1.26E-107	PASS
	Children	275.85	254.79	21.06	7.63%	4.81E-52	PASS
	Preschool	166.16	153.12	13.04	7.85%	7.33E-90	PASS
	Teen	323.16	301.97	21.19	6.56%	1.61E-72	PASS
Saturated Fat (g/day)	Adult	2.68	0.75	1.93	72.01%	1.54E-213	PASS
	Children	0.03	0.01	0.02	66.67%	7.41E-62	PASS
	Preschool	0.05	0.02	0.03	60.00%	6.55E-76	PASS
	Teen	0.06	0.04	0.02	33.33%	1.25E-68	PASS
Sodium (g/day)	Adult	0.07	0.06	0.01	14.29%	1.70E-83	PASS
	Children	0.08	0.07	0.01	12.50%	1.71E-43	PASS
	Preschool	0.06	0.05	0.01	16.67%	5.70E-82	PASS
	Teen	0.08	0.07	0.01	12.50%	3.34E-66	PASS

Sugar (g/day)	Adult	56.33	53.02	3.31	5.88%	5.72E-59	PASS
	Children	67.21	60.89	6.32	9.40%	2.26E-61	PASS
	Preschool	40.65	36.27	4.38	10.77%	1.11E-96	PASS
	Teen	80.1	72.41	7.69	9.60%	5.97E-78	PASS
Total Fat (g/day)	Adult	3.88	1.17	2.71	69.85%	8.70E-172	PASS
	Children	0.36	0.36	0	0.00%	5.30E-62	PASS
	Preschool	0.39	0.39	0	0.00%	7.53E-83	PASS
	Teen	0.39	0.49	0.01	2.00%	9.99E-72	PASS

Desserts, Biscuits, Cakes, Ice Cream and Confectionery

Nutrient	Age	2005 P95 intake	2017 P95 intake	Absolute reduction	% Difference	P-value	Test 1
Energy (kcal/day)	Adult	387.58	393.11	-5.53	-1.43%	1.70E-11	PASS
	Children	458.42	472.02	-13.6	-2.97%	1.97E-06	PASS
	Preschool	243.76	256.49	-12.73	-5.22%	3.90E-20	PASS
	Teen	518.2	517.98	0.22	0.04%	3.91E-16	PASS
Saturated Fat (g/day)	Adult	10.3	10.23	0.07	0.68%	3.70E-10	PASS
	Children	13.16	12.67	0.49	3.72%	4.51E-01	PASS
	Preschool	6.1	6.35	-0.25	-4.10%	2.37E-03	PASS
	Teen	12.89	13.12	-0.23	-1.78%	6.98E-07	FAIL
Sodium (g/day)	Adult	0.2	0.2	0	0.00%	1.39E-94	PASS
	Children	0.19	0.19	0	0.00%	3.18E-38	PASS
	Preschool	0.14	0.14	0	0.00%	3.74E-23	PASS
	Teen	0.2	0.2	0	0.00%	7.17E-14	PASS
Sugar (g/day)	Adult	36.02	36.34	-0.32	-0.89%	1.45E-02	PASS
	Children	48.22	50.74	-2.52	-5.23%	1.16E-02	FAIL
	Preschool	23.34	23.16	0.18	0.77%	7.30E-01	PASS
	Teen	59.31	58.75	0.56	0.94%	1.45E-03	PASS
Total Fat (g/day)	Adult	18.31	18.17	0.14	0.76%	4.86E-05	PASS
	Children	22.85	21.31	1.54	6.74%	5.52E-02	PASS
	Preschool	10.84	10.87	-0.03	-0.28%	1.46E-04	PASS
	Teen	22.87	22.52	0.35	1.53%	1.19E-07	FAIL

Breakfast Cereals

Nutrient	Age	2005 P95 intake	2017 P95 intake	Absolute reduction	% Difference	P-value	Test 1
Energy (kcal/day)	Adult	315.84	320.99	-5.15	-1.63%	2.10E-114	PASS
	Children	299.75	301.74	-1.99	-0.66%	1.10E-52	PASS
	Preschool	183.35	183.84	-0.49	-0.27%	2.48E-81	PASS
	Teen	377.66	380.46	-2.8	-0.74%	6.49E-67	PASS
Saturated Fat (g/day)	Adult	0.64	0.64	0	0.00%	2.01E-32	PASS
	Children	0.59	0.61	-0.02	-3.39%	1.37E-12	PASS
	Preschool	0.36	0.37	-0.01	-2.78%	2.49E-12	PASS
	Teen	0.75	0.78	-0.03	-4.00%	7.29E-19	PASS

Sodium (g/day)	Adult	0.32	0.32	0	0.00%	5.46E-04	PASS
	Children	0.3	0.3	0	0.00%	7.59E-01	PASS
	Preschool	0.18	0.19	-0.01	-5.56%	1.28E-03	FAIL
	Teen	0.37	0.38	-0.01	-2.70%	6.50E-01	FAIL
Sugar (g/day)	Adult	16.9	16.09	0.81	4.79%	3.08E-62	PASS
	Children	15.78	14.55	1.23	7.79%	1.40E-38	PASS
	Preschool	9.6	9.21	0.39	4.06%	8.16E-61	PASS
	Teen	20.24	18.85	1.39	6.87%	3.16E-32	PASS
Total Fat (g/day)	Adult	2.14	2.27	-0.13	-6.07%	1.80E-03	PASS
	Children	2	2.1	-0.1	-5.00%	9.72E-01	FAIL
	Preschool	1.26	1.28	-0.02	-1.59%	2.44E-01	PASS
	Teen	2.59	2.74	-0.15	-5.79%	5.86E-02	FAIL

Meat Products

Nutrient	Age	2005 P95 intake	2017 P95 intake	Absolute reduction	% Difference	P-value	Test 1
Energy (kcal/day)	Adult	299.55	300.01	-0.46	-0.15%	3.76E-21	PASS
	Children	190.7	190.7	0	0.00%	6.64E-11	PASS
	Preschool	166.55	166.1	0.45	0.27%	1.67E-12	PASS
	Teen	237.06	236.61	0.45	0.19%	1.06E-03	PASS
Saturated Fat (g/day)	Adult	5.95	6.29	-0.34	-5.71%	1.85E-41	PASS
	Children	3.9	3.94	-0.04	-1.03%	2.53E-15	PASS
	Preschool	3.3	3.35	-0.05	-1.52%	9.18E-19	PASS
	Teen	4.75	4.86	-0.11	-2.32%	1.80E-11	PASS
Sodium (g/day)	Adult	1.1	1.1	0	0.00%	8.91E-19	PASS
	Children	0.7	0.7	0	0.00%	8.66E-11	PASS
	Preschool	0.61	0.61	0	0.00%	1.03E-16	PASS
	Teen	0.87	0.87	0	0.00%	4.10E-07	PASS
Sugar (g/day)	Adult	1	1.36	-0.36	-36.00%	1.12E-123	PASS
	Children	0.64	0.85	-0.21	-32.81%	3.46E-50	PASS
	Preschool	0.56	0.71	-0.15	-26.79%	4.54E-74	PASS
	Teen	0.8	1.05	-0.25	-31.25%	5.93E-39	PASS
Total Fat (g/day)	Adult	17.99	18.5	-0.51	-2.83%	1.39E-05	PASS
	Children	11.45	12.02	-0.57	-4.98%	8.95E-04	PASS
	Preschool	10	10.02	-0.02	-0.20%	2.59E-08	PASS
	Teen	14.24	14.57	-0.33	-2.32%	1.74E-02	PASS

Milk and Dairy Products

Nutrient	Age	2005 P95 intake	2017 P95 intake	Absolute reduction	% Difference	P-value	Test 1
Energy (kcal/day)	Adult	358.15	352.84	5.31	1.48%	1.20E-40	PASS
	Children	232.52	232.72	-0.2	-0.09%	2.99E-07	PASS
	Preschool	285.72	279.16	6.56	2.30%	3.51E-09	PASS
	Teen	305.62	299.09	6.53	2.14%	1.15E-09	PASS

Saturated Fat (g/day)	Adult	11.03	11.11	-0.08	-0.73%	6.05E-01	PASS
	Children	7.1	7.18	-0.08	-1.13%	6.00E-02	PASS
	Preschool	7.78	7.64	0.14	1.80%	5.76E-07	FAIL
	Teen	10.71	10.66	0.05	0.47%	2.17E-09	FAIL
Sodium (g/day)	Adult	0.47	0.47	0	0.00%	1.18E-14	PASS
	Children	0.31	0.31	0	0.00%	2.19E-01	PASS
	Preschool	0.32	0.32	0	0.00%	7.96E-16	PASS
	Teen	0.47	0.46	0.01	2.13%	2.11E-19	PASS
Sugar (g/day)	Adult	31.52	31.01	0.51	1.62%	2.70E-100	PASS
	Children	22.48	21.77	0.71	3.16%	6.09E-15	PASS
	Preschool	30.54	29.56	0.98	3.21%	1.83E-19	PASS
	Teen	23.59	22.72	0.87	3.69%	2.82E-17	PASS
Total Fat (g/day)	Adult	17.99	18.12	-0.13	-0.72%	1.69E-02	PASS
	Children	11.58	11.65	-0.07	-0.60%	7.55E-03	PASS
	Preschool	12.59	12.56	0.03	0.24%	4.22E-09	PASS
	Teen	17.48	17.08	0.4	2.29%	4.35E-08	PASS

Rice, Pasta, Savouries and Gluten Free Bread

Nutrient	Age	2005 P95 intake	2017 P95 intake	Absolute reduction	% Difference	P-value	Test 1
Energy (kcal/day)	Adult	400.45	395.29	5.16	1.29%	6.13E-19	PASS
	Children	162.49	161.64	0.85	0.52%	3.57E-17	PASS
	Preschool	344.86	294.46	50.4	14.61%	9.01E-21	PASS
	Teen	253.01	253.01	0	0.00%	7.74E-08	PASS
Saturated Fat (g/day)	Adult	7.7	7.48	0.22	2.86%	7.45E-19	PASS
	Children	3.2	3.2	0	0.00%	4.89E-17	PASS
	Preschool	6.79	4.88	1.91	28.13%	3.26E-20	PASS
	Teen	4.98	4.98	0	0.00%	1.23E-06	PASS
Sodium (g/day)	Adult	0.74	0.74	0	0.00%	2.02E-18	PASS
	Children	0.23	0.23	0	0.00%	3.50E-11	PASS
	Preschool	0.52	0.52	0	0.00%	4.15E-16	PASS
	Teen	0.36	0.36	0	0.00%	7.74E-08	PASS
Sugar (g/day)	Adult	4.58	4.58	0	0.00%	1.47E-07	PASS
	Children	1.18	1.22	-0.04	-3.39%	2.68E-17	PASS
	Preschool	2.12	2.12	0	0.00%	3.56E-19	PASS
	Teen	1.47	1.63	-0.16	-10.88%	7.89E-07	PASS
Total Fat (g/day)	Adult	15.75	15.75	0	0.00%	2.38E-17	PASS
	Children	6.54	6.51	0.03	0.46%	1.87E-19	PASS
	Preschool	13.89	12.53	1.36	9.79%	8.34E-22	PASS
	Teen	10.19	10.19	0	0.00%	9.85E-07	PASS

Savoury Snacks (Including Crisps)

Nutrient	Age	2005 P95 intake	2017 P95 intake	Absolute reduction	% Difference	P-value	Test 1
Energy (kcal/day)	Adult	211.14	208	3.14	1.49%	1.62E-02	PASS
	Children	147.71	146.33	1.38	0.93%	6.92E-06	PASS
	Preschool	89.81	90.14	-0.33	-0.37%	1.78E-12	PASS
	Teen	221.55	219.68	1.87	0.84%	3.07E-01	PASS
Saturated Fat (g/day)	Adult	1.65	1.44	0.21	12.73%	1.25E-75	PASS
	Children	1.13	1.01	0.12	10.62%	5.58E-51	PASS
	Preschool	0.71	0.64	0.07	9.86%	6.45E-77	PASS
	Teen	1.71	1.46	0.25	14.62%	1.47E-32	PASS
Sodium (g/day)	Adult	0.28	0.26	0.02	7.14%	2.77E-26	PASS
	Children	0.19	0.18	0.01	5.26%	2.30E-25	PASS
	Preschool	0.12	0.12	0	0.00%	5.93E-38	PASS
	Teen	0.28	0.28	0	0.00%	7.94E-13	PASS
Sugar (g/day)	Adult	0.63	0.84	-0.21	-33.33%	5.72E-38	PASS
	Children	0.44	0.61	-0.17	-38.64%	1.07E-35	PASS
	Preschool	0.28	0.43	-0.15	-53.57%	2.88E-56	PASS
	Teen	0.66	0.9	-0.24	-36.36%	2.51E-17	PASS
Total Fat (g/day)	Adult	12.1	12.54	-0.44	-3.64%	1.46E-39	PASS
	Children	8.46	8.74	-0.28	-3.31%	5.00E-33	PASS
	Preschool	5.13	5.42	-0.29	-5.65%	4.00E-50	PASS
	Teen	12.63	12.97	-0.34	-2.69%	1.16E-15	PASS

Soups, Sauces, Pulses and Misc. Foods*

Nutrient	Age	2005 P95 intake	2017 P95 intake	Absolute reduction	% Difference	P-value	Test 1
Energy (kcal/day)	Adult	193.36	200.29	-6.93	-3.58%	1.94E-68	PASS
	Children	112.93	118.11	-5.18	-4.59%	1.03E-34	PASS
	Preschool	84.78	88.34	-3.56	-4.20%	2.62E-50	PASS
	Teen	136.37	140.8	-4.43	-3.25%	6.36E-23	PASS
Saturated Fat (g/day)	Adult	2.72	2.72	0	0.00%	4.17E-04	PASS
	Children	1.45	1.41	0.04	2.76%	5.13E-01	FAIL
	Preschool	1.12	1.06	0.06	5.36%	5.24E-02	FAIL
	Teen	1.79	1.76	0.03	1.68%	9.24E-01	FAIL
Sodium (g/day)	Adult	1	1.01	-0.01	-1.00%	8.29E-09	PASS
	Children	0.6	0.62	-0.02	-3.33%	4.50E-04	FAIL
	Preschool	0.47	0.46	0.01	2.13%	4.48E-01	FAIL
	Teen	0.73	0.73	0	0.00%	3.07E-01	PASS

Sugar (g/day)	Adult	9	9.87	-0.87	-9.67%	1.43E-61	PASS
	Children	5.37	6.11	-0.74	-13.78%	8.24E-18	PASS
	Preschool	4.23	4.37	-0.14	-3.31%	6.40E-12	PASS
	Teen	6.67	7.03	-0.36	-5.40%	5.73E-02	PASS
Total Fat (g/day)	Adult	12.36	12.8	-0.44	-3.56%	1.45E-32	PASS
	Children	5.87	6.51	-0.64	-10.90%	1.59E-16	PASS
	Preschool	4.77	4.85	-0.08	-1.68%	6.38E-22	PASS
	Teen	7.74	8.02	-0.28	-3.62%	1.89E-09	PASS

Spreading Fats

Nutrient	Age	2005 P95 intake	2017 P95 intake	Absolute reduction	% Difference	P-value	Test 1
Energy (kcal/day)	Adult	283.2	274.87	8.33	2.94%	1.96E-85	PASS
	Children	143.51	134.79	8.72	6.08%	4.75E-16	PASS
	Preschool	78.86	78.57	0.29	0.37%	5.11E-21	PASS
	Teen	231.41	227.53	3.88	1.68%	1.62E-15	PASS
Saturated Fat (g/day)	Adult	15.26	14.68	0.58	3.80%	1.62E-67	PASS
	Children	6.79	6.77	0.02	0.29%	3.01E-12	PASS
	Preschool	4.86	4.46	0.4	8.23%	2.14E-15	PASS
	Teen	12.86	12.56	0.3	2.33%	1.41E-15	PASS
Sodium (g/day)	Adult	0.3	0.3	0	0.00%	1.23E-152	PASS
	Children	0.13	0.13	0	0.00%	1.14E-54	PASS
	Preschool	0.08	0.08	0	0.00%	6.48E-71	PASS
	Teen	0.23	0.23	0	0.00%	6.17E-44	PASS
Sugar (g/day)	Adult	0.34	0.35	-0.01	-2.94%	1.10E-69	PASS
	Children	0.17	0.17	0	0.00%	5.33E-22	PASS
	Preschool	0.1	0.1	0	0.00%	7.96E-23	PASS
	Teen	0.27	0.28	-0.01	-3.70%	1.51E-18	PASS
Total Fat (g/day)	Adult	31.23	30.61	0.62	1.99%	4.23E-73	PASS
	Children	15.8	14.9	0.9	5.70%	1.28E-10	PASS
	Preschool	8.73	8.73	0	0.00%	1.60E-18	PASS
	Teen	25.48	25.46	0.02	0.08%	1.29E-10	PASS

Dataset 3: Optimistic estimate for mean total population

Total Diet

Nutrient	Age	2005 mean intake	2017 mean intake	Absolute reduction	% Difference	P-value	Test 1	Test 2	Test 3	Test 4
Energy (kcal/day)	Adult	2020.99	2041.87	no change	no change	1.12E-14	PASS	PASS	FAIL	PASS
	Teen	2009.78	2005.25	no change	no change	1.97E-02	PASS	PASS	FAIL	PASS
	Children	1694.79	1716.08	no change	no change	6.22E-09	PASS	PASS	FAIL	PASS
	Preschool	1141.52	1166.82	no change	no change	5.92E-18	PASS	PASS	FAIL	PASS
Saturated Fat (g/day)	Adult	29.72	27.71	2.01	6.77%	4.57E-106	PASS	PASS	PASS	PASS
	Teen	31.77	30.28	1.49	4.68%	2.10E-24	PASS	PASS	PASS	PASS
	Children	27.75	26.75	1.00	3.60%	7.11E-26	PASS	PASS	PASS	PASS
	Preschool	19.19	18.42	0.77	4.01%	6.30E-24	PASS	PASS	PASS	PASS
Sodium (g/day)	Adult	2.55	2.65	no change	no change	1.07E-30	PASS	PASS	FAIL	PASS
	Teen	2.43	2.40	0.03	1.32%	9.02E-24	PASS	FAIL	PASS	PASS
	Children	2.00	1.93	0.06	3.10%	1.71E-51	PASS	PASS	PASS	PASS
	Preschool	1.28	1.27	no change	no change	1.83E-30	PASS	FAIL	FAIL	PASS
Sugar (g/day)	Adult	92.06	87.85	4.22	4.58%	2.21E-86	PASS	PASS	PASS	PASS
	Teen	109.08	98.52	10.56	9.68%	2.91E-60	PASS	PASS	PASS	PASS
	Children	103.23	93.64	9.59	9.29%	1.95E-83	PASS	PASS	PASS	PASS
	Preschool	78.56	73.37	5.20	6.62%	1.13E-65	PASS	PASS	PASS	PASS
Total Fat (g/day)	Adult	74.66	72.96	1.70	2.28%	2.74E-66	PASS	PASS	PASS	PASS
	Teen	76.87	75.95	0.91	1.19%	7.90E-07	PASS	PASS	PASS	PASS
	Children	63.63	63.20	0.43	0.68%	7.78E-04	PASS	PASS	PASS	PASS
	Preschool	42.06	41.39	0.67	1.59%	7.58E-16	PASS	PASS	PASS	PASS

Beverages (Excl. Milk)

Nutrient	Age	2005 mean intake	2017 mean intake	Absolute reduction	% Difference	P-value	Test 1	Test 2	Test 3	Test 4
Energy (kcal/day)	Adult	72.07	52.57	19.49	27.05%	7.63E-189	PASS	PASS	PASS	PASS
	Teen	157.12	108.94	48.18	30.67%	2.13E-72	PASS	PASS	PASS	PASS
	Children	136.98	91.21	45.77	33.41%	1.52E-98	PASS	PASS	PASS	PASS
	Preschool	54.29	38.43	15.87	29.22%	1.31E-81	PASS	PASS	PASS	PASS
Saturated Fat (g/day)	Adult	0.30	0.14	0.16	53.14%	2.42E-242	PASS	PASS	PASS	PASS
	Teen	0.16	0.04	no change	no change	6.48E-70	PASS	PASS	FAIL	PASS
	Children	0.09	0.02	no change	no change	3.00E-92	PASS	PASS	FAIL	PASS
	Preschool	0.08	0.06	no change	no change	9.31E-75	PASS	PASS	FAIL	PASS
Sodium (g/day)	Adult	0.02	0.01	no change	no change	1.55E-21	PASS	PASS	FAIL	PASS
	Teen	0.03	0.01	0.01	51.55%	4.27E-12	PASS	PASS	PASS	PASS
	Children	0.02	0.01	no change	no change	7.87E-01	FAIL	PASS	FAIL	PASS
	Preschool	0.01	0.01	no change	no change	1.16E-43	PASS	PASS	FAIL	PASS

Sugar (g/day)	Adult	14.73	10.79	3.94	26.75%	6.65E-226	PASS	PASS	PASS	PASS
	Teen	33.26	22.72	10.54	31.70%	2.54E-73	PASS	PASS	PASS	PASS
	Children	29.24	19.22	10.02	34.25%	6.63E-99	PASS	PASS	PASS	PASS
	Preschool	12.51	8.80	3.71	29.68%	3.72E-82	PASS	PASS	PASS	PASS
Total Fat (g/day)	Adult	0.38	0.23	no change	no change	3.94E-237	PASS	PASS	FAIL	PASS
	Teen	0.28	0.15	no change	no change	1.34E-68	PASS	PASS	FAIL	PASS
	Children	0.20	0.12	no change	no change	3.56E-85	PASS	PASS	FAIL	PASS
	Preschool	0.19	0.17	no change	no change	3.79E-73	PASS	PASS	FAIL	PASS

Desserts, Biscuits, Cakes, Ice Cream and Confectionery

Nutrient	Age	2005 mean intake	2017 mean intake	Absolute reduction	% Difference	P-value	Test 1	Test 2	Test 3	Test 4
Energy (kcal/day)	Adult	137.87	189.35	no change	no change	2.49E-172	PASS	PASS	FAIL	PASS
	Teen	220.62	272.37	no change	no change	3.40E-58	PASS	PASS	FAIL	PASS
	Children	236.13	309.01	no change	no change	3.69E-96	PASS	PASS	FAIL	PASS
	Preschool	110.97	157.85	no change	no change	3.03E-75	PASS	PASS	FAIL	PASS
Saturated Fat (g/day)	Adult	4.20	3.95	0.25	6.04%	6.77E-65	PASS	PASS	PASS	PASS
	Teen	6.38	6.27	no change	no change	9.91E-06	PASS	PASS	FAIL	PASS
	Children	6.90	6.95	no change	no change	5.85E-01	FAIL	PASS	FAIL	PASS
	Preschool	3.28	3.41	no change	no change	3.49E-01	FAIL	PASS	FAIL	PASS
Sodium (g/day)	Adult	0.07	0.05	0.01	20.12%	1.06E-161	PASS	PASS	PASS	PASS
	Teen	0.10	0.07	0.03	28.76%	4.26E-65	PASS	PASS	PASS	PASS
	Children	0.11	0.08	0.03	28.82%	7.03E-95	PASS	PASS	PASS	PASS
	Preschool	0.06	0.05	0.01	22.37%	4.57E-56	PASS	PASS	PASS	PASS
Sugar (g/day)	Adult	10.70	11.45	no change	no change	1.08E-64	PASS	PASS	FAIL	PASS
	Teen	19.61	21.54	no change	no change	9.96E-41	PASS	PASS	FAIL	PASS
	Children	20.10	23.10	no change	no change	7.96E-90	PASS	PASS	FAIL	PASS
	Preschool	8.49	9.66	no change	no change	1.59E-50	PASS	PASS	FAIL	PASS
Total Fat (g/day)	Adult	6.98	6.63	no change	no change	8.07E-66	PASS	PASS	FAIL	PASS
	Teen	10.78	10.49	no change	no change	5.51E-09	PASS	PASS	FAIL	PASS
	Children	11.60	11.62	no change	no change	3.70E-01	FAIL	FAIL	FAIL	PASS
	Preschool	5.46	5.53	no change	no change	9.22E-03	PASS	FAIL	FAIL	PASS

Breakfast Cereals

Nutrient	Age	2005 mean intake	2017 mean intake	Absolute reduction	% Difference	P-value	Test 1	Test 2	Test 3	Test 4
Energy (kcal/day)	Adult	74.47	78.07	no change	no change	5.13E-233	PASS	PASS	FAIL	PASS
	Teen	110.67	116.01	no change	no change	2.87E-73	PASS	PASS	FAIL	PASS
	Children	111.62	117.01	no change	no change	8.00E-97	PASS	PASS	FAIL	PASS
	Preschool	68.80	72.14	no change	no change	1.66E-77	PASS	PASS	FAIL	PASS
Saturated Fat (g/day)	Adult	0.16	0.15	no change	no change	1.11E-60	PASS	PASS	FAIL	PASS
	Teen	0.24	0.21	no change	no change	3.54E-15	PASS	PASS	FAIL	PASS
	Children	0.24	0.21	no change	no change	1.13E-20	PASS	PASS	FAIL	PASS
	Preschool	0.15	0.13	no change	no change	5.80E-24	PASS	PASS	FAIL	PASS

Sodium (g/day)	Adult	0.08	0.08	no change	no change	3.53E-71	PASS	PASS	FAIL	PASS
	Teen	0.12	0.12	no change	no change	1.09E-16	PASS	PASS	FAIL	PASS
	Children	0.13	0.12	no change	no change	1.69E-35	PASS	PASS	FAIL	PASS
	Preschool	0.08	0.07	no change	no change	1.11E-21	PASS	PASS	FAIL	PASS
Sugar (g/day)	Adult	4.95	3.41	1.54	31.09%	1.73E-228	PASS	PASS	PASS	PASS
	Teen	7.28	5.05	2.23	30.70%	1.71E-70	PASS	PASS	PASS	PASS
	Children	7.38	5.15	2.23	30.19%	6.48E-98	PASS	PASS	PASS	PASS
	Preschool	4.55	3.15	1.40	30.85%	1.54E-80	PASS	PASS	PASS	PASS
Total Fat (g/day)	Adult	0.60	0.57	no change	no change	4.61E-49	PASS	PASS	FAIL	PASS
	Teen	0.89	0.85	no change	no change	2.84E-10	PASS	PASS	FAIL	PASS
	Children	0.90	0.86	no change	no change	6.36E-10	PASS	PASS	FAIL	PASS
	Preschool	0.55	0.54	no change	no change	1.24E-05	PASS	PASS	FAIL	PASS

Meat Products

Nutrient	Age	2005 mean intake	2017 mean intake	Absolute reduction	% Difference	P-value	Test 1	Test 2	Test 3	Test 4
Energy (kcal/day)	Adult	n/a	92.60	n/a	n/a	3.21E-201	PASS	PASS	FAIL	FAIL
	Teen	n/a	83.86	n/a	n/a	4.13E-68	PASS	PASS	FAIL	FAIL
	Children	n/a	67.16	n/a	n/a	2.24E-93	PASS	PASS	FAIL	FAIL
	Preschool	n/a	46.75	n/a	n/a	1.85E-69	PASS	PASS	FAIL	FAIL
Saturated Fat (g/day)	Adult	n/a	2.28	n/a	n/a	8.43E-209	PASS	PASS	PASS	FAIL
	Teen	n/a	2.07	n/a	n/a	4.65E-71	PASS	PASS	PASS	FAIL
	Children	n/a	1.68	n/a	n/a	1.31E-91	PASS	PASS	PASS	FAIL
	Preschool	n/a	1.16	n/a	n/a	5.28E-66	PASS	PASS	PASS	FAIL
Sodium (g/day)	Adult	n/a	0.34	n/a	n/a	2.03E-01	FAIL	FAIL	FAIL	FAIL
	Teen	n/a	0.31	n/a	n/a	2.94E-01	FAIL	FAIL	FAIL	FAIL
	Children	n/a	0.25	n/a	n/a	6.29E-01	FAIL	FAIL	FAIL	FAIL
	Preschool	n/a	0.17	n/a	n/a	1.93E-02	PASS	FAIL	FAIL	FAIL
Sugar (g/day)	Adult	n/a	0.78	n/a	n/a	1.01E-246	PASS	PASS	FAIL	FAIL
	Teen	n/a	0.72	n/a	n/a	5.47E-74	PASS	PASS	FAIL	FAIL
	Children	n/a	0.56	n/a	n/a	5.70E-99	PASS	PASS	FAIL	FAIL
	Preschool	n/a	0.41	n/a	n/a	1.26E-83	PASS	PASS	FAIL	FAIL
Total Fat (g/day)	Adult	n/a	6.21	n/a	n/a	1.12E-01	FAIL	FAIL	FAIL	FAIL
	Teen	n/a	5.60	n/a	n/a	5.13E-03	PASS	PASS	FAIL	FAIL
	Children	n/a	4.51	n/a	n/a	9.37E-02	FAIL	FAIL	FAIL	FAIL
	Preschool	n/a	3.12	n/a	n/a	1.13E-01	FAIL	FAIL	FAIL	FAIL

Milk and Dairy Products

Nutrient	Age	2005 mean intake	2017 mean intake	Absolute reduction	% Difference	P-value	Test 1	Test 2	Test 3	Test 4
Energy (kcal/day)	Adult	127.51	120.25	no change	no change	5.39E-125	PASS	PASS	FAIL	PASS
	Teen	88.37	82.00	no change	no change	5.19E-38	PASS	PASS	FAIL	PASS
	Children	78.97	73.35	no change	no change	7.80E-62	PASS	PASS	FAIL	PASS
	Preschool	113.52	104.97	8.55	7.53%	1.15E-51	PASS	PASS	PASS	PASS
Saturated Fat (g/day)	Adult	3.78	3.68	no change	no change	5.92E-12	PASS	PASS	FAIL	PASS
	Teen	2.81	2.68	no change	no change	8.06E-06	PASS	PASS	FAIL	PASS
	Children	2.22	2.10	no change	no change	9.61E-18	PASS	PASS	FAIL	PASS
	Preschool	2.95	2.69	0.27	9.04%	6.29E-28	PASS	PASS	PASS	PASS
Sodium (g/day)	Adult	0.18	0.17	no change	no change	2.22E-15	PASS	PASS	FAIL	PASS
	Teen	0.13	0.13	no change	no change	1.63E-09	PASS	PASS	FAIL	PASS
	Children	0.10	0.10	no change	no change	7.73E-02	FAIL	FAIL	FAIL	PASS
	Preschool	0.13	0.13	no change	no change	6.94E-06	PASS	PASS	FAIL	PASS
Sugar (g/day)	Adult	9.42	8.19	1.23	13.05%	2.08E-219	PASS	PASS	PASS	PASS
	Teen	5.86	4.98	0.88	15.10%	1.47E-59	PASS	PASS	PASS	PASS
	Children	6.65	5.64	1.01	15.21%	2.14E-93	PASS	PASS	PASS	PASS
	Preschool	10.74	9.08	1.66	15.48%	2.36E-80	PASS	PASS	PASS	PASS
Total Fat (g/day)	Adult	6.26	6.04	no change	no change	3.49E-23	PASS	PASS	FAIL	PASS
	Teen	4.67	4.40	no change	no change	8.10E-13	PASS	PASS	FAIL	PASS
	Children	3.65	3.40	no change	no change	5.24E-30	PASS	PASS	FAIL	PASS
	Preschool	4.75	4.38	0.38	7.90%	6.76E-23	PASS	PASS	PASS	PASS

Rice, Pasta, Savouries and Gluten Free Bread

Nutrient	Age	2005 mean intake	2017 mean intake	Absolute reduction	% Difference	P-value	Test 1	Test 2	Test 3	Test 4
Energy (kcal/day)	Adult	n/a	10.56	n/a	n/a	1.01E-246	PASS	PASS	FAIL	FAIL
	Teen	n/a	19.58	n/a	n/a	5.47E-74	PASS	PASS	FAIL	FAIL
	Children	n/a	10.49	n/a	n/a	6.20E-98	PASS	PASS	FAIL	FAIL
	Preschool	n/a	4.87	n/a	n/a	1.26E-83	PASS	PASS	FAIL	FAIL
Saturated Fat (g/day)	Adult	n/a	0.15	n/a	n/a	1.63E-245	PASS	PASS	FAIL	FAIL
	Teen	n/a	0.35	n/a	n/a	5.47E-74	PASS	PASS	FAIL	FAIL
	Children	n/a	0.17	n/a	n/a	6.01E-98	PASS	PASS	FAIL	FAIL
	Preschool	n/a	0.08	n/a	n/a	1.26E-83	PASS	PASS	FAIL	FAIL
Sodium (g/day)	Adult	n/a	0.02	n/a	n/a	1.32E-227	PASS	PASS	FAIL	FAIL
	Teen	n/a	0.04	n/a	n/a	5.55E-55	PASS	PASS	FAIL	FAIL
	Children	n/a	0.02	n/a	n/a	2.21E-81	PASS	PASS	FAIL	FAIL
	Preschool	n/a	0.01	n/a	n/a	1.40E-77	PASS	PASS	FAIL	FAIL
Sugar (g/day)	Adult	n/a	0.14	n/a	n/a	6.33E-231	PASS	PASS	FAIL	FAIL
	Teen	n/a	0.25	n/a	n/a	5.47E-74	PASS	PASS	FAIL	FAIL
	Children	n/a	0.13	n/a	n/a	7.89E-98	PASS	PASS	FAIL	FAIL
	Preschool	n/a	0.06	n/a	n/a	2.46E-82	PASS	PASS	FAIL	FAIL

Total Fat (g/day)	Adult	n/a	0.37	n/a	n/a	1.01E-246	PASS	PASS	FAIL	FAIL
	Teen	n/a	0.72	n/a	n/a	5.47E-74	PASS	PASS	FAIL	FAIL
	Children	n/a	0.37	n/a	n/a	5.70E-99	PASS	PASS	FAIL	FAIL
	Preschool	n/a	0.18	n/a	n/a	1.26E-83	PASS	PASS	FAIL	FAIL

Savoury Snacks (Including Crisps)

Nutrient	Age	2005 mean intake	2017 mean intake	Absolute reduction	% Difference	P-value	Test 1	Test 2	Test 3	Test 4
Energy (kcal/day)	Adult	25.37	23.66	no change	no change	1.63E-224	PASS	PASS	FAIL	PASS
	Teen	57.88	53.92	no change	no change	2.06E-71	PASS	PASS	FAIL	PASS
	Children	49.28	45.63	no change	no change	6.16E-95	PASS	PASS	FAIL	PASS
	Preschool	15.48	14.36	no change	no change	3.42E-73	PASS	PASS	FAIL	PASS
Saturated Fat (g/day)	Adult	0.23	0.14	no change	no change	1.54E-222	PASS	PASS	FAIL	PASS
	Teen	0.54	0.32	0.22	40.15%	5.35E-71	PASS	PASS	PASS	PASS
	Children	0.46	0.28	0.18	40.01%	7.61E-97	PASS	PASS	PASS	PASS
	Preschool	0.14	0.09	no change	no change	1.06E-77	PASS	PASS	FAIL	PASS
Sodium (g/day)	Adult	0.06	0.03	0.03	48.30%	1.01E-246	PASS	PASS	PASS	PASS
	Teen	0.13	0.07	0.06	47.99%	5.47E-74	PASS	PASS	PASS	PASS
	Children	0.11	0.06	0.05	48.50%	5.70E-99	PASS	PASS	PASS	PASS
	Preschool	0.04	0.02	0.02	48.00%	1.26E-83	PASS	PASS	PASS	PASS
Sugar (g/day)	Adult	0.09	0.11	no change	no change	7.50E-99	PASS	PASS	FAIL	PASS
	Teen	0.21	0.24	no change	no change	1.80E-17	PASS	PASS	FAIL	PASS
	Children	0.18	0.21	no change	no change	8.22E-24	PASS	PASS	FAIL	PASS
	Preschool	0.06	0.07	no change	no change	1.65E-27	PASS	PASS	FAIL	PASS
Total Fat (g/day)	Adult	1.25	1.48	no change	no change	9.01E-234	PASS	PASS	FAIL	PASS
	Teen	2.85	3.37	no change	no change	3.36E-72	PASS	PASS	FAIL	PASS
	Children	2.42	2.87	no change	no change	1.21E-96	PASS	PASS	FAIL	PASS
	Preschool	0.76	0.90	no change	no change	4.19E-81	PASS	PASS	FAIL	PASS

Soups, Sauces, Pulses and Misc. Foods*

Nutrient	Age	2005 mean intake	2017 mean intake	Absolute reduction	% Difference	P-value	Test 1	Test 2	Test 3	Test 4
Energy (kcal/day)	Adult	46.80	54.69	no change	no change	1.87E-134	PASS	PASS	FAIL	PASS
	Teen	37.14	44.09	no change	no change	1.91E-55	PASS	PASS	FAIL	PASS
	Children	25.90	30.55	no change	no change	4.29E-72	PASS	PASS	FAIL	PASS
	Preschool	17.35	20.16	no change	no change	4.09E-47	PASS	PASS	FAIL	PASS
Saturated Fat (g/day)	Adult	0.81	0.80	no change	no change	2.11E-01	FAIL	FAIL	FAIL	PASS
	Teen	0.62	0.61	no change	no change	9.27E-01	FAIL	FAIL	FAIL	PASS
	Children	0.39	0.39	no change	no change	3.78E-01	FAIL	FAIL	FAIL	PASS
	Preschool	0.24	0.24	no change	no change	3.49E-01	FAIL	FAIL	FAIL	PASS

Sodium (g/day)	Adult	0.26	0.41	no change	no change	3.23E-08	PASS	PASS	FAIL	PASS
	Teen	0.22	0.33	no change	no change	1.08E-03	PASS	PASS	FAIL	PASS
	Children	0.15	0.22	no change	no change	3.80E-01	FAIL	PASS	FAIL	PASS
	Preschool	0.10	0.15	no change	no change	8.01E-02	FAIL	PASS	FAIL	PASS
Sugar (g/day)	Adult	1.64	3.35	no change	no change	3.21E-149	PASS	PASS	FAIL	PASS
	Teen	1.48	2.78	no change	no change	1.03E-44	PASS	PASS	FAIL	PASS
	Children	1.09	1.80	no change	no change	4.77E-38	PASS	PASS	FAIL	PASS
	Preschool	0.77	1.12	no change	no change	6.08E-17	PASS	PASS	FAIL	PASS
Total Fat (g/day)	Adult	2.20	2.24	no change	no change	3.99E-01	FAIL	PASS	FAIL	PASS
	Teen	1.53	1.58	no change	no change	8.35E-02	FAIL	PASS	FAIL	PASS
	Children	1.00	1.02	no change	no change	6.39E-01	FAIL	FAIL	FAIL	PASS
	Preschool	0.65	0.68	no change	no change	7.46E-02	FAIL	PASS	FAIL	PASS

Spreading Fats

Nutrient	Age	2005 mean intake	2017 mean intake	Absolute reduction	% Difference	P-value	Test 1	Test 2	Test 3	Test 4
Energy (kcal/day)	Adult	83.25	70.56	12.69	15.24%	2.87E-81	PASS	PASS	PASS	PASS
	Teen	65.93	58.20	no change	no change	1.63E-10	PASS	PASS	FAIL	PASS
	Children	50.52	45.33	no change	no change	4.62E-13	PASS	PASS	FAIL	PASS
	Preschool	28.70	24.59	no change	no change	8.69E-12	PASS	PASS	FAIL	PASS
Saturated Fat (g/day)	Adult	3.64	2.18	1.45	39.94%	1.36E-48	PASS	PASS	PASS	PASS
	Teen	2.74	1.84	0.90	32.70%	1.12E-03	PASS	PASS	PASS	PASS
	Children	2.05	1.45	0.59	28.98%	1.34E-03	PASS	PASS	PASS	PASS
	Preschool	1.29	0.77	0.52	40.24%	2.63E-06	PASS	PASS	PASS	PASS
Sodium (g/day)	Adult	0.10	0.08	0.01	14.42%	1.40E-233	PASS	PASS	PASS	PASS
	Teen	0.08	0.07	0.01	15.99%	7.95E-74	PASS	PASS	PASS	PASS
	Children	0.06	0.05	no change	no change	2.63E-98	PASS	PASS	FAIL	PASS
	Preschool	0.03	0.03	no change	no change	1.12E-72	PASS	PASS	FAIL	PASS
Sugar (g/day)	Adult	0.03	0.04	no change	no change	1.92E-212	PASS	PASS	FAIL	PASS
	Teen	0.02	0.03	no change	no change	7.56E-70	PASS	PASS	FAIL	PASS
	Children	0.02	0.02	no change	no change	4.61E-94	PASS	PASS	FAIL	PASS
	Preschool	0.01	0.01	no change	no change	5.40E-68	PASS	PASS	FAIL	PASS
Total Fat (g/day)	Adult	9.12	7.86	1.26	13.80%	9.03E-59	PASS	PASS	PASS	PASS
	Teen	7.26	6.52	0.75	10.26%	3.73E-06	PASS	PASS	PASS	PASS
	Children	5.56	5.06	0.50	8.96%	2.09E-07	PASS	PASS	PASS	PASS
	Preschool	3.17	2.74	0.43	13.59%	3.18E-09	PASS	PASS	PASS	PASS

Dataset 4: Optimistic estimate for consumer 95th percentile

Total Diet

Nutrient	Age	2005 P95 intake	2017 P95 intake	Absolute reduction	% Difference	P-value	Test 1	Test 4
Energy (kcal/day)	Adult	3258.42	3274.42	-16.00	-0.49%	1.12E-14	PASS	PASS
	Teen	3092.76	3092.90	-0.15	0.00%	1.97E-02	PASS	PASS
	Children	2360.72	2338.82	21.90	0.93%	6.22E-09	PASS	PASS
	Preschool	1625.71	1663.86	-38.15	-2.35%	5.92E-18	PASS	PASS
Saturated Fat (g/day)	Adult	52.24	48.80	3.44	6.58%	4.57E-106	PASS	PASS
	Teen	56.23	52.64	3.59	6.38%	2.10E-24	PASS	PASS
	Children	42.19	40.81	1.39	3.28%	7.11E-26	PASS	PASS
	Preschool	30.94	29.60	1.34	4.33%	6.30E-24	PASS	PASS
Sodium (g/day)	Adult	4.34	4.39	-0.05	-1.04%	1.07E-30	PASS	PASS
	Teen	3.81	3.87	-0.06	-1.63%	9.02E-24	PASS	PASS
	Children	3.01	2.96	0.04	1.45%	1.71E-51	PASS	PASS
	Preschool	2.07	2.02	0.05	2.47%	1.83E-30	PASS	PASS
Sugar (g/day)	Adult	171.23	163.83	7.40	4.32%	2.21E-86	PASS	PASS
	Teen	186.25	168.83	17.42	9.35%	2.91E-60	PASS	PASS
	Children	163.61	145.31	18.30	11.19%	1.95E-83	PASS	PASS
	Preschool	116.70	110.80	5.90	5.05%	1.13E-65	PASS	PASS
Total Fat (g/day)	Adult	126.61	122.87	3.73	2.95%	2.74E-66	PASS	PASS
	Teen	124.35	123.65	0.70	0.56%	7.90E-07	PASS	PASS
	Children	92.38	91.81	0.58	0.63%	7.78E-04	PASS	PASS
	Preschool	65.19	63.63	1.56	2.39%	7.58E-16	PASS	PASS

Beverages (Excl. Milk)

Nutrient	Age	2005 P95 intake	2017 P95 intake	Absolute reduction	% Difference	P-value	Test 1	Test 4
Energy (kcal/day)	Adult	293.71	204.04	89.66	30.53%	4.25E-172	PASS	PASS
	Teen	389.73	271.84	117.88	30.25%	2.13E-72	PASS	PASS
	Children	314.60	221.36	93.24	29.64%	2.16E-98	PASS	PASS
	Preschool	164.30	128.85	35.46	21.58%	3.38E-80	PASS	PASS
Saturated Fat (g/day)	Adult	1.93	0.67	1.27	65.57%	2.03E-220	PASS	PASS
	Teen	0.81	0.00	0.81	100.00%	6.48E-70	PASS	PASS
	Children	0.43	0.00	0.43	100.00%	4.24E-92	PASS	PASS
	Preschool	0.16	0.04	0.12	78.06%	2.32E-73	PASS	PASS
Sodium (g/day)	Adult	0.09	0.04	0.05	52.33%	1.72E-13	PASS	PASS
	Teen	0.14	0.04	0.10	71.53%	4.27E-12	PASS	PASS
	Children	0.07	0.03	0.04	52.20%	7.94E-01	FAIL	PASS
	Preschool	0.03	0.02	0.01	20.00%	1.42E-42	PASS	PASS

Sugar (g/day)	Adult	60.25	42.86	17.39	28.87%	9.53E-206	PASS	PASS
	Teen	82.63	58.17	24.46	29.60%	2.54E-73	PASS	PASS
	Children	67.47	48.18	19.29	28.60%	9.61E-99	PASS	PASS
	Preschool	36.88	28.30	8.58	23.26%	9.89E-81	PASS	PASS
Total Fat (g/day)	Adult	2.01	0.99	1.02	50.81%	2.48E-215	PASS	PASS
	Teen	1.14	0.49	0.64	56.48%	1.34E-68	PASS	PASS
	Children	0.67	0.34	0.34	49.99%	4.85E-85	PASS	PASS
	Preschool	0.42	0.40	0.02	4.89%	9.60E-72	PASS	PASS

Desserts, Biscuits, Cakes, Ice Cream and Confectionery

Nutrient	Age	2005 P95 intake	2017 P95 intake	Absolute reduction	% Difference	P-value	Test 1	Test 4
Energy (kcal/day)	Adult	427.24	616.67	-189.43	-44.34%	1.32E-166	PASS	PASS
	Teen	549.04	709.35	-160.30	-29.20%	4.07E-58	PASS	PASS
	Children	487.99	648.64	-160.65	-32.92%	1.51E-95	PASS	PASS
	Preschool	270.45	422.80	-152.35	-56.33%	2.96E-73	PASS	PASS
Saturated Fat (g/day)	Adult	13.19	12.50	0.69	5.22%	9.60E-51	PASS	PASS
	Teen	15.87	15.25	0.62	3.93%	1.47E-05	PASS	PASS
	Children	15.57	15.31	0.26	1.67%	6.07E-01	FAIL	PASS
	Preschool	8.19	8.74	-0.55	-6.69%	6.37E-01	FAIL	PASS
Sodium (g/day)	Adult	0.23	0.19	0.04	17.75%	2.06E-144	PASS	PASS
	Teen	0.28	0.18	0.10	34.68%	4.33E-64	PASS	PASS
	Children	0.25	0.17	0.07	29.54%	3.37E-94	PASS	PASS
	Preschool	0.17	0.13	0.04	24.19%	6.29E-55	PASS	PASS
Sugar (g/day)	Adult	35.05	37.10	-2.05	-5.84%	9.35E-62	PASS	PASS
	Teen	50.83	59.66	-8.83	-17.38%	8.47E-41	PASS	PASS
	Children	44.63	51.85	-7.23	-16.19%	2.16E-89	PASS	PASS
	Preschool	21.00	24.72	-3.72	-17.69%	2.47E-50	PASS	PASS
Total Fat (g/day)	Adult	21.82	21.06	0.76	3.47%	3.10E-50	PASS	PASS
	Teen	26.29	25.41	0.88	3.33%	8.54E-09	PASS	PASS
	Children	25.90	25.19	0.72	2.78%	3.85E-01	FAIL	PASS
	Preschool	25.90	25.19	0.72	2.78%	3.85E-01	FAIL	PASS

Breakfast Cereals

Nutrient	Age	2005 P95 intake	2017 P95 intake	Absolute reduction	% Difference	P-value	Test 1	Test 4
Energy (kcal/day)	Adult	310.96	326.17	-15.21	-4.89%	1.64E-134	PASS	PASS
	Teen	358.42	382.16	-23.74	-6.62%	5.51E-60	PASS	PASS
	Children	294.35	306.43	-12.07	-4.10%	2.69E-90	PASS	PASS
	Preschool	181.37	190.65	-9.28	-5.12%	2.10E-69	PASS	PASS
Saturated Fat (g/day)	Adult	0.70	0.86	-0.16	-22.75%	1.90E-17	PASS	PASS
	Teen	0.79	0.86	-0.07	-8.44%	1.79E-11	PASS	PASS
	Children	0.63	0.67	-0.04	-6.22%	1.36E-19	PASS	PASS
	Preschool	0.39	0.43	-0.04	-10.97%	3.36E-21	PASS	PASS

Sodium (g/day)	Adult	0.37	0.33	0.03	9.33%	6.70E-35	PASS	PASS
	Teen	0.41	0.39	0.03	6.65%	3.93E-14	PASS	PASS
	Children	0.34	0.31	0.03	8.71%	4.36E-35	PASS	PASS
	Preschool	0.21	0.19	0.02	8.66%	8.41E-21	PASS	PASS
Sugar (g/day)	Adult	21.43	15.07	6.37	29.71%	4.02E-137	PASS	PASS
	Teen	24.26	16.60	7.66	31.56%	5.69E-59	PASS	PASS
	Children	19.31	13.78	5.53	28.62%	1.76E-91	PASS	PASS
	Preschool	12.37	8.55	3.82	30.90%	7.33E-73	PASS	PASS
Total Fat (g/day)	Adult	2.56	2.87	-0.31	-12.07%	2.33E-16	PASS	PASS
	Teen	2.94	3.12	-0.17	-5.93%	6.84E-08	PASS	PASS
	Children	2.33	2.46	-0.13	-5.68%	1.69E-09	PASS	PASS
	Preschool	2.33	2.46	-0.13	-5.68%	1.69E-09	PASS	PASS

Meat Products

Nutrient	Age	2005 P95 intake	2017 P95 intake	Absolute reduction	% Difference	P-value	Test 1	Test 4
Energy (kcal/day)	Adult	n/a	287.48	n/a	n/a	1.02E-179	PASS	FAIL
	Teen	n/a	219.9271	n/a	n/a	1.70E-64	PASS	FAIL
	Children	n/a	181.3029	n/a	n/a	1.62E-87	PASS	FAIL
	Preschool	n/a	154.065	n/a	n/a	9.51E-58	PASS	FAIL
Saturated Fat (g/day)	Adult	n/a	7.3367	n/a	n/a	1.08E-186	PASS	FAIL
	Teen	n/a	5.7472	n/a	n/a	5.43E-67	PASS	FAIL
	Children	n/a	4.5109	n/a	n/a	4.98E-87	PASS	FAIL
	Preschool	n/a	4.0787	n/a	n/a	6.16E-56	PASS	FAIL
Sodium (g/day)	Adult	n/a	1.0738	n/a	n/a	6.47E-01	FAIL	FAIL
	Teen	n/a	0.836	n/a	n/a	3.35E-01	FAIL	FAIL
	Children	n/a	0.6748	n/a	n/a	7.66E-01	FAIL	FAIL
	Preschool	n/a	0.588	n/a	n/a	1.67E-01	FAIL	FAIL
Sugar (g/day)	Adult	n/a	2.8424	n/a	n/a	4.36E-208	PASS	FAIL
	Teen	n/a	2.21	n/a	n/a	1.35E-68	PASS	FAIL
	Children	n/a	1.6206	n/a	n/a	3.90E-91	PASS	FAIL
	Preschool	n/a	1.5325	n/a	n/a	2.49E-65	PASS	FAIL
Total Fat (g/day)	Adult	n/a	19.7452	n/a	n/a	3.57E-01	FAIL	FAIL
	Teen	n/a	15.63	n/a	n/a	5.47E-03	PASS	FAIL
	Children	n/a	11.9469	n/a	n/a	1.19E-01	FAIL	FAIL
	Preschool	n/a	10.6225	n/a	n/a	5.61E-01	FAIL	FAIL

Milk and Dairy Products

Nutrient	Age	2005 P95 intake	2017 P95 intake	Absolute reduction	% Difference	P-value	Test 1	Test 4
Energy (kcal/day)	Adult	354.91	333.63	21.28	5.99%	3.21E-121	PASS	PASS
	Teen	311.94	281.66	30.28	9.71%	1.26E-34	PASS	PASS
	Children	231.84	218.44	13.40	5.78%	7.16E-59	PASS	PASS
	Preschool	283.15	267.30	15.85	5.60%	3.37E-51	PASS	PASS
Saturated Fat (g/day)	Adult	10.70	10.75	-0.05	-0.51%	8.17E-11	PASS	PASS
	Teen	9.84	9.81	0.03	0.35%	8.06E-05	PASS	PASS
	Children	6.77	6.49	0.28	4.11%	3.44E-17	PASS	PASS
	Preschool	7.24	7.03	0.21	2.87%	6.46E-28	PASS	PASS
Sodium (g/day)	Adult	0.52	0.49	0.03	5.73%	1.42E-12	PASS	PASS
	Teen	0.51	0.48	0.04	7.06%	4.00E-08	PASS	PASS
	Children	0.32	0.32	0.00	0.97%	2.59E-01	FAIL	PASS
	Preschool	0.33	0.33	0.01	1.82%	1.18E-05	PASS	PASS
Sugar (g/day)	Adult	31.21	27.89	3.32	10.62%	3.04E-205	PASS	PASS
	Teen	24.81	21.50	3.31	13.34%	2.76E-53	PASS	PASS
	Children	22.21	19.02	3.19	14.37%	5.53E-86	PASS	PASS
	Preschool	30.00	25.33	4.68	15.59%	3.46E-78	PASS	PASS
Total Fat (g/day)	Adult	17.48	17.42	0.07	0.40%	2.55E-22	PASS	PASS
	Teen	16.10	16.39	-0.28	-1.75%	2.15E-11	PASS	PASS
	Children	11.33	10.58	0.75	6.60%	2.97E-29	PASS	PASS
	Preschool	12.02	11.49	0.53	4.41%	9.20E-23	PASS	PASS

Rice, Pasta, Savouries and Gluten Free Bread

Nutrient	Age	2005 P95 intake	2017 P95 intake	Absolute reduction	% Difference	P-value	Test 1	Test 4
Energy (kcal/day)	Adult	n/a	395.95	n/a	n/a	6.15E-21	PASS	FAIL
	Teen	n/a	183.64	n/a	n/a	1.87E-19	PASS	FAIL
	Children	n/a	119.17	n/a	n/a	5.49E-23	PASS	FAIL
	Preschool	n/a	250.61	n/a	n/a	7.74E-08	PASS	FAIL
Saturated Fat (g/day)	Adult	n/a	5.05	n/a	n/a	7.96E-21	PASS	FAIL
	Teen	n/a	3.36	n/a	n/a	1.87E-19	PASS	FAIL
	Children	n/a	2.12	n/a	n/a	4.78E-23	PASS	FAIL
	Preschool	n/a	3.21	n/a	n/a	7.74E-08	PASS	FAIL
Sodium (g/day)	Adult	n/a	0.62	n/a	n/a	1.49E-17	PASS	FAIL
	Teen	n/a	0.35	n/a	n/a	4.49E-13	PASS	FAIL
	Children	n/a	0.22	n/a	n/a	3.64E-18	PASS	FAIL
	Preschool	n/a	0.43	n/a	n/a	3.35E-06	PASS	FAIL
Sugar (g/day)	Adult	n/a	5.82	n/a	n/a	1.02E-15	PASS	FAIL
	Teen	n/a	2.37	n/a	n/a	1.87E-19	PASS	FAIL
	Children	n/a	1.75	n/a	n/a	1.66E-22	PASS	FAIL
	Preschool	n/a	3.19	n/a	n/a	1.06E-06	PASS	FAIL

Total Fat (g/day)	Adult	n/a	13.37	n/a	n/a	6.15E-21	PASS	FAIL
	Teen	n/a	7.24	n/a	n/a	1.87E-19	PASS	FAIL
	Children	n/a	4.46	n/a	n/a	4.46E-23	PASS	FAIL
	Preschool	n/a	8.66	n/a	n/a	7.74E-08	PASS	FAIL

Savoury Snacks (Including Crisps)

Nutrient	Age	2005 P95 intake	2017 P95 intake	Absolute reduction	% Difference	P-value	Test 1	Test 4
Energy (kcal/day)	Adult	217.95	206.73	11.22	5.15%	9.02E-75	PASS	PASS
	Teen	227.83	212.16	15.66	6.87%	4.46E-51	PASS	PASS
	Children	152.58	141.50	11.08	7.26%	1.92E-77	PASS	PASS
	Preschool	93.40	90.36	3.04	3.25%	2.37E-30	PASS	PASS
Saturated Fat (g/day)	Adult	2.27	1.20	1.06	46.96%	6.87E-74	PASS	PASS
	Teen	2.39	1.25	1.14	47.58%	1.83E-50	PASS	PASS
	Children	1.78	0.87	0.91	51.14%	3.81E-78	PASS	PASS
	Preschool	1.29	0.55	0.74	57.23%	3.33E-32	PASS	PASS
Sodium (g/day)	Adult	0.50	0.26	0.25	49.23%	1.00E-78	PASS	PASS
	Teen	0.52	0.27	0.25	48.18%	2.86E-51	PASS	PASS
	Children	0.36	0.18	0.17	48.42%	2.13E-78	PASS	PASS
	Preschool	0.22	0.12	0.10	44.36%	2.94E-33	PASS	PASS
Sugar (g/day)	Adult	0.82	1.02	-0.20	-24.01%	1.38E-14	PASS	PASS
	Teen	0.84	1.05	-0.21	-25.64%	2.68E-13	PASS	PASS
	Children	0.58	0.71	-0.12	-21.33%	1.60E-21	PASS	PASS
	Preschool	0.39	0.54	-0.14	-35.75%	2.44E-06	PASS	PASS
Total Fat (g/day)	Adult	10.77	12.88	-2.11	-19.59%	7.74E-77	PASS	PASS
	Teen	11.03	13.44	-2.40	-21.79%	4.81E-51	PASS	PASS
	Children	7.49	8.92	-1.43	-19.11%	3.09E-78	PASS	PASS
	Preschool	4.68	5.56	-0.88	-18.85%	6.34E-33	PASS	PASS

Soups, Sauces, Pulses and Misc. Foods*

Nutrient	Age	2005 mean intake	2017 mean intake	Absolute reduction	% Difference	P-value	Test 1	Test 4
Energy (kcal/day)	Adult	152.57	187.60	-35.03	-22.96%	6.24E-124	PASS	PASS
	Teen	107.05	130.28	-23.23	-21.70%	1.59E-53	PASS	PASS
	Children	89.48	107.61	-18.13	-20.26%	4.76E-68	PASS	PASS
	Preschool	69.17	83.06	-13.89	-20.08%	1.04E-39	PASS	PASS
Saturated Fat (g/day)	Adult	3.01	3.20	-0.19	-6.41%	6.65E-01	FAIL	PASS
	Teen	2.06	2.01	0.05	2.26%	9.25E-01	FAIL	PASS
	Children	1.47	1.63	-0.16	-10.60%	4.15E-01	FAIL	PASS
	Preschool	1.25	1.30	-0.05	-3.98%	6.56E-01	FAIL	PASS

Sodium (g/day)	Adult	0.87	1.11	-0.25	-28.45%	2.64E-07	PASS	PASS
	Teen	0.67	0.90	-0.24	-35.16%	1.55E-03	PASS	PASS
	Children	0.52	0.62	-0.09	-17.87%	4.10E-01	FAIL	PASS
	Preschool	0.38	0.47	-0.08	-21.05%	4.87E-01	FAIL	PASS
Sugar (g/day)	Adult	6.14	14.96	-8.81	-143.54%	8.43E-138	PASS	PASS
	Teen	4.79	10.03	-5.24	-109.44%	1.97E-43	PASS	PASS
	Children	3.68	7.35	-3.67	-99.83%	1.64E-36	PASS	PASS
	Preschool	3.01	4.90	-1.88	-62.51%	8.25E-13	PASS	PASS
Total Fat (g/day)	Adult	8.12	9.15	-1.03	-12.67%	9.15E-01	FAIL	PASS
	Teen	4.73	5.24	-0.52	-10.96%	7.98E-02	FAIL	PASS
	Children	3.65	4.08	-0.43	-11.73%	9.68E-01	FAIL	PASS
	Preschool	3.02	3.54	-0.52	-17.12%	6.06E-01	FAIL	PASS

Spreading Fats

Nutrient	Age	2005 P95 intake	2017 P95 intake	Absolute reduction	% Difference	P-value	Test 1	Test 4
Energy (kcal/day)	Adult	269.35	234.25	35.10	13.03%	4.58E-81	PASS	PASS
	Teen	229.37	195.82	33.55	14.63%	9.24E-11	PASS	PASS
	Children	133.64	117.91	15.73	11.77%	1.09E-13	PASS	PASS
	Preschool	77.70	71.69	6.01	7.73%	1.33E-12	PASS	PASS
Saturated Fat (g/day)	Adult	13.87	7.68	6.18	44.60%	2.43E-48	PASS	PASS
	Teen	11.11	6.22	4.89	43.98%	7.34E-04	PASS	PASS
	Children	6.33	3.97	2.36	37.29%	8.14E-04	PASS	PASS
	Preschool	4.61	2.34	2.27	49.24%	5.47E-07	PASS	PASS
Sodium (g/day)	Adult	0.33	0.28	0.05	15.56%	3.08E-205	PASS	PASS
	Teen	0.27	0.22	0.05	18.59%	1.75E-65	PASS	PASS
	Children	0.15	0.12	0.03	19.55%	6.79E-92	PASS	PASS
	Preschool	0.09	0.08	0.01	16.00%	7.44E-64	PASS	PASS
Sugar (g/day)	Adult	0.13	0.18	-0.05	-35.66%	1.00E-194	PASS	PASS
	Teen	0.11	0.14	-0.03	-22.81%	2.30E-63	PASS	PASS
	Children	0.06	0.08	-0.02	-26.17%	1.73E-88	PASS	PASS
	Preschool	0.05	0.07	-0.02	-37.50%	3.26E-62	PASS	PASS
Total Fat (g/day)	Adult	29.88	26.38	3.50	11.71%	2.40E-58	PASS	PASS
	Teen	24.98	21.78	3.20	12.81%	4.14E-06	PASS	PASS
	Children	14.71	13.39	1.32	9.00%	1.00E-07	PASS	PASS
	Preschool	8.59	7.80	0.79	9.15%	8.90E-10	PASS	PASS

*Due to an error in the input data, 38 of the 1,015 nutrient values analysed in the Soups, Sauces, Pulses and Misc. Foods category were incorrect. Eight of these relate to energy, two relate to saturated fat, eight to sodium, 19 to sugar and nine to total fat. In all cases, the correct figures would have indicated greater nutrient reductions than those shown in the dataset tables above.

While the model could not be rerun, for illustrative purposes Creme Global used manual calculations to estimate the impact on the absolute reductions for mean total population (adults) in the optimistic scenario. Impact on 2017 intakes if correct data was applied: energy – reduction of

6.1 kcal/day; saturated fat – reduction of 0.01 g/day; sodium – reduction of 0.02 g/day; sugar – reduction of 0.49 g/day; total fat – reduction of 0.37 g/day. The estimated impact for adults is in line with the impacts for the other population groups.

The impact of these category changes have been manually assessed against the total diet. The effect on the total diet results are all less than 1%, therefore negligible, and would not have any notable impact on the results.

Special **thanks** to our contributing members





FD Food
Drink
Ireland

ibec



Dublin (Head Office)

84/86 Lower Baggot Street
Dublin 2
Tel: + 353 1 605 1500
Email: membership@lbec.ie
Web: www.lbec.ie/membership

Galway

Ross House
Victoria Place
Galway
Tel: + 353 91 561109
Email: galway@lbec.ie
Web: www.lbec.ie/west

Cork

Knockrea House
Douglas Road
Cork
Tel: + 353 21 4295511
Email: cork@lbec.ie
Web: www.lbec.ie/cork

Brussels

Avenue de Cortenbergh, 89,
Box 2
B-1000 Brussels
Belgium
Tel: + 32 (0)2 512.33.33
Fax: + 32 (0)2 512.13.53
Email: europe@lbec.ie
Web: www.lbec.ie/europe

Limerick

Gardner House Bank Place
Charlotte Quay
Limerick
Tel: + 353 61 410411
Email: midwest@lbec.ie
Web: www.lbec.ie/midwest

Donegal

3rd Floor, Pier One Quay Street
Donegal Town
Donegal
Tel: + 353 74 9722474
Email: northwest@lbec.ie
Web: www.lbec.ie/northwest

Waterford

Waterford Business Park
Cork Road
Waterford
Tel: + 353 51 331260
Email: southeast@lbec.ie
Web: www.lbec.ie/southeast