



**The Food
Foundation**

The Broken Plate 2023: Technical Report

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The Food Foundation

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1) Affordability of a healthy diet

Data source(s)

Dr Asha Kaur and Prof Peter Scarborough (2023), '[The cost of achieving the Eatwell Guide diet 2023 update](#)'.

Department for Work and Pensions, [Households below average income: for financial years ending 1995 to 2022](#) - part of the Family Resources Survey (FRS). Analysis for London School of Hygiene & Tropical Medicine.

Methodology

The 2021/22 HBAI dataset was used in conjunction with an estimate of the daily cost of adhering to Eatwell Guide to calculate the average proportion of unequalised household disposable income (after housing costs) that would be used up by the estimated household Eatwell cost, by income quintile.

The cost of the Eatwell Guide was estimated using a methodology based on [modelling published by Scarborough et al., 2016](#). The updated methodology uses a more comprehensive database of food items and prices (13,912 food and drink items for the 2022 analysis vs. 7,575 items which were used in the 2016 modelling). The cost of the Eatwell Guide was estimated to be £7.48 per adult per day, based on food price data for 18,441 products from May 2022. Given the current rapid food price inflation which the UK is experiencing, food price inflation since then has been taken into account. The £7.48 figure was therefore adjusted based on the headline CPI inflation figure for 'food and non-alcoholic beverages'. Inflation from May 2022 to March 2023 was 15.6%, taking the Eatwell Guide cost to £8.65.

A secondary analysis of the FRS was then conducted, in which the estimated cost of an 'Eatwell' diet was considered in relation to UK household disposable income from 21/2022, building on the methodology set out in The Food Foundation's 2018 report, '[The Affordability of the Eatwell Guide](#)'.

Weekly Eatwell cost per household was determined based on household composition. To consider different dietary intakes of children under 19 years, as well as economies of scale that would likely affect the overall Eatwell cost for a household, the McClement's equivalence scale was used to adjust the per-person cost. Although a crude method, the McClement's scale was chosen over alternative equivalisation scales (e.g. OECD) because it better captures age group differences. This approach was also chosen over adjusting the adult cost based on recommended energy requirements (EAR) by age group/sex because it considers economies of scale with increasing numbers of household members, which an EAR approach would not.

Disposable income was defined as the amount of money available for spending and saving after direct taxes (such as income tax, national insurance and council tax) and after housing costs (AHC) are removed. It includes income from earnings and employment, private pensions and investments, and cash benefits provided by the state. Disposable income in the HBAI also includes the value of Free School Meals. Housing costs removed from disposable income included: rent; water rates, community water charges and council water charges; mortgage interest payments; structural insurance premiums; and ground rent and service charges.

The cost of achieving the Eatwell Guide was estimated using the same methodology as the Broken Plate 2022 report meaning that the findings reported in this year's report are comparable to that report, but not directly comparable to the figures provided in Broken Plate Reports from 2019, 2020 and 2021 which used a different methodology.

2) Cost of healthy food

Data source(s)

Analysis of the Office for National Statistics (ONS) Consumer Price Index (CPI) continuous dataset; National Diet and Nutrition Survey (NDNS) waves 9-11.

Methodology

Food price

The MRC Epidemiology unit at the University of Cambridge built on food price research first conducted in [this 2014 paper](#).

The CPI dataset provides monthly data on the price of a number of food and drinks products. Food and drink products are selected for inclusion in the CPI based on economic rationale and the list of items is updated each year to reflect the content of an average UK shopping basket. Health considerations are not taken into account. As a result, items drop in and out of the basket every year, and the basket does not necessarily reflect diets recommended in the Eatwell Guide. In order to track price trends over the course of a decade, only the 113 food and drink items that were consistently included in the CPI over 2013-2023 were included in the analysis for this year's report.

For a number of products, prices were not collected across all quarters. In these cases, missing price data was imputed using the price of the quarter before (i.e. last value carried forward).

Price per 1,000 kilocalorie in each quarter of each year was calculated for each item and mean price across each quarter in each year calculated. These prices were then converted to price per kilocalorie, which is a helpful way to understand the relative prices of foods that make up diets and meals, rather than comparing individual products within specific food categories.

Food weights and nutritional content

Updated price data calculated as above was linked to NDNS Waves 9-11 on average purchase weight and nutritional content.

Purchase weight was either as stated in the CPI (e.g. potatoes-new-per-kg) or the average of a purchase weight as stated in the CPI (e.g. when a range was given); the weight of nearest match products from an online supermarket aggregator for items described in units (e.g. individual pizza); or weights provided in the [USDA National Nutrient database](#) for loose items (e.g. single fruits).

Nutritional content per 100g was obtained from the UK Nutrient Databank. Some products in the CPI (e.g. tinned fruit) represent broader product groups than in the Nutrient Databank (e.g. tinned peaches, tinned pears). In these cases, the mean nutritional content of all products within the group, weighted by consumption frequency from the National Diet & Nutrition Survey (NDNS) years 9-11 was calculated.

Food price data relates to food items as purchased (e.g. 100g of raw chicken breast) whereas nutritional data relates to food as consumed (e.g. 100g grilled chicken breast). To adjust for differences in weight and nutritional composition food yields were used from the [US Department of Agriculture handbook 102: Food yields](#).

Categorisation

Each item was categorised as either 'more healthy' or 'less healthy' using the [nutrient profiling model](#) developed by the Food Standards Agency (FSA).

Foods were also categorised into the groups in the Eatwell Guide using the process described on p55 [here](#).

We plotted trends in mean price per 1,000kcal per year for more and less healthy items; and for items in each of the five Eatwell Guide food groups.

Comparability to previous years

This year's findings were calculated using the same method as for Broken Plate 2022, but is updated from previous Broken Plate reports. However, due to updates in the CPI dataset, relative purchase weights and nutritional data, the data presented is not comparable between Broken Plate reports.

3) Cost of sustainable alternatives

Data source(s)

Data for comparison among chicken products (plain chicken breast and coated chicken pieces), plant-based chicken alternatives (plain and coated) and chickpea products were obtained from major UK retailers. The price and nutritional content of all products in these categories sold online from Aldi, Tesco and Waitrose were collected in March-April 2023. Where available, information was recorded on both a per 100g and per serving size basis.

Data on the environmental impact of each product group were sourced from a combination of relevant databases because greenhouse gas emissions (GHGE) data at a product level are limited. The majority of GHGE data estimates were sourced from [Open Food Facts](#), and complemented with data from a forthcoming LSHTM systematic review, [Our World in Data](#), and Mike Berners-Lee's UK carbon data [charts](#).

Methodology

A database containing relevant chicken, plant-based chicken alternative, and chickpea products from each retailer was created. Information included: the product group, retailer, brand, fresh/frozen, packet price, packet weight, and serving size. Nutritional information collected included: energy (kcal), saturated fat (g), sugar (g), fibre (g), protein (g), and salt (g).

Where the same product was sold across more than one retailer, the average price was calculated and recorded in the final database. Retailers were selected to represent a range of price points in the UK supermarket sector - Aldi as the cheapest, Waitrose as the most expensive, and Tesco which falls in the middle but is the supermarket with the largest market share (Kantar, May 2023).

To distinguish between the wide variety of processing methods used in chicken and plant-based chicken alternatives, we grouped products into two different categories.

1. Plain chicken breast (meat and plant-based alternatives), and;
2. Coated chicken pieces - including nuggets, dippers, "popcorn", breaded or fried fillets/strips/pieces - (meat and plant-based alternatives).

As plant-based chicken alternatives can be highly processed, we also looked at the price, nutritional content, and environmental impact of chickpeas (ready-to-use/canned) as a less processed meat alternative.

From the final database, the mean price and nutrient content of each product category was calculated per 100g. Results were presented per 100g for consistency, and because many plant-based chicken alternative products suggest smaller serving sizes than their meat equivalents.

Sample sizes for the nutrient and price calculations were considerably larger than for the GHGE data, despite combining a variety of data sources for the latter. This is because environmental impact estimates at a product level are currently much more limited than nutrient data, which are provided on all products. The more limited environmental data means that it is currently typical in the scientific literature to rely on very few, sometimes just one, estimates of impacts per product rather than a range.

4) Places to buy food on the high street

Data source(s)

Data from Ordnance Survey and analysed with the MRC Epidemiology Unit at the University of Cambridge. © Crown copyright and database rights 2023 Ordnance Survey (100025252). This product includes data licensed from PointX © Database Right/Copyright (2023) and OS © Crown Copyright (2023). All rights reserved

Methodology

Data on the proportion of fast-food outlets out of the total number of food outlets for each local authority were obtained from Ordnance Survey's Points of Interest (OS POI) dataset. OS POI data for June 2022 contains information from over 170 suppliers and is one of the most complete sources of food outlet locations available in England. Data were extracted for the locations of cafes, convenience stores, restaurants, supermarkets, specialty and takeaway food ('fast-food') outlets (Ordnance survey, 2018b). OS POI classes 'fast food and takeaway outlets', 'fast food delivery services', 'fish and chip shops' and 'bakeries' were combined as fast-food food outlets.

Fast-food outlets as a proportion of all food outlets (%) within local authorities was then calculated. This method is consistent with the method that has been used in previous Broken Plate reports and the data have been compared to data from previous Broken Plate reports to assess changes over time.

To assess the proportion of local authorities that have seen an increase or decrease, percentage change in proportion of fast-food outlets since June 2020 for each local authority was calculated. Percentage change was classified as an increase or decrease if it was 5% or greater.

Local authority deprivation scores were from the Index of Multiple Deprivation 2015. All local authorities were numbered according to their IMD ranking and divided into quintiles in equal proportions. The average density of fast-food outlets for each quintile of deprivation was then calculated.

5) Sugar in children's food in retail settings

Data source(s)

Action on Sugar

Methodology

Action on Sugar collected full nutritional data of breakfast cereals and yogurts, following strict inclusion and exclusion criteria for what would be deemed 'child friendly packaging' based on previous surveys for the Broken Plate. Data were primarily collected in store between January- February 2023 and a total of 9 major supermarkets were included: Aldi, ASDA, Lidl, Marks & Spencer's, Morrisons, Sainsbury's, Tesco, The Co-operative and Waitrose & Partners.

Inclusion and Exclusion Criteria

Inclusion:

- A. Child friendly imagery (such as cartoon characters)
- B. Child friendly style (such as bright colours, animated)
- C. Child friendly brand character (such as Tony the Tiger)
- D. Child friendly font (such as balloon letters and child friendly fronts)
- E. Child friendly media partnerships (such as Disney)
- F. Child friendly offers (such as a free game)
- G. Child themed language (such as 'made for kids')
- H. Child friendly activities (such as word searches on the back of pack)

Exclusion:

- A. Animations that are part of company logos
1. Non-child themed lifelike drawings (such as pencil like drawings or sketches)
- C. Duplicates of the same product, in but in different packaging sizes

Products that met the inclusion criteria were assessed against the Government's Front of Pack Nutrition Labelling Guidanceⁱ to note how many products were high, medium, or low in sugar, salt (breakfast cereals only), and saturated fat (yogurts only). In addition to this, a scoring system was created for fibre (breakfast cereals only) based on previous reportsⁱⁱ (Table 1).

Nutrition information was gathered for products that met the inclusion criteria and were available for sale at the time of collection. Cereal and yogurts that were collected the previous year but not found in-store were then sought online, and if in stock on any retailer's website (including Ocado) and still meeting the inclusion criteria, they were included in the final dataset.

Portion sizes were based on the on-pack suggestion and does not reflect 'real' servings.

Table 1 – Nutrition labelling criteria for 100g of food (The scoring system was created for fibre by Action on Sugar in Broken Plate 2019)

	Low	Medium	High
Colour Code	Green	Amber	Red
Saturates	≤1.5g/100g	>1.5g to ≤5.0g/100g	>5.0g/100g
(Total) Sugars	≤5.0/100g	>5.0g to ≤22.5g/100g	>22.5g/100g
Salt	≤0.3g/100g	>0.3g to ≤1.5g/100g	>1.5g/100g
Fibre	≥10g/100g	≥5g to <10g/100g	<5g/100g

A total of 133 breakfast cereals and 77 yogurts met the inclusion criteria. The difference in the total number of products surveyed each year is likely a result of; new product development, a change in product packaging which falls in or out of scope of the inclusion criteria, and availability in-store and online at the time of data collection.

6) Business reporting on healthy and sustainable food sales

Data source(s)

[Plating Up Progress dashboard](#). The Food Foundation.

Methodology

The Food Foundation's Plating Up Progress project assesses the performance of 29 major UK-operating food companies in supporting a transition towards a more healthy, just and sustainable food system on an annual basis: 11 food retailers, 5 caterers, 5 casual dining and 6 quick service restaurant chains, as well as 2 wholesalers. For Broken Plate, the 2 wholesalers were excluded, as they are not directly consumer-facing businesses. The Broken Plate analysis is therefore based on 27 companies.

The full Plating Up Progress analysis uses 20 metrics to assess food businesses' reporting and targets across a range of food-related health, environmental and social issues. The data is taken from publicly available sources including corporate reports, company websites and other reporting mechanisms and industry benchmarks. Only data that is publicly available at the time of writing is considered for inclusion given the importance of public disclosure for business transparency.

For Broken Plate, the three Plating Up Progress metrics relevant to healthy and sustainable food sales were assessed – whether companies were reporting on

- 1) the percentage of their sales that come from healthy food;
- 2) the percentage of their sales that come from fruit and vegetables (taken from the original Plating Up Progress metrics on sales of fruit and vegetables and from The Food Foundation's Peas Please project); and,
- 3) the percentage of their protein sales that come from animal-based proteins vs. plant-based proteins.

The headline statistic includes business that are reporting on any one of the three metrics, as opposed to last year's Broken Plate in which it only included businesses reporting on all three.

The Broken Plate analysis did not consider whether companies were setting targets, nor progress against targets where these have been set, but simply whether they were reporting on sales data in each of these three areas. Cases where companies were only reporting on partial data (such as sales of vegetables only for certain food categories, or only reporting on product ranges rather than sales) were not scored for the Broken Plate metric.

A number of food businesses reviewed as part of Plating Up Progress are due to publish their corporate sustainability reports with updated commitments and data between June and September 2023. The Food Foundation's forthcoming State of the Food Industry report will therefore provide a more up to date review of corporate progress for 2023.

The full analysis from Plating Up Progress and accompanying methodology can be found [here](#).

7) Advertising spend on food

Data source(s)

Nielsen Ad Intel

Methodology

Nielsen measures advertising expenditure across all traditional media channels. Nielsen's advertising expenditure is used by advertisers and networks to shape the buying and selling of advertising. Digital advertising is monitored but due to the complexities of buying this medium Nielsen have decided not to include.

Nielsen ran a report for use in Broken Plate for the calendar year 01 January 2022 to 31 December 2022. This included data on advertising spend across seven different media channels (cinema, direct mail, door drops, outdoor, press, radio and TV) for the 222 minor product categories which are included within the 'food' and 'drink' major product categories.

There is a significant amount of volatility year on year in terms of where ad spend goes. As a result, each year some minor product categories drop off the list and new ones come in, with spend per minor category fluctuating a fair amount.

Minor product categories were allocated to one of the following groups (with the exception of a small number of excluded categories – see below):

- Brand advertising (not on a specific product or category of food)
- Desserts
- Snacks
- Confectionary
- Soft drinks
- Fruit and vegetables
- Carbohydrates
- Condiments
- Cereals
- Convenience foods
- Ready meals
- Meat and fish
- Dairy and alternatives
- Water, tea and coffee
- Other

This categories which were excluded from the analysis were those relating to alcoholic drinks and baby foods.

The total advertising spend in sterling and percentage (%) spend was then calculated per grouping.

8) Marketing of baby and toddler snacks

Data source(s)

Action on Sugar

Methodology

This is the first-year baby and toddler snacks have been collected for the Broken Plate Report.

All products were initially collected in store and assessed against the inclusion and exclusion criteria.

Inclusion criteria:

- *Incomplete meals often consumed on the go or in between meals, e.g. biscuits, bars, fruti-based snacks*
- *Located in the baby food aisle*
- *Products that have an age guidance on them for 4-36 months*

Exclusion criteria

- *Snacks advertised for children without an age guidance*
- *Yogurts*

Products were collected between October 2022 and January 2023 from Aldi; Asda; Lidl; Marks and Spencer's; Morrisons; Sainsbury's; Tesco and Waitrose.

A total of 102 snacks met the inclusion criteria.

The packaging was assessed for front of pack claims.

According to the European Commission, a nutrition claim is “any claim which states, suggests or implies that a food has particular beneficial nutritional properties due to:

1. The energy (calorific value) it:
 - a. provides
 - b. provides at a reduced or increased rate or
 - c. does not provide
2. The nutrients or other substances it:
 - a. contains
 - b. contains in reduced or increased proportions or
 - c. does not contain”

According to the European Commission, a health claim is “any statement about a relationship between food and health.”

A Health Halo Claim is a claim that states, suggests or implies a product is healthy

Examples include:

- No artificial anything
- 100% real fruit
- No junk promise

Examples also include the following due to the misconception that such products are healthier:

- Vegetarian/Vegan
- Gluten Free
- Organic

Nutrition information was gathered for products that met the inclusion criteria and were available for sale at the time of collection. Sugar data is based on total sugars i.e., any added, free or naturally present sugars. However, most of the sugars in these products can also be classed as free sugars – sugars that are added or naturally present in honey, fruit/vegetable juices or syrups (but not sugars in whole fruit and vegetables or dairy). ‘Free’ simply means that they are sugars not contained within a cell structure, and consuming too much can cause tooth decay.

9) Nutritious food consumption

Data source(s)

[National Diet and Nutrition Survey.](#)

Methodology

Data were analysed from the National Diet and Nutrition Survey Year 9-11 for adults over the age of 18, with the exception of salt. Quintiles represent equivalised income. The results were considered significant at $P < 0.05$.

Data on salt were from Year 5 (2014). Estimated salt intake was calculated using the equation $17.1 \text{ mmol of sodium} = 1 \text{ g of salt}$ and assumes all sodium was derived from salt. For salt, income quintiles are hhinc not equivalised income quintiles.

10) Ultraprocessed food consumption

Data source(s)

[11 years olds +:](#) Madruga, M., Martínez Steele, E., Reynolds, C., Levy, R., & Rauber, F. (2022). Trends in food consumption according to the degree of food processing among the UK population over 11 years. *British Journal of Nutrition*, 1-8. doi:10.1017/S0007114522003361

Methodology

An academic study analysed data for children over the age of 11 years old and adults from the National Diet and Nutrition Survey 2018-2019. The study used the NOVA classification to define ultra-processed foods and evaluated the contribution of UPFs to total energy intake. This study was not commissioned or independently analysed by The Food Foundation.

11) Children’s dental decay

Data source(s)

Office for Health Improvement and Disparities, National Dental Epidemiology Programme (NDEP) for England: oral health survey of 5 year old children 2022.

Methodology

The data presented are from the sixth National Dental Epidemiology Programme survey of 5-year-old children in England, 2022 conducted by the Office for Health Improvement and Disparities. The data was collected during the 2021/22 school year. Deprivation groups are based on the index of multiple deprivation 2019 (IMD 2019) scores based on the home postcodes of the participants. Deprivation scores were used to allow weighting of the data to more closely match the actual distribution of deprivation quintiles in the source population. The figures presented are for dental decay and do not include enamel decay.

The data are presented exactly as published by the UK Government and are not independently analysed by The Food Foundation.

12) Children’s weight

Data source(s)

England: [National Child Measurement Programme](#), NHS Digital.

Scotland: [Primary 1 Body Mass Index \(BMI\) statistics Scotland](#), Public Health Scotland.

Methodology

The Child Measurement Programmes in both nations are annual surveillance programmes that measure the height and weight of children.

For England, the data reported is for children in Reception (age 4-5). Due to disruptions caused by Covid-19, fewer children than usual were measured in 2020/21. Statistical weighting was therefore applied to data collected to produce estimates of the prevalence of underweight, healthy weight, overweight, obese and severely obese children at national level that can be compared to data from previous years. Deprivation is measured by the Index of Multiple Deprivation (IMD) and is based on postcode of the school. The Food Foundation took the average of the two most deprived deciles to provide an estimate of the prevalence by quintile of deprivation.

For Scotland, the data are for children in Primary 1 (age 4.5-6.25). Similarly, Covid-19 disruption means that fewer children than usual were measured 2020/21, and there was also variability in coverage within and between areas. In view of this, detailed analysis was carried out to check whether the data submitted was comparable to previous years, and at a national level, these analyses indicate that they are sufficiently comparable to earlier years to provide meaningful trend data. Deprivation was measured by the Scottish Index of Multiple Deprivation (SIMD). Data definitions are based on epidemiological categories which defines obesity as a BMI greater than or equal to 95th centile. The data are presented as published by Public Health Scotland and no independent analysis was conducted by The Food Foundation.

Due to pandemic restrictions, the child measurement programme for Wales was only able to collect data in two health boards and therefore has not been included in this years report. Northern Ireland report on children’s weight using international definitions of overweight and obesity rather than the definitions used by the other three nations in the UK and therefore hasn’t been included as it is not comparable to the other countries.

13) Children's growth

Data source(s)

Office for Health Improvement and Disparities (OHID), [Height by deprivation decile in children aged 10 to 11](#).

Methodology

The data show average height in centimetres for children aged 10 to 11 years (Year 6) measured in the National Child Measurement Programme (NCMP) in the academic year 2021-2022 by deprivation decile and sex. The data shown are for White British children in England only. The NCMP is an annual surveillance programme that measures the height and weight of children attending state-maintained primary schools in England. Deprivation was measured using the 2019 Income Deprivation Affecting Children Index (IDACI) which measures the proportion of children under the age of 16 living in low-income households. Deprivation groups have been shown as deciles. This analysis was requested by The Food Foundation and reported as published by the UK Government. No independent analysis has been conducted by The Food Foundation.

The average height in centimetres for children measured in the 2021 to 2022 NCMP is higher than previous year's as a larger proportion of measurements were taken later in the end of the academic year than pre-pandemic years; the average age of children measured will be higher and children will be taller compared to the beginning of the academic year. Therefore, average height measurements are not comparable to data from previous years.

14) Diabetes-related amputations

Data source(s)

NHS Digital, [National Diabetes Audit](#).

Methodology

The Diabetic Footcare Profile presents information on people with diabetes (all types) from England who were admitted to hospital for foot disease. The information in the profile is compiled from Hospital Episode Statistics (HES). Data are provided number of admissions for major and minor amputations over three-year periods. A major lower-limb amputation refers to above the ankle. The Food Foundation calculated the average per year over each three-year period.

Data on proportion of people with type 2 diabetes by deprivation group is from data on registrations from the National Diabetes Audit in England 2022. Data is for Type 2 and other diabetes (excluding Type 1). Quintile of deprivation is based on the Index of Multiple Deprivation.

15) Healthy life expectancy

Data source(s)

Office for National Statistics, [Health state life expectancies by national deprivation deciles, England](#)

Methodology

Data from the Office of National Statistics on Healthy Life Expectancy at birth for 2018–20 were compared to 2017-19. Healthy life expectancy at birth is an estimate of the average number of years babies born this year would live in a state of 'good' general health if mortality levels at each age and the level of good health at each age remain constant in the future. Data are reported for men and women per decile of deprivation based on the Index of Multiple Deprivation 2019. This data was not commissioned or independently analysed by The Food Foundation.

