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Global Burden of Disease (GBD) 2023

Food and nutrition

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Purpose of briefing

This briefing provides a summary on the latest release of the Global Burden of Disease and Risk Factors Study (GBD) 2023 and what it tells about the burden of dietary risks in the South East and England.

Background

Eating a healthy, balanced diet is an important part of maintaining good health and reduces the risk of a range of non-communicable diseases including diabetes, cardiovascular diseases and some cancers (Office for Health Improvement and Disparities, 2023).

Across the world, governments provide guidance on the balance of foods and drinks that make up a healthy diet. The Eatwell guide, the UK's Government's healthy eating model, provides guidelines on how much of each of the five main food groups people should eat to maintain a healthy, balanced diet (British Nutrition Foundation, 2023). The five main groups are: fruit and vegetables; potatoes, bread, rice, pasta and other starchy carbohydrates; beans, pulses, fish, eggs, meat and other proteins; dairy and alternatives; and oils and spreads.

According to the Eatwell Guide, fruit and vegetables should make up over a third of people's daily diets, with recommendations to eat at least five 80g portions of a variety of fruit and vegetables each day. However, based on data from the latest Sport England's Active Lives Survey covering November 2024-25, only 31.4% of adults in England are meeting these recommendations. This has decreased from 34.9% in November 2020-21.

Understanding the magnitude of disease burden associated with dietary risk factors, such as eating too little fruit, vegetables and fibre and eating too much processed meat, red meat and foods high in fat, sugar and salt, can help to inform public health policy and practice (Brinsden, 2024).

Global Burden of Disease

The GBD provides a comprehensive assessment of the causes of disability and mortality worldwide. Co-ordinated by the Institute for Health Metrics and Evaluation (IHME), an independent population health research organisation, the study uses modelled data to help healthcare workers and analysts understand the burden of various diseases and injuries across different sexes, age groups, and locations (IHME, 2025).

The latest GBD 2023 study, published in October 2025, provides updated estimates of incidence, prevalence and mortality, alongside three summary measures of disease burden: years of life lost due to premature mortality (YLLs), years lived with disability (YLDs), and a combined measure of disability adjusted life years (DALYs). These estimates are provided for 375 diseases and injuries in 204 countries and territories from 1990 to 2023. A summary table of these measures is provided in Table 1.

For a small number of countries, subnational estimates are also provided, depending on collaborations with in-country partners and data availability. This includes the United Kingdom with subnational estimates provided for England and the nine English regions (Estep, 2025).

Table 1 Summary measures included in the Global Burden of Disease and Risk Factors Study

Measure	Definition
Measures of disease frequency	
Deaths	Deaths occurring in a population during a set period
Incidence	Number of new cases of a given cause or disease within a specified population during a set period
Prevalence	Total number of cases (both new and existing) of a given cause within a specified population at a given time
Measures of life expectancy	
Life expectancy	Number of years a person is expected to live based on their present age
Healthy life expectancy	Number of years that a person at a given age can expect to live in good health, if current rates of mortality and disability remain constant.
Measures of health burden	
Years of life lost (YLL)	Years of life lost due to premature mortality
Years lived with disability (YLD)	Years of healthy life lost due to living with illness, injury, or disability
Disability adjusted life years (DALYs)	Years of healthy life lost due to premature death and disability, calculated as the sum of YLL and YLDs. This can help us to understand the total health burden (both fatal and non-fatal) overtime.

Source. IHME (n.d.,)

To calculate estimates for the GBD 2023, IHME and its collaborators used over 310,000 sources of health data including surveys, censuses, vital statistics (which collects data on the "vital" events, such as live births and deaths of every member of a population), and other health-related data sources (GBD 2023 Disease and Injury and Risk Factor Collaborators, 2025, Supplementary Appendix 1).

To ensure comparability of measurement overtime and across populations, each new iteration of the GBD provides updated estimates for the entire time series back to 1990, incorporating newly available data and changes in methodology, where appropriate. This means that estimates provided by the GBD 2023 replace all previously published estimates (IHME, 2024).

The GBD 2023 categorises the 375 diseases and injuries into a four-level cause hierarchy. Level 1 causes are grouped into three broad categories: communicable, maternal, neonatal, and nutritional diseases; non-communicable diseases; and injuries. These categories are then broken down into more detailed subcategories across levels 2, 3 and 4, with level 4 representing the most detailed diseases and injuries. An example which illustrates the cause hierarchy is provided in Figure 1.

Figure 1 Illustrative example of the four-level cause hierarchy used in the GBD



Risk assessment framework

The study also provides estimates of the burden of disease attributable to specific behavioural, environmental, occupational, and metabolic risk factors, based on the comparative risk assessment framework.

This framework considers how the burden of disease may change with variations in multiple risk factors simultaneously. This is important because many factors can act through other, intermediate, factors, or in combination with other risks (Murray et al, 2003). To take this consideration into account, the framework is based on a causal web of hierarchically organised, modifiable risk factors or causes that contribute to health outcomes. This causal web allows for risks or causes to be quantified at any level of the framework (GBD 2023 Disease and Injury and Risk Factor Collaborators, 2025).

Consistent with previous iterations, GBD 2023, evaluated a set of behavioural, environmental and occupational; and metabolic risks. Relationships between risk factors and specific health outcomes, known as risk outcome pairs, were then included based on convincing or probable evidence. Risk factors were then categorised into a four-level hierarchy, referred to as the risk hierarchy. This is categorised in a similar way to the cause hierarchy ranging from level 1, where risk factors are grouped into three broad categories (metabolic, behavioural, and environmental/occupational), to level 4, which includes risks of the most granular level (GBD 2016 Risk Factors Collaborators, 2017). An overarching category for all risk factors is also presented. However, unlike the cause hierarchy, the risk hierarchy is not collectively exhaustive which means that not all burden can be attributed to a known risk factor (Estep, 2025).

To estimate the burden attributable to a given risk factor, the CRA framework includes four key components: the measure of burden used (whether this is fatal burden e.g., mortality or non-fatal burden e.g., DALYs), the exposure levels for the risk factor, the relative risk of a given health outcome due to exposure, and the optimum level of exposure associated with the lowest possible health risk, based on epidemiological evidence. This optimum level of exposure is referred to as the theoretical minimum-risk exposure level or TMREL (Li, et al., 2025). For further information on the terms outlined, alongside a summary of the steps involved within the CRA framework, refer to a summary within this frequently asked questions learning resource. This summary is taken from pages 128-173 of the GBD 2023 Supplementary Appendix 2.

GBD 2023 included a total of 88 risk factors, across the four hierarchal levels, and 159 health outcomes.

Disease and injury burden attributable to risk factors

Dietary risks were categorised as a level 2 risk factor, under behavioural risks, with 15 specific dietary risks at level 3. These specific dietary risks were broadly divided into protective food groups and nutrients which reduce the risk of disease, such as vegetables, alongside harmful risk factors which increase the risk of disease, such as sugar-sweetened beverages. However, it is important to note that some risk factors, such as milk and calcium, can have mixed effects depending on consumption and the particular health outcome (IHME, n.d.). For example, red meat was classified as a J-shaped risk which meant that either the risk decreased before increasing, the opposite, or did not demonstrate a change in relative risk until it reached a certain threshold. For further context of J-shaped risk, with an example of alcohol, refer to this IHME video resource. A list of the 15 dietary risk factors is presented in Table 1.

Table 2 Specific level 3 dietary risks included in the GBD 2023

Diets low in	Diets high in
Fruit, vegetables, legumes, whole grains, nuts and seeds, milk, fibre, calcium, seafood omega-3 fatty acids, omega-6 polyunsaturated fatty acids	Red meat, processed meat, sugar-sweetened beverages, trans fatty acids and sodium

Source. IHME (2026) GBD 2023 results tool

For each specific risk factor, the optimal level of exposure of intake was defined by the TMREL. GBD 2023 collaborators used different approaches to set the TMREL based on whether the specific risk factor was

protective, harmful, mixed or J-shaped. For a summary of the methodology specifically related to estimating the burden of dietary risks, refer to Appendix A. For further information on the methodology, refer to pages 128-173 of the methodology document featured in GBD 2023 Supplementary Appendix 2.

Information on the definitions used by the GBD 2023 for each specific risk factor and the optimal level of intake as defined by the TMREL is provided in Appendix B.

Estimates for dietary risks were calculated for adults aged 25 years and over. This briefing will present findings on the burden of dietary risks for level 2 disease groups, such as cardiovascular diseases and neoplasms, alongside level 3 specific causes, such as ischaemic heart disease or diabetes, featured within the GBD cause hierarchy. Findings will be presented for the South East with comparisons made to England.

The number of DALYs and deaths are presented alongside age standardised rates per 100,000 population, which account for differences in both population size and age-structure. Counts have been rounded to the nearest whole number and age-standardised rates to one decimal place. Since the 2017 iteration of the GBD, the IHME transitioned to using its own world standard population to calculate age-standardised rates (IHME, 2019). This means age-standardised rates cannot be compared against rates calculated using other standard populations such as the European Standard Population (ESP2013). For further information on the methodology used to create the GBD world standard population, refer to Appendix A.

Good to know

This briefing does not provide data on the consumption of major food and nutrients for the South East and England as this is provided directly by the GBD's Environmental, Occupational, and Dietary Risk Factors Team and cannot be accessed through the GBD results tool.

Impact of dietary risks overall

Disability adjusted life years (DALYs) attributable to all dietary risks

In 2023, an estimated 183,993 DALYs (95% UI: 84,196– 260,026) were attributed to dietary risks in 2023 across adults aged 25 and over in the South East. This number of DALYs has decreased from 290,603 (95% UI: 97,602-423,017) in 1990.

The proportion of the South East's overall number of DALYs attributable to dietary risks was 6.2% (95% UI: 2.9-8.9%).

When controlling for the number and age structure of the population, using age standardised rates, the rate of DALYs attributable to dietary risks in the South East was 1,005.4 (95% UI: 461.5- 1,393.1) per 100,000 population. Whilst this is lower than the rate for England (1,196.1 [95% UI: 533.6- 1,659.4] per 100,000), the difference is not statistically significant.

The age-standardised rate was higher for males (1,354.9 [95% UI: 640.1- 1,867.8] per 100,000) compared to females (689.9 [95% UI: 313.2- 1,007.2] per 100,000) in the South East. However, this difference was not significant.

Deaths attributable to dietary risks

In 2023, an estimated 8,895 (95% UI: 3,758- 13,251) deaths were attributable to dietary risks across adults aged 25 and over in the South East. This has decreased from 14,401 (95% UI: 4,455- 21,740) in 1990.

The proportion of the South East's overall number of deaths attributable to dietary risks was 9.8% (95% UI: 4.2-14.6%). This equated to an age-standardised rate of 39.7 (95% UI: 17.2- 58.1) of deaths attributable to dietary risks per 100,000 population. Whilst this is lower than the national rate (46.7 [95% UI: 20.2- 67.9] per 100,000), the difference is not statistically significant.

Impact of dietary risks on individual causes

Disability adjusted life years (DALYs) attributable to all dietary risks

In 2023, cardiovascular disease was the leading cause of diet-related DALYs in the South East (106,913 [95% UI: 46,140-150,901). This was followed by neoplasms (43,201 [95% UI: 14,956-70,049]) and diabetes and kidney diseases (33,826 [95% UI: 19,581-47,205)]).

Dietary risks accounted for 30.9% (95% UI: 19.5-41%) of the total DALYs from diabetes and kidney diseases, 25.2% (95% UI: 11.1-35%) of the total DALYs from cardiovascular diseases and 7.2% (95% UI: 2.8-12.7%) of the total DALYs from neoplasms in the South East.

Ischemic heart disease was the leading level 3 cause of diet-related DALYs in the South East (88,825 [95% UI: 29,118- 131,326]). This was followed by colon and rectum cancer (27,161 [95% UI: 14,120-39,732]), diabetes (26,566 [95% UI:

The main GBD Level 3 causes of DALYs attributable to dietary risks were hypertensive heart disease (55.3%; 95% UI: 45.3-66.4), ischemic heart disease (49.3%; 95% UI: 16.8-72.3%), colon and rectum cancer (41.5%; 95% UI: 22.9-59.3%), diabetes mellitus (35.4%; 95% UI: 21.6-47.8%) and oesophageal cancer (21.7%; 95% UI: -4.1-43%).

Deaths attributable to all dietary risks

In 2023, dietary risks accounted for 25.3% (95% UI: 15.7- 35.7%) of the total deaths from diabetes and kidney diseases, 23.9% (95% UI: 10-34.7%) of the total deaths from cardiovascular diseases and 8% (95% UI: 2.9-12.7%) of the total deaths from neoplasms in the South East.

The main GBD Level 3 causes of deaths attributable to dietary risks were hypertensive heart disease (54%; 95% UI: 44.4-64.8), ischemic heart disease (45.3%; 95% UI: 14.4-68.7%), colon and rectum cancer (41%; 95% UI: 22.3-59%), diabetes mellitus (33%; 95% UI: 19.2-45.9%) and oesophageal cancer (21.9%; 95% UI: -4.3-43.2%).

Conclusion

This briefing provided a summary on the GBD study, alongside an overview of findings from the latest release in 2023 and what this tells us about the burden attributable to dietary risk factors in the South East and England.

Whilst this data provides useful insights into the disease burden of particular risk factors for the South East and England, there are caveats which need to be acknowledged when interpreting this analysis. For example, data was not available on the consumption of major food and nutrients for the South East and England. This affected our ability to identify whether consumption of each dietary risk was above or below the TMREL range. In addition, as acknowledged by Li and Li (2025), this analysis focused solely on the impact of dietary risk factors and did not account for potential confounding impacts from other lifestyle or environmental risk factors that may co-occur with dietary patterns.

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Appendix A

Methodology for calculating the burden of dietary risks

The burden of dietary risks was estimated with a comparative risk assessment framework. This involved a series of steps undertaken by the IHME and collaborators. A brief overview provided below:

1. Each risk factor in the GBD study is associated with a health outcome or outcomes, and each combination of risk and outcome is referred to as a risk-outcome pair. These pairs were included based on convincing or probable evidence. For the GBD 2021 iteration onwards, the IHME introduced the burden of proof methodology which assesses the strength of evidence for each risk-outcome pair and assigns star rating from one to five. For GBD 2023, risk-outcome pairs included in GBD 2021 remained unless updated burden of proof analysis indicated exclusion.
2. Estimate the population level dietary intake for each risk by age, sex, year and location. This was produced using multiple data sources including national and subnational nutrition surveys, household budget surveys, accounts of national sales from Euromonitor, and food availability data from the United Nations Food and Agriculture Organisation of the United Nations.
3. Determine the relative risks of a given outcome due to exposure for each risk-outcome pair based on pooled epidemiological evidence.
4. Determine the theoretical minimum risk exposure level (TMREL), which refers to the level of intake associated with the lowest risk, identified through epidemiological evidence.
5. Calculate the population attributable fraction by comparing observed exposure to the TMREL
6. Generate estimates of the risk-attributable disease burden for each dietary risk by year, location, sex, and age group.

For further information on the terms outlined, alongside a summary of the steps involved within the CRA framework, refer to a summary within this internal learning resource. This summary is taken from pages 128-173 of the GBD 2023 Supplementary Appendix 2.

Appendix B

Dietary risk factor exposure definitions and optimal level of exposure as defined by GBD 2023

Dietary risk factor	Definition of exposure	Optimum level or range of exposure
Protective		
Fruits	Average daily consumption (in g per day) of fruit including fresh, frozen, cooked, canned, or dried fruit, excluding fruit juices and salted or pickled fruits.	340–350 g/day
Vegetables	Average daily consumption (in g per day) of vegetables, including fresh, frozen, cooked, canned, or dried vegetables and excluding legumes and salted or pickled vegetables, juices, nuts and seeds, and starchy vegetables such as potatoes or corn.	306–372 g/day
Whole grains	Average daily consumption (in g per day) of whole grains (bran, germ, and endosperm in their natural proportion) from breakfast cereals, bread, rice, pasta, biscuits, muffins, tortillas, pancakes, and other sources.	160–210 g/day
Nuts and seeds	Average daily consumption (in g per day) of nuts and seeds, including tree nuts and seeds and peanuts.	19–24 g/day
Dietary fibre	Average daily consumption (in g per day) of fibre from all sources including fruits, vegetables, grains, legumes, and pulses.	22–25 g/day
Legumes	Average daily consumption (in g per day) of legumes and pulses, including fresh, frozen, cooked, canned, or dried legumes.	100–110 g/day
Omega-6 polyunsaturated fatty acids	Average daily consumption (in % daily energy) from omega-6 polyunsaturated fatty acids (PUFA) (specifically linoleic acid, γ-linolenic acid, eicosadienoic acid, dihomo-γ-linolenic acid, arachidonic acid).	9–10% of total daily energy
Seafood omega-3 fatty acids	Average daily consumption (in mg per day) of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA).	470–660 mg/day
Harmful		
Processed meats	Average daily consumption (in g per day) of meat preserved by smoking, curing, salting, or addition of chemical preservatives.	0 g/day
Dietary sodium	Average 24-hour urinary sodium excretion (in g per day).	1–5 g/day

Sugar-sweetened beverages	Average daily consumption (in grams per day) of beverages with ≥50 kcal per 226.8g serving, including carbonated beverages, sodas, energy drinks, and fruit drinks, but excluding 100% fruit and vegetable juices.	0 g/day
Trans fatty acids	Average daily consumption (in % daily energy) of trans fat from industrially produced trans-fat mainly from partially hydrogenated vegetable oils.	0% of total daily energy
J-shaped		
Red meats	Average daily consumption (in g per day) of unprocessed red meat including pork and bovine meats such as beef, pork, lamb, and goat, but excluding all processed meats, poultry, fish, and eggs	0–200 g/day
Mixed protective and harmful		
Dietary calcium	Average daily consumption (in g per day) of calcium from all sources, including milk, yoghurt, and cheese	0.72–0.86 g/day (males) 1.1–1.2 g/day (females)
Milk	Average daily consumption (in g per day) of dairy milk including non-fat, low-fat, and full-fat milk, but excluding plant-based milks, fermented milk products such as buttermilk, and other dairy products such as cheese	280–340 g/day (males) 500–610 g/day (females)

Source. GBD 2023 Disease and Injury and Risk Factor Collaborators, 2025 [Supplementary Appendix 2].