Modelling the impact of reduction in meat and dairy consumption on nutrient intakes and greenhouse gas emissions in children and young people living in Scotland

October 2025

THE UNIVERSITY of EDINBURGH

Food Standards Scotland

Inbhe Bìdh Alba

Authors (alphabetical): Lindsay Jaacks, Joe Kennedy, Geraldine McNeill, Ricki Runions

Contents

List of Tables

List of Annexe Tables

Annexe Tables 1. Mean contribution of main food groups to meat intake, overall and by demographic group (sex, age group, age group and sex, and Scottish Index of Multiple Deprivation).

Annexe Tables 2. Mean contribution of main food groups to dairy intake, overall and by demographic group (sex, age group, age group and sex, and Scottish Index of Multiple Deprivation).

Annexe Tables 3. Mean change and absolute values for the impact of meat and dairy reduction scenarios on nutrient intake, percentage below the Lower Reference Nutrient Intake, adherence to the Scottish Dietary Goals, and greenhouse gas emissions, overall and by sex, age, and Scottish Index of Multiple Deprivation.

List of Figures

Abbreviations

CCC	Climate Change Committee
CI	Confidence Interval
DISH	Dietary Intake in Scotland's cHildren
DRV	Dietary Reference Value
EAR	Estimated Average Requirement
FSS	Food Standards Scotland
GHG	Greenhouse Gas Emissions
LRNI	Lower Reference Nutrient Intake
NDNS	National Diet and Nutrition Survey
PBDA	Plant-based Dairy Alternatives
PBMA	Plant-based Meat Alternatives
RNI	Reference Nutrient Intake
RRPM	Red and Red Processed Meat
SACN	Scientific Advisory Committee on Nutrition
SHeS	Scottish Health Survey
SIMD	Scottish Index of Multiple Deprivation

Acknowledgements

We are grateful to all the families who participated in the survey. Many people contributed to the successful completion of this project. Cristina Stewart helped with setting up the survey. Graham Horgan of Biomathematics and Statistics Scotland provided statistical advice and carried out the survey weighting. Nicky Taylor, Lisa Dixon, Greg Leyden, and staff at Taylor McKenzie Research led the data collection. Polly Page, Toni Steer, Birdem Amoutzopoulos, and David Collins from the MRC Epidemiology Unit, University of Cambridge, supported the use of Intake24 for dietary intake assessment and provided statistical advice for implementing the multiple source method. Sarah Bierbaum-Williams from the Office of the Chief Statistician, Scottish Government, oversaw the Postcode Address File sampling. Staff in the Public Health Nutrition team at Food Standards Scotland, notably Fiona Comrie, Nikki Fernie, Lesley Curtis, and Alana Mcdonald gave guidance on execution of all stages. The Advisory Group (Gillian Purdon, Polly Page, Gillian Swan, and Peter Craig) provided advice and support throughout the project.

Executive Summary

The Climate Change Committee's (CCC) Seventh Carbon Budget recommends that population average meat and dairy consumption declines by 20% by 2035, rising to a 35% reduction in meat by 2050 compared to 2019 levels. A steeper reduction in red meat consumption is recommended (40% by 2050) to reflect the higher carbon intensity of beef and lamb. The CCC also recommends meat products are replaced by plant-based alternative protein products, plant-based whole foods, and, in later years, novel alternative proteins such as those produced using precision fermentation.

Throughout this report, unless otherwise specified, **"total meat"** and **"meat"** refer to all of the following: beef, lamb, pork, other red meat, offal, poultry, game birds, processed red meat, processed poultry, burgers, and sausages.

"**Red and red processed meat**" refers to all of the following: beef, lamb, pork, other red meat, processed red meat, burgers, sausages, and offal.

"**Processed meat**" refers to processed red meat and processed poultry.

"**Dairy**" refers to milk, cheese, yoghurt, cream, and butter.

This transition to less meat and dairy relates to the average UK diet, and the CCC recognises that individual reductions will vary by various characteristics such as current consumption levels, age, and personal preference. For example, adults currently consuming well above the Eatwell recommended level of red and processed meat may see much larger reductions than young people with insufficient nutrient intakes, who may not reduce their consumption at all in a scenario wherein population average intake still declines.

The aims of this report were to describe current intakes of meat and dairy among children and young people living in Scotland, and to model the impact of various meat and dairy reduction scenarios on energy and nutrient intake, achievement of the Scottish Dietary Goals, and greenhouse gas emissions. Data underlying the report were collected in 2024 from 1,700 children and young people aged 2 to 15 years who completed 1-4 days of diet recall as part of the Dietary Intake in Scotland's cHildren (DISH) Survey. As such, reductions in meat and dairy reflect reductions from 2024 levels, not 2019 levels as data were not available for diets of children and young people living in Scotland from 2019.

Current Meat and Dairy Consumption

Most children and young people in Scotland reported consuming meat (90%) and dairy (99.6%). Most meat eaten is poultry (40%) or pork (37%) with beef contributing about one-fifth (21%) and lamb contributing very small amounts (1%). More than half of dairy (67%) was consumed as milk.

Young people aged 11 to 15 years are the highest meat consumers and children aged 2 to 10 years are the highest dairy consumers.

There were no meaningful differences in dairy consumption or dairy type (i.e., milk versus yoghurt versus cheese) by SIMD among children and young people. There were also no

differences in meat consumption except that those living in the most deprived neighbourhoods had slightly higher white meat consumption (32g/day versus 26g/day in the least deprived neighbourhoods) and had a higher proportion of meat from poultry (42% versus 35%) and smaller proportion of meat from pork (32% versus 44%). The higher white meat / poultry consumption was driven by higher intake of 'coated chicken manufactured', which includes chicken nuggets/pieces/dippers and coated chicken breast fillets.

Meat and meat products were major contributors (contributing >20%) to intakes of selenium (24.0%) and zinc (21.4%). Milk and milk products were major contributors to intakes of calcium (35.5%), iodine (44.6%), and vitamin B_{12} (39.1%).

Seventy-eight percent of children and young people consumed at least some red and red processed meat. Red and red processed meat consumption is spread across lunch and dinner. A very small proportion (6-7%) of red and red processed meat was purchased at cafes, restaurants, pubs, and takeaways (i.e., out of home foods).

Achieving a 20% or 35% Reduction in Total Meat by Reducing Red and Red Processed Meat

Our modelling showed that a 20% reduction in the population average "total meat" intake for children and young people could be achieved if maximum red and red processed meat intake was pegged at 33g/day for children aged 2 to 4 years; 39g/day for children 5 to 10 years; and 54g/day for young people aged 11 to 15 years. This value for 11- to 15-year-olds is only slightly lower than a comparable value found in a previous report for adults (60g/day).

Likewise, a 35% reduction in the population average "total meat" intake for children and young people could be achieved if maximum red and red processed meat intake was pegged at 17g/day for children aged 2 to 4 years; 19g/day for children 5 to 10 years; and 26g/day for young people aged 11 to 15 years. This value for 11- to 15-year-olds is only slightly lower than a comparable value found in a previous report for adults (31g/day).

Impact of Reducing Meat and Dairy Consumption on Nutrient Intake

We simulated 27 scenarios. However, here we focus on the two most useful scenarios to demonstrate both the achievement of the public health goal for red and red processed meat, and the worst-case scenario of no replacement: (1) 20% less meat, 20% less dairy, RRPM [red and red processed meat] and (2) 35% less meat, 20% less dairy, RRPM (**Executive Summary Table 1**).

Executive Summary Table 1. Summary of two most useful simulation scenarios to demonstrate both the achievement of the public health goal for red and red processed meat, and the worst-case scenario of no replacement.

Name	Change in meat	Replacement of meat	Change in dairy	Replacement of dairy
20% less meat, 20% less dairy, RRPM	RRPM max 33g/d in 2-4y, 39g/d in 5-10y, 54g/d in 11-15y	None	20% reduction all dairy	None
35% less meat, 20% less dairy, RRPM	RRPM max 17g/d in 2-4y, 19g/d in 5-10y, 26g/d in 11-15y	None	20% reduction all dairy	None

Abbreviation: RRPM, red and red processed meat.

The impact of these two scenarios on nutrient intake was as follows (**Executive Summary Table 2**):

The percentages of the population below the lower reference nutrient intake (LRNI) for zinc would increase by ~4-35 percentage points. This was the largest impact on any nutrient, due to both 'meat and meat products' and 'milk and milk products' contributing ~20% each to zinc intake at baseline.

The percentages of the population below the LRNI for iodine would increase by ~4-7 percentage points.

The percentages of young people aged 11 to 15 years below the LRNI for iron, calcium, selenium, and vitamin B_{12} would increase by ~3-6 percentage points.

The percentages of children aged 2 to 10 years below the LRNI for iron, calcium, selenium, and vitamin B_{12} would increase by ~1-3 percentage points.

Intakes of protein are not of concern at baseline or after meat and dairy reductions.

Most of the decreases in iron and selenium were attributed to reductions in meat whereas most of the decreases in calcium, iodine and vitamin B_{12} were attributed to reductions in dairy. The contribution of meat and dairy to decreases in protein and zinc in these scenarios was relatively equivalent.

Executive Summary Table 2. Summary of percentage of the population below the LRNI for key nutrients among children and young people aged 2 to 15 years living in Scotland at baseline (2024) and following a reduction in red and red processed meat to achieve a 20% or 35% reduction in the population average "total meat" intake for children and young people, together with a 20% reduction in dairy and no replacement.

	Baseline	**20% less meat, 20% less dairy, RRPM**	**35% less meat, 20% less dairy, RRPM**
Iron			
2-4y	3%	3%	3%
5-10y	3%	4%	4%
11-15y	31%	34%	36%
Calcium			
2-4y	1%	1%	1%
5-10y	3%	4%	4%
11-15y	15%	19%	20%
Iodine			
2-4y	10%	14%	14%
5-10y	8%	11%	12%
11-15y	24%	31%	31%
Selenium			
2-4y	0%	0%	1%
5-10y	2%	4%	5%
11-15y	21%	25%	27%
Zinc			
2-4y	9%	13%	15%
5-10y	9%	14%	19%
11-15y	26%	34%	41%
Vitamin B_{12}			
2-4y	1%	1%	1%
5-10y	1%	1%	1%
11-15y	5%	6%	8%

Impact of Reducing Meat and Dairy Consumption on Achievement of the Scottish Dietary Goals

The modelling indicated potential positive impacts on overall diet, when reductions are made and replacements are included. Replacing meat and dairy with a variety of products, including pulses and legumes, vegetables, eggs, oily fish, plant-based alternatives, or chicken can increase the percentage of children and young people meeting the goals for energy density, total fat, saturated fat, fibre, and salt. However, modelled replacements – which are based on current intakes – suggest that these scenarios may slightly reduce the percentage of children and young people meeting the goals for free sugars and total carbohydrates.

Impact of Reducing Meat and Dairy Consumption on Greenhouse Gas Emissions

On average, in 2024, dietary greenhouse gas emissions among children and young people aged 2 to 15 years living in Scotland were 3.65 $kgCO_2e$ per day. Emissions were lowest for 2- to 4-year-olds (2.98 $kgCO_2e$ per day) and highest for 11- to 15-year-olds (4.00 $kgCO_2e$ per day).

Greenhouse gas emissions associated with diets of children and young people could be reduced by up to ~28% of baseline emissions by reducing red and red processed meat to achieve a 35% reduction in “total meat”. Significant reductions were observed across all replacement scenarios, whether meat and dairy were replaced with vegetables, eggs or plant-based alternatives.

Recommendations

Overall, this research suggests that dairy and meat are widely consumed by children and young people in Scotland and are an important source of nutrients, particularly zinc which is generally too low in this population, and iodine and calcium, which are generally too low in young people (11 to 15 years). Reducing either “total meat” or red and red processed meat could result in significant reductions in greenhouse gas emissions associated with diets of children and young people. However, given that children and young people aged 2 to 15 years make up only about 15% of Scotland’s population, these impacts will be much less than the impacts of similar reductions among adults. Careful consideration of replacements could mitigate some—but not all—of the negative impacts on nutrient intake and maximise positive impacts on achievement of the Scottish Dietary Goals. However, given the especially poor diets of young people (11 to 15 years), concerted efforts are needed to improve overall diet quality for this population.

1. Introduction

1.1. Background

The 2022 CCC recommendations for how reductions in greenhouse gas emissions may be achieved by the UK include the following:

"*take low-cost, low-regret actions to encourage a 20% shift away from all meat by 2030, rising to 35% by 2050, and a 20% shift from dairy products by 2030.*"

On 20 June 2023, the Scottish Government partially accepted this recommendation (1).

In February 2025, the CCC published its Seventh Carbon Budget, which included a shift to lower-carbon choices, particularly a shift from meat (especially beef and lamb) and dairy consumption to plant-based foods, within overall healthier diets. Specifically, the Seventh Carbon Budget recommends a 20% reduction in all meat by 2035 (versus 2030 in the Sixth Carbon Budget), rising to 35% by 2050, and a 20% reduction in dairy by 2035 (versus 2030 in the Sixth Carbon Budget) compared to 2019 levels. A steeper reduction in red meat consumption is recommended (40% by 2050) to reflect the higher carbon intensity of beef and lamb. The CCC also recommends meat products are replaced by plant-based alternative protein products, plant-based whole foods, and, in later years, novel alternative proteins such as those produced using precision fermentation.

Throughout this report, unless otherwise specified, **"total meat"** and **"meat"** refer to all of the following: beef, lamb, pork, other red meat, offal, poultry, game birds, processed red meat, processed poultry, burgers, and sausages.

"**Red and red processed meat**" refers to all of the following: beef, lamb, pork, other red meat, processed red meat, burgers, sausages, and offal.

"**Processed meat**" refers to processed red meat and processed poultry.

"**Dairy**" refers to milk, cheese, yoghurt, cream, and butter.

This report on the impacts of reducing meat and dairy consumption among children and young people living in Scotland, follows a consistent approach to a previous report on the impacts in adults, which was based on the Sixth Carbon Budget.

This transition to less meat and dairy relates to the average UK diet, and the CCC recognises that individual reductions will vary by various characteristics such as current consumption levels, age, and personal preference. For example, adults currently consuming well above the Eatwell recommended level of red and processed meat may see much larger reductions than young people with insufficient nutrient intakes, who may not reduce their consumption at all in a scenario wherein population average intake still declines.

Food Standards Scotland (FSS) sought to establish the nutritional impact of a variety of reductions in meat and dairy consumption among children and young people living in Scotland. To this end, FSS commissioned the University of Edinburgh to complete modelling work through analysis of data collected in 2024, from 1,700 children and young people aged 2 to 15 years living in Scotland, who completed 1-4 days of diet recall as part of the DISH Survey.

As such, reductions in meat and dairy reflect reductions from 2024 levels, not 2019 levels as data were not available for diets of children and young people living in Scotland from 2019.

1.2. Aims

1. Calculate current intakes of meat and dairy, overall and by sex, age group, sex and age group, and Scottish Index of Multiple Deprivation (SIMD) quintile.
2. Calculate the foods/food groups contributing to intake of meat and dairy, overall and by population subgroups.
3. Calculate the contribution of 'meat and meat products' and 'milk and milk products' to nutrient intake, overall and by population subgroups.
4. Investigate consumption behaviours of red and red processed meat.
5. Model the impact of various scenarios on energy and nutrient intake, achievement of the Scottish Dietary Goals, and greenhouse gas emissions.

The broader influences such as cultural and financial challenges which children and young people and their families face in making healthy changes to their diets are not addressed by this report.

1.3. Rationale for selection of nutrients

This work focused on energy and seven nutrients: protein, calcium, iron, iodine, selenium, zinc, and vitamin B_{12}. These were selected because meat and dairy are sources of these nutrients.

1.4. Explanation of Dietary Reference Values

Reductions in meat and dairy consumption will lead to lower intakes of the nutrients found in these foods, though some of these can be replaced by foods consumed in their place. The net change will range from a reduction to an increase in nutrient intake, depending on the amount of nutrients in the foods substituted for the meat and dairy foods.

The impact of these changes on nutrient intake can be assessed by comparison with the recommended intake of each nutrient. In the UK, the following metrics are used to assess nutrient adequacy (2):

1. Reference Nutrient Intake (RNI): the intake that is adequate for 97.5% of the population.
2. Estimated Average Requirement (EAR): the intake that is adequate for 50% of the population.
3. LRNI: the intake that is adequate for 2.5% of the population.

Values are given for different sex and age groups to reflect the variation in nutrient needs according to differences in body size and physiological factors.

1.5. Format of this report

Chapter 2 summarises current intakes of meat and dairy. Chapter 3 describes the simulations evaluated. Chapters 4 to 6 summarise results of the simulations, including the impact on energy and nutrient intake (Chapter 4), adherence to the Scottish Dietary Goals (Chapter 5), and greenhouse gas emissions (Chapter 6). At the end of major sections, key messages are

provided in a blue box. Chapter 7 summarises key messages of the survey, discusses the results relative to a similar report in adults 16+ years living in Scotland, and provides recommendations for future research and policy. Throughout the report, pink boxes are used to call out important information to aid the interpretation of results.

2. Current intakes of meat and dairy among children and young people living in Scotland

2.1. Approach to understanding current intakes of meat and dairy

In order to understand the likely nutritional risks of reducing meat and dairy consumption, we evaluated current intakes of meat and dairy, and the contribution of 'meat and meat products' and 'milk and milk products' to energy and select nutrients for which meat and dairy are likely to be major sources (protein, calcium, iron, iodine, selenium, zinc, and vitamin B_{12}).

DISH is a representative survey of the diets of children and young people aged 2 to 15 years living in Scotland. Diet data were collected in 2024 using an online platform called Intake24. Up to four 24-hour dietary recalls were collected from each child. Diets were reported by parents/guardians for children in pre-school or primary school. Children in secondary school had the opportunity to report their own diets, and a majority (61%) of them did so. The final sample was 1,700 children and young people. Most (84%) participants completed two or more recalls; 32% completed four recalls.

Unless otherwise specified, all statistics presented in this report are weighted to be representative of children and young people aged 2 to 15 years living in Scotland. The multiple source method (a statistical model) was used to estimate usual intake for all nutrients and meat and dairy except for game and lamb which were consumed by <15% of participants (3,4).

Differences by sex, age group, sex and age group, and SIMD quintile were tested using Wilcoxon rank-sum tests for complex survey samples for continuous outcomes and chi-squared tests with Rao and Scott's second-order correction for binary outcomes. Only statistically significant differences (p-value<0.05) were highlighted in the text of this report.

Characteristics of the survey sample are presented in **Table 1**. The median age was 9 years, 48% were female, 87% were white, and 17% lived in single-parent households.

Table 1. Characteristics of children and young people aged 2 to 15 years living in Scotland who completed at least one dietary recall, 2024.

	Overall (n=1,700)[1]	**Female** (n=815)	**Male** (n=874)
Age, years	9 (5, 12)	9 (5, 13)	8 (5, 11)
Age group			
2-4y	20% (413)	19% (187)	20% (225)
5-10y	43% (698)	39% (309)	48% (388)
11-15y	37% (589)	42% (319)	32% (261)
Ethnicity			
White	87% (1,497)	86% (717)	88% (774)
Asian or Asian British	4.6% (79)	5.2% (43)	3.9% (35)
Mixed or multiple ethnic groups	4.4% (73)	4.5% (36)	4.3% (37)
Black, Black British, Caribbean or African	2.6% (28)	3.1% (14)	2.1% (14)
Other	0.7% (11)	0.1% (<5[2])	1.3% (10)
Prefer not to say	0.7% (12)	0.7% (<5[2])	0.3% (<5[2])
Stage of education			
Pre-school	20% (426)	20% (196)	21% (229)
Primary school	50% (805)	45% (352)	55% (451)
Secondary school	30% (469)	36% (267)	24% (194)
Number of adults in household			
1	17% (275)	17% (126)	18% (146)
2	75% (1,298)	73% (615)	77% (675)
3 or more	7.7% (127)	9.9% (74)	5.7% (53)
Number of children in household			
1	28% (647)	29% (318)	26% (325)
2	48% (791)	46% (374)	49% (411)
3 or more	24% (262)	24% (123)	25% (138)

Values are weighted percentage (unweighted n) or weighted median (weighted interquartile range).

[1] Includes 11 participants who reported 'Prefer not to say' for sex.

[2] Exact number suppressed to prevent identifiability.

2.1.1. Definitions of meat categories

Estimates of meat consumption were based on disaggregated meat values (5). We estimated five meat categories:

1. **Total meat**: beef, lamb, pork, other red meat, offal, poultry, game birds, processed red meat, processed poultry, burgers, and sausages
2. **Red meat (unprocessed)**: beef, lamb, pork, other red meat, and offal
3. **White meat (unprocessed)**: poultry and game birds
4. **Processed meat**: processed red meat, processed poultry, burgers, and sausages
5. **Red and red processed meat**: beef, lamb, pork, other red meat, offal, processed red meat, burgers, and sausages

We also estimated the intake of each animal type[1]:

1. Beef
2. Lamb
3. Pork
4. Poultry
5. Game

For composite dishes such as 'beef bolognese' or 'chicken and bacon sandwich with white/malted bread', **disaggregated meat values** are the amount of meat (in grams) in the dish. For example, someone may report eating 100g 'chicken and bacon sandwich with white/malted bread' for lunch on the previous day. That sandwich is estimated to contain 42g poultry and 17g processed red meat. These values (42g poultry and 17g processed red meat), along with the values for all other meat-containing items reported that day, are used to determine the individual's meat consumption.

Unfortunately, it **was not possible in this analysis to disaggregate the nutrients** in composite dishes and attribute them to specific components of the dish. For example, while we can attribute 9% of protein intake to sandwiches, we cannot determine what percentage of this protein is from the meat in the sandwich versus other ingredients.

2.1.2. Definitions of dairy categories

Estimates of dairy consumption were also based on disaggregated dairy values previously derived for the Scottish Health Survey (SHeS) and updated for DISH (6,7). We estimated six dairy categories:

1. **Total dairy**: milk, cheese, yoghurt, cream, and butter
2. **Milk:** skimmed, semi-skimmed, and whole varieties
3. **Cheese[2]**: cheddar cheese, cottage cheese, and other cheese; skimmed, semi-skimmed, and whole varieties
4. **Yoghurt[3]**: skimmed, semi-skimmed, and whole varieties
5. **Cream**: semi-skimmed and whole varieties
6. **Butter**

[1] This required manually identifying and re-categorising items as beef, lamb, pork, poultry, or game from the following disaggregated meat categories: processed red meat, other red meat, burgers, sausages, and offal. For example, under 'processed red meat', 'corned beef, canned' was classified as 'beef' whereas 'glazed baked gammon' was classified as 'pork'. See **Table 11** in **Annexe 1** for details.
[2] Includes Quark which was consumed by 1 participant.
[3] Includes Kefir which was consumed by 10 participants.

2.1.3. Definitions of food categories and food groups

We explored three levels of food groups (see **Table 2** and **Table 3** for examples, and **Table 12** in **Annexe 1** for all food categories):

1. Food categories (16 total)
2. Main food group (58 total)
3. Sub food group (131 total)

Table 2. Example of hierarchy of food groups evaluated for the food category, 'milk and milk products'.

Food category	Main food groups	Sub food groups	Examples of items (most frequently reported in DISH)
Milk and milk products	Whole milk (3.8% fat)	Whole milk	Whole milk Whole milk, boiled
	Semi skimmed milk (1.8% fat)	Semi skimmed milk	Semi skimmed milk Milk, cow's/dairy, type unknown
	1% fat milk	1% fat milk	Milk 1% fat Milk 1% fat, boiled
	Skimmed milk (0.5% fat)	Skimmed milk	Skimmed milk Skimmed milk, boiled
	Other milk and cream	Infant formula	Toddler/growing up milk (1-2 years) e.g. Aptamil 3, Cow & Gate 3 Toddler/ growing up milk (2-3 years), e.g. Aptamil 4, Cow & Gate 4
		Cream (including imitation cream)	Sour cream Dairy squirty/spray cream (e.g. anchor) Double cream
		Other milk	Hot chocolate, made with milk Milkshake / Milk drink, not chocolate (e.g. strawberry, banana) Milkshake / Milk drink, chocolate flavour
	Cheese	Cottage cheese	Cottage cheese Cottage cheese, fat-free/low-fat
		Cheddar cheese	Cheddar cheese Cheddar cheese, vegetarian
		Other cheese	Parmesan cheese Cheese strings/strips (e.g. Dairylea) Babybel cheese
	Yoghurt, fromage frais and other dairy desserts	Yoghurt	Fruit yoghurt Natural yoghurt, greek-style Children's yoghurt drink (e.g. Munch Bunch Squashums, Petits Filous yoghurt drinks)
		Fromage frais and dairy desserts manufactured	Yoplait Frubes/Wildlife Choobs Petit Filous fromage frais Fromage frais, fruit (incl. children's) not fortified (e.g. Tesco value)
	Ice cream	Ice cream	Soft scoop vanilla ice cream Cornetto/king cone (Including supermarket brands)

Table 3. Example of hierarchy of food groups evaluated for the food category, 'meat and meat products'.

Food category	Main food groups	Sub food groups	Examples of items (most frequently reported in DISH)
Meat and Meat Products	Bacon and ham	Ready meals / meal centres based on bacon and ham	Bacon and cheese grills Ham and egg salad
		Other bacon and ham including homemade dishes	Ham, not smoked Ham, smoked
	Beef, veal and dishes	Manufactured beef products including ready meals	Beef lasagne, ready meal Spaghetti bolognese, ready meal
		Other beef & veal including homemade recipe dishes	Spaghetti bolognese, home made (pasta and sauce) Beef burger/hamburger, in a bun, not quarter pounder Beef lasagne
	Lamb and dishes	Manufactured lamb products including ready meals	Kheema naan Shepherd's pie (lamb), ready meal
		Other lamb including homemade recipe dishes	Lamb curry, homemade Lamb kebab with minced lamb and herbs
	Pork and dishes	Manufactured pork products including ready meals	Pork/pork and beef meatballs, grilled Roast pork slices, pre-packed/deli Sweet and sour pork, ready meal, with rice
		Other pork including homemade recipe dishes	Meatballs in tomato sauce Pork chop, grilled, fat not eaten Chinese dumpling
	Coated chicken and turkey manufactured	Manufactured coated chicken / turkey products	Chicken goujon/nugget/dipper, in breadcrumb or batter Chicken nuggets/pieces, from takeaway e.g McNuggets Coated chicken breast fillet, grilled
	Chicken, turkey and dishes	Manufactured chicken products incl ready meals	Chicken pasta bake Chicken slice, smoked or unsmoked (pre-packed/deli) Chicken chow mein, stir fry (with noodles)
		Other chicken / turkey incl homemade recipe dishes	Chicken breast, fried Chicken curry home made Roast chicken (skin eaten)
	Liver, products and dishes	Liver and dishes	Pate (e.g. brussels liver pate / duck and orange pate) Lambs liver, fried
	Burgers and kebabs	Burgers and kebabs purchased	Beef meatballs, grilled or oven baked McDonalds Cheeseburger Beef burger, 100% beef, grilled (no bun)

Sausages	Ready meals based on sausages	Toad in the hole
	Other sausages including homemade dishes	Pork sausage, grilled Hot dog/frankfurter Sausage, fried
Meat pies and pastries	Manufactured meat pies and pastries	Sausage roll Steak pie, slice from a large pie (including steak and kidney) Steak pie, individual (including steak and kidney)
	Homemade meat pies and pastries	Chicken pie, slice from a large Chicken and vegetable pie, slice from a large Chicken pie, gravy based, slice from a large pie
Other meat and meat products	Other meat products manufactured incl ready meals	Pepperami or snack salami Salami Luncheon meat, not canned Haggis
	Other meat including homemade recipe dishes	Corned beef hash Chinese crispy duck (including pancake and sauce) Roast duck (skin eaten)

All food categories and groups except ‘alcoholic beverages’ and ‘artificial sweeteners’ (which were not reported due to low numbers reporting in the sample) were analysed and reported as defined in the UK National Diet and Nutrition Survey (NDNS) and SHeS though we made some modifications to the food category ‘milk and milk products’, notably the inclusion of milky coffees (e.g., lattes, cappuccinos) and butter, and the removal of dairy-free items (see **Table 13** in **Annexe 1**).

2.2. Meat consumption

2.2.1. Consumption of processed meat, white meat, and red meat

Ninety percent of respondents were meat consumers (i.e., they reported eating >0g of any meat across their dietary recalls): 67% consumed processed meat, 65% consumed white meat, and 47% consumed red meat. Females were less likely to be consumers of processed meat and children aged 2 to 4 years were less likely to be consumers of red meat, especially among males (**Figure 1**). Those living in the least deprived neighbourhoods were less likely to consume white meat than those living in more deprived neighbourhoods. There were no other meaningful differences in the percentage of consumers of total meat, processed meat, white meat, or red meat across population subgroups.

Figure 1. Percentage consumers of total (i.e., any) meat, processed meat, white meat, and red meat by sex, age group, sex and age group, and SIMD quintile among children and young people aged 2 to 15 years living in Scotland, 2024.

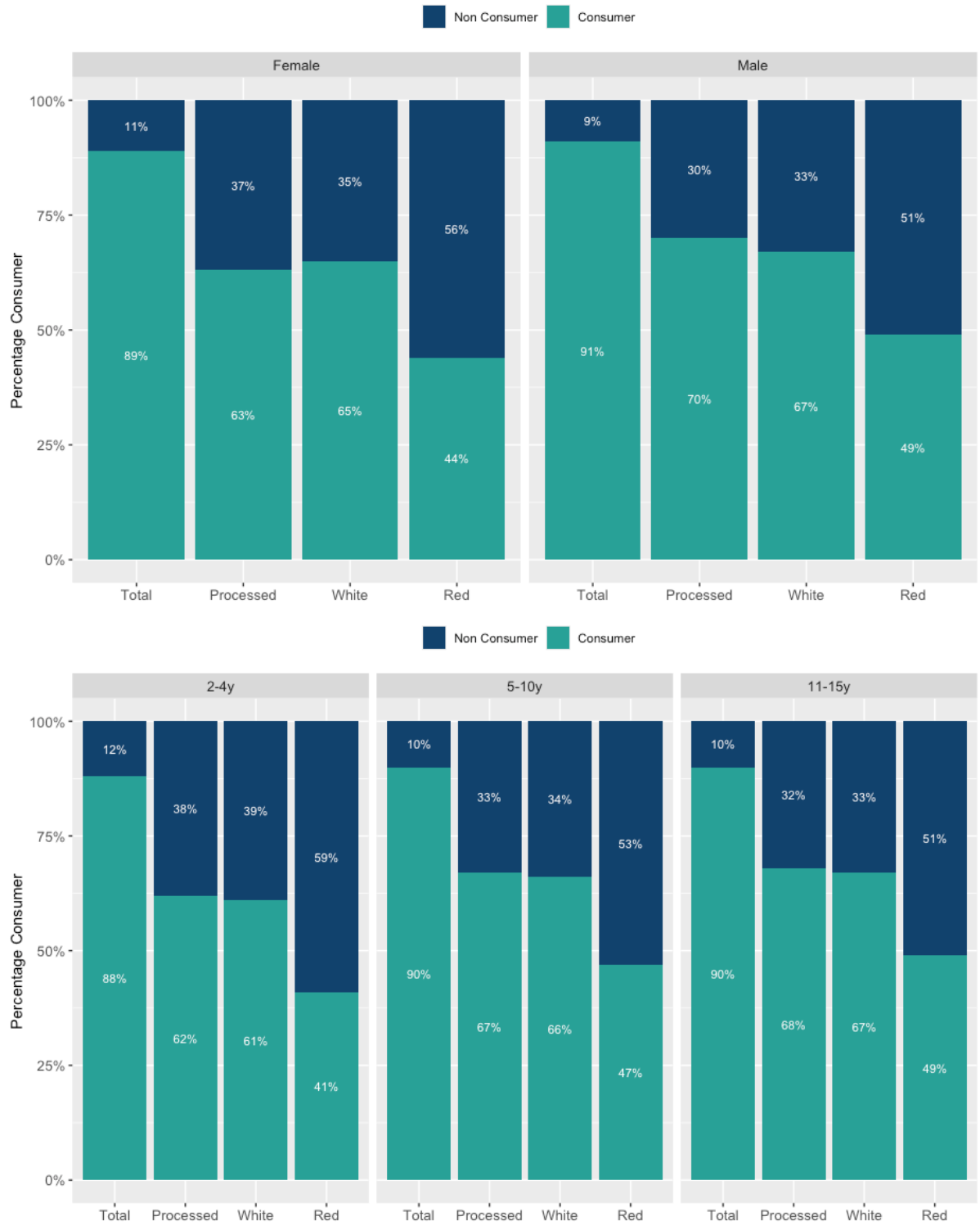
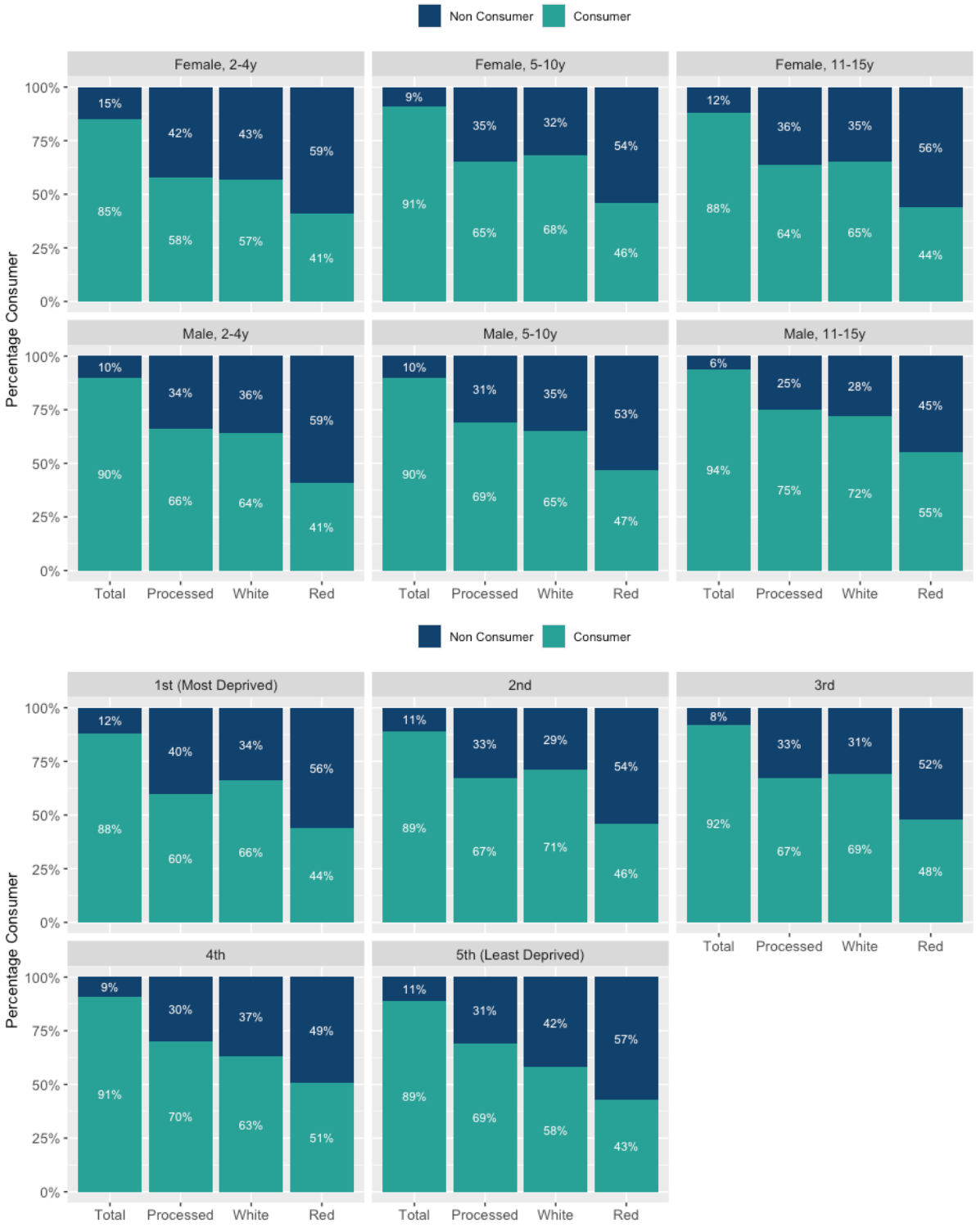


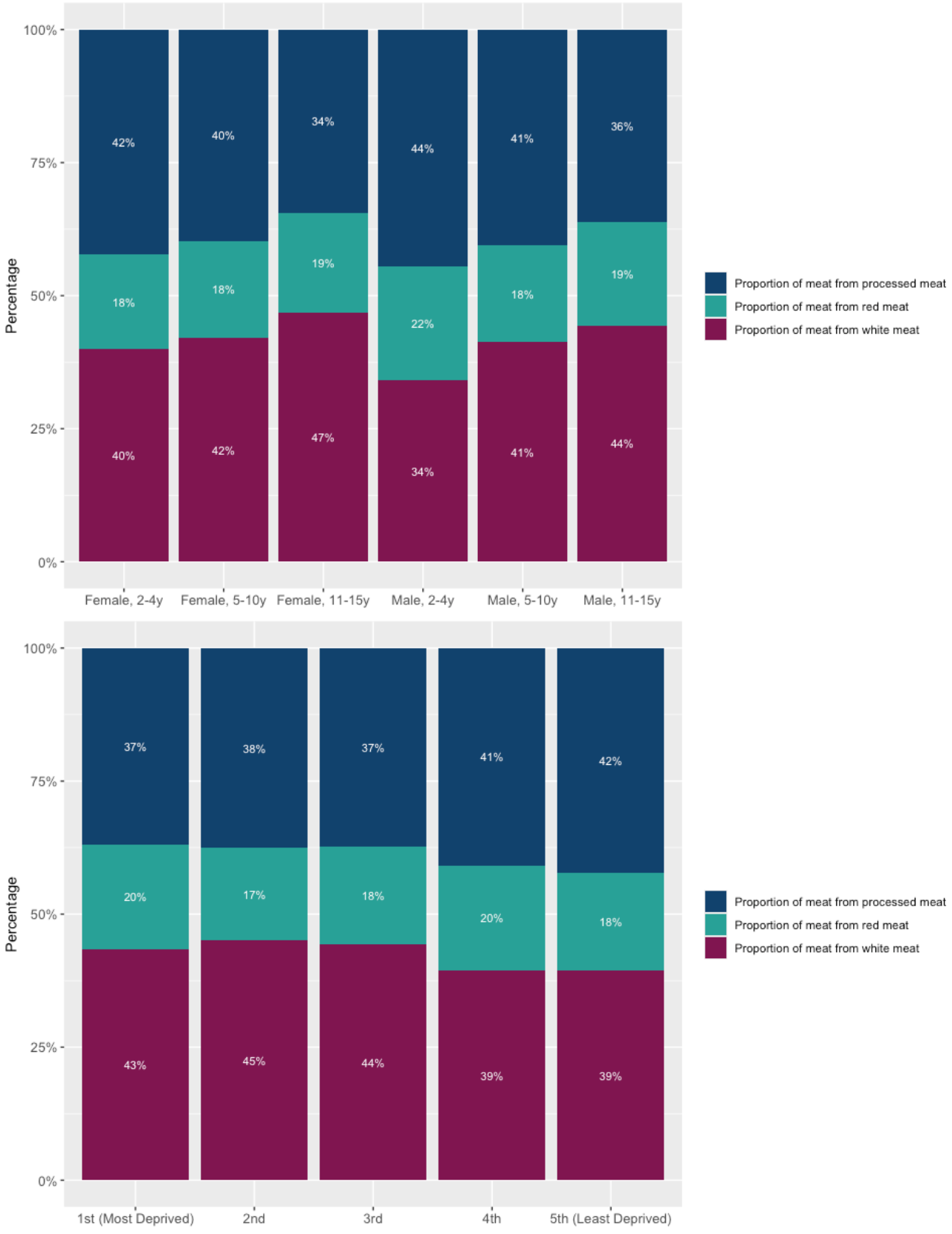
Figure 1. Continued.



Overall, 42% of the meat eaten was white meat, 39% was processed meat and 19% was red meat. There was not a meaningful difference in these proportions by sex (**Figure 2**). However, the proportion from processed meat was significantly higher in 2- to 4-year-olds than 11- to 15-year-olds (43% versus 35%, respectively) and the proportion from white meat significantly lower (37% in 2- to 4-year-olds versus 46% in 11- to 15-year-olds). Those living in the least deprived neighbourhoods had the highest proportion from processed meat (42% versus 37% among those living in the most deprived neighbourhoods) and the lowest proportion from white meat (39% versus 43% among those living in the most deprived neighbourhoods).

Figure 2. Percentage contribution of different types of meat to average daily meat consumption by sex, age group, sex and age group, and SIMD quintile among children and young people aged 2 to 15 years living in Scotland, 2024.

Figure 2. Continued.



Average meat consumption for all ages was 71g/day, comprised of 29g/day white meat, 27g/day processed meat, and 13g/day red meat.[4]

Differences by population subgroups were as follows (**Figure 3**):

Males consumed, on average, significantly more total meat, processed meat, and red meat than females, but the differences were relatively small (e.g., ~5g/day more processed meat and ~2g/day more red meat).

The amount of total meat, processed meat, white meat, and red meat consumed, on average, was significantly higher in older children. For example, total meat consumption was 45g/day in children aged 2 to 4 years and 87g/day in young people aged 11 to 15 years.

The amount of meat and meat types consumed was higher in older age groups in both females and males, but the difference was larger among males. For example, total meat consumption in females was 42g/day in 2- to 4-year-olds versus 74g/day in 11- to 15-year-olds. In males, total meat consumption was 48g/day in 2- to 4-year-olds versus 104g/day in 11- to 15-year-olds.

The amount of total meat consumed, on average, was significantly higher among those living in the most deprived neighbourhoods compared to those in the least deprived neighbourhoods. This was driven by significantly higher consumption of white meat: 32g/day in SIMD 1st (Most Deprived) versus 26g/day in SIMD 5th (Least Deprived).

[4] The sum of the rounded means of meat subtypes does not equal the total meat due to rounding to the nearest whole gram.

Figure 3. Average consumption (g/day) of processed meat, white meat, and red meat by sex, age group, sex and age group, and SIMD quintile among children and young people aged 2 to 15 years living in Scotland, 2024.

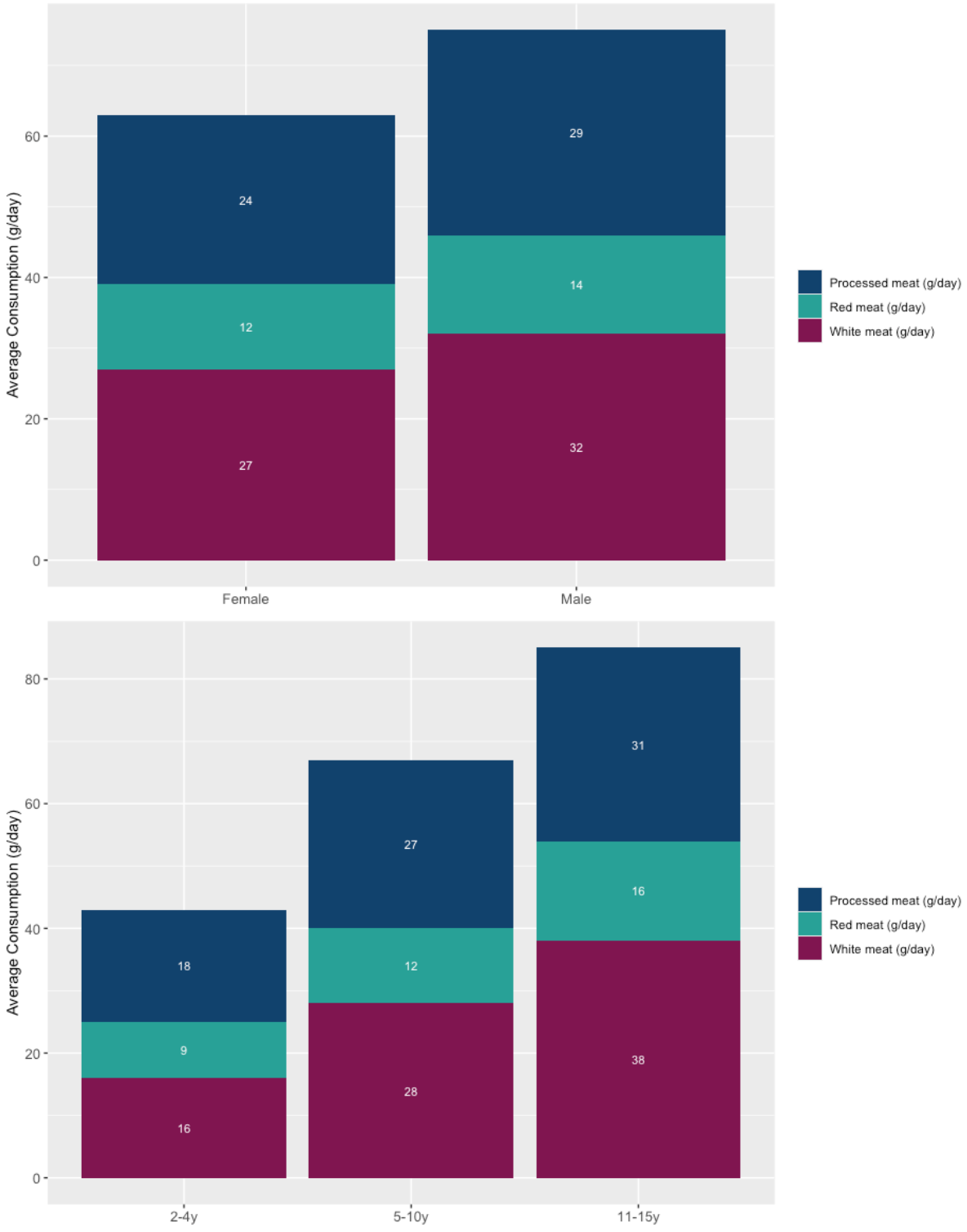
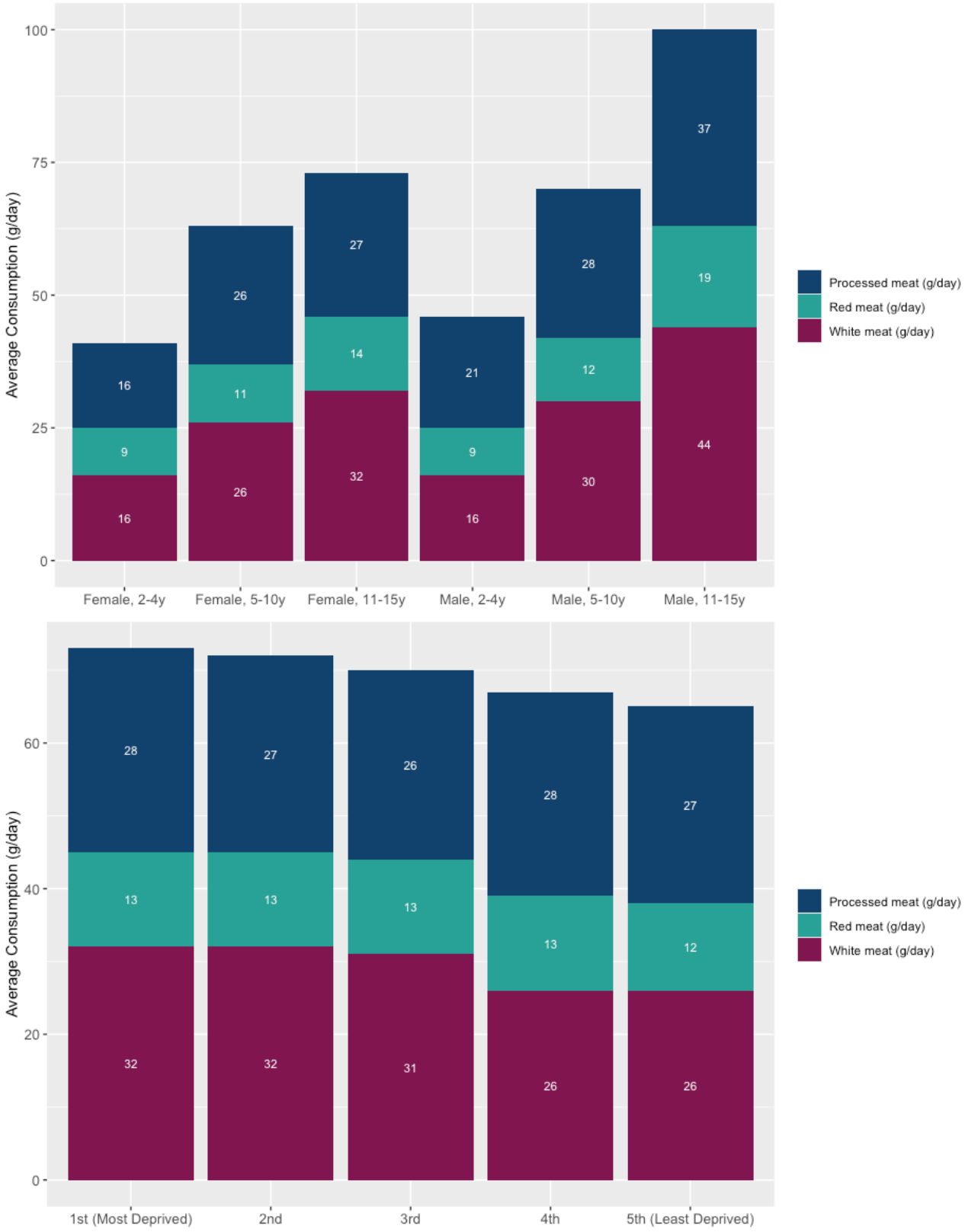


Figure 3. Continued.



2.2.2. Contribution of beef, pork, lamb, poultry, and game to meat consumption

The majority of the meat eaten was poultry (40%) followed by pork (37%) and beef (21%), with small intakes from lamb (1%). There was not a meaningful difference in these proportions by sex or age group, however, among females, the proportions of meat from beef and pork was slightly lower in older children whereas the proportion from poultry was slightly higher (**Figure 4**). The proportion of meat from pork was lower and the proportion from poultry higher among those in SIMD 1st (Most Deprived) compared to those in SIMD 5th (Least Deprived).

Figure 4. Percentage contribution of different animal types to average daily meat consumption by sex, age group, sex and age group, and SIMD quintile among children and young people aged 2 to 15 years living in Scotland, 2024. Labels have not been included for proportions less than 5%.

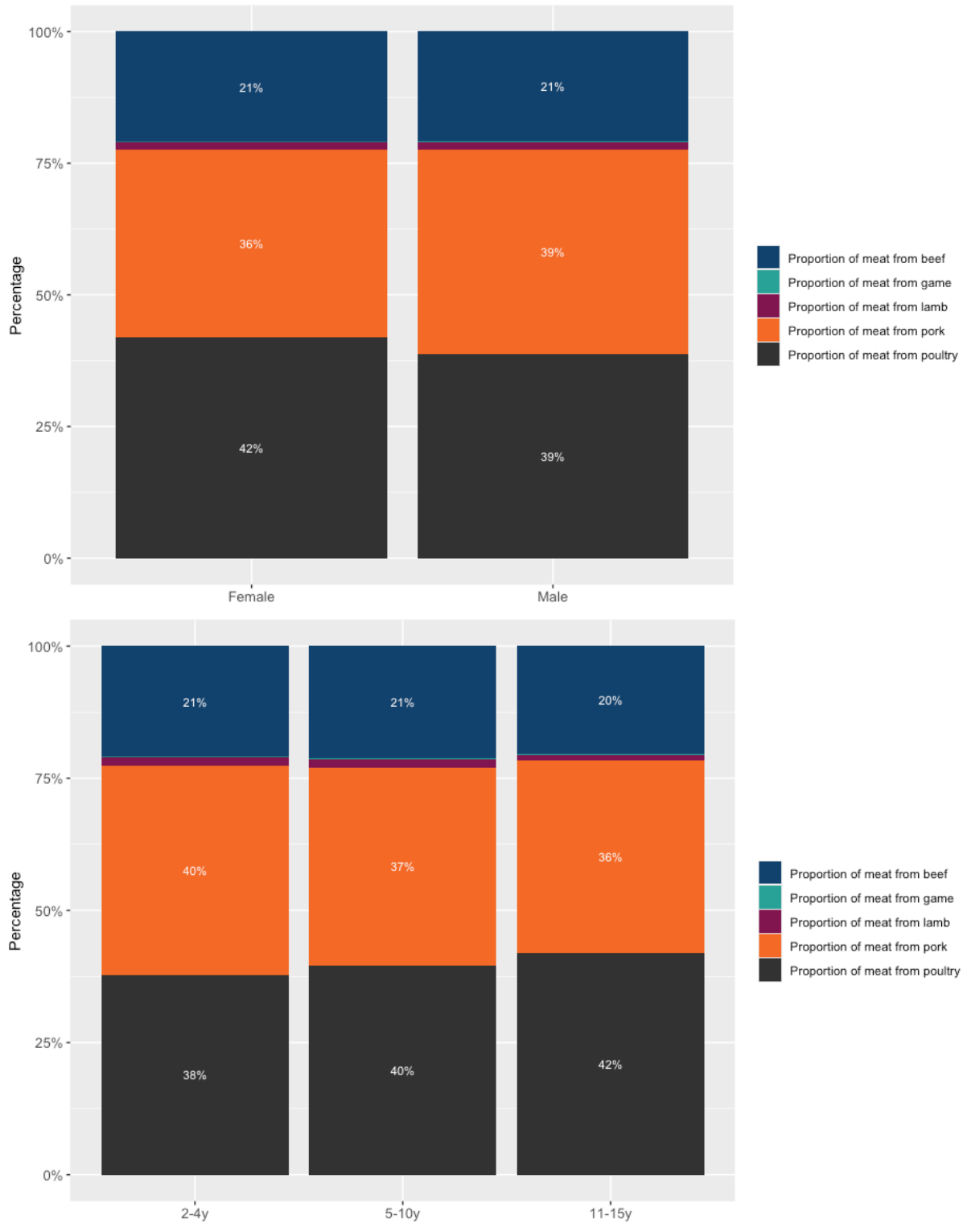
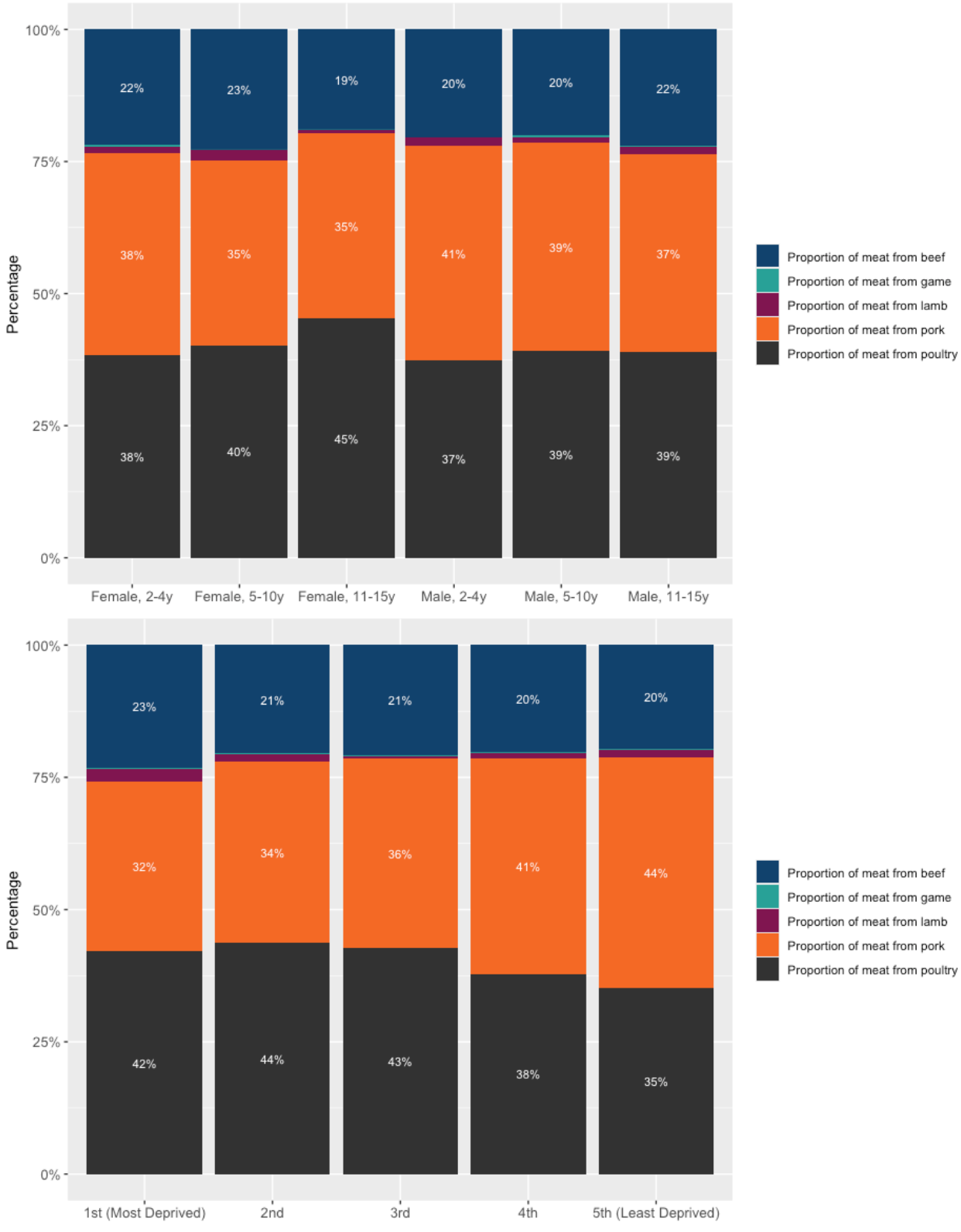


Figure 4. Continued.



2.2.3. Contribution of food groups to meat consumption

The top contributing **main food groups** to total meat consumption (g) among consumers were ‘chicken, turkey and dishes’ (herein: ‘chicken dishes’) (20.3%), followed by ‘beef, veal and dishes’ (herein: ‘beef dishes’) (14.6%), ‘sandwiches’ (12.4%), ‘coated chicken and turkey manufactured’ (10.6%), and ‘sausages’ (9.6%) (**Annexe Tables 1**).

The following differences were observed in contributions of main food groups to total meat consumption by population subgroup (**Annexe Tables 1**):

‘Sausages’ were a larger contributor among males (10.9%) versus females (8.2%).

‘Sandwiches’ were a larger contributor among young people aged 11 to 15 years (14.2%) versus children aged 2 to 4 years (10.7%).

‘Burgers and kebabs’ were a larger contributor among young people aged 11 to 15 years (2.2%) versus children aged 2 to 4 years (0.5%).

‘Coated chicken and turkey manufactured’ was a larger contributor among those living in SIMD 1st (Most Deprived) versus those living in SIMD 5th (Least Deprived): 12.3% versus 8.3%.

Sausages were a larger contributor among those living in SIMD 5th (Least Deprived) versus those living in SIMD 1st (Most Deprived): 12.9% versus 6.7%.

More specifically, within the **sub food group** 'other chicken and turkey including homemade recipe dishes', 'chicken breast, fried', was the most commonly reported food item (**Table 4**). Within the sub food group, 'other beef and veal including homemade recipe dishes', 'spaghetti bolognese' and 'beef burgers' were the most commonly reported food items. Within the sub food group, 'sandwiches', and 'other sausages including homemade recipe dishes', 'ham sandwiches' and 'grilled pork sausages' were most common, respectively.

Table 4. Most commonly reported meat-containing food items within the top five contributing sub food groups to meat consumption among children and young people aged 2 to 15 years living in Scotland, 2024.

Sub food group	Food item	Frequency	
		n	%
Other chicken and turkey including homemade recipe dishes	Chicken breast, fried	210	20.5
	Chicken curry home made	150	14.6
	Roast chicken (skin eaten)	93	9.1
	Roast/grilled chicken breast (skin not eaten)	81	7.9
	Roast chicken (skin not eaten)	42	4.1
	Chicken burger, in a bun, with lettuce and mayo	42	4.1
Other beef and veal including homemade recipe dishes	Spaghetti Bolognese, homemade (pasta and sauce)	239	30.5
	Beef burger/hamburger, in a bun, not quarter pounder	83	10.6
	Beef lasagne	54	6.9
	Beef bolognese sauce, home made	45	5.7
Sandwiches	Ham sandwich with white/malted bread	353	25.9
	Cheese sandwich with white/malted bread	263	19.3
	Cheese and ham sandwich with white/malted bread	85	6.2
	Cheese sandwich with wholemeal/oatmeal bread	75	5.5
Coated chicken and turkey manufactured	Chicken goujon/nugget/dipper, in breadcrumb or batter	276	45.4
	Chicken nuggets/pieces, from takeaway e.g. McNuggets	83	13.7
	Coated chicken breast fillet, grilled	49	8.1
	Coated chicken pieces, fried	36	5.9
Other sausages including homemade recipe dishes	Pork sausage, grilled	300	52.1
	Hot dog/frankfurter	59	10.2
	Sausage, fried	36	6.3
	Chorizo	28	4.9
	Hot dog/frankfurter with sauce in a bun	27	4.7

2.2.4. Red and red processed meat consumption behaviours

Seventy-eight percent of DISH respondents consumed at least some red and red processed meat. The Goals do not currently specify a target for children and young people, but, for adults, the target is to reduce red and red processed meat consumption to a maximum of 70g/day.

"**Red and red processed meat**" refers to all of the following: beef, lamb, pork, other red meat, processed red meat, burgers, sausages, and offal.

A 20% or 35% reduction in "total meat" consumption could be achieved by specifically reducing red and red processed meat consumption among high consumers. In order to define high consumers, we calculated how much red and red processed meat consumption would have to be reduced to achieve a 20% or 35% reduction in "total meat", overall and by age group. Because the calculation was completed at the food item level, these calculations were not adjusted for usual intake using the multiple source method. The results of these calculations were as follows (**Table 5**):

Overall, across all ages, reducing red and red processed meat consumption in high consumers to a maximum of 45g/day would achieve a 20% reduction in "total meat".

Specifically, reducing red and red processed meat consumption in high consumers to a maximum of 33g/day in 2-4y, 39g/day in 5-10y and 54g/day in 11-15y. This would affect 36% of the population of children and young people.

Overall, across all ages, reducing red and red processed meat consumption in high consumers to a maximum of 22g/day would achieve a 35% reduction in "total meat".

Specifically, reducing red and red processed meat consumption in high consumers to a maximum of 17g/day in 2-4y, 19g/day in 5-10y and 26g/day in 11-15y. This would affect 60% of the population of children and young people.

Table 5. Daily maximum intake of red and red processed meat required to achieve a 20% or 35% reduction in "total meat", for the entire population of 2- to 15-year-olds and by age group.

	Max intake red and red processed meat to achieve 20% reduction in "total meat" (g/day)	Max intake red and red processed meat to achieve 35% reduction in "total meat" (g/day)
Entire sample	45	22
Age group		
2-4y	33	17
5-10y	39	19
11-15y	54	26

Consumers of red and red processed meat exceeding the values in **Table 5** (max intake of red and red processed meat to achieve a 20% reduction in "total meat") were described as 'high consumers':

For those aged 2 to 4 years: consuming >33g/day

For those aged 5 to 10 years: consuming >39g/day

For those aged 11 to 15 years: consuming >54g/day

Those at or below these values were described as ‘moderate consumers’.

Mean intake of red and red processed meat was 40.6g/day: 69.8g/day among high consumers and 31.5g/day among moderate consumers.

Males were more likely to be a high consumer of red and red processed meat (40%) than females (32%) (*P*=0.002). There were no significant differences by age group or SIMD.

Lunch and dinner accounted for the highest proportion of red and red processed meat among both high (40% and 43% for lunch and dinner respectively) and moderate (44% and 44%) consumers. Breakfast accounted for a significantly higher proportion of red and red processed meat among high consumers (6.3%) than moderate consumers (2.6%) (**Figure 5**).[5]

The majority of red and red processed meat was purchased from supermarkets (85% for high consumers and 81% for moderate consumers), with 6-7% purchased from out of home and 8-10% from schools or nursery (**Figure 5**). There were no meaningful differences in the source of red and red processed meat between high and moderate consumers.

On average, red and red processed meat consumption was highest on Tuesday, followed by Thursday and Sunday with similar patterns between high and moderate consumers (**Figure 5**).[6]

[5] ‘Supermarkets’ included home delivery services like Hello Fresh and Gousto, as well as smaller shops such as butcher’s and baker’s. ‘Other’ sources included leisure centres, hospitals, food banks, vending machines, parties, holidays, and purchased from farms (e.g., eggs from local farm, fruit and veg box from farm, milk delivery, etc.)

[6] Only mean intakes by day of week were analysed—not the proportion of red and red processed meat consumed on a given day—because there was not an even distribution of recalls across the days of the week: Tuesday and Thursday were over-represented in the dietary data whereas Friday and Saturday were under-represented.

Figure 5. Red and red processed meat consumption by meal occasion, purchase location, and day of the week among children and young people aged 2 to 15 years living in Scotland, 2024.

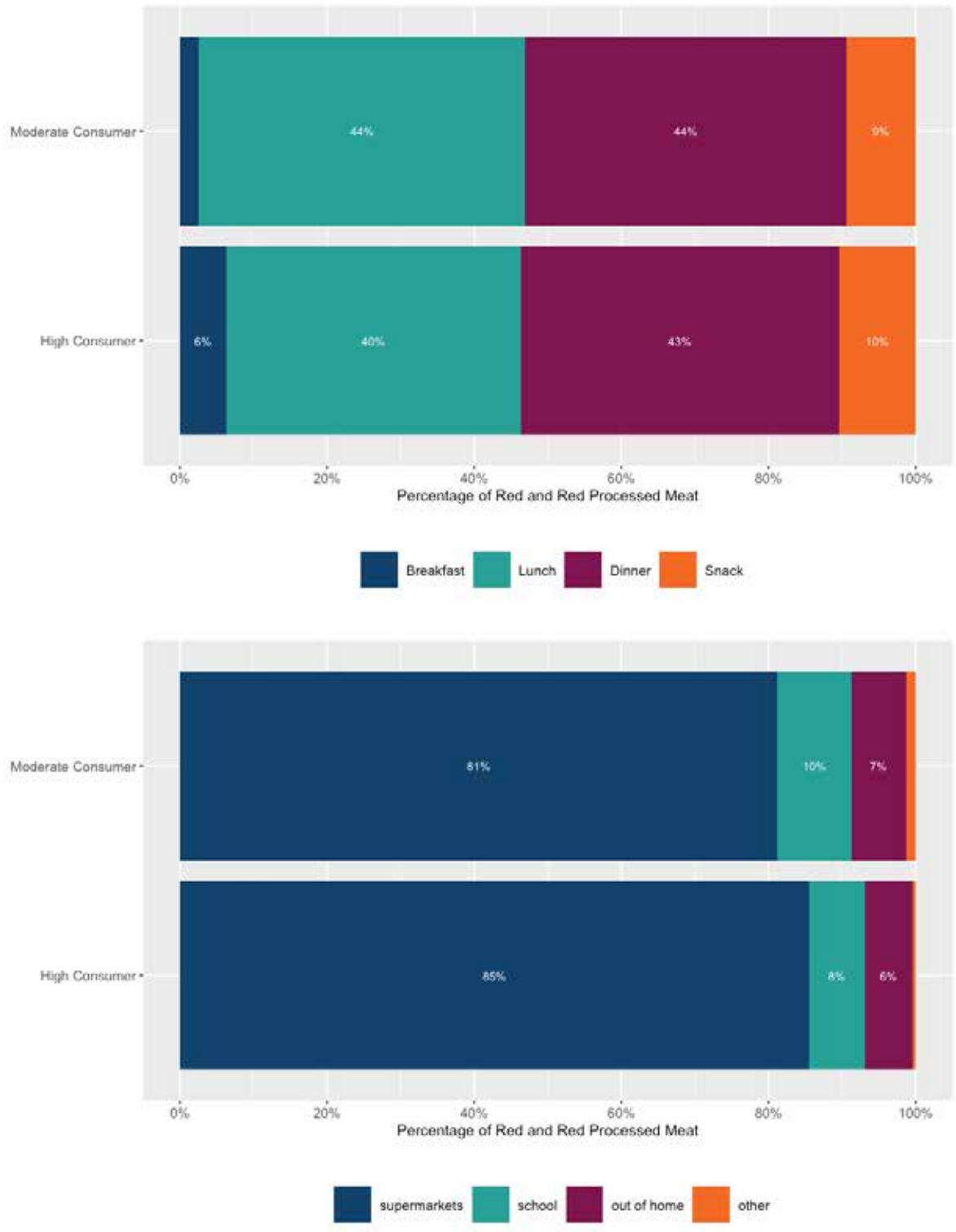
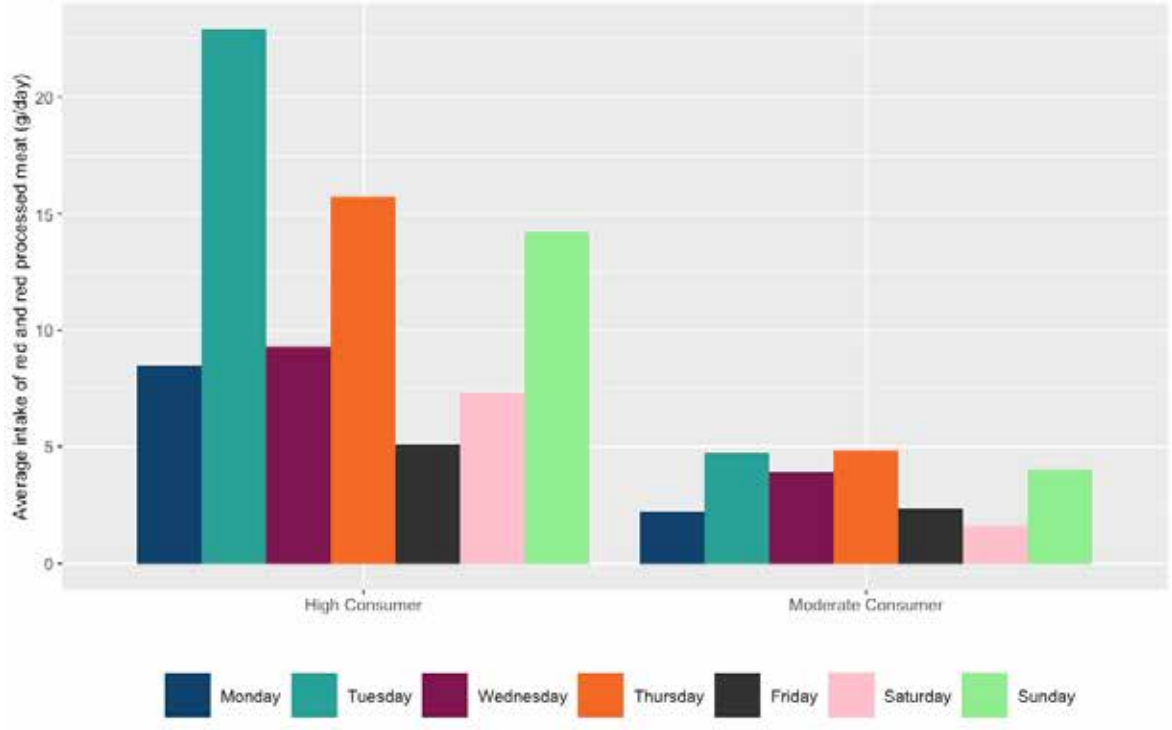
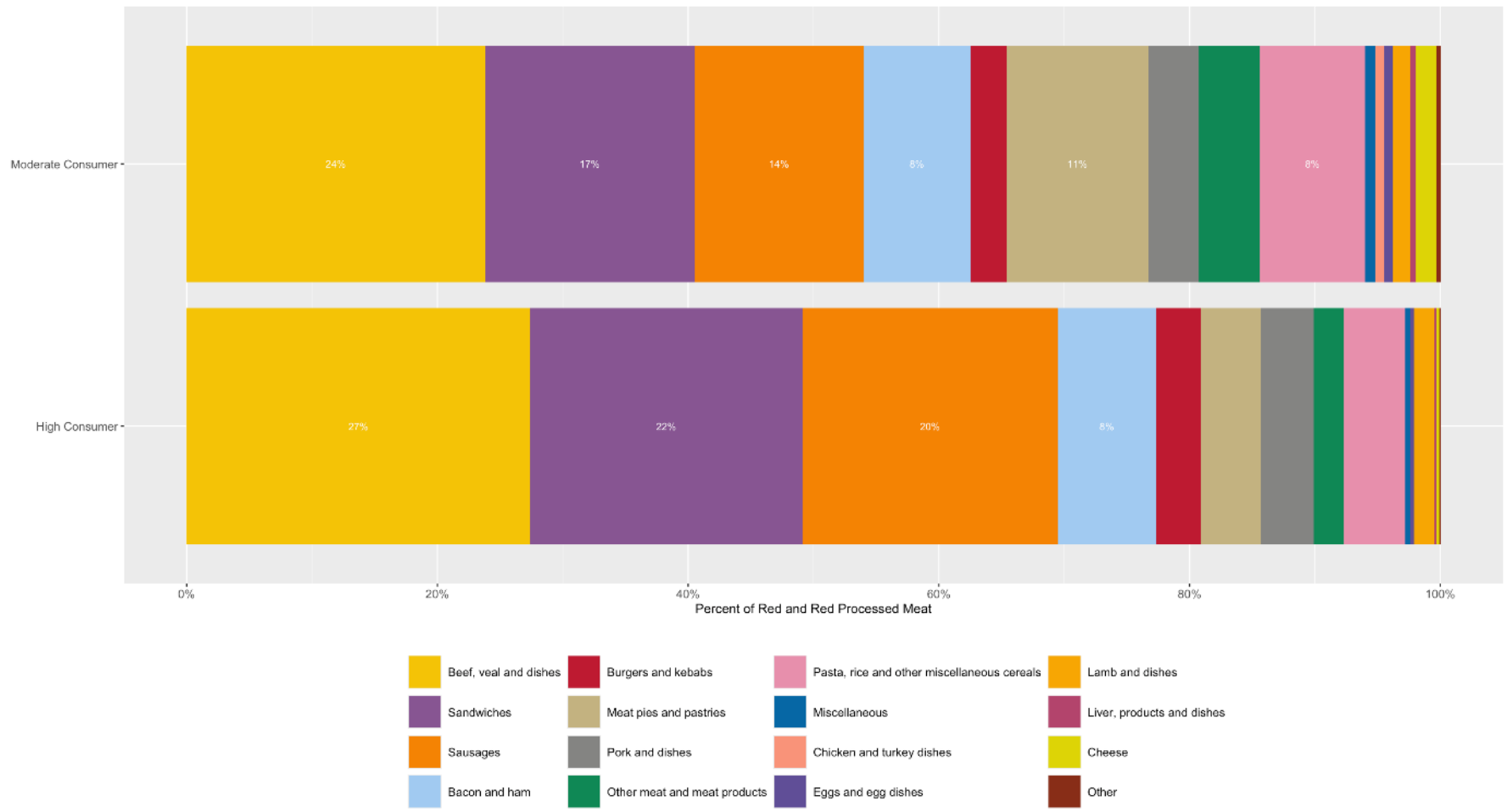


Figure 5. Continued.



'Beef dishes' and 'sandwiches' (notably 'spaghetti bolognese' and 'ham sandwiches') were the largest contributors to intake among high (27.4% and 21.7%, respectively) and moderate (23.8% and 16.7%, respectively) consumers (**Figure 6**).

Figure 6. Percentage contribution of main food groups to red and red processed meat consumption among children and young people aged 2 to 15 years living in Scotland, 2024. Labels shown for food groups contributing >5%.



Key Messages: Meat Consumption

1. On any given day, most children and young people in Scotland – 90% – consume meat. As dietary intake was only assessed on up to four days, it is possible meat-eating was missed for some individuals, and an even greater proportion consume meat.
2. Average meat consumption was 71g/day, comprised of 29g/day white meat, 27g/day processed meat, and 13g/day red meat.
3. Males had higher intakes of processed meat and red meat than females though differences were small (<5g/day).
4. All types of meat intake were higher in older children, especially among males.
5. There were no differences in meat consumption by SIMD except that those in SIMD 1st (Most Deprived) had slightly higher white meat consumption (32g/day versus 26g/day in SIMD 5th (Least Deprived)) and had a higher proportion of meat from poultry (42% versus 35%) and smaller proportion of meat from pork (32% versus 44%).
6. Homemade dishes containing chicken or beef, such as a 'chicken breast, fried', or 'spaghetti bolognese', and 'ham sandwiches' are some of the most common ways in which children and young people living in Scotland consume meat.
7. In order to achieve a 20% reduction in the population average "total meat" intake, all children aged 2 to 4 years currently consuming more than 33g/day red and red processed meat would need to reduce their intake to 33g/day; those aged 5 to 10 years would need to reduce their intake to 39g/day; and those aged 11 to 15 years would need to reduce their intake to 54g/day. This would affect 36% of the population.
8. In order to achieve a 35% reduction in the population average "total meat" intake, all children aged 2 to 4 years currently consuming more than 17g/day red and red processed meat would need to reduce their intake to 17g/day; those aged 5 to 10 years would need to reduce their intake to 19g/day; and those aged 11 to 15 years would need to reduce their intake to 26g/day. This would affect 60% of the population.
9. Males are more likely to be high consumers of red and red processed meat than females.
10. Consumption of red and red processed meat is highest on Tuesdays and spread across lunch and dinner. High consumers consumed twice the proportion of red and red processed meat at breakfast compared to moderate consumers (about 6% versus 3%).
11. Only 6-7% of red and red processed meat was purchased at cafes, restaurants, pubs and takeaways.

2.3. Dairy consumption

2.3.1. Consumption of milk, cheese, yoghurt, butter, and cream

Nearly all (99.6%) respondents consumed dairy, and this was true across all population subgroups. Average dairy consumption was 274g/day, comprised of 210g/day milk, 26g/day cheese, 24g/day yoghurt, 7g/day butter, and 7g/day cream.

Differences by population subgroups were as follows (**Figure 7**):

Males consumed more dairy than females (305g/day versus 240g/day). This was largely driven by higher consumption of milk, and, albeit to a lesser extent, cheese.

Children aged 2 to 4 years and 5 to 10 years consumed more dairy than young people 11 to 15 years (290 and 298g/day versus 236g/day). This was largely driven by higher consumption of milk and yoghurt. There were no significant differences in cheese intake by age.

The lower dairy consumption in older children was especially true for females as compared to males (283g/day in 2- to 4-year-old females versus 198g/day in 11- to 15-year-old females as compared to 297g/day versus 284g/day in males). This difference was largely driven by proportionally lower milk consumption among females as compared to males.

There were not significant differences in dairy consumption across SIMD quintiles.

Figure 7. Average consumption (g/day) of milk, cheese, yoghurt, butter, and cream by sex, age group, sex and age group, and SIMD quintile among children and young people aged 2 to 15 years living in Scotland, 2024.

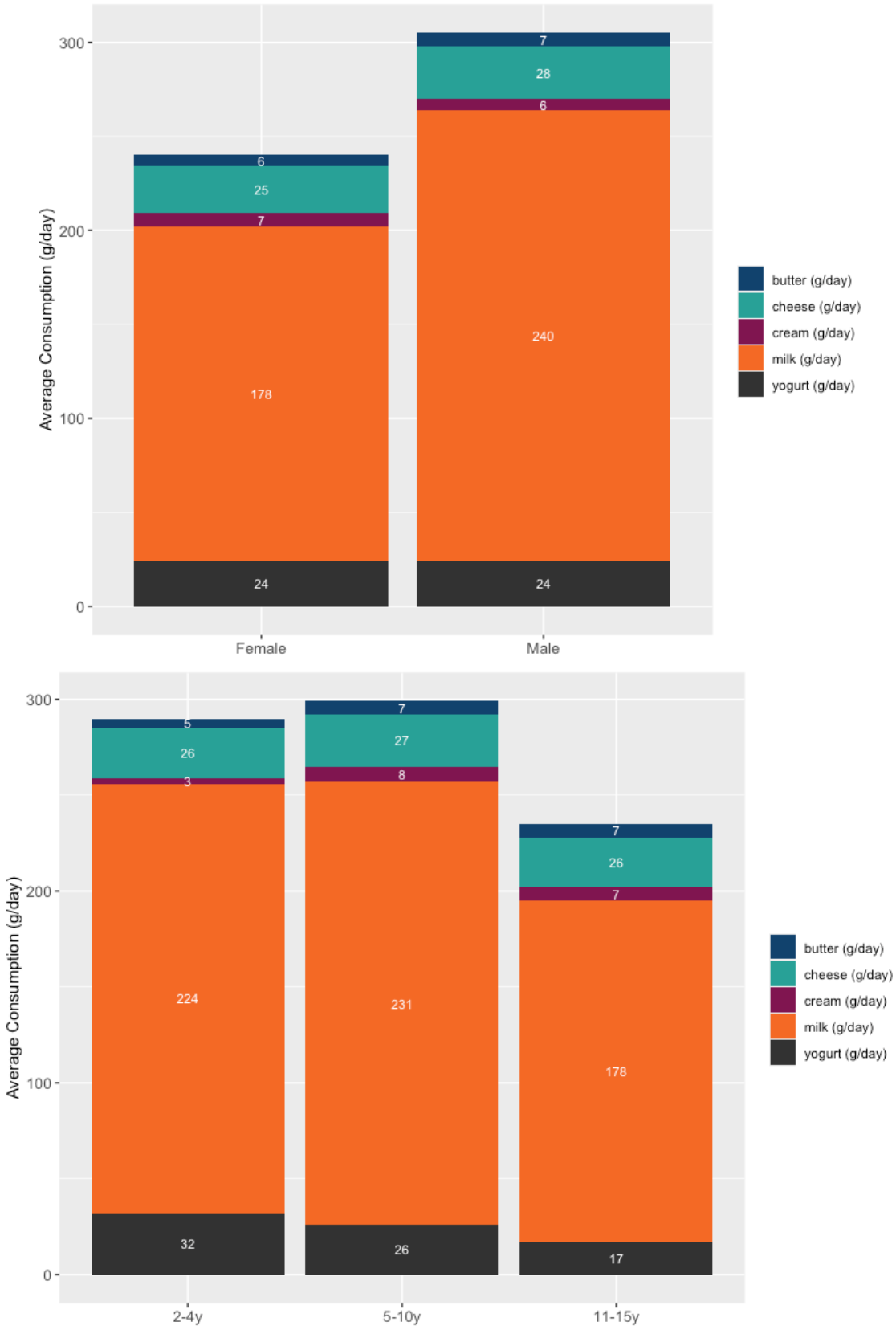
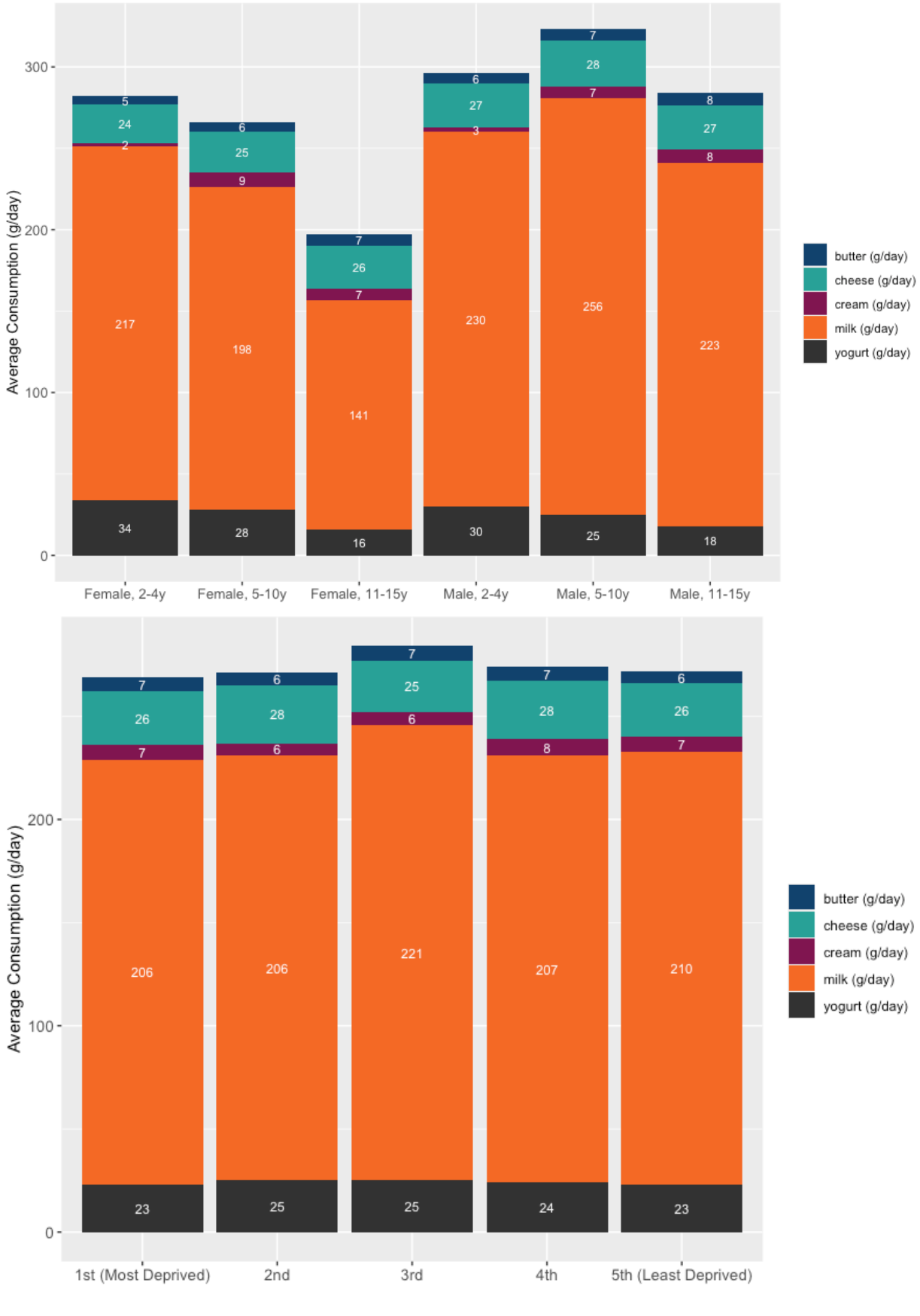


Figure 7. Continued.



The majority of the dairy consumed by weight was milk (67%) followed by cheese (15%) and yoghurt (10%), with smaller contributions from butter (4%) and cream (4%). About half (53%) of the dairy consumed was low fat (skimmed or semi-skimmed).

These proportions differed across population subgroups in the following ways (**Figure 8**):

Males had a slightly higher proportion of dairy from milk as compared to females (70% versus 64%) and slightly lower proportion from cheese (13% versus 16%).

Young people aged 11 to 15 years had a slightly lower proportion of dairy from milk (63% versus 68-70%) and yoghurt (8% versus 10-15%) and slightly higher proportion from cheese (18% versus 13%), and butter (6% versus 3-4%) as compared to children aged 2 to 10 years. These trends were observed in both males and females.

There were no meaningful differences in the proportion of dairy from milk, cheese, yoghurt, butter, or cream across SIMD quintiles.

Figure 8. Percentage contribution of dairy subtypes to dairy consumption by sex, age group, sex and age group, and SIMD quintile among children and young people aged 2 to 15 years living in Scotland, 2024. Proportion labels included for >5% contributions.

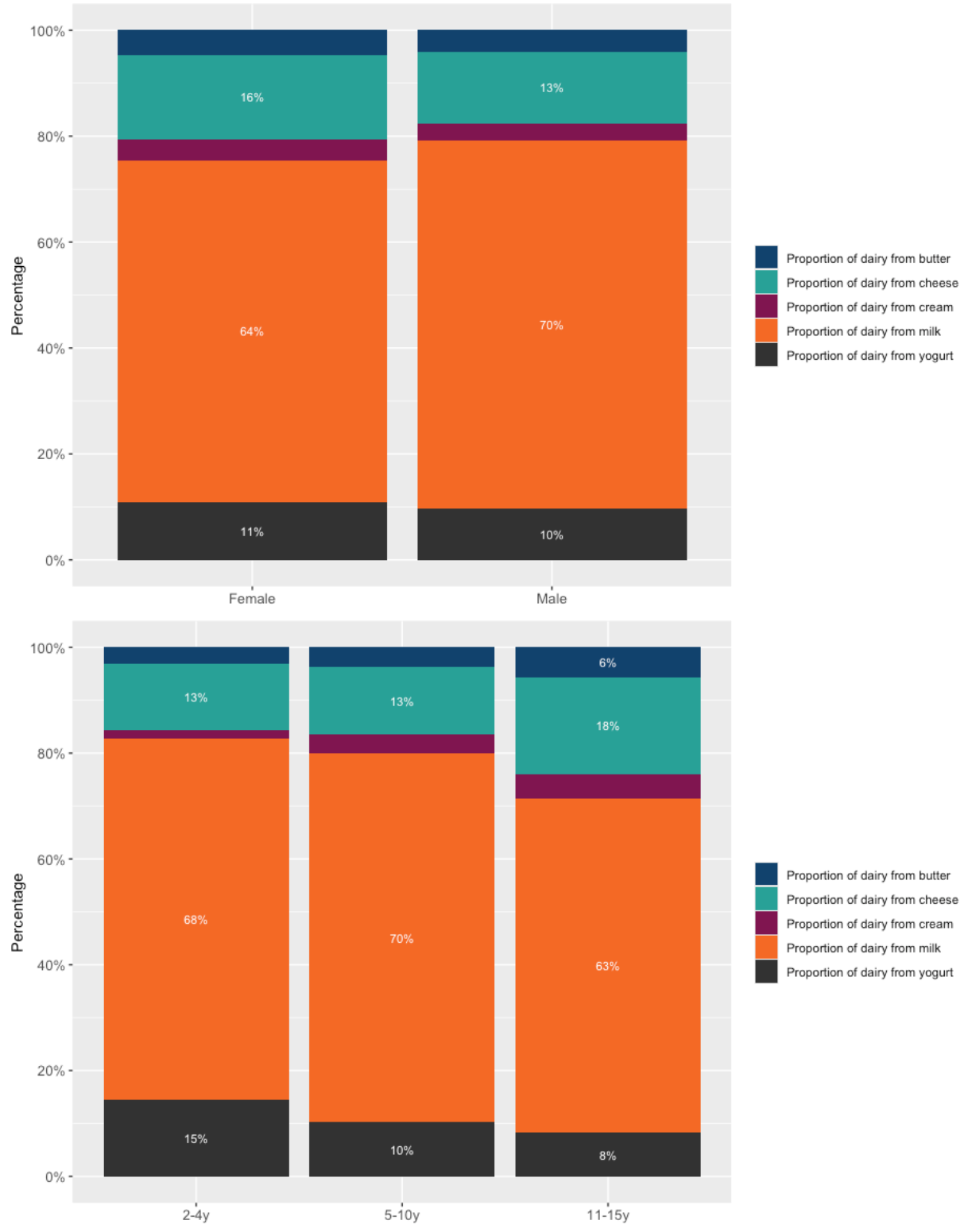
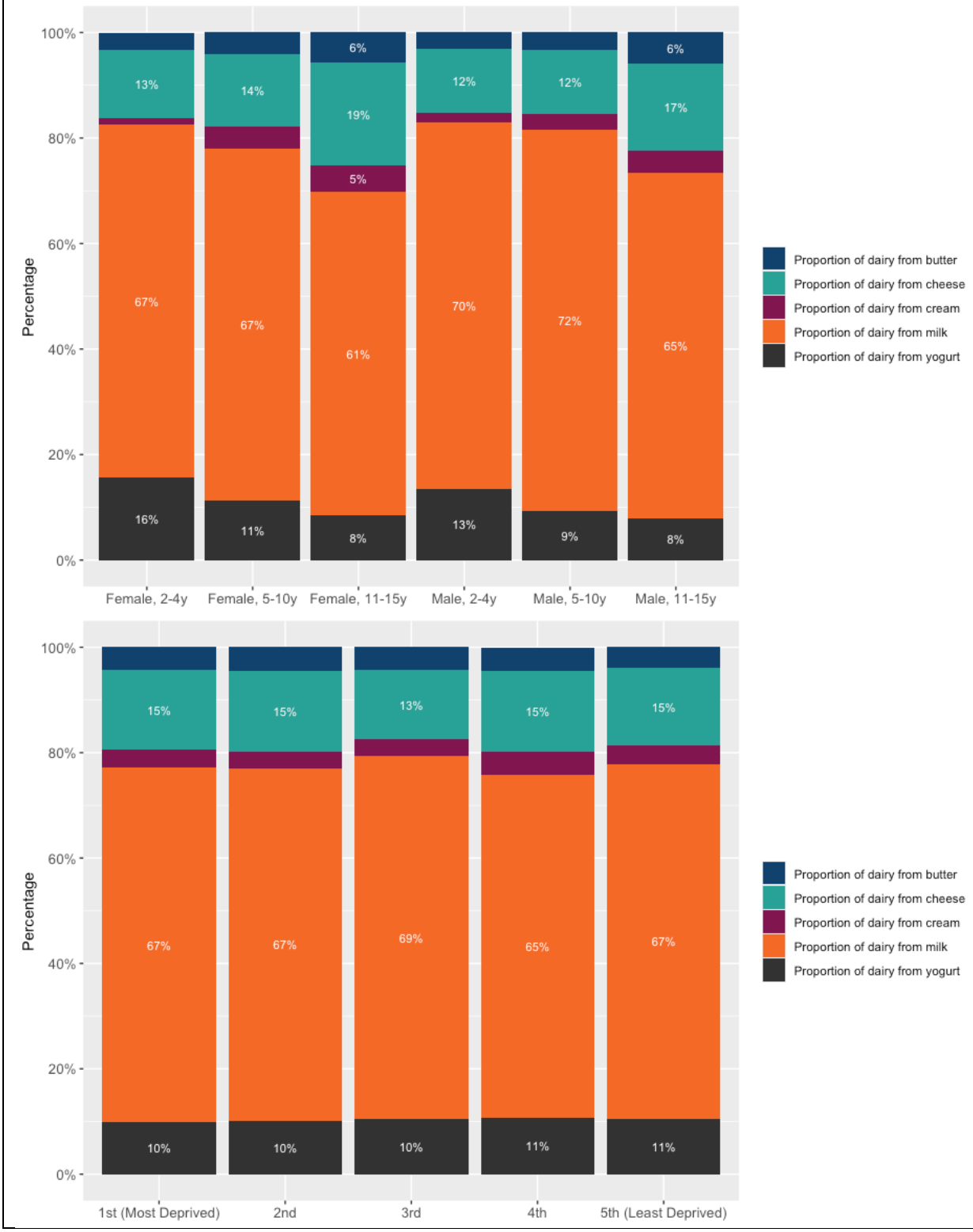


Figure 8. Continued.



2.3.2. Contribution of food groups to dairy consumption

Among dairy consumers, the top contributing **main food groups** to dairy consumption (g) were: 'semi-skimmed milk' (22.7%), 'whole milk' (19.4%), 'yoghurt, fromage frais and other dairy desserts' (9.5%, with 9.1% specifically from yoghurt), 'pasta, rice, pizza, and other miscellaneous cereals' (7.3%, with 4.1% from pizza), 'cheese' (5.6%), and 'sandwiches' (4.8%) (**Annexe Tables 2**).

The following differences were observed in contributions of main food groups to dairy consumption by population subgroup (**Annexe Tables 2**):

'Whole milk' contributed a slightly greater percentage among males (21.7%) versus females (17.1%).

'Whole milk' contributed a greater percentage – more than twice as much – among children aged 2 to 4 years (30.9%) versus young people aged 11 to 15 years (12.3%).

'Semi-skimmed milk' contributed a slightly greater percentage among young people aged 11 to 15 years (21.6%) versus children aged 2 to 4 years (18.7%).

'Yoghurt, fromage frais and other dairy desserts' contributed a greater percentage among children aged 2 to 4 years (12.6%) versus young people aged 11 to 15 years (6.7%).

There were no meaningful differences in food groups contributing to dairy consumption by SIMD quintiles.

Overall, 80.9% of 'sandwiches' contained dairy (n=1,102), among these the most common 'sandwiches' were 'plain ham sandwiches (containing butter)' and 'cheese sandwiches'.
All 'pizzas' contained dairy, except 'pizza dough items' (97.9%, n=597), among these, the most frequently reported 'pizzas' were 'cheese and tomato (e.g., Margherita)' (65%, n = 394) and 'meat pizza (e.g., Hawaiian, pepperoni, meat feast)' (17%, n = 106).

Key Messages: Dairy Consumption

1. Nearly all children and young people who completed the survey consumed dairy (99.6%).
2. Average dairy consumption was 274g/day, comprised of 210g/day milk, 26g/day cheese, 24g/day yoghurt, 7g/day butter, and 7g/day cream.
3. Males and younger children (2 to 10 years) had higher intakes of dairy.
4. There was no meaningful difference in dairy consumption by SIMD.
5. The majority of the dairy consumed by weight was milk (67%) followed by cheese (15%) and yoghurt (10%), with smaller contributions from butter (4%) and cream (4%).
6. The most important composite dairy dishes were ‘sandwiches’ and ‘pizza’, yet their contribution was small (4.8% and 4.1%).

2.4. Contribution of meat and meat products and milk and milk products to energy and nutrient intake

The following sections present nutrient intake from food and drink only (i.e., not including supplements).

Collectively, 'meat and meat products' and 'milk and milk products' accounted for 26% of energy intake and 41% of protein intake (**Figure 9**).

'Meat and meat products' contributed a greater percentage to energy and protein among young people aged 11 to 15 years versus children aged 2 to 4 years. The opposite was observed for 'milk and milk products' which contributed a smaller percentage to energy and protein among young people aged 11 to 15 years versus children aged 2 to 4 years. These trends were observed in both males and females.

The contribution of 'meat and meat products' to energy and protein was higher among those living in the most deprived neighbourhoods compared to those living in the least deprived neighbourhoods (14.6% compared to 11.1% for energy and 25.6% compared to 21.2% for protein). The opposite was observed for 'milk and milk products' (13.1% compared to 11.4% for energy in SIMD 1 versus SIMD 5 respectively, and 17.2% compared to 15.2% for protein).

There were no meaningful differences in the contribution of 'meat and meat products' or 'milk and milk products' to energy or protein by sex.

Figure 9. Percentage contribution of food categories to average daily energy (kcal) and protein (g) intake overall and by sex, age group, and SIMD quintile among children and young people aged 2 to 15 years living in Scotland, 2024. 'Other' includes all food categories other than 'meat and meat products', 'milk and milk products' and 'sandwiches'. Food categories are mutually exclusive.

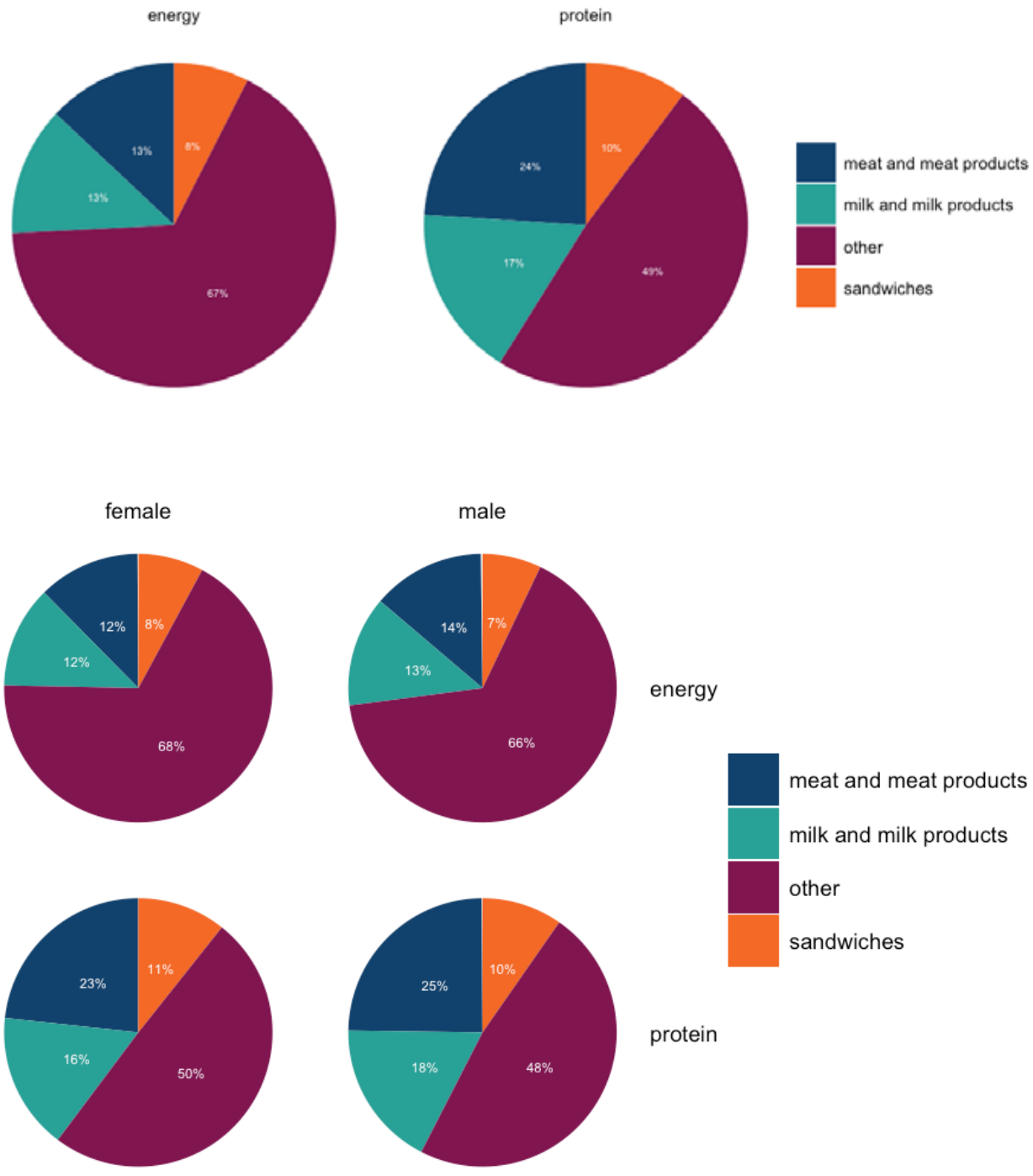


Figure 9. Continued.

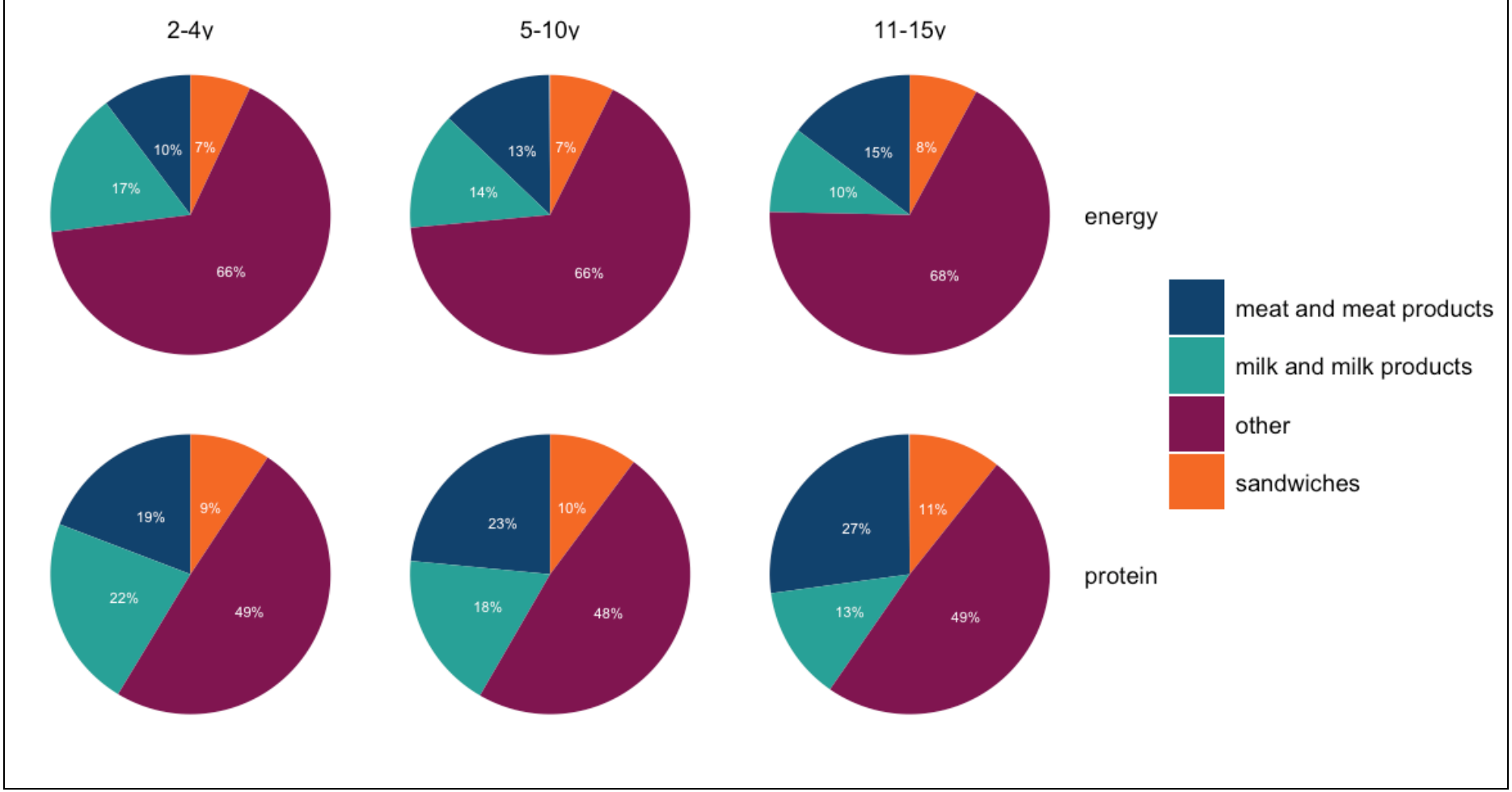
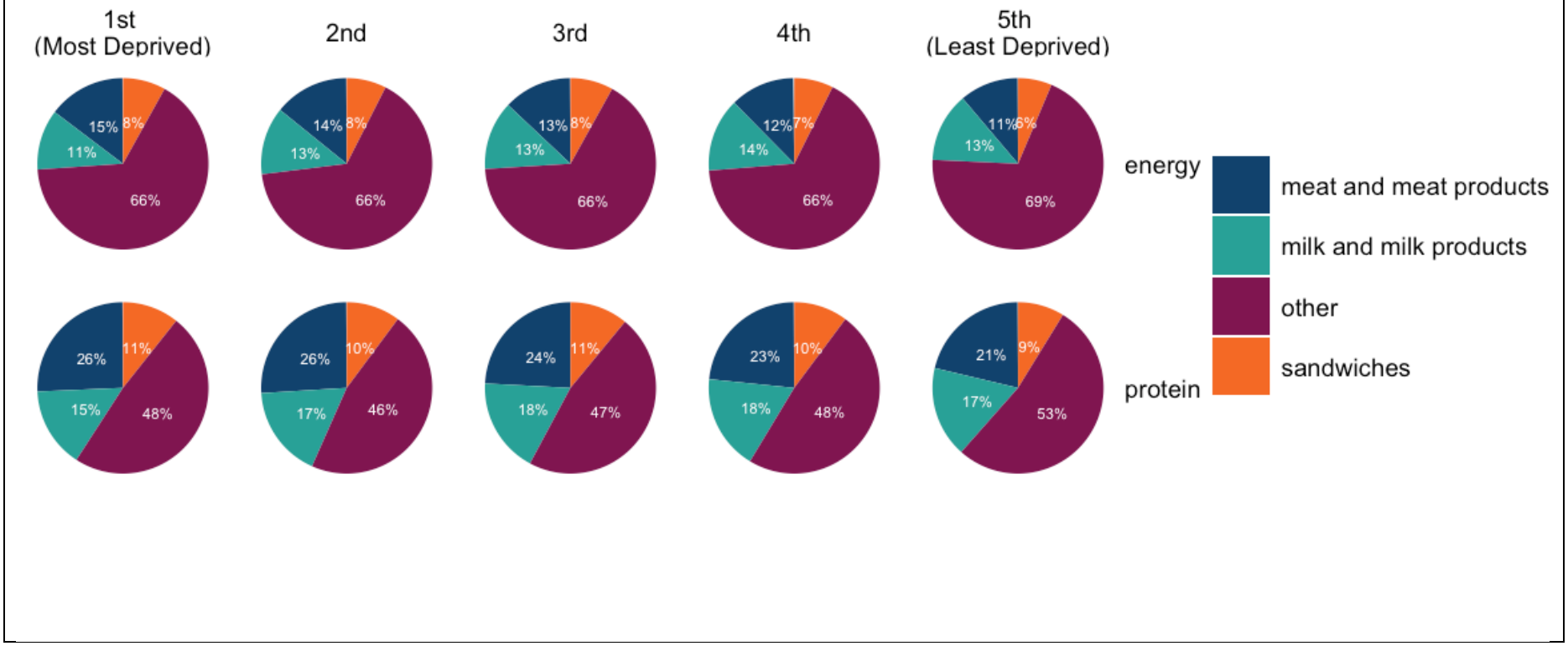


Figure 9. Continued.



Contributions from ‘meat and meat products’ varied from 7.2% for calcium to 24.0% for selenium. Contributions from ‘milk and milk products’ varied from 2.2% for iron to 44.6% for iodine (**Figure 10**). Overall, ‘meat and meat products’ were major contributors (contributing >20%) to intakes of selenium (24.0%) and zinc (21.4%). ‘Milk and milk products’ were major contributors to intakes of calcium (35.5%), iodine (44.6%), and vitamin B_{12} (39.1%).

Compared to females, males had slightly higher contributions of ‘milk and milk products’ to intakes of calcium (36.9% versus 33.9%), iodine (46.8% versus 42.2%), and vitamin B_{12} (41.1% versus 37.0%).

The contribution of ‘meat and meat products’ to intakes of calcium, iron, iodine, selenium, zinc, and vitamin B_{12} was higher in older children. The opposite was observed for ‘milk and milk products’ where the contribution of these products to nutrient intake was lower in older children. These trends were observed in males and females.

‘Meat and meat products’ contributed slightly more to intakes of iron (16.5% versus 11.7%), iodine (9.5% versus 6.9%), selenium (25.9% versus 20.7%) and zinc (23.8% versus 18.8%) in those living in the most deprived versus least deprived neighbourhoods.

‘Milk and milk products’ contributed slightly less to intakes of zinc (16.9% versus 18.9%) in those living in the most deprived versus least deprived neighbourhoods.

Figure 10. Percentage contribution of food categories to average daily calcium, iron, iodine, selenium, zinc, and vitamin B_{12} intake overall and by sex, age group, and SIMD quintile among children and young people aged 2 to 15 years living in Scotland, 2024. 'Other' includes all food categories other than 'meat and meat products', 'milk and milk products' and 'sandwiches'. Food categories are mutually exclusive.

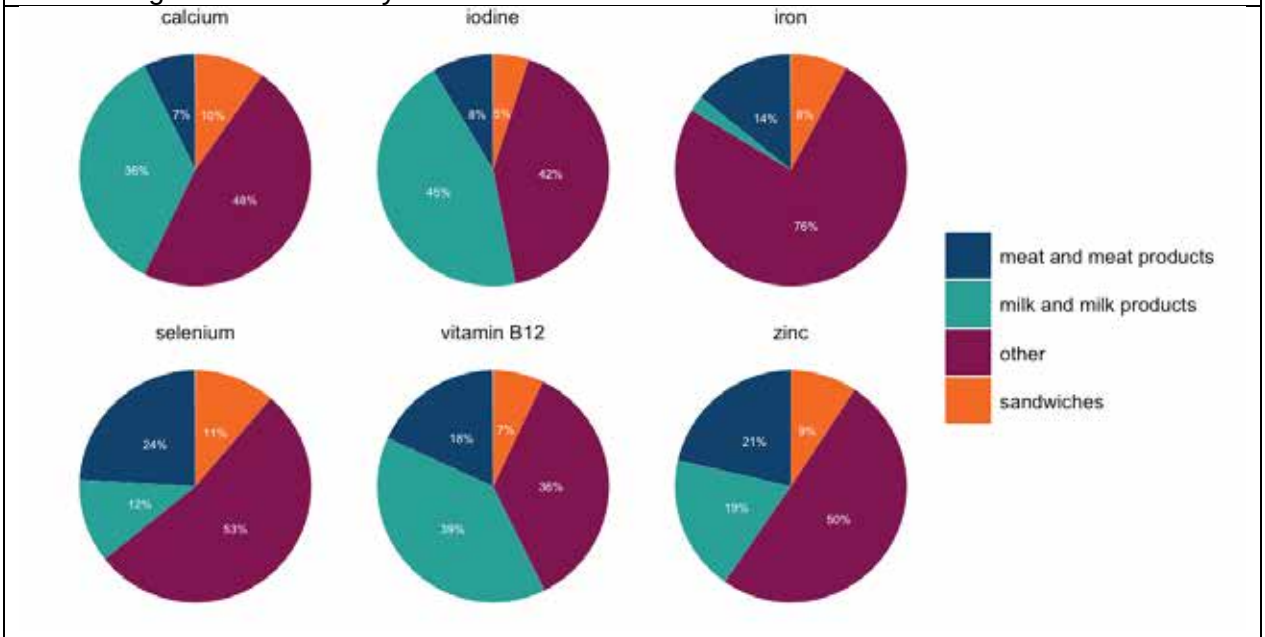


Figure 10. Continued.

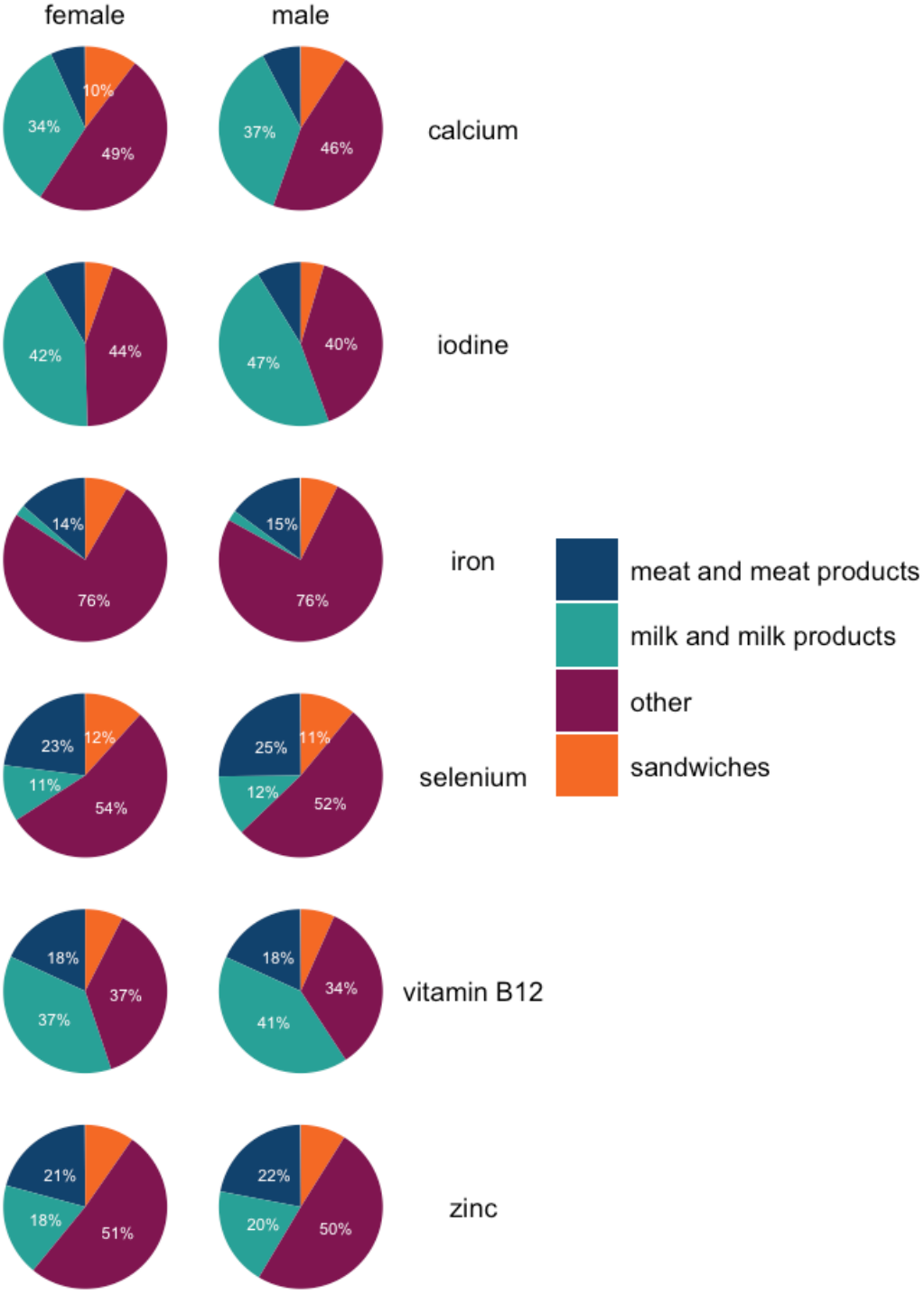


Figure 10. Continued.

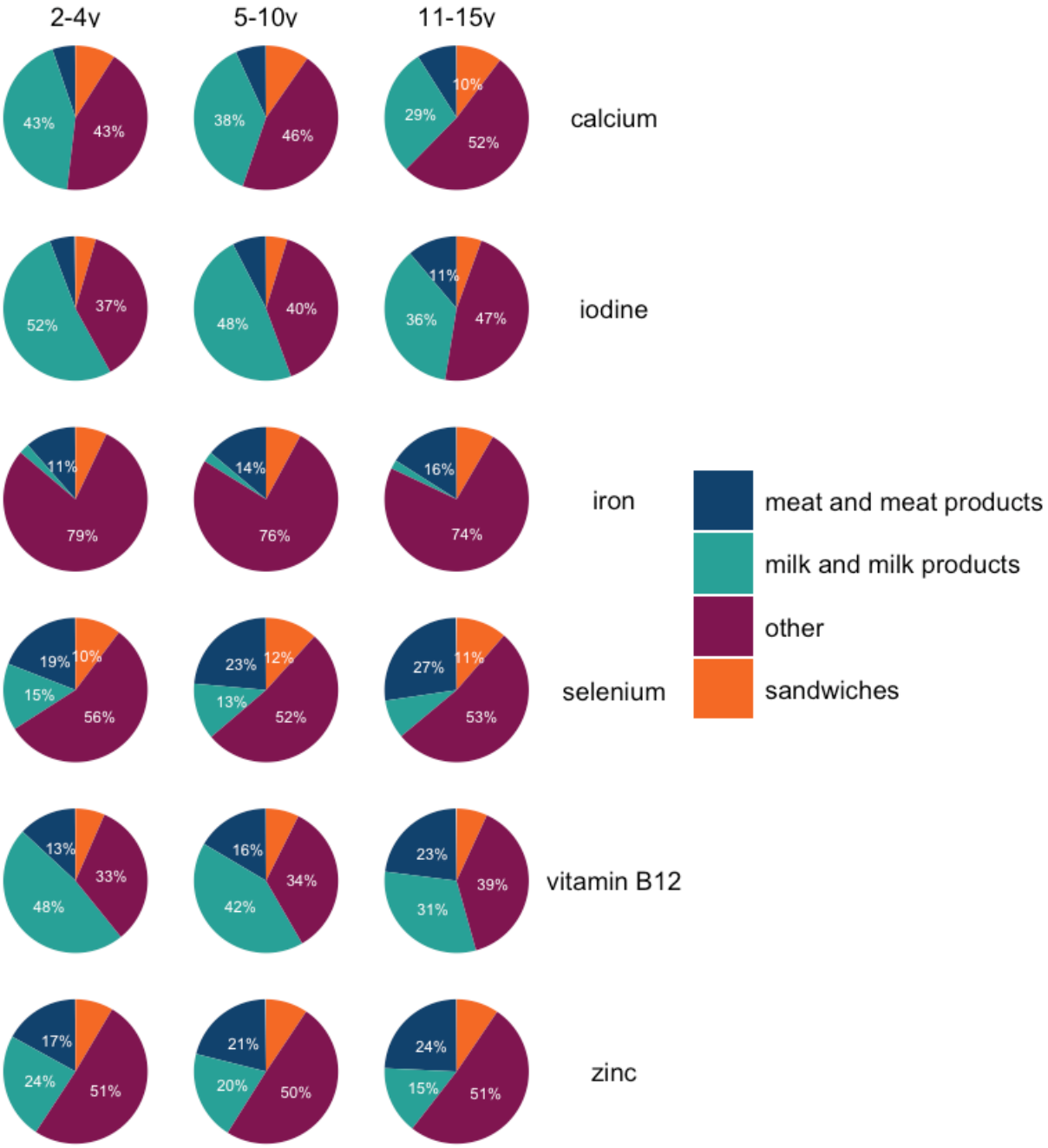
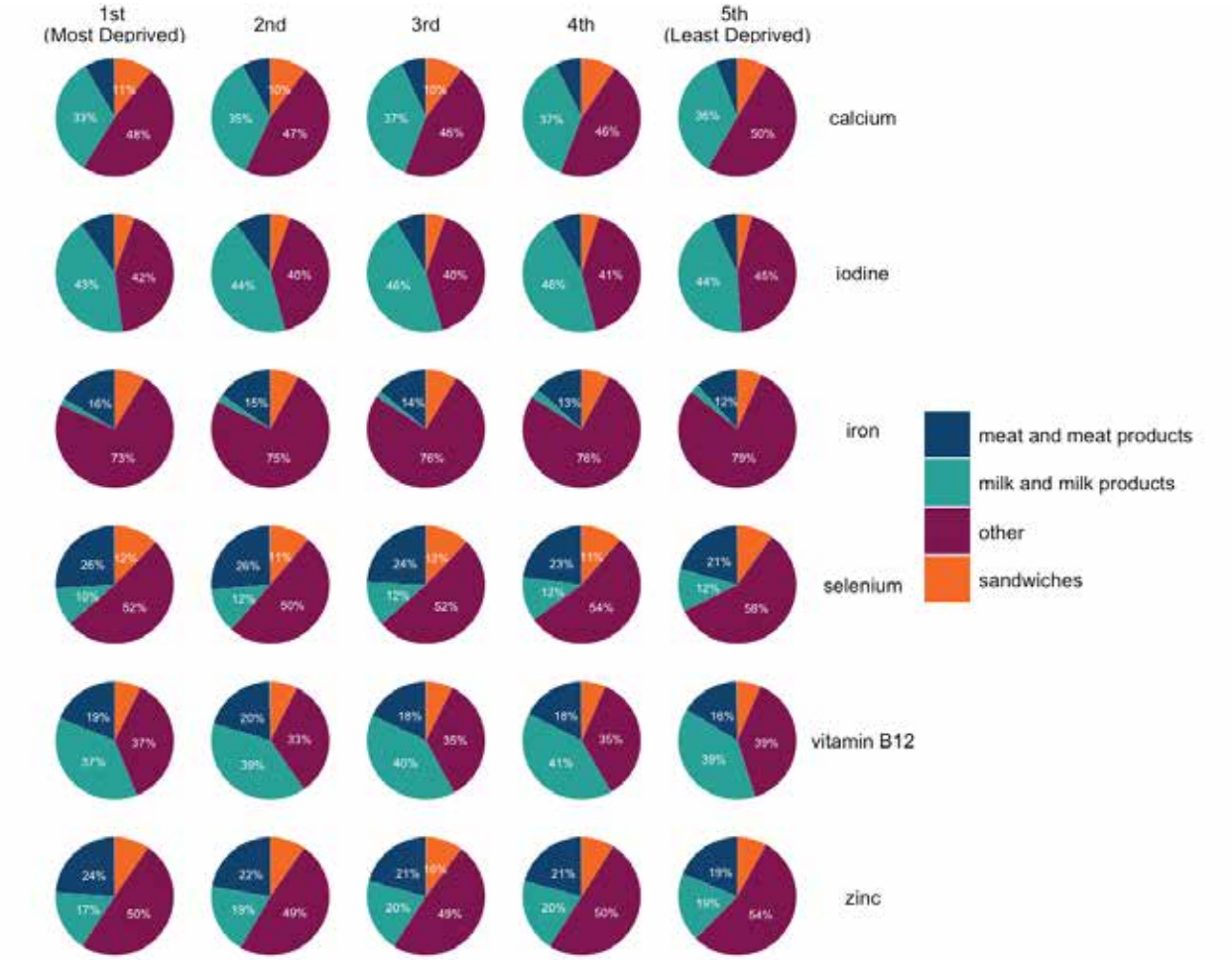


Figure 10. Continued.



Key Messages: Contribution of Meat and Meat Products and Milk and Milk Products to Energy and Nutrient Intake

1. 'Meat and meat products' were major contributors (contributing >20%) to intakes of selenium (24.0%) and zinc (21.4%).
2. 'Milk and milk products' were major contributors to intakes of calcium (35.5%), iodine (44.6%), and vitamin B_{12} (39.1%).
3. While there are only slight differences in the contribution of 'meat and meat products' and 'milk and milk products' to energy, protein, and nutrient intake by sex and SIMD, the contribution of 'meat and meat products' to energy and nutrient intakes was higher in older children and the contribution of 'milk and milk products' was lower.

3. Simulation Scenarios

The micro-Simulation of the Health Impacts of Food Transformations (mSHIFT) was used for all simulations. mSHIFT has previously been used to estimate the impact of the Sixth Carbon Budget recommendations to reduce meat and dairy on nutrient intake, adherence to the Scottish Dietary Goals, chronic diseases, and greenhouse gas emissions in SHeS 2021.

We first simulated a 20% reduction in "total meat" and dairy by 2030, and a 35% reduction in "total meat" and 20% reduction in dairy by 2050.

"Total meat" refers to the following: beef, lamb, pork, other red meat, processed red meat, burgers, sausages, offal, poultry, game birds and processed poultry.

"**Red and red processed meat**" refers to the following: beef, lamb, pork, other red meat, processed red meat, burgers, sausages and offal.

We then simulated reductions in red and red processed meat among high consumers to meet the 20% or 35% reduction in "total meat" along with a 20% reduction in dairy. Finally, we simulated a 20% reduction in dairy with no reduction in meat.

We modelled replacement of meat with foods rich in nutrients of concern. Nutrient values for replacement foods were taken from the UK Nutrient Databank. For each replacement food, a single composite nutrient value was derived, weighted based on frequency of reported intake of foods in this food group in DISH (**Annexe 2**). For example, for the replacement "pulses and legumes", 76% of the nutrients were based on the nutrients in baked beans, 21% lentil soup, 1.5% houmous, and 1.5% reduced sugar baked beans. Using the nutrients from as-consumed products such as baked beans was thought to be a more realistic behaviour change than only replacing with the nutrients in pulses and legumes.

Given evidence that as consumption of red meat has declined in the UK, consumption of white meat has increased (8), we simulated the impact of replacing red and red processed meat with chicken in scenarios with reductions in red and red processed meat.

All dairy products were reduced by 20%. However, only milk, yoghurt, and butter were replaced (not cheese or cream). Milk was replaced with plant-based milk drinks[7], yoghurt with plant-based yoghurt[8], and butter with plant-based solid fats (**Annexe 2**). We did not replace cheese or cream as plant-based replacements for these products are not widely available in Scotland (9).

All replacements were gram-for-gram replacements, which means that calories were not held constant. This was thought to be a more realistic behaviour change than calorie-for-calorie replacement.

[7] For plant-based milk drinks, 95.8% of the nutrients were based on the nutrients in 'oat milk,' 2.2% 'soya milk, unsweetened,' and 1.4% 'almond milk / hazelnut milk' based on the frequency of reported intake of these foods in DISH. The nutrient composition of these plant-based milk drinks is from the UK Nutrient Databank.

[8] Yoghurt replaced with 'soya yoghurt, plain (e.g. Alpro Soya)' which was the only plant-based yoghurt available in the UK Nutrient Databank.

We simulated 27 scenarios (**Table 6**).

Table 6. Summary of simulation scenarios for reducing meat and dairy among children and young people aged 2 to 15 years in Scotland.

No.	Name	Change in meat	Replacement of meat	Change in dairy	Replacement of dairy
1	20% less meat, 20% less dairy	20% reduction "total meat"	None	20% reduction all dairy	None
2			Pulses/legumes		PBDA*
3			Vegetables		PBDA*
4			Eggs		PBDA*
5			Oily fish		PBDA*
6			PBMA		PBDA*
7	35% less meat, 20% less dairy	35% reduction "total meat"	None	20% reduction all dairy	None
8			Pulses/legumes		PBDA*
9			Vegetables		PBDA*
10			Eggs		PBDA*
11			Oily fish		PBDA*
12			PBMA		PBDA*
13	20% less meat, 20% less dairy, RRPM	RRPM max 33g/d in 2-4y, 39g/d in 5-10y, 54g/d in 11-15y	None	20% reduction all dairy	None
14			Pulses/legumes		PBDA*
15			Vegetables		PBDA*
16			Eggs		PBDA*
17			Oily fish		PBDA*
18			PBMA		PBDA*
19			Chicken		PBDA*
20	35% less meat, 20% less dairy, RRPM	RRPM max 17g/d in 2-4y, 19g/d in 5-10y, 26g/d in 11-15y	None	20% reduction all dairy	None
21			Pulses/legumes		PBDA*
22			Vegetables		PBDA*
23			Eggs		PBDA*
24			Oily fish		PBDA*
25			PBMA		PBDA*
26			Chicken		PBDA*
27	20% less dairy	None	N/A	20% reduction in all dairy	None

Abbreviations: PBDA, plant-based dairy alternatives; PBMA, plant-based meat alternatives; RRPM, red and red processed meat.
* PBDA included plant-based milk drinks, plant-based yoghurt and plant-based solid fats.

Environmental impact data were obtained by mapping items in DISH to appropriate matches in foodDB (10,11). foodDB contains standardised environmental impacts data per 100g of approximately 70,000 items available in UK based supermarkets, derived by combining data from a large meta-analysis of life cycle assessments with an ingredient decomposition analysis (11,12). The environmental impact of each item in DISH was calculated as the average of the environmental impact of the matched items in foodDB. The total environmental impact was calculated by multiplying the environmental impact per gram by the gram weight of each consumed item, before summing over all items and dividing by the number of days of recall. Further details on the data processing required to match DISH to foodDB are provided in **Annexe 1**.

4. Simulation Results: Energy and Nutrient Intake

Energy intake decreased across all scenarios (**Annexe 4** and **Annexe Tables 3**). The average decrease ranged from **108kcal/d** (~7% of baseline energy intake) when red and red processed meat was reduced to achieve a 35% reduction in "total meat" and dairy was reduced by 20%, with no replacement, to **15kcal/d** (<1% of baseline energy intake) when "total meat" was reduced by 35% and was replaced with oily fish along with a 20% dairy reduction replaced with plant-based dairy alternatives. About two-thirds of the decrease in energy intake in the scenarios without replacement and a 20% decrease in both meat and dairy was attributed to dairy, and the rest (about one-third) to meat.

Protein intake decreased across all scenarios except when red and red processed meat was reduced to achieve a 35% reduction in "total meat" and replaced with chicken (**Annexe 4** and **Annexe Tables 3**). The average change ranged from a **decrease of 9g/day** (~15% of baseline protein intake) when "total meat" was reduced by 35% and dairy by 20% with no replacement, to an **increase of 0.2g/day** (<1% of baseline protein intake) when red and red processed meat was reduced to achieve a 35% reduction in "total meat" and replaced with chicken. About half of the decrease in protein intake in the scenarios without replacement and a 20% decrease in both meat and dairy was attributed to dairy, and the rest (about half) to meat.

Despite these decreases, average protein intake remained above age-specific RNIs across all scenarios and the percentage of children aged 2 to 10 years below the RNI remained <3% (**Annexe Tables 3**). However, the percentage of young people aged 11 to 15 years below the RNI increased by 7-11 percentage points when "total meat" or red and red processed meat were reduced to achieve a 35% reduction in "total meat" and not replaced or replaced with vegetables or pulses and legumes.

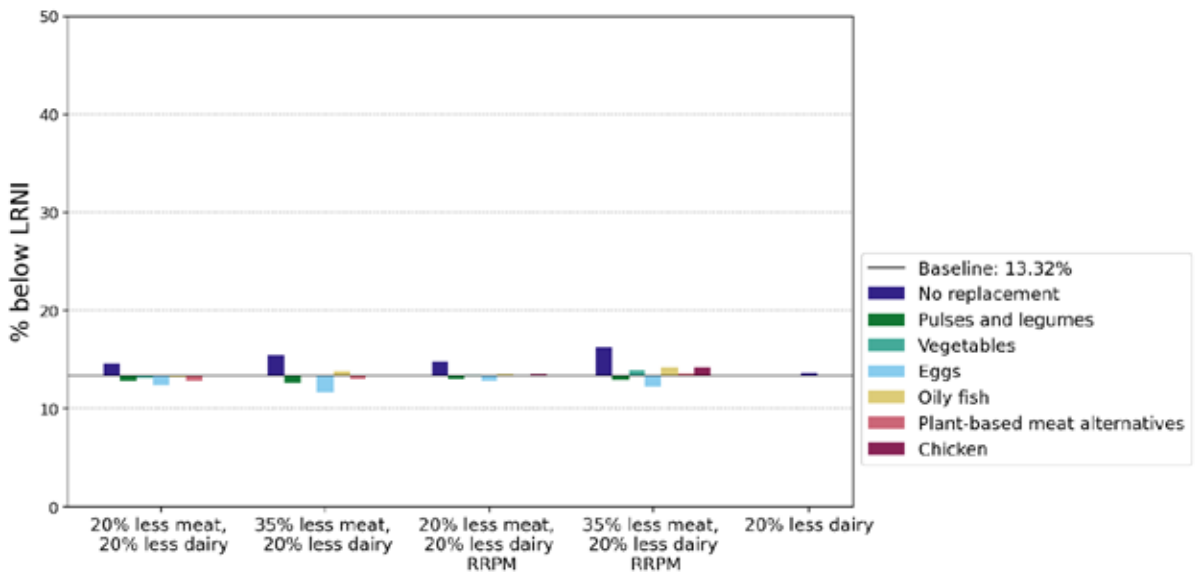
The average change in iron intake ranged from a **decrease of 0.4mg/day** (~4% of baseline iron intake) when red and red processed meat was reduced to achieve a 35% reduction in "total meat" and dairy by 20% with no replacement, to an **increase of 0.4mg/day** (~4% of baseline iron intake) when "total meat" was reduced by 35% and replaced with egg, and dairy was reduced by 20% and replaced with plant-based dairy alternatives (**Annexe 4** and **Annexe Tables 3**). However, most of this increase in iron is **non-haem iron** which is less efficiently absorbed than haem iron. Thus, for individuals with an increased need for iron, such as females of reproductive age, and individuals who have low iron intakes to begin with, further consideration of the chemical form of iron may be warranted. About 10% of the decrease in iron intake in the scenarios without replacement and a 20% decrease in both meat and dairy was attributed to dairy, and the rest (about 90%) to meat.

There are two chemical forms of iron in our diets: **haem iron** and **non-haem iron**. Haem iron is found in meat and fish whereas non-haem iron is found in both animal and plant foods. Haem iron is more efficiently absorbed than non-haem iron.

Average iron intake remained above age-specific RNIs across all scenarios for children aged 2 to 4 years and all scenarios except when red and red processed meat was reduced to achieve a 35% reduction in "total meat" and dairy by 20% with no replacement among children aged 5 to 10 years (**Annexe Tables 3**). The percentage of children aged 2 to 10 years below the LRNI was <5% across all scenarios (**Figure 11** and **Annexe Tables 3**). However, at baseline, young people aged 11 to 15 years, on average, had iron intakes below the RNI and across all scenarios, even those in which iron increased, iron intakes in this age group remained below the RNI (**Annexe Tables 3**). At baseline, nearly one-third (31%) of young

people aged 11 to 15 years were below the LRNI for iron. However, this percentage did not change substantially across any of the scenarios – ranging from an increase of 5 percentage points when red and red processed meat was reduced to achieve a 35% reduction in "total meat" and dairy by 20% with no replacement to a decrease of 3.5 percentage points when "total meat" was reduced by 35% and replaced with egg (**Figure 11** and **Annexe Tables 3**).

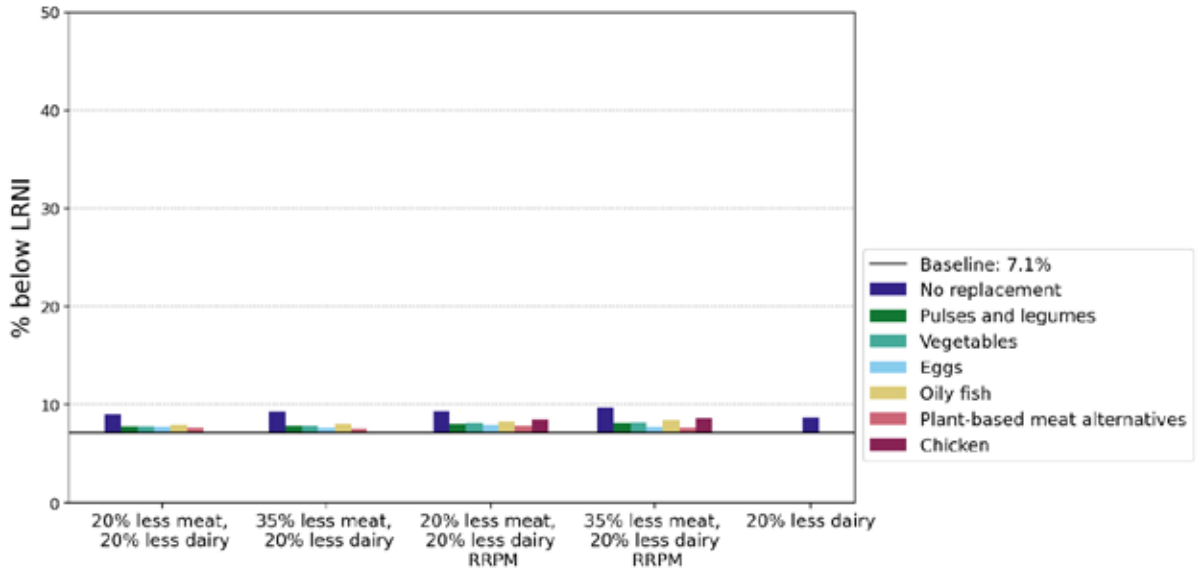
Figure 11. Impact of reducing meat and dairy on the percentage of the population below the LRNI for iron intake among children and young people aged 2 to 15 years living in Scotland, 2024.



Calcium intake decreased across all scenarios (**Annexe 4** and **Annexe Tables 3**). The average change ranged from a **decrease of 105mg/day** (~13% of baseline calcium intake) when red and red processed meat was reduced to achieve a 35% reduction in "total meat" and dairy by 20% with no replacement, to a **decrease of 29mg/day** (~3% of baseline calcium intake) when meat and dairy were replaced with plant-based meat and dairy alternatives. More than 90% of the decrease in calcium intake in the scenarios without replacement and a 20% decrease in both meat and dairy was attributed to dairy, and the rest (less than 10%) to meat.

Average calcium intake was above the RNI among children aged 2 to 10 years across all scenarios (**Annexe Tables 3**). The percentage of children aged 2 to 10 years below the LRNI was <5% across all scenarios (**Figure 12** and **Annexe Tables 3**). However, at baseline, young people aged 11 to 15 years, on average, had calcium intakes below the RNI and across all scenarios (**Annexe Tables 3**). At baseline, 15% of young people aged 11 to 15 years were below the LRNI for calcium, and this percentage did not change substantially across any of the scenarios – ranging from an increase of 0.6 percentage points when "total meat" was reduced by 35% and dairy by 20% and they were replaced with plant-based meat and dairy alternatives to an increase of 5 percentage points when red and red processed meat was reduced to achieve a 35% reduction in "total meat" and dairy by 20%, with no replacement (**Figure 12** and **Annexe Tables 3**).

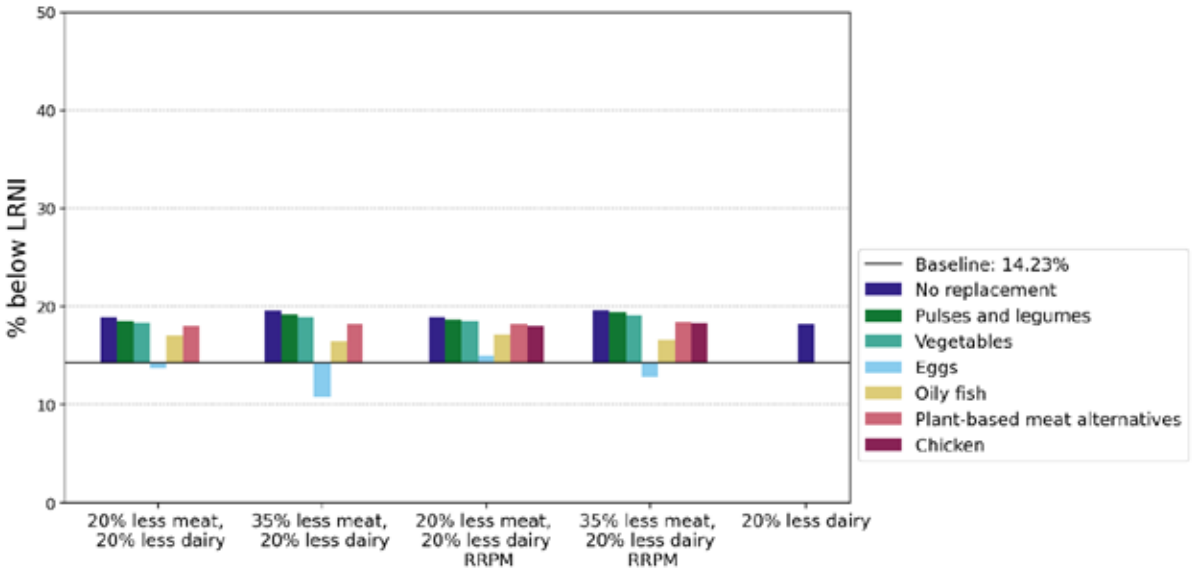
Figure 12. Impact of reducing meat and dairy on the percentage of the population below the LRNI for calcium intake among children and young people aged 2 to 15 years living in Scotland, 2024.



Iodine intake decreased across all scenarios (**Annexe 4** and **Annexe Tables 3**). The average change ranged from a **decrease of 19µg/day** (~14% of baseline iodine intake) when red and red processed meat was reduced to achieve a 35% reduction in "total meat" and dairy by 20% with no replacement, to a **decrease of 4.7µg/day** (~3% of baseline iodine intake) when red and red processed meat was replaced with egg. More than 90% of the decrease in iodine intake in the scenarios without replacement and a 20% decrease in both meat and dairy was attributed to dairy, and the rest (less than 10%) to meat.

Average iodine intake was above the RNI among children aged 2 to 10 years across all scenarios (**Annexe Tables 3**). The percentage of children 2 to 10 years below the LRNI was 8-10% at baseline, and this percentage increased by 3-4 percentage points when "total meat" was reduced by 35% and dairy by 20% with no replacement (**Figure 13** and **Annexe Tables 3**). However, it decreased by 1-3 percentage points when meat was replaced with egg. At baseline, young people aged 11 to 15 years, on average, had iodine intakes just at or below the RNI, and across all scenarios this dropped further below the RNI (**Annexe Tables 3**). At baseline, 24% of young people aged 11 to 15 years were below the LRNI for iodine, and this percentage increased by 8 percentage points when red and red processed meat was reduced to achieve a 35% reduction in "total meat" and dairy by 20% with no replacement (**Figure 13** and **Annexe Tables 3**). In contrast, the percentage below the LRNI decreased by 6 percentage points when meat was replaced with egg.

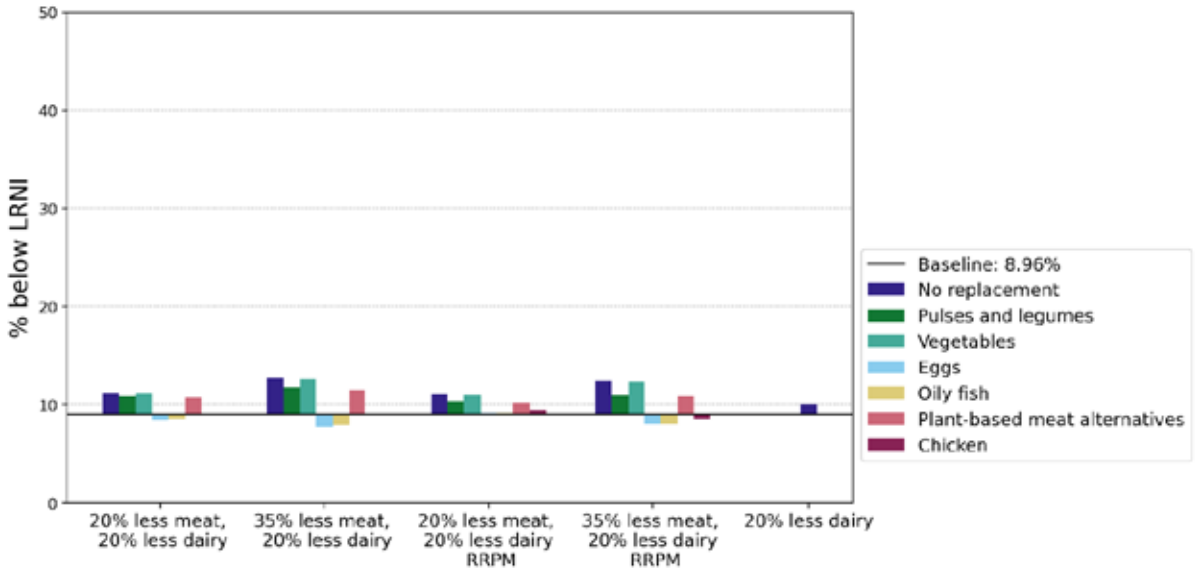
Figure 13. Impact of reducing meat and dairy on the percentage of the population below the LRNI for iodine intake among children and young people aged 2 to 15 years living in Scotland, 2024.



Selenium intake decreased across all scenarios in which meat was not replaced or replaced with pulses and legumes, vegetables or plant-based meat alternatives, and increased when meat was replaced with egg, oily fish or chicken (**Annexe 4** and **Annexe Tables 3**). The average change in selenium intake ranged from a **decrease of 4µg/day** (~11% of baseline selenium intake) when "total meat" was reduced by 35% and dairy by 20% with no replacement, to an **increase of 2µg/day** (~6% of baseline selenium intake) when red and red processed meat was reduced to achieve a 35% reduction in "total meat" and replaced with egg. Slightly more than one-third of the decrease in selenium intake in the scenarios without replacement and a 20% decrease in both meat and dairy was attributed to dairy, and the rest (slightly more than two-thirds) to meat.

Average selenium intake remained above the RNI among children aged 2 to 10 years across all scenarios (**Annexe Tables 3**). The percentage of children 2 to 4 years below the LRNI was <1% at baseline and remained <2% across all scenarios (**Figure 14** and **Annexe Tables 3**). The percentage of children 5 to 10 years below the LRNI was 2% at baseline and increased by 3 percentage points when red and red processed meat was reduced to achieve a 35% reduction in "total meat" and not replaced or replaced with vegetables. At baseline, young people aged 11 to 15 years, on average, had selenium intakes below the RNI, and across all scenarios, even when selenium intake increased, it remained below the RNI (**Annexe Tables 3**). At baseline, 21% of young people aged 11 to 15 years were below the LRNI for selenium, and this percentage increased by 7 percentage points when "total meat" was reduced by 35% and not replaced or replaced with vegetables (**Figure 14** and **Annexe Tables 3**). In contrast, the percentage below the LRNI decreased by 3 percentage points when meat was replaced with egg.

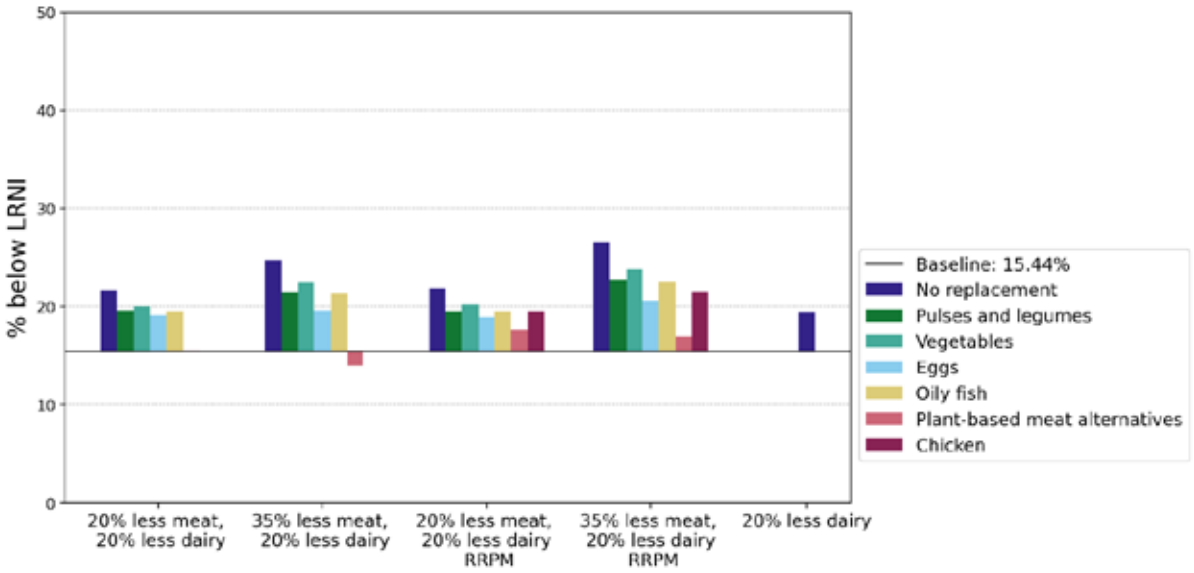
Figure 14. Impact of reducing meat and dairy on the percentage of the population below the LRNI for selenium intake among children and young people aged 2 to 15 years living in Scotland, 2024.



Zinc intake decreased across all scenarios except when meat was replaced with plant-based meat alternatives (**Annexe 4** and **Annexe Tables 3**). The average change ranged from a **decrease of 1mg/day** (~15% of baseline zinc intake) when red and red processed meat was reduced to achieve a 35% reduction in "total meat" and dairy by 20% with no replacement, to an **increase of 0.2mg/day** (~3% of baseline zinc intake) when red and red processed meat was reduced to achieve a 35% reduction in "total meat" and replaced with plant-based meat alternatives. About half of the decrease in zinc intake in the scenarios without replacement and a 20% decrease in both meat and dairy was attributed to dairy, and the rest (about half) to meat.

Average zinc intake was below the RNI across all age groups at baseline and remained below the RNI even in scenarios where zinc intake increased (**Annexe Tables 3**). The percentage of children aged 2 to 10 years below the LRNI was 9% at baseline and increased by up to 7 percentage points in children 2 to 4 years and 9.5 percentage points in children 5 to 10 years. At baseline, 26% of young people aged 11 to 15 years were below the LRNI and this increased by 14 percentage points when red and red processed meat was reduced to achieve a 35% reduction in "total meat" and dairy by 20% with no replacement (**Figure 15** and **Annexe Tables 3**).

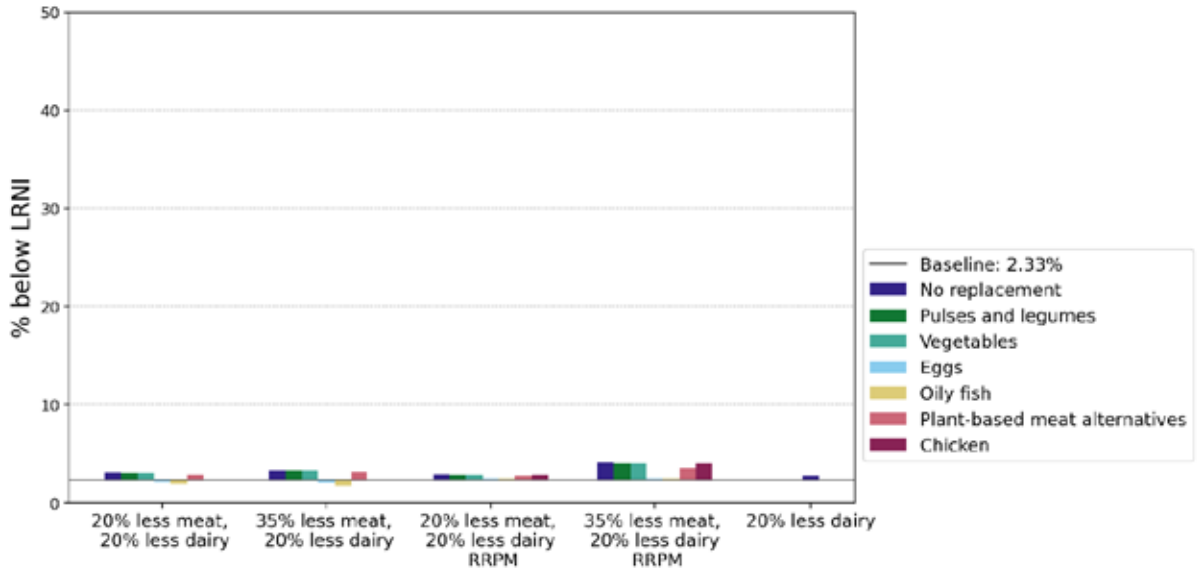
Figure 15. Impact of reducing meat and dairy on the percentage of the population below the LRNI for zinc intake among children and young people aged 2 to 15 years living in Scotland, 2024.



Vitamin B_{12} intake decreased in all scenarios except when meat was replaced with oily fish, but remained above the RNI across all age groups (**Annexe 4** and **Annexe Tables 3**). The average **change in vitamin B_{12} intake** ranged from a **decrease of 0.8µg/day** (~19% of baseline vitamin B_{12} intake) when red and red processed meat was reduced to achieve a 35% reduction in "total meat" and dairy was reduced by 20% with no replacement, to an **increase of 0.3µg/day** (~7% of baseline vitamin B_{12} intake) when "total meat" was reduced by 35% and replaced with oily fish along with a 20% reduction in dairy replaced by plant-based dairy alternatives. About three-fourths of the decrease in vitamin B_{12} intake in the scenarios without replacement and a 20% decrease in both meat and dairy was attributed to dairy, and the rest (about one-fourth) to meat.

The percentage of children aged 2 to 10 years below the RNI remained <2% across all scenarios (**Figure 16** and **Annexe Tables 3**). The percentage of young people aged 11 to 15 years below the RNI was 5% at baseline, and increased by a maximum of 3 percentage points when red and red processed meat was reduced to achieve a 35% reduction in "total meat" and dairy was reduced by 20% with no replacement.

Figure 16. Impact of reducing meat and dairy on the percentage of the population below the LRNI for vitamin B_{12} intake among children and young people aged 2 to 15 years living in Scotland, 2024.



Key Messages: Impact of Reducing Meat and Dairy on Energy and Nutrient Intake

1. Under the most useful scenario to demonstrate both the achievement of the public health goal for red and red processed meat, and the worst-case scenario of no replacement, about 5-6 percentage points more of the population will fall below the LRNI for iodine and zinc, and about 1-2 percentage points more of the population will fall below the LRNI for iron, calcium, selenium, and vitamin B_{12} in reducing meat and dairy by 20%.
2. Even under the most extreme scenarios, average intake of protein and vitamin B_{12} remained above the RNI for all age groups.
3. Average iron and calcium intake remained above the RNI and the percentage of children below the LRNI was <5% across nearly all scenarios for children aged 2 to 10 years. However, at baseline, young people aged 11 to 15 years, on average, had iron and calcium intakes below the RNI and across all scenarios, iron and calcium intakes in this age group remained below the RNI.
4. Average iodine intake was above the RNI among children aged 2 to 10 years across all scenarios but the percentage below the LRNI was 8-10% at baseline, and increased by 3-4 percentage points when ”total meat” was reduced by 35% and dairy was reduced by 20%, with no replacement. In young people aged 11 to 15 years, average iodine intake was just at or below the RNI, and across all scenarios this dropped further below the RNI, increasing the percentage below the LRNI by up to 8 percentage points when red and red processed meat was reduced to achieve a 35% reduction in “total meal” and dairy was reduced by 20%, with no replacement. Replacement of meat with egg attenuated some of these effects.
5. Average selenium intake remained above the RNI among children aged 2 to 10 years and the percentage of children below the LRNI remained low (<10%) across all scenarios. However, among young people aged 11 to 15 years, average selenium intake was below the RNI at baseline and across all scenarios, even when selenium intake increased (which occurred when meat was replaced with egg, oily fish or chicken).
6. At baseline and across all scenarios, average zinc intake was below the RNI. The percentage of children and young people below the LRNI increased by up to 7 percentage points in children 2 to 4 years, 9.5 percentage points in children 5 to 10 years, and 14 percentage points in young people 11 to 15 years when red and red processed meat was reduced to achieve a 35% reduction in “total meal” and dairy was reduced by 20%, with no replacement.
7. When meat and dairy were both reduced and not replaced, most of the decreases in iron and selenium were attributed to reductions in meat whereas most of the decreases in calcium, iodine and vitamin B_{12} were attributed to reductions in dairy. The contribution of meat and dairy to decreases in protein and zinc in these scenarios was relatively equivalent.

4. Simulation Results: Scottish Dietary Goals

The impact of the 27 simulations on the percentage of children and young people aged 2 to 15 years in Scotland who met the Scottish Dietary Goals (**Table 7**) was evaluated. We did not estimate the impact on oily fish given that this was assessed using a food frequency question instead of Intake24.

Table 7. Definition of achieving Scottish Dietary Goals in children and young people aged 2 to 15 years living in Scotland.

	Current Scottish Dietary Goal (13)	**Definition for DISH survey**
Energy	kcal/100g	Energy density of food and milk [1]
Total fat	energy	excluding ethanol[2]
Saturated fat	food energy	energy excluding ethanol[3]
Trans fat	Trans fat intake to be <1% of food energy	Trans fat intake to be <1% of energy excluding ethanol
Free sugars	energy	energy excluding ethanol
Total carbohydrate	Total carbohydrate intake to be ~50% of total energy	Total carbohydrate intake to be 45-55% of energy excluding ethanol
Fibre	and in line with Scientific Advisory Committee on Nutrition (SACN) recommendations in children: -4y -10y -15y	Fibre intake to be: -4y -10y -15y
Salt	Salt intake to be <6 g/day in adults	Salt intake to be: <2 g/day for 2-3y <3 g/day for 4-6y <5 g/day for 7-10y <6 g/day for 11-15y
Fruit and vegetables	Fruit and vegetable consumption to be >400 g/day in adults	Fruit and vegetable consumption to be >400 g/day in adults[4]
Red and red processed meat[5]	Red and red processed meat adults	Red and red processed meat

[1] In order to be consistent with previous monitoring of the Scottish Dietary Goals based on secondary analysis of purchase data from the Scottish subsample of the UK Living Costs and Food Survey (14), the calculation of energy density excludes the following non-milk drinks: Fruit juice, Smoothies 100% fruit and/or juice, Soft drinks not low calorie concentrated, Soft drinks not low calorie carbonated, Soft drinks not low calorie RTD (ready-to-drink) still, Soft drinks low calorie concentrated, Soft drinks low calorie carbonated, Soft drinks low calorie RTD still, Coffee, Tea, Herbal tea (made-up weight), Bottled water still or carbonated and Tap water only.

[2] All macronutrients in the DISH survey have been reported based on energy intake excluding ethanol, according to the latest SACN guidance (15).

[3] A cut-point of 10% was used for saturated fat instead of 11%, according to the latest SACN guidance (15).
[4] Allows for up to 40 g beans and 75 g fruit juice or smoothie in children aged 2 to 10 years and up to 80 g beans and 150 g fruit juice or smoothie in young people aged 11 to 15 years.
[5] No specific goal for children, 70 g/day is adult-specific and provided for comparison.
[6] Adherence to the oily fish Scottish Dietary Goal calculated based on a food frequency question asked during the survey.

All scenarios in which meat and dairy were replaced increased the percentage of children and young people meeting the goal for energy density (Annexe). The increase ranged from 0.7 percentage point when meat was replaced with oily fish to 5 percentage points when red and red processed meat was replaced with vegetables.

All scenarios increased the percentage of children and young people meeting the goal for total fat (Annexe). The increase ranged from 1 percentage point when meat was replaced with oily fish to 15 percentage points when red and red processed meat was replaced with chicken.

All scenarios increased the percentage of children meeting the goal for saturated fat (Annexe). The increase ranged from 6 percentage points when meat was replaced with eggs to 15 percentage points when red and red processed meat was replaced with chicken.

There was little impact in any of the scenarios on the percentage of children and young people meeting the Scottish Dietary Goal for trans fat: 99% of children and young people met the goal at baseline and in all scenarios (**Annexe Tables 3**).

All scenarios slightly decreased the percentage of children and young people meeting the goal for free sugars (Annexe). The decrease ranged from 1 percentage point when only dairy was reduced with no replacement to 4.5 percentage points when red and red processed meat was replaced with pulses and legumes (reminder: the replacement for pulses and legumes included baked beans which contained sugar, see **Annexe 2**).

All scenarios decreased the percentage of children and young people meeting the goal for total carbohydrates (Annexe). The decrease ranged from 1 percentage point when red and red processed meat was replaced with eggs to 10 percentage points when red and red processed meat was not replaced.

All scenarios in which meat and dairy were replaced increased the percentage of children and young people meeting the goal for fibre (Annexe). The increase ranged from 2 percentage point when red and red processed meat was replaced with egg to 7 percentage points when meat was replaced with plant-based meat alternatives.

All but one scenario – when “total meat” was reduced by 35% and replaced with plant-based meat alternatives – increased the percentage of children and young people meeting the goal for salt (Annexe). The increase ranged from 0.7 percentage point when “total meat” was reduced by 20% and replaced with plant-based meat alternatives to 8 percentage points when red and red processed meat was reduced and not replaced.

In scenarios wherein meat was replaced with pulses and legumes or vegetables, a slightly higher percentage (2-5 percentage points) of children and young people met the goal for fruit and vegetables (Annexe).

At baseline, 82% of children met the Scottish Dietary Goal for red and red processed meat (**Annexe Tables 3**). All scenarios that met a 20% or 35% reduction in "total meat" through reductions in red and red processed meat increased the percentage of children and young people meeting the goal for red and red processed meat to 100%. The scenarios with 20% or 35% reductions in "total meat" increased the percentage of children and young people meeting the goal for red and red processed meat to 88% and 93%, respectively.

Key Messages: Impact of Reducing Meat and Dairy on Adherence to the Scottish Dietary Goals

1. All scenarios increased the percentage of children and young people meeting the goal for red and red processed meat.
2. Replacing meat with pulses and legumes or vegetables slightly increased the percentage of children and young people meeting the goal for fruit and vegetables.
3. Replacing meat and dairy with a variety of products, including pulses and legumes, vegetables, eggs, oily fish, plant-based alternatives, or chicken can increase the percentage of children and young people meeting the goals for energy density, total fat, saturated fat, fibre, and salt.
4. Reducing meat and dairy may slightly reduce the percentage of children and young people meeting the goals for free sugars and total carbohydrates.
5. Generally, the impacts were larger when red and red processed meat were reduced rather than "total meat".

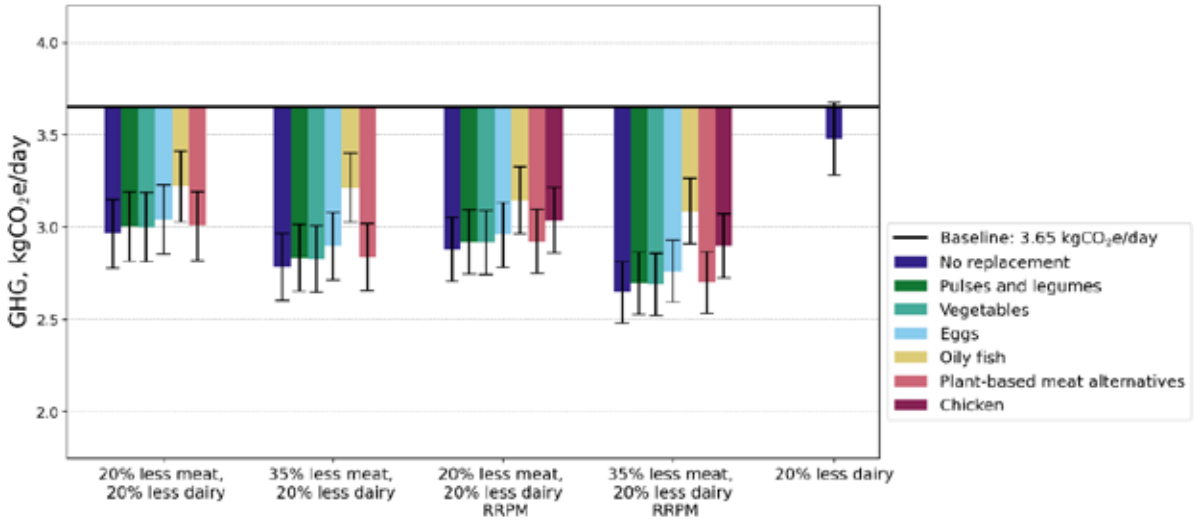
5. Simulation Results: Greenhouse gas emissions

On average, in 2024, dietary greenhouse gas emissions among children and young people aged 2 to 15 years living in Scotland were 3.65 $kgCO_2e$ per day. Emissions were lowest for 2- to 4-year-olds (2.98 $kgCO_2e$ per day) and highest for 11- to 15-year-olds (4.00 $kgCO_2e$ per day). Dietary greenhouse gas emissions were significantly reduced in all scenarios except when meat was not reduced (i.e., 'dairy only' scenario) (**Figure 17**).

The average decrease ranged from 1.01 $kgCO_2e$ per day (~28% of baseline emissions) when red and red processed meat was reduced to achieve a 35% reduction in "total meat" and dairy was reduced by 20% with no replacement, to 0.17 $kgCO_2e$ per day (~5% of baseline emissions) when dairy was reduced by 20%.

Figure 17. Impact of reducing meat and dairy on dietary greenhouse gas emissions (GHG) in all scenarios overall and by age group among children and young people aged 2 to 15 years living in Scotland, 2024.

Overall



2 to 4 years

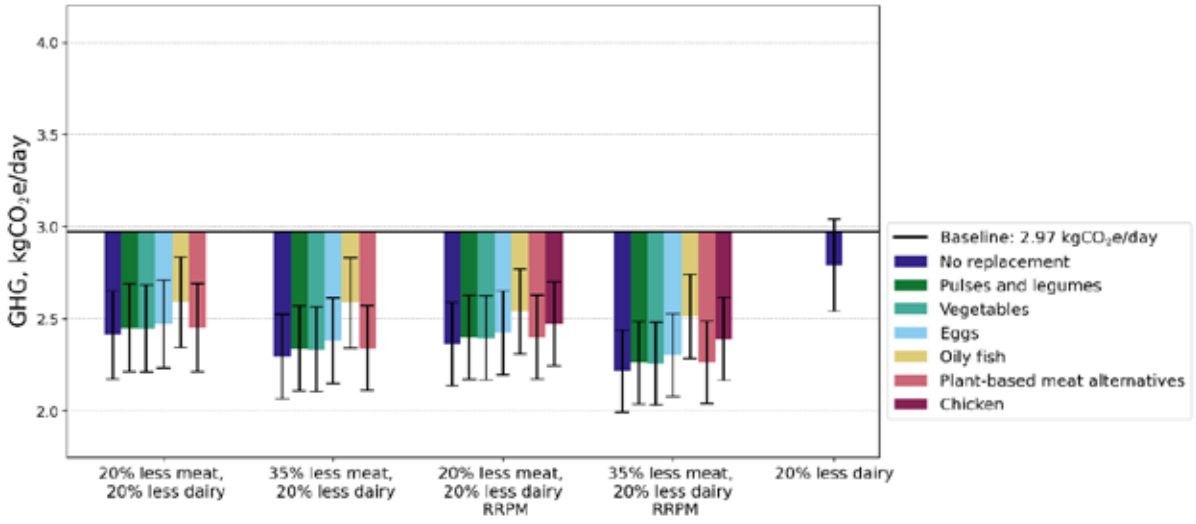
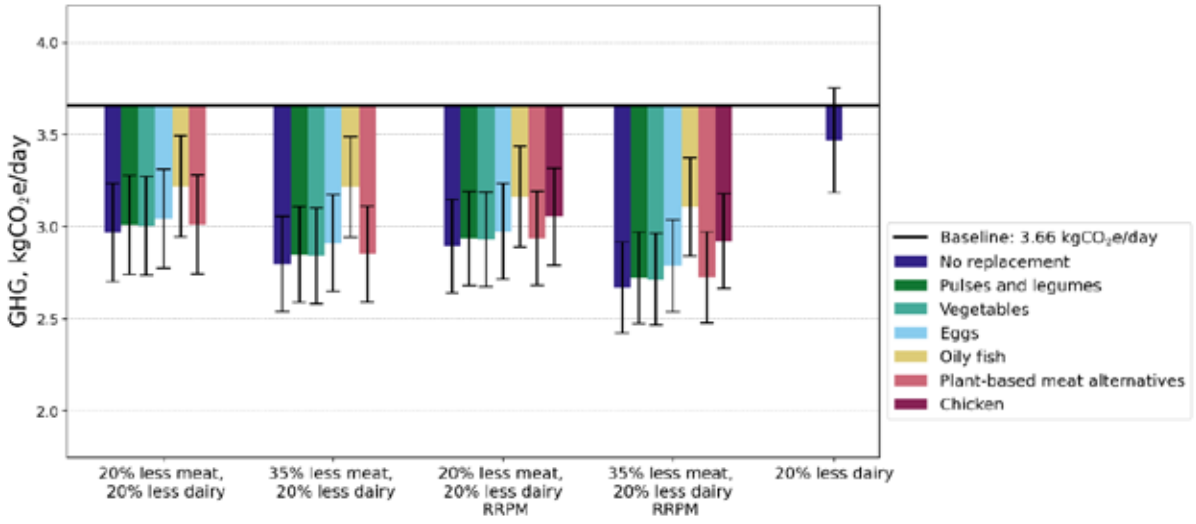
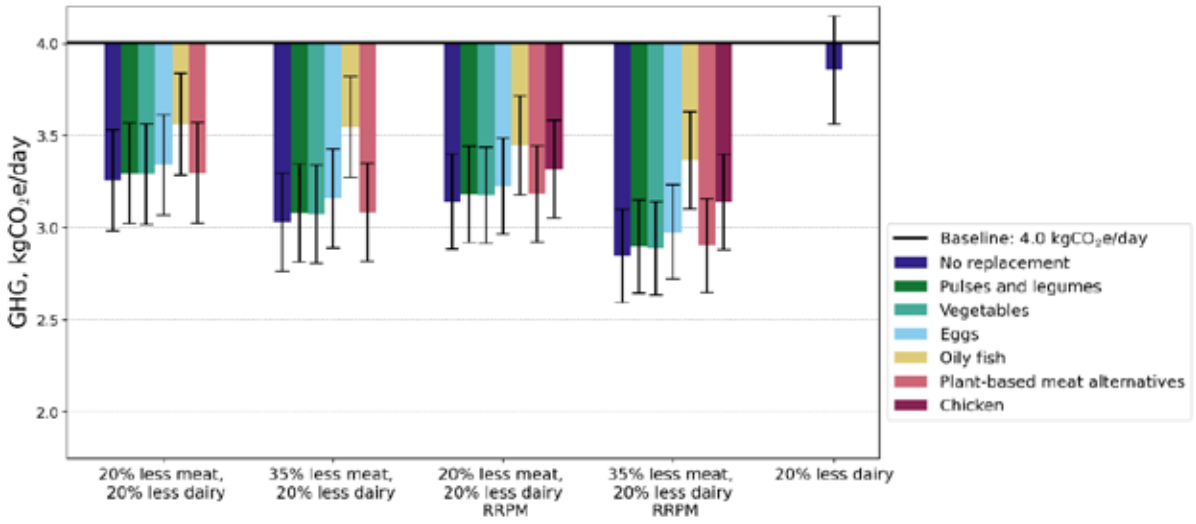


Figure 25. Continued.

5 to 10 years



11 to 15 years



Key Messages: Impact of Reducing Meat and Dairy on Greenhouse Gas Emissions

1. On average, in 2024, dietary greenhouse gas emissions among children and young people aged 2 to 15 years living in Scotland were 3.65 $kgCO_2e$ per capita per day. This is slightly lower than the greenhouse gas emissions associated with adult (16+ years) diets in Scotland in 2021 (4.17 $kgCO_2e$ per capita per day).
2. Dietary greenhouse gas emissions were significantly reduced in all scenarios except when meat was not reduced (i.e., 'dairy only' scenario).

6. Conclusions

Most children and young people in Scotland reported consuming meat (90%) and dairy (99.6%), so any recommended changes to meat and dairy consumption are likely to impact a large proportion of this population. Young people aged 11 to 15 years are the highest meat consumers and children aged 2 to 10 years are the highest dairy consumers.

Greenhouse gas emissions associated with diets of children and young people could be reduced by up to ~28% of baseline emissions by reducing red and red processed meat to achieve a 35% reduction in "total meat". Significant reductions were observed across all replacement scenarios, whether meat and dairy were replaced with vegetables, eggs or plant-based alternatives.

Current intakes of meat and dairy among children and young people in Scotland provide insights that can inform policies to support achieving the CCC recommendations. For example,

- Most meat eaten is poultry (40%) or pork (37%) with beef contributing about one-fifth (21%) and lamb contributing very small amounts (1%).
- More than half of dairy (67%) was consumed as milk.
- Homemade dishes containing chicken or beef, such as a chicken breast or spaghetti Bolognese, and ham sandwiches are some of the most common ways in which children and young people in Scotland consume meat.
- Red and red processed meat consumption is spread across lunch and dinner.
- A very small proportion (6-7%) of red and red processed meat was purchased at cafes, restaurants, pubs, and takeaways (i.e., out of home foods).

There were very few differences in meat and dairy intake by SIMD among children and young people. There were no meaningful differences in dairy consumption or dairy type (i.e., milk versus yoghurt versus cheese). There were no differences in meat consumption except that those living in the most deprived neighbourhoods had slightly higher white meat consumption (32g/day versus 26g/day in the least deprived neighbourhoods) and had a higher proportion of meat from poultry (42% versus 35%) and smaller proportion of meat from pork (32% versus 44%). The higher white meat / poultry consumption was driven by higher intake of 'coated chicken manufactured', which includes chicken nuggets/pieces/dippers and coated chicken breast fillets.

'Meat and meat products' were major contributors (contributing >20%) to intakes of selenium (24.0%) and zinc (21.4%). 'Milk and milk products' were major contributors to intakes of calcium (35.5%), iodine (44.6%), and vitamin B_{12} (39.1%).

An alternative approach to recommending all consumers reduce all their meat (including poultry) would be to focus on high consumers of red and red processed meat. Our modelling showed that a 20% reduction in the population average "total meat" intake could be achieved if maximum red and red processed meat intake was pegged at 33g/day for children aged 2 to 4 years; 39g/day for children 5 to 10 years; and 54g/day for young people aged 11 to 15 years. This value for 11- to 15-year-olds is only slightly lower than a comparable value found in a previous report for adults (60g/day). Likewise, a 35% reduction in the population average "total meat" intake could be achieved if maximum red and red processed meat intake was pegged

at 17g/day for children aged 2 to 4 years; 19g/day for children 5 to 10 years; and 26g/day for young people aged 11 to 15 years. This value for 11- to 15-year-olds is only slightly lower than a comparable value found in a previous report for adults (31g/day).

Under the most useful scenarios to demonstrate both the achievement of the public health goal for red and red processed meat, and the worst-case scenario of no replacement,

- The percentages of the population below the LRNI for zinc would increase by ~4-35 percentage points (**Table 8**). This was the largest impact on any nutrient, due to both 'meat and meat products' and 'milk and milk products' contributing ~20% each to zinc intake at baseline.
- The percentages of the population below the LRNI for iodine would increase by ~4-7 percentage points (**Table 8**).
- The percentages of young people aged 11 to 15 years below the LRNI for iron, calcium, selenium, and vitamin B_{12} would increase by ~3-6 percentage points (**Table 8**).
- The percentages of children aged 2 to 10 years below the LRNI for iron, calcium, selenium, and vitamin B_{12} would increase by ~1-3 percentage points (**Table 8**).
- Intakes of protein are not of concern at baseline or after meat and dairy reductions.
- Most of the decreases in iron and selenium were attributed to reductions in meat whereas most of the decreases in calcium, iodine and vitamin B_{12} were attributed to reductions in dairy. The contribution of meat and dairy to decreases in protein and zinc in these scenarios was relatively equivalent.

Table 8. Summary of percentage of the population below the LRNI for key nutrients among children and young people aged 2 to 15 years living in Scotland at baseline (2024) and following a reduction in red and red processed meat to achieve a 20% or 35% reduction in "total meat" together with a 20% reduction in dairy and no replacement.

	Baseline	**20% less meat, 20% less dairy, RRPM**	**35% less meat, 20% less dairy, RRPM**
Iron			
2-4y	3%	3%	3%
5-10y	3%	4%	4%
11-15y	31%	34%	36%
Calcium			
2-4y	1%	1%	1%
5-10y	3%	4%	4%
11-15y	15%	19%	20%
Iodine			
2-4y	10%	14%	14%
5-10y	8%	11%	12%
11-15y	24%	31%	31%
Selenium			
2-4y	0%	0%	1%
5-10y	2%	4%	5%
11-15y	21%	25%	27%
Zinc			
2-4y	9%	13%	15%
5-10y	9%	14%	19%
11-15y	26%	34%	41%
Vitamin B_{12}			
2-4y	1%	1%	1%
5-10y	1%	1%	1%
11-15y	5%	6%	8%

While the nutritional status (meaning the level of nutrients available in the body for use in maintaining bodily functions) was not determined in this study, NDNS evaluated nutritional status for three of the six nutrients evaluated in this report (iron, iodine, and vitamin B_{12}). There was evidence of low iron stores in 17% of girls aged 11 to 18 years (**Table 9**). However, all age and sex groups met the World Health Organization criteria for adequate iodine status (median urinary iodine concentrations between 100 and 199µg/l and fewer than 20% of the population below 50µg/l) and <5% had serum vitamin B_{12} levels below the threshold (**Table 9**).

Table 9. Summary of percentage of the population below the threshold for biomarkers of nutritional status in NDNS, years 9-11 (2016/17-2018/19).

	Boys		Girls	
	4-10y	**11-18y**	**4-10y**	**11-18y**
Iron[1]	5%	6%	13%	17%
Iodine[2] median, µg/L	164	155	133	111
% below 20µg/L	3%	2%	3%	4%
% below 50µg/L	8%	11%	15%	14%
% below 100µg/L	23%	29%	34%	42%
Vitamin B_{12} [3]	0%	1%	0%	2%

[1] Plasma ferritin (µg/L) 1.5-4y males <12mg/L, 1.5-4y females <12mg/L, 5y+ males <15mg/L, 5y+ females <15mg/L.
[2] Iodine concentration (mg/L) in spot urine samples. As the data are based on spot urine samples, the percentage below 100 µg/L does not necessarily indicate the percentage of the population who are iodine deficient.
[3] Serum vitamin B_{12} (pmol/L) below 150pmol/L.

The modelling indicated potential positive impacts on overall diet, when reductions are made and replacements are included. Replacing meat and dairy with a variety of products, including pulses and legumes, vegetables, eggs, oily fish, plant-based alternatives, or chicken can increase the percentage of children and young people meeting the goals for energy density, total fat, saturated fat, fibre, and salt. However, modelled replacements – which are based on current intakes – suggest that these scenarios may slightly reduce the percentage of children and young people meeting the goals for free sugars and total carbohydrates.

Table 10. Summary of impacts of reducing meat and dairy on the achievement of the Scottish Dietary Goals among children and young people aged 2 to 15 years living in Scotland, 2024. indicates increased adherence and X indicates decreased adherence.

Replacement for meat[1]	**Scottish Dietary Goal**							
	Energy Density	Total Fat	Saturated Fat	Free Sugars	Total Carbs	Fibre	Salt	F and V
None	X			X	X	X		X
Pulses and legumes				X	X			
Vegetables				X	X			
Eggs				X	X			X
Oily fish				X	X			X
PBMA				X	X		Mixed	X
Chicken				X	X			X

[1] All dairy replaced with plant-based dairy alternatives except cheese.
PBMA, plant-based meat alternatives; F and V, fruit and vegetables.

Overall, this research suggests that dairy and meat are widely consumed by children and young people in Scotland and are a major source of nutrients, particularly zinc which is generally too low in this population, and iodine and calcium, which are generally too low in young people (11 to 15 years). Reducing either “total meat” or red and red processed meat could result in significant reductions in greenhouse gas emissions associated with diets of

children and young people. However, given that children and young people aged 2 to 15 years make up only about 15% of Scotland's population, these impacts will be much less than the impacts of similar reductions among adults. Careful consideration of replacements could mitigate some—but not all—of the negative impacts on nutrient intake and maximise positive impacts on achievement of the Scottish Dietary Goals. However, given the especially poor diets of young people (11 to 15 years), concerted efforts are needed to improve overall diet quality for this population.

References

1. Scottish Government. Climate Change Committee's (CCC) annual progress report 2022 recommendations: SG response [Internet]. Edinburgh: Scottish Government; 2023 Jun [cited 2023 Sep 25]. Available from: http://www.gov.scot/publications/scotlands-response-climate-change-committees-ccc-annual-progress-report-2022-recommendations/

2. Department of Health. Dietary Reference Values. A guide [Internet]. London: Her Majesty's Stationery Office; 1991 [cited 2023 Mar 31]. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/743790/Dietary_Reference_Values_-_A_Guide__1991_.pdf

3. German Institute of Human Nutrition Potsdam-Rehbrücke. The Multiple Source Method (MSM). 2024 [cited 2024 Oct 9]. MSM Program. Available from: https://msm.dife.de/tps/en

4. Harttig U, Haubrock J, Knüppel S, Boeing H. The MSM program: web-based statistics package for estimating usual dietary intake using the Multiple Source Method. Eur J Clin Nutr. 2011 Jul;65(1):S87–91.

5. Fitt E, Mak TN, Stephen AM, Prynne C, Roberts C, Swan G, et al. Disaggregating composite food codes in the UK National Diet and Nutrition Survey food composition databank. Eur J Clin Nutr. 2010 Nov;64 Suppl 3:S32-6.

6. Stewart C, McNeill G, Runions R, Comrie F, McDonald A, Jaacks LM. Meat and dairy consumption in Scottish adults: insights from a national survey. J Hum Nutr Diet. 2024;37(6):1571–81.

7. Jaacks LM, Amoutzopoulos B, Runions R, Vonderschmidt A, McNeill G, Comrie F, et al. Disaggregation of Dairy in Composite Foods in the UK. Curr Dev Nutr [Internet]. 2024 May 16 [cited 2024 Jun 2];0(0). Available from: https://cdn.nutrition.org/article/S2475-2991(24)01708-6/fulltext

8. Stewart C, Piernas C, Cook B, Jebb SA. Trends in UK meat consumption: analysis of data from years 1–11 (2008–09 to 2018–19) of the National Diet and Nutrition Survey rolling programme. Lancet Planet Health. 2021 Oct 1;5(10):e699–708.

9. Comrie F, Jaacks LM, Kennedy J, McDonald A, McNeill G, Runions R, et al. Modelling the impact of reductions in meat and dairy consumption on nutrient intakes and disease risk | Food Standards Scotland [Internet]. Aberdeen: Food Standards Scotland; 2024 [cited 2024 Jun 22]. Available from: https://www.foodstandards.gov.scot/publications-and-research/publications/modelling-the-impact-of-reductions-in-meat-and-dairy-consumption-on-nutrient-intakes-and-disease-risk

10. Harrington RA, Adhikari V, Rayner M, Scarborough P. Nutrient composition databases in the age of big data: foodDB, a comprehensive, real-time database infrastructure. BMJ Open. 2019 Jun 1;9(6):e026652.

11. Clark M, Springmann M, Rayner M, Scarborough P, Hill J, Tilman D, et al. Estimating the environmental impacts of 57,000 food products. Proc Natl Acad Sci. 2022 Aug 16;119(33):e2120584119.

12. Poore J, Nemecek T. Reducing food’s environmental impacts through producers and consumers. Science. 2018 Jun;360(6392):987–92.

13. Scottish Government. Scottish dietary goals: March 2016 [Internet]. 2016 [cited 2024 Dec 18]. Available from: https://www.gov.scot/publications/scottish-dietary-goals-march-2016/

14. Food Standards Scotland. Estimation of food and nutrient intakes from food purchase data in Scotland between 2001 and 2018 | Food Standards Scotland [Internet]. Aberdeen: Food Standards Scotland; 2022 Feb [cited 2024 Dec 18]. Available from: https://www.foodstandards.gov.scot/publications-and-research/publications/estimation-of-food-and-nutrient-intakes-from-food-purchase-data-in-scotland-between-2001-and-2018

15. SACN. Scientific Advisory Committee on Nutrition. 2024 [cited 2024 Sep 14]. Paper for discussion. Reporting energy and macronutrient intakes. Agenda item: 6. Available from: https://eur02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fapp.box.com%2Fs%2Fjt5mt4dz7gm9dcqi4l5khtobhmpu0rrx%2Ffile%2F1599395839169anddata=05%7C02%7C%7C7425a2b742984d4062e508dcb302815c%7C2e9f06b016694589878910a06934dc61%7C0%7C0%7C638582072116631640%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C0%7C%7C%7Candsdata=RQYsToRgQRnrJm%2Bg7MJAgGlB7Q73r558tXgjgu6D8VU%3Dandreserved=0

16. Page P, Steer T, Amoutzopoulos B, Harvey A, Holmes L. Rebuild of the Food Standards Agency Recipes Database, Final Report [Internet]. [cited 2025 Jan 8]. Available from: http://doc.ukdataservice.ac.uk/doc/8159/mrdoc/pdf/8159_fsa_recipes_database_rebuild_final_report.pdf (2015).

Annexe 1. Data processing

Table 11. Summary of classification of animal type for mixed-meat disaggregated meat variables.

Disaggregated meat variable	Food description	Animal type
Processed red meat	Pastrami	Beef
	Corned beef	Beef
	Beef bourguignon	Beef
	Ham	Pork
	Bacon	Pork
	Carbonara pasta sauce	Pork
	Dairylea Lunchables	Pork
	Gammon	Pork
	Pepperoni	Pork
	Pepperami or snack salami	Pork
	Prosciutto	Pork
Burgers	Beef burgers and unspecified burgers, e.g., 'Cheeseburger' and 'McDonald's Big Mac burger'	Beef
	Beef meatballs	Beef
	Hot dogs	Pork
Sausages	Beef Sausage	Beef
	Spaghetti bolognese, canned	Beef
	Pork sausage	Pork
	Unspecified sausages, e.g., 'Breakfast sandwich', 'Baked beans and sausages' and 'Square/Lorne sausage'	Pork
	Bierwurst	Pork
	Bratwurst	Pork
	Chorizo	Pork
	Hot dogs	Pork
Offal	Black pudding	Pork
	Cup a soup, made up	Poultry
	Haggis	Lamb
	Pate	Poultry
Other red meat	Meat risotto	Beef
	Venison	Game

Table 12. Food groups evaluated.			
Food category	Main food group	Sub food groups	Examples of items
Cereals and Cereal Products	Pasta, rice, pizza and other miscellaneous cereals	pizza	Cheese and tomato pizza (e.g. Margherita) Meat pizza (e.g. Hawaiian, pepperoni, meat feast)
		pasta manufactured products & ready meals	Instant noodles (e.g. Supernoodles) Pasta in tomato sauce, canned (e.g. Heinz Spaghetti Hoops)
		other pasta including homemade dishes	Pasta shapes, white/tricolore Macaroni cheese
		rice manufactured products & ready meals	Ready cooked savoury rice (e.g. Uncle Bens) Coconut rice
		other rice including homemade dishes	White basmati rice (including easy-cook) White rice, fried (e.g. pilau rice)
		other cereals	Chocolate filled crepe Yorkshire pudding, shop-bought (e.g. Aunt Bessie)
	White bread	white bread (not high fibre; not multiseed bread)	Toast, white bread Garlic bread Wrap/tortilla, white
	Wholemeal bread	wholemeal bread	Toast, wholemeal (brown) bread Toast, multiseed wholemeal bread
	Brown, granary and wheatgerm bread	brown granary and wheatgerm bread	Toast, 50:50 bread (e.g. Kingsmill) Toast, Hovis Best of Both bread 50/50 bread (e.g. Kingsmill, Warburtons)
	Other breads	other bread	Toast, gluten-free white bread Toast, rye bread
	High fibre breakfast cereals	high fibre breakfast cereals	Weetabix / Wheat biscuits Porridge, made with semi skimmed milk

	Other breakfast cereals	other breakfast cereals	Multigrain hoops (cheerios), supermarket brands Frosted Flakes cereal, supermarket brands
	Biscuits	biscuits manufactured / retail	Chocolate chip cookie Cream cracker Digestive biscuit
		biscuits homemade	Peanut butter cookies
	Buns, cakes, pastries and fruit pies	fruit pies manufactured	Fruit pie, slice from large pie, double crust Fruit pie, fried (e.g. McDonalds apple pie)
		fruit pies homemade	Fruit flan/tart Fruit pie, single crust
		buns cakes & pastries manufactured	Scotch pancake/drop scone Croissant, plain Pain au chocolat/chocolate croissant
		buns cakes & pastries homemade	Sponge cake, with no filling Sponge cake with butter cream filling, iced (e.g. birthday cake) Banana bread/cake
	Puddings	cereal based milk puddings - manufactured	Custard, ready to serve Custard, ready to eat, individual pots Rice pudding, low fat, ready to eat, not canned (e.g. Muller rice)
		cereal based milk puddings - homemade	Semolina Confectioners custard Rice pudding, not canned
		sponge puddings - manufactured	Chocolate sponge pudding, including melt in the middle Sticky toffee pudding Sponge pudding with jam/syrup/treacle, shop-bought
		sponge puddings - homemade	Sponge pudding Sponge pudding with jam/syrup/treacle, home made Pineapple upside down cake
		other cereal based puddings - manufactured	Trifle Cheesecake, flavoured, not with fruit, (e.g. chocolate/toffee) Pancake with sultanas or raisins

		other cereal based puddings - homemade	Jelly Jelly, reduced sugar Apple Crumble
Milk and Milk Products	Whole milk (3.8% fat)	whole milk	Whole milk Whole milk, boiled
	Semi skimmed milk (1.8% fat)	semi skimmed milk	Semi skimmed milk Milk, cow's/dairy, type unknown
	1% fat milk	1% fat milk	Milk 1% fat Milk 1% fat, boiled
	Skimmed milk (0.5% fat)	skimmed milk	Skimmed milk Skimmed milk, boiled
	Other milk and cream	infant formula	Toddler/growing up milk (1-2 years) e.g. Aptamil 3, Cow & Gate 3 Toddler/ growing up milk (2-3 years), e.g. Aptamil 4, Cow & Gate 4
		cream (including imitation cream)	Sour cream Dairy squirty/spray cream (e.g. anchor) Double cream
		other milk	Hot chocolate, made with milk Milkshake / Milk drink, not chocolate (e.g. strawberry, banana) Milkshake / Milk drink, chocolate flavour
	Cheese	cottage cheese	Cottage cheese Cottage cheese, fat-free/low-fat
		cheddar cheese	Cheddar cheese Cheddar cheese, vegetarian
		other cheese	Parmesan cheese Cheese strings/strips (e.g. Dairylea) Babybel cheese
	Yoghurt, fromage frais and other dairy desserts	yoghurt	Fruit yoghurt Natural yoghurt, greek-style Children's yoghurt drink (e.g. Munch Bunch Squashums, Petits Filous yoghurt drinks)
		fromage frais and dairy desserts manufactured	Yoplait Frubes/Wildlife Choobs Petit Filous fromage frais Fromage frais, fruit (incl. children's) not fortified (e.g. Tesco value)

		dairy desserts homemade	Not reported in DISH
	Ice cream	ice cream	Soft scoop vanilla ice cream Cornetto/king cone (Including supermarket brands)
Eggs and Egg Dishes	Eggs and egg dishes	egg products - manufactured	Vegetable based quiche (e.g. cheese & onion) Meringue Egg mayonnaise sandwich filler
		other eggs and egg dishes including homemade	Scrambled egg Boiled egg Fried egg
Fat Spreads	Butter	butter (including spreadable butter)	Butter, salted Butter, unsalted Spreadable butter, salted
	Polyunsaturated margarine and oils	polyunsaturated margarine	Not reported in DISH
		polyunsaturated oils	Sunflower oil (e.g. Flora) Nut oil (e.g peanut/groundnut oil)
	Low fat spread	polyunsaturated low fat spread	Flora Light spread/margarine Flora Pro-Activ Light Spread
		low fat spread not polyunsaturated	Reduced fat buttery-taste spread / soft margarine (e.g. Tesco Butter Me Up Light) I can't believe it's not butter light
	Margarine and other cooking fats and oils NOT polyunsaturated	block margarine	Hard spread/margarine (e.g. Stork, Willow)
		soft margarine not polyunsaturated	Not reported in DISH
		other cooking fats and oils not pufa	Olive oil Coconut oil

	Reduced fat spread	reduced fat spread (polyunsaturated)	Flora Buttery spread/margarine Flora Original spread/margarine
		reduced fat spread (not polyunsaturated)	Lightest spreadable butter (e.g. Lurpak, Sainsbury,Äôs Buttersoft Light) Clover spread/margarine
Meat and Meat Products	Bacon and ham	ready meals / meal centres based on bacon and ham	Bacon and cheese grills Ham and egg salad
		other bacon and ham including homemade dishes	Ham, not smoked Ham, smoked
	Beef, veal and dishes	manufactured beef products including ready meals	Beef lasagne, ready meal Spaghetti bolognese, ready meal
		other beef & veal including homemade recipe dishes	Spaghetti bolognese, home made (pasta and sauce) Beef burger/hamburger, in a bun, not quarter pounder Beef lasagne
	Lamb and dishes	manufactured lamb products including ready meals	Kheema naan Shepherd's pie (lamb), ready meal
		other lamb including homemade recipe dishes	Lamb curry, homemade Lamb kebab with minced lamb and herbs

	Pork and dishes	manufactured pork products including ready meals	Pork/pork and beef meatballs, grilled Roast pork slices, pre-packed/deli Sweet and sour pork, ready meal, with rice
		other pork including homemade recipe dishes	Meatballs in tomato sauce Pork chop, grilled, fat not eaten Chinese dumpling
	Coated chicken and turkey manufactured	manufactured coated chicken / turkey products	Chicken goujon/nugget/dipper, in breadcrumb or batter Chicken nuggets/pieces, from takeaway e.g McNuggets Coated chicken breast fillet, grilled
	Chicken, turkey and dishes	manufactured chicken products incl ready meals	Chicken pasta bake Chicken slice, smoked or unsmoked (pre-packed/deli) Chicken chow mein, stir fry (with noodles)
		other chicken / turkey incl homemade recipe dishes	Chicken breast, fried Chicken curry home made Roast chicken (skin eaten)
	Liver, products and dishes	liver and dishes	Pate (e.g. brussels liver pate / duck and orange pate) Lambs liver, fried
	Burgers and kebabs	burgers and kebabs purchased	Beef meatballs, grilled or oven baked McDonalds Cheeseburger Beef burger, 100% beef, grilled (no bun)
	Sausages	ready meals based on sausages	Toad in the hole
		other sausages including homemade dishes	Pork sausage, grilled Hot dog/frankfurter Sausage, fried
	Meat pies and pastries	manufactured meat pies and pastries	Sausage roll Steak pie, slice from a large pie (including steak and kidney) Steak pie, individual (including steak and kidney)

		homemade meat pies and pastries	Chicken pie, slice from a large Chicken and vegetable pie, slice from a large Chicken pie, gravy based, slice from a large pie
	Other meat and meat products	other meat products manufactured incl ready meals	Pepperami or snack salami Salami Luncheon meat, not canned Haggis
		other meat including homemade recipe dishes	Corned beef hash Chinese crispy duck (including pancake and sauce) Roast duck (skin eaten)
Fish and Fish Dishes	White fish coated or fried including fish fingers	white fish coated or fried	Fish fingers, grilled or oven baked Fish fillet in breadcrumbs/batter grilled or oven baked Haddock in breadcrumb/batter, grilled or oven baked
	Other white fish, shellfish, fish dishes and canned tuna	manufactured white fish products incl ready meals	Sushi, tuna based Fish pie, toddler meal (e.g. Little Dish, Annabel Karmel)
		other white fish including homemade dishes	Cod grilled or oven baked Fisherman's pie, home made Sea bass, baked or grilled
		manufactured shellfish products incl ready meals	Crabstick / seafood stick Mixed meat/seafood paella
		other shellfish including homemade dishes	Prawns/shrimps, boiled Prawn stir fry (prawns and vegetables) Fish/seafood chowder
		manufactured canned tuna products incl ready meals	Tuna, in brine, canned Tuna, in oil, canned Tuna mayonnaise, shop-bought

		other canned tuna including homemade dishes	Tuna, in spring water, canned Tuna pasta salad Tuna mayonnaise, home made
	Oily fish	manufactured oily fish products incl ready meals	Sushi, salmon based Salmon, canned Fish sandwich paste (e.g. salmon)
		other oily fish including homemade dishes	Salmon, grilled or oven baked Salmon, cold smoked Salmon, fried
Sandwiches	Sandwiches	sandwiches	Ham sandwich with white/malted bread Cheese sandwich with white/malted bread Cheese and ham sandwich with white/malted bread
Vegetables, potatoes	Salad and other raw vegetables	carrots raw	Carrots, raw Baby carrots, raw
		salad and other raw vegetables	Cucumber Red/yellow/orange pepper, raw Side salad (e.g. including lettuce, tomato, cucumber), no dressing
		tomatoes raw	Cherry tomatoes Tomato, fresh
	Vegetables (not raw) including vegetable dishes	peas not raw	Peas, cooked from frozen Peas
		green beans not raw	Green beans/French beans Green beans/French beans, canned
		baked beans	Baked beans Baked beans, reduced sugar Baked beans on toast (with white/malted bread)
		leafy green vegetables not raw	Broccoli, boiled Broccoli, steamed/microwaved Tenderstem broccoli, cooked
		carrots not raw	Carrots Carrots, roasted Carrots, cooked from frozen
		tomatoes not raw	Passata (strained tomatoes) Tomatoes, canned Sundried tomatoes

		beans and pulses incl ready meal & homemade dishes	Houmous/hummus Lentil dahl / Tarka dahl Houmous/hummus, reduced fat
		meat alternatives incl ready meals & homemade dish	Vegetarian chicken-style nuggets/goujons, in breadcrumbs (e.g. Quorn nuggets) Vegetarian meat-style sausage (e.g. Linda McCartney), not Quorn Vegan/plant-based sausages
		other manufactured vegetable products incl rm	Vegetarian sushi Vegetable rice Guacamole
		other vegetables including homemade dishes	Sweetcorn / sweet corn, canned Sweetcorn / sweet corn, cooked Corn on the cob (sweetcorn)
	Chips, fried and roast potatoes and potato products	chips purchased including takeaway	Oven chips Chips, french fries/fine cut, fried (from frozen) Takeaway chips, fries (McDonalds Only)
		other manufactured potato products fried/baked	Potato waffles, grilled/baked Potato shapes (e.g. Alphabites, Smilies), grilled/baked Potato farl/cake
		other fried / roast potatoes incl homemade dishes	Chips, fried Roast potatoes Takeaway chips, chip shop style
	Other potatoes, potato salads and dishes	other potato products & dishes - manufactured	Gnocchi New potatoes (baby potatoes), canned Potato salad, with mayonnaise/salad cream

		other potatoes including homemade dishes	Mashed potato, with butter Baked potato / jacket potato, skin eaten Potato wedges
Fruit	Fruit	apples and pears not canned	Apple, skin eaten Apple, skin not eaten Pear, skin eaten
		citrus fruit not canned	Orange Tangerines / mandarins / clementines/ satsumas Grapefruit
		bananas	Banana Banana, baked Banana chips
		canned fruit in juice	Apple slices, canned Peaches, canned in juice Fruit cocktail, canned in juice
		canned fruit in syrup	Peaches, canned in syrup Fruit cocktail, canned in syrup Mandarins, canned in juice
		other fruit not canned	Strawberries Red grapes Blueberries / bilberries
Sugar, Preserves and Confectionery	Sugar, Preserves and Confectionery	sugar	White sugar Maple syrup Brown sugar
		preserves	Jam/conserve, berries (e.g. strawberry) Honey Jam/conserve, reduced sugar
		sweet spreads fillings and icing	Chocolate and nut spread (e.g Nutella) Chocolate spread Ice cream topping sauce (e.g. strawberry)
	Sugar confectionery	sugar confectionery	Haribo (sweets) Ice lolly, juice-based (e.g. Fruit Pastilles) Bear yoyo (pure fruit rolls)
	Chocolate confectionery	chocolate confectionery	Milk chocolate bar (e.g. Dairy Milk) Kinder chocolate bar Milk chocolate buttons
Crisps and savoury snacks	Crisps and savoury snacks	crisps and savoury snacks	Potato crisps (e.g. Walkers) Pom Bears (crisps) Baked potato crisps (e.g. Walkers)
Nuts and Seeds	Nuts and seeds	nuts and seeds	Peanut butter, smooth Peanut butter, crunchy (with bits) Peanut butter, no added sugar

Non-alcoholic beverages	Fruit Juice	fruit juice	Apple juice Orange juice, 100% fruit (e.g. Tropicana) Mixed fruit juice, 100% fruit (e.g. Tropicana)
		smoothies 100% fruit and/or juice	Red berry fruit smoothie Yellow fruit smoothie (e.g. coconut and mango) Fruit smoothie with added vitamins (e.g. Naked, super smoothie, protect/energise type)
	Tea, coffee and water	coffee	Coffee, instant Coffee, fresh Espresso coffee
		tea	Tea Decaf tea Green Tea
		herbal tea (made-up weight)	Herbal/ Fruit tea Redbush/ Red Bush/ Rooibos tea
		bottled water still or carbonated	Bottled mineral water, still or fizzy Mineral water, flavoured, no added sugar (e.g. Fruit Shoot Hydro, Volvic touch of fruit sugar free) Soda water
		tap water only	Water (from tap, including hot water, filtered water)
	Soft drinks, not diet	soft drinks low calorie concentrated	Blackcurrant squash / juice, with ADDED SUGAR, diluted Apple and blackcurrant squash / juice, with ADDED SUGAR, diluted Fruit squash / juice, with ADDED SUGAR, diluted
		soft drinks low calorie carbonated	Flavoured water, still or fizzy (with added sugar) (e.g. Volvic a touch of fruit) Coca-Cola/Coke/Pepsi Irn bru
		soft drinks low calorie rtd still	Apple juice drink, ready to drink Mixed fruit juice drink, ready to drink, 25-49% juice (e.g. Capri sun, Rubicon) Ribena juice drink, ready to drink
	Soft drinks, diet	soft drinks not low calorie concentrated	Orange squash, no added sugar, diluted Apple and blackcurrant squash, no added sugar, diluted Blackcurrant squash / juice, no added sugar, diluted
		soft drinks not low calorie carbonated	Diet Coca-Cola, e.g. Coke Zero, Pepsi Max Fanta Zero Diet irn bru

		soft drinks not low calorie rtd still	Fruit shoot Robinson's fruit shoot juiced Apple juice drink, ready to drink, no added sugar
Miscellaneous	Miscellaneous	beverages dry weight	Premixed / ready to drink spirits and cocktails, low alcohol, based on gin, rum, vodka, whisky Nesquik milkshake powder Cocoa powder
		soup manufactured/ retail	Chicken noodle soup Cream of tomato soup, canned Tomato soup (without cream), carton
		soup homemade	Lentil soup Vegetable soup Chicken and vegetable soup, homemade
		nutrition powders and drinks	Protein Shake Protein powder Soya protein powder
		savoury sauces pickles gravies & condiments	Tomato ketchup Tomato based pasta sauce, home made Gravy
Toddler foods	Toddler foods	commercial toddlers drinks	Infant and toddler fruit juice and water drink, ready to drink, with added vit C
		commercial toddlers foods	Toddler cereal bar (e.g. Organix carrot cake cereal bar) Pure fruit puree, ready to eat pot or pouch Baby biscuits/biscotti (e.g. Organix goodies, Heinz biscotti)
Milk and Milk Products (dairy-free)	Other milk and cream DF	other milk and cream DF	Soya-based toddler/ growing up milk (1-3 years), e.g. Alpro Junior Non dairy cream alternative (e.g. Alpro soya) Oat milk
	Cheese DF	cheese DF	Vegan, dairy free cheese, coconut based
	Yoghurt, fromage frais and other dairy desserts DF	yoghurt, fromage frais and other dairy desserts DF	Soya yoghurt, plain (e.g. Alpro Soya) Soya yoghurt, with fruit (e.g. Alpro Soya) Coconut-based yoghurt, Greek style, e.g.Oykos dairy free, Alpro
	Ice cream DF	ice cream DF	Dairy free ice cream Dairy free / vegan ice cream, oat/nut/coconut-based (e.g. Ben & Jerry's)

Table 13. Summary of main food groups included in food categories ‘meat and meat products’ and ‘milk and milk products’.		
Food category	**Main food groups**	**Food items**
Meat and meat products	Bacon and ham (code=22)	All
	Beef, veal and dishes (code=23)	All
	Lamb and dishes (code=24)	All
	Pork and dishes (code=25)	All
	Coated chicken and turkey manufactured (code=26)	All
	Chicken and turkey dishes (code=27)	All
	Liver, products and dishes (code=28)	All
	Burgers and kebabs (code=29)	All
	Sausages (code=30)	All
	Meat pies and pastries (code=31)	All
	Other meat and meat products (code=32)	All
Milk and milk products	Whole milk (code=10)	All
	Semi-skimmed milk (code=11)	All
	Skimmed milk (code=12)	All
	Other milk and cream (code=13)	All except dairy-free
	Cheese (code=14)	All except dairy-free
	Yoghurt, fromage frais and other dairy desserts (code=15)	All except dairy-free
	Butter (code=17)	All
	Ice cream (code=53)	All except dairy-free
	1% Milk (code=60)	All
	Tea, coffee and water (code=51)	All those containing the words ‘cappuccino’, ‘latte’, ‘flat white’, or ‘mocha’

The set of food items from the NDB 2022 that corresponded to each DISH food code were identified to include the environmental impact data of these items. There were 12 food codes in the DISH survey data that did not correspond to a food code in the NDB 2022. Of these, six items had the same item description with a different food code and were therefore matched based on the item description (**Table 14**). Of the remaining six items, NDB items with a similar food description were matched to these six DISH items to obtain estimates for both environmental impact and disaggregated dairy data (**Table 15**). In instances where the food code in DISH corresponded to multiple items in the NDB, the associated environmental impact was estimated by taking the average of each item with a duplicate food code. After merging the NDB environmental impact data with the DISH item level, there were 17 unique items that did not have data on greenhouse gas emissions (**Table 16**). These items were reported in 148 instances corresponding to 0.2% of the total items reported. Finally, as the impact per gram of beverage items that require additional water corresponded to the gram weight of the commodity without water (e.g., ground coffee), while the gram weight of the drink item reported in DISH corresponds to the weight of the drink including water (e.g., a cup of coffee), we applied several conversion factors to each relevant beverage item in order to not overestimate the impact of these items.

Table 14. Food items reported in DISH that share an item description with NDB 2022 but have a different food code.		
DISH food code (NutrientTableCode)	DISH description (Description_English)	NDB 2022 food code
11612	Spanish omelette / frittata	6172
11610	Tomato soup (without cream), carton	7927
11608	Vegetable pasta salad	9099
11588	Dairy free / vegan ice cream, oat/nut/coconut-based (e.g. Ben and Jerry's)	9053
11613	Vegetarian mince chilli (e.g. Quorn)	6323
11614	Horlicks/Ovaltine, made with milk	10724

Table 15. Food items in DISH that share neither an item description or a food code with items in the NDB 2022 which have been matched to other NDB items.			
DISH food code (NutrientTableCode)	DISH description (Description_English)	Matched NDB 2022 item description	Matched NDB Food code
6171	Vegetarian bolognese sauce, made with lentils	Vegetarian bolognese sauce (e.g. made with Quorn mince)	9180
5466	Meatballs in tomato sauce, e.g. chicken/turkey	Meatballs in tomato sauce	11522
8286	Vegetable curry, ready meal, with rice (e.g balti, tikka masala)	Vegetable curry	1943
11611	Vegetarian bolognese sauce, made with vegetables only	Vegetarian bolognese sauce (e.g. made with Quorn mince)	9180
11609	Vegetable pasta bake (with cheese)	Pasta with vegetables in a cream/cheese-based sauce	6139
2260	Sesame Snaps	Savoury cracker (e.g. Sesame and poppy thins, butter puffs, onion crackers)	10062

Table 16. Items consumed in the DISH survey that did not have data on greenhouse gas emissions following the process of merging foodDB with NDB 2022.
Cook-in-sauce, chilli with pulses (e.g. Uncle Bens)
Egg curry
Finecut salad (e.g. including lettuce, pepper, carrot, sweetcorn, cabbage type) with a cream-based/mayonnaise type dressing
Pure fruit puree, (4mth+), ready to eat pot or pouch
KFC tower burger
Pea and cheese curry (e.g. matar paneer)
Toddler cereal bar (e.g. Organix carrot cake cereal bar, Kiddylicious crispy sticks)
Toddler corn snacks (e.g. organix carrot sticks and tomato stars)
Vegetarian sausage, cheese based
Boiled egg, white only
Boiled egg, yolk only
Chewing gum, sugar free
Naan bread, kheema
Mixed nuts, unsalted
Turmeric
Chicken curry, ready meal, with rice, reduced fat

Each meat containing item was assigned one meat ingredient per meat food type that it contained. Meat ingredients were defined as all items where the gram weight of the item was equal to the gram weight of the associated meat type. The mapping between meat containing items and the associated meat ingredient was the same as that used in Jaacks et al. which was based on the description of the item in SHeS 2021 (7). As some meat item descriptions differed between SHeS and DISH, we converted each item description in the mapping to the associated food code in DISH of the item in DISH. If the food code was not available in DISH then we used the associated food code in SHeS to convert the meat ingredient mapping to food codes. The nutrients per gram of each meat ingredient were then assigned based on food code. For example, the item in the original meat ingredient mapping “Lamb tikka masala” did not exist in DISH, but its food code 5592 corresponds to the DISH item “Lamb curry, homemade”. The lamb ingredient assigned to “Lamb tikka masala” in the original mapping was “Stewing lamb, stewed” with food code 1003. We therefore set the lamb ingredient in the

DISH item “Lamb curry, homemade” to be “Stewing lamb, stewed”. In addition, five non-composite meat ingredients in SHeS were considered as composite ingredients in DISH. Each of these composite items was matched to a non-composite meat item to be the associated meat ingredient as per the other non-composite meat items. The non-composite meat items associated with these five items are provided in **Table 17**.

Table 17. Summary of the mapping between composite items in DISH that were not considered composite items in SHeS and their associated non-composite meat ingredients.

Composite item description in DISH and the food code	Non composite item description and food code
“Sausage, fried”, “Square/Lorne sausage”, 1279	“Pork sausage, grilled”, 11529
“Beef sirloin steak, fried”, 9425	“Beef sirloin steak, grilled”, 9427
“Bacon, smoked, fried (including fat)”, 8246	“Bacon, back/middle, smoked, grilled (including fat)”, 8238
“Bacon, unsmoked, fried (including fat)”, 909	“Bacon, back/middle, unsmoked, grilled (including fat)”, 914
“Tandoori chicken”, 1123	“Roast/grilled chicken breast (skin not eaten)”, 5127

As the environmental impact dataset was created based on the NDB 2022 but the dairy disaggregation was performed using the Food Standard’s Agency’s recipe database (16), there were some dairy ingredient food codes without environmental impact data. The environmental impact of these dairy ingredients were matched to closely matched dairy ingredients. For example, the dairy ingredient “MILK SKIMMED AFTER BOILING” with food code 700 was assigned to have the same environmental impact per gram as “Skimmed milk”. A summary of these matches is provided in **Table 18**.

Table 18. Summary of the mapping between dairy ingredients from the FSA recipe database without environmental impact data and items from the NDB 2022 with environmental impact data.	
Food code and food name from the FSA recipe database	Matched dairy food ingredient in the NDB 2022
613, MILK SKIMMED PASTEURISED SUMMER	Skimmed milk
8544, MILK SKIMMED PASTEURISED WINTER	Skimmed milk
616, MILK SKIMMED UHT	Skimmed milk
700, MILK SKIMMED AFTER BOILING	Skimmed milk
10251, ONE PERCENT (1%) MILK, PASTEURISED	Skimmed milk
608, MILK SEMI-SKIMMED PASTEURISED SUMMER	Semi skimmed milk
8543, MILK SEMI-SKIMMED PASTEURISED WINTER	Semi skimmed milk
602, MILK WHOLE SUMMER PASTEURISED	Whole milk
603, MILK WHOLE PASTEURISED WINTER	Whole milk
604, MILK WHOLE STERILISED	Whole milk
605, MILK WHOLE UHT	Whole milk
7738, FROMAGE FRAIS, VIRTUALLY FAT FREE, NATURAL, UNSWEET	Natural fromage frais, fat free, sugar free
7112, CHEESE SOFT MEDIUM FAT	Soft cheese, full-fat (e.g. Philadelphia); Soft cheese, reduced fat (e.g. Philadelphia Light/Extra Light)
659, CHEESE CHEDDAR LOW FAT	Reduced fat hard cheese (e.g. Cheddar/Cheshire)
10977, FROMAGE FRAIS, LOW FAT, NATURAL, UNSWEETENED E.G. PETIT FILOUS	Petits Filous fromage frais
7727, CHEESE EDAM REDUCED FAT	Edam cheese
654, CHEESE CHEDDAR ENGLISH	Cheddar cheese
688, CHEESE CREAM FULLFAT	Double Gloucester cheese; Cheddar cheese
7735, FROMAGE FRAIS, FULL FAT, NATURAL, UNSWEETENED	Natural fromage frais, sugar free
639, CREAM SINGLE FROZEN	Single cream
640, CREAM SINGLE UHT	Single cream
645, CREAM WHIPPING FROZEN	Whipped cream
646, CREAM WHIPPING UHT	Whipped cream

Annexe 2. Replacement foods

Figure 18. Distribution of food items that made up pulses and legumes replacement.

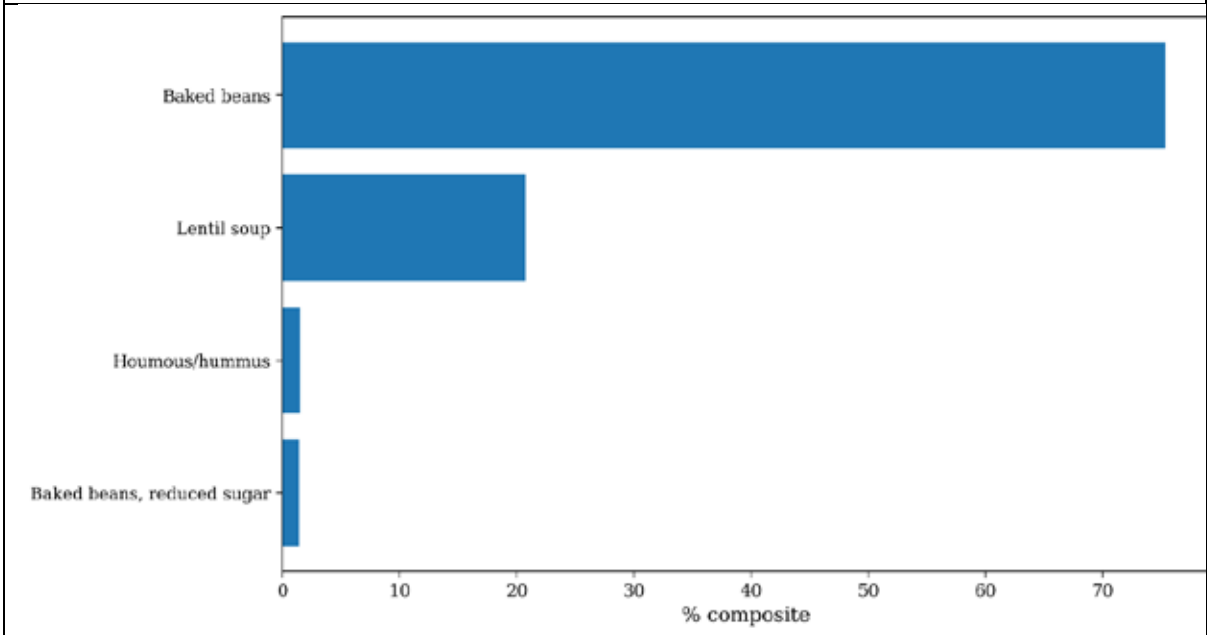


Figure 19. Distribution of food items that made up vegetables replacement.

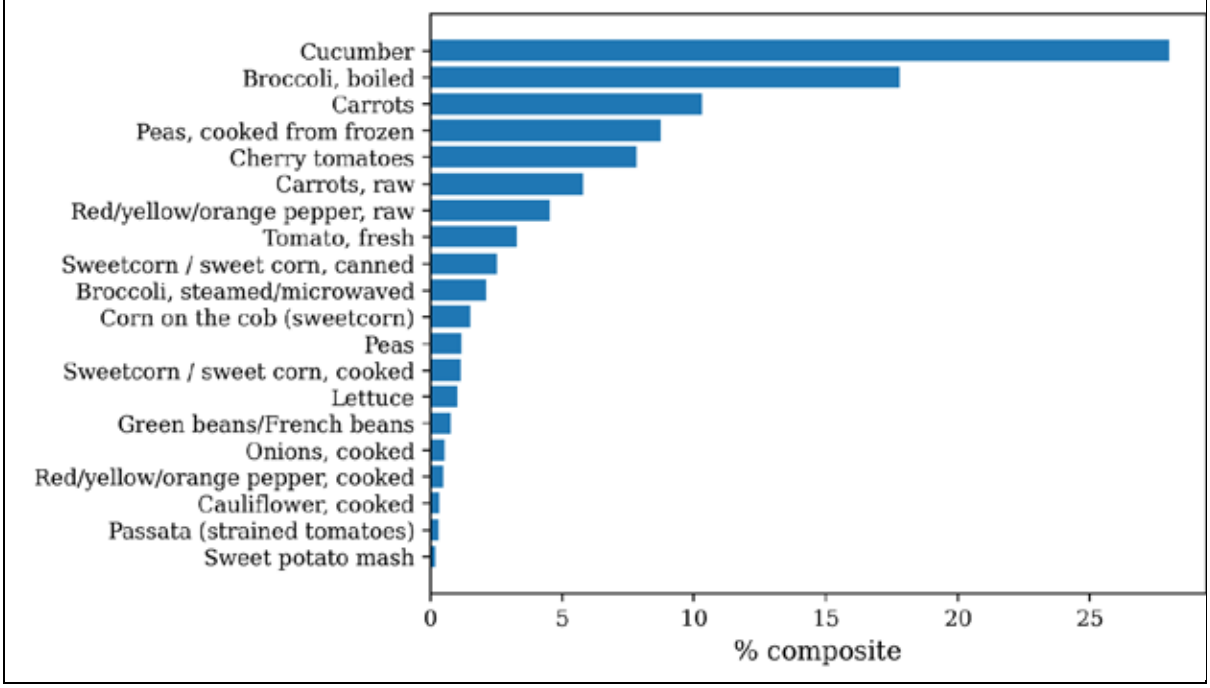


Figure 20. Distribution of food items that made up eggs replacement.

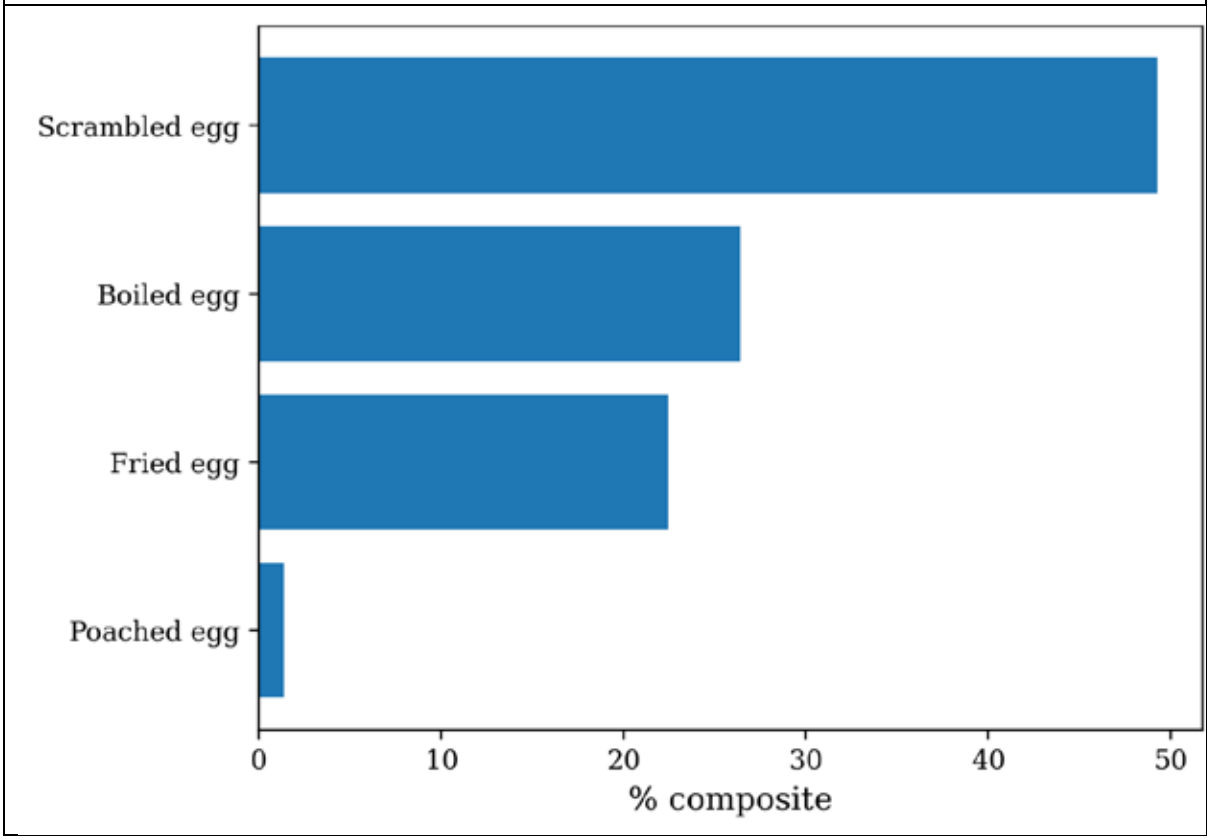


Figure 21. Distribution of food items that made up oily fish replacement.

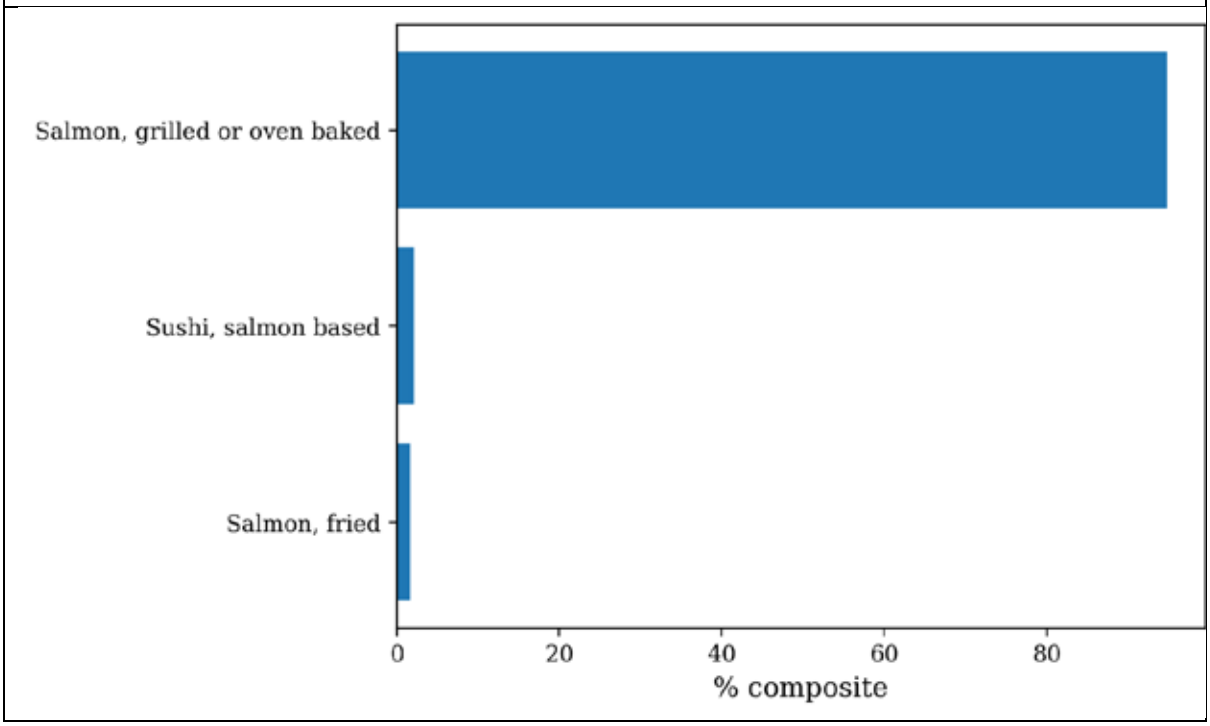
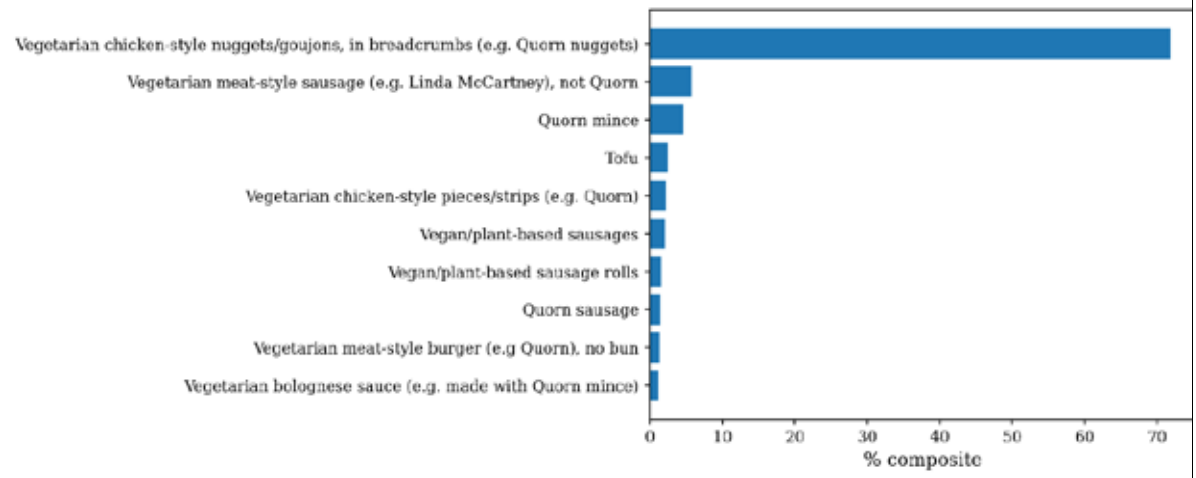


Figure 22. Distribution of food items that made up plant-based meat alternatives replacement.



All items with the FoodGroupCode = 115 were considered in the composition of the plant-based meat alternative replacement, except the item 'Vegetarian sausage, cheese based' as including this item would not meet the dairy reduction targets in the simulated scenario.

Figure 23. Distribution of food items that made up plant-based milks replacement.

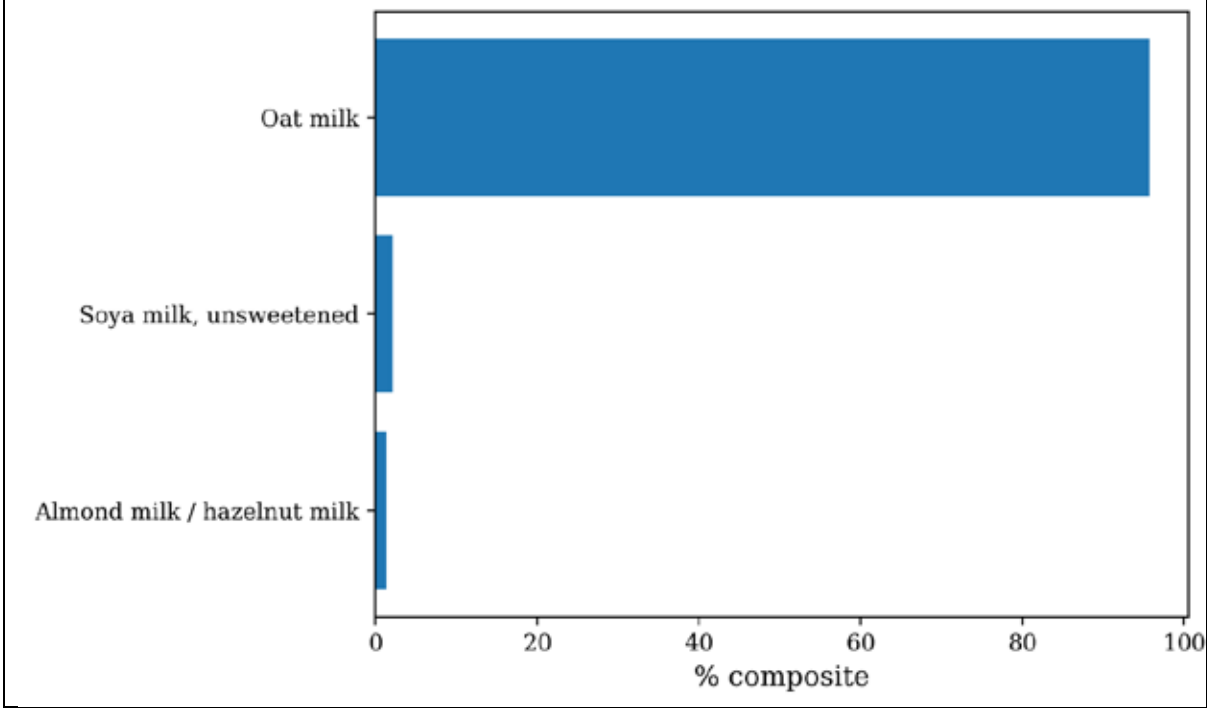
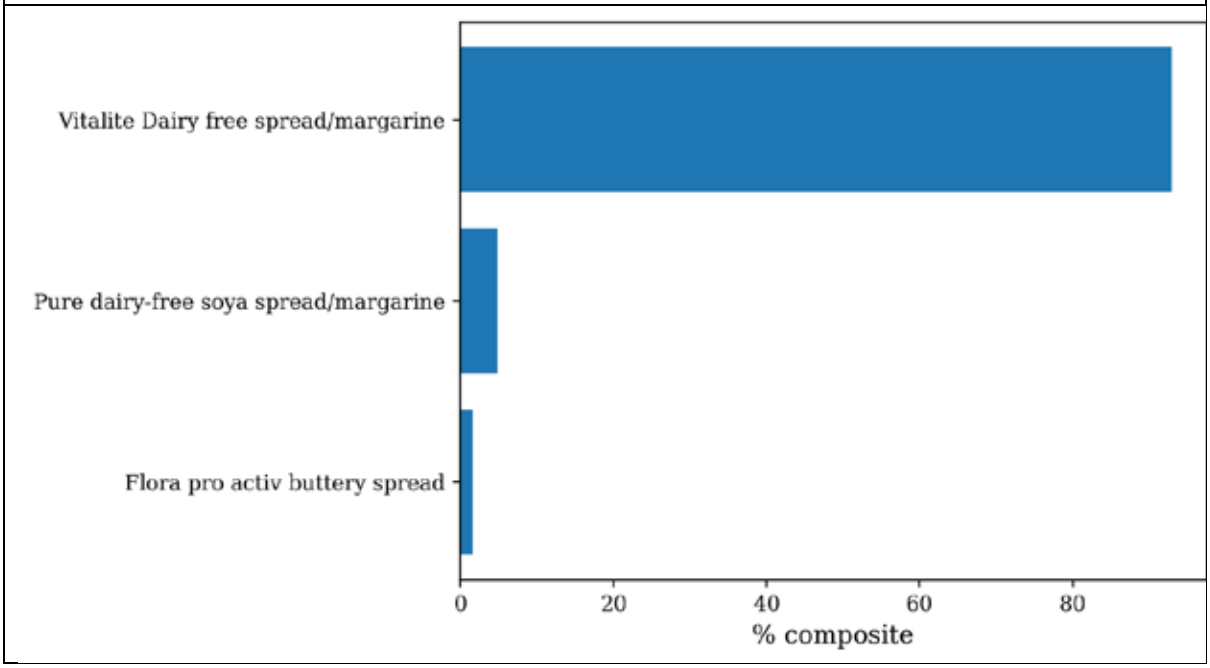


Figure 24. Distribution of food items that made up plant-based butter replacement.



Annexe 3. Note on comparing simulation results to other DISH analyses

Because the simulation used in this report is run using item-level nutrient and food composition (i.e., meat and dairy content) information, whereas the multiple source method is run at the participant level, none of the simulation results adjust for usual intake.

Moreover, because the simulation calculates the impact of each substitution at the level of average daily intake, all Scottish Dietary Goal calculations that involved taking a proportion were performed by taking the proportion of the average daily intake rather than the average of the proportions on each day of recall separately.

For these reasons, 'baseline' values may not be directly comparable to previous analyses of DISH wherein the multiple source method was used. This method did not result in substantially different values and so conclusions are not affected by these differences in approach.

Table 19 summarises which analyses in the report were adjusted for usual intake.

Table 19. Summary of analyses adjusted for usual intake using the multiple source method.

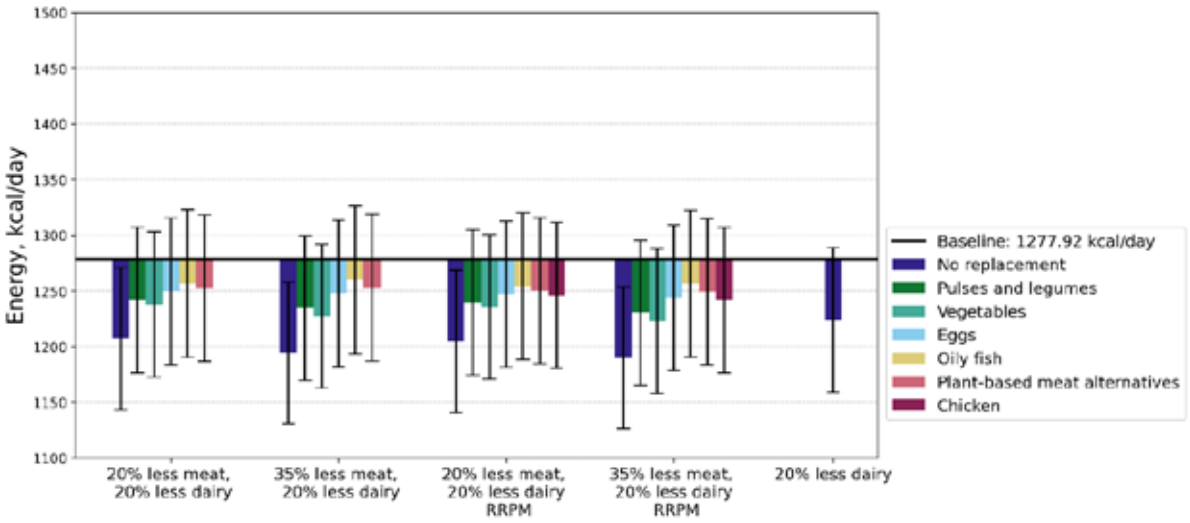
Section	Analysis	Adjusted for Usual Intake?
2.2 Meat Consumption	2.2.1 Meat consumers Figure 1	No
	2.2.1 Average meat consumption (g/day) Figure 2	Yes
	2.2.2 Contribution of animal types to average daily meat consumption Figure 3	No
	2.2.3 Contribution of main food groups to meat consumption (g/day) Annexe tables 1	No
	2.2.3 Contribution of sub food groups and items to meat consumption (g/day) Table 2	No
	2.2.4 RRPM mean intakes (g/day)	Yes
	2.2.4 RRPM meal occasions Figure 4	No
	2.2.4 RRPM purchase location	No
	2.2.4 RRPM day of week	No
2.3 Dairy Consumption	2.3.1 Mean dairy intake (g/day) Figure 6	Yes
	2.3.1 Contribution from dairy subtypes Figure 7	Yes

	2.3.2 Contribution of food groups to dairy consumption (g/day) Annexe tables 2	No
2.4 Contribution of meat and meat products and milk and milk products to nutrient intake	Figure 8 and Figure 9	No
Chapters 4-6: Simulation Scenarios	All simulation scenarios and results	No

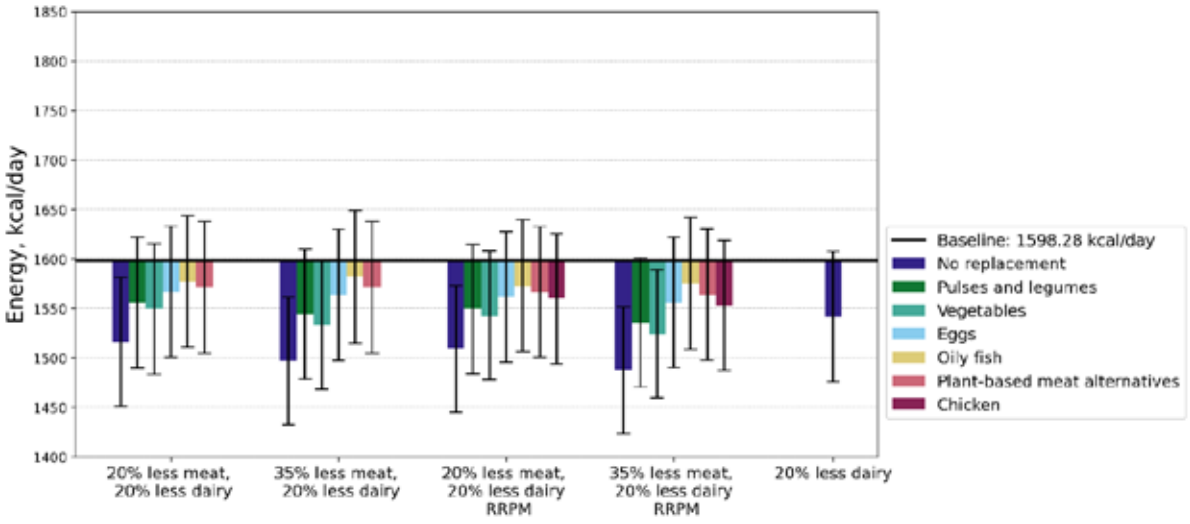
Annexe 4. Simulation Results: Energy and Nutrient Intake, Figures

Figure 25. Impact of reducing meat and dairy on energy intake (kcal/day) by age group among children and young people aged 2 to 15 years living in Scotland, 2024.

2-4 years



5-10 years



11-15 years

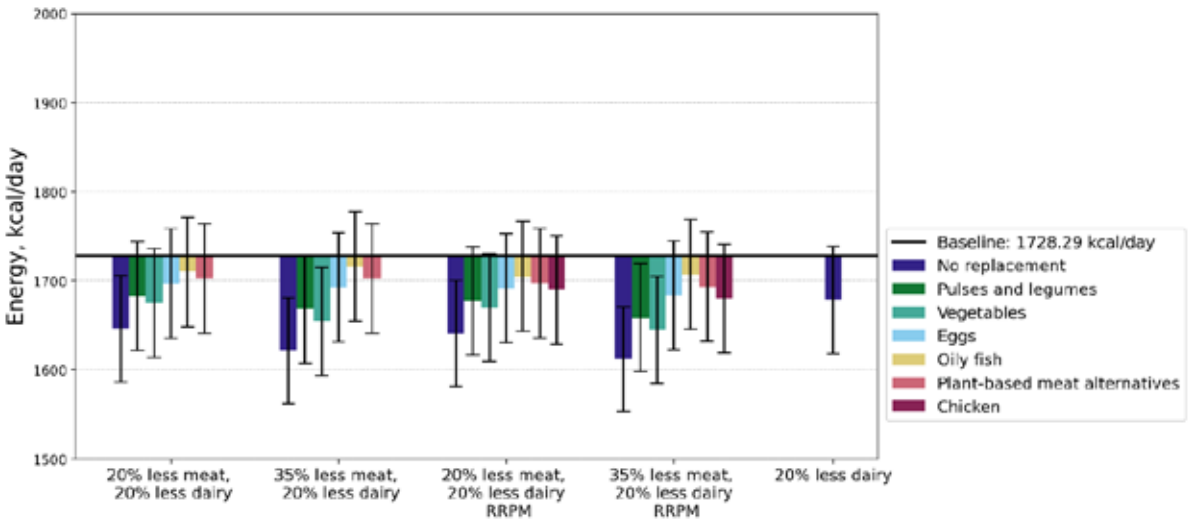
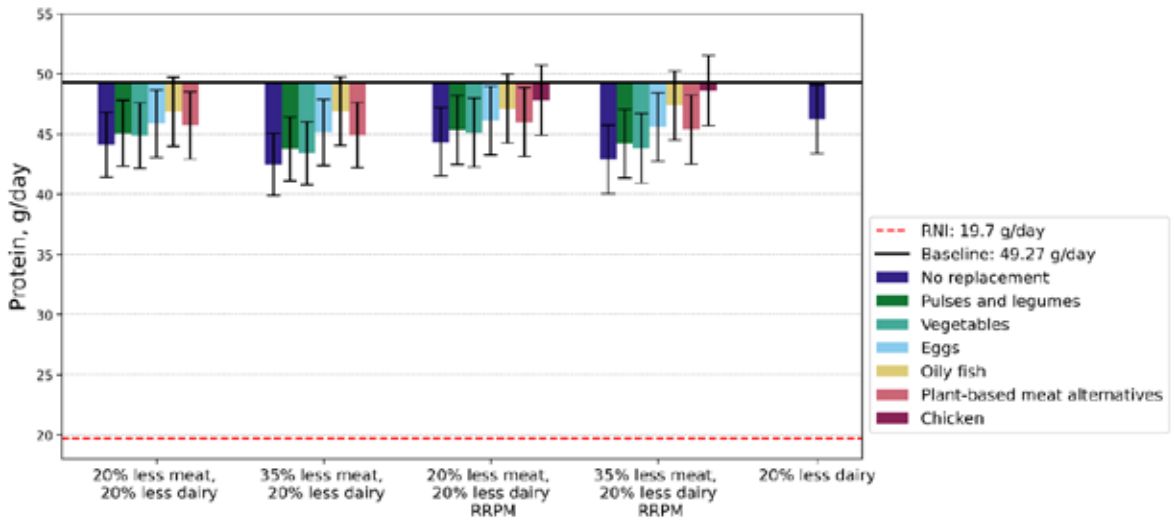
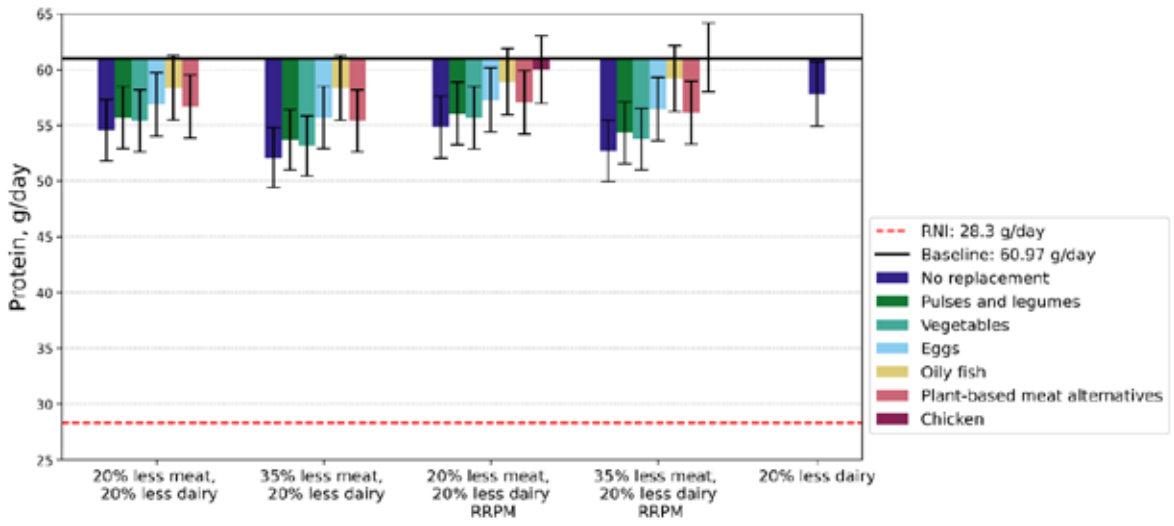

2000
1900
1800
1700
1600
1500
Energy, kcal/day
20% less meat, 20% less dairy
35% less meat, 20% less dairy
20% less meat, 20% less dairy RRPM
35% less meat, 20% less dairy RRPM
20% less dairy
Baseline: 1728.29 kcal/day
No replacement
Pulses and legumes
Vegetables
Eggs
Oily fish
Plant-based meat alternatives
Chicken

Figure 26. Impact of reducing meat and dairy on protein intake (g/day) by age group among children and young people aged 2 to 15 years living in Scotland, 2024. RNI values correspond to the highest value in each age group.

2-4 years



5-10 years



11-15 years

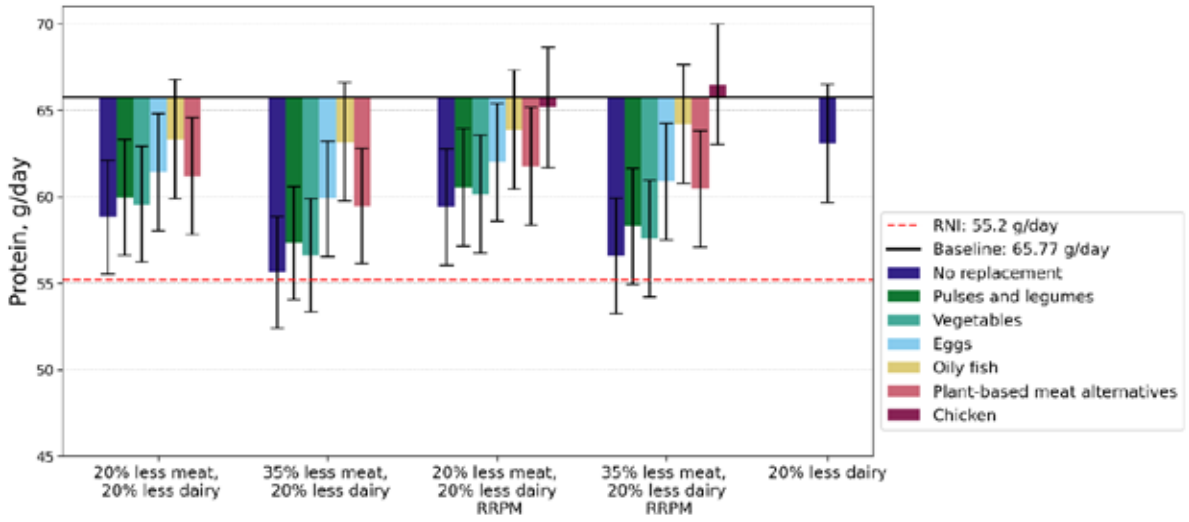
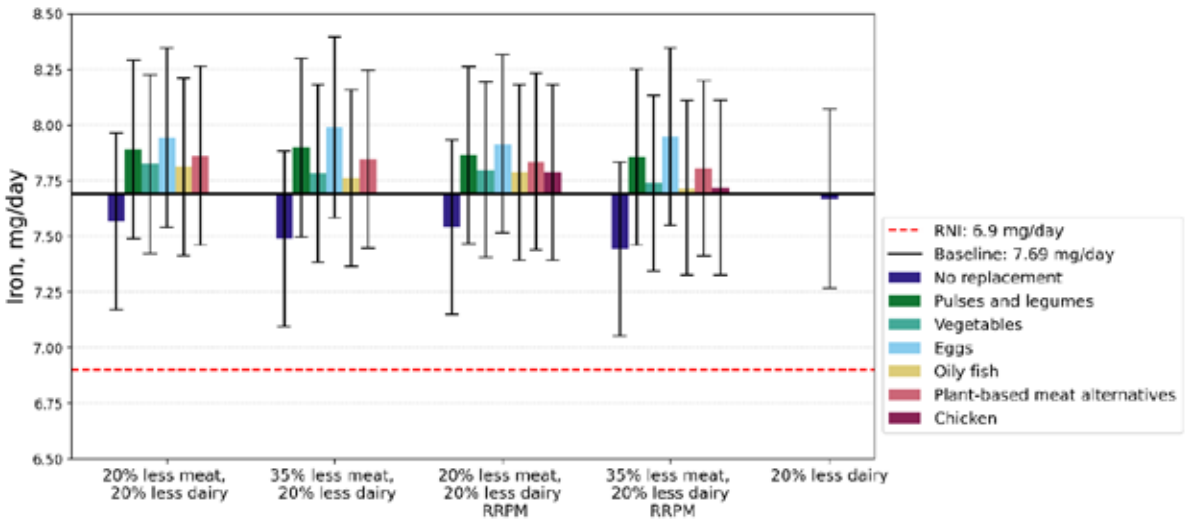
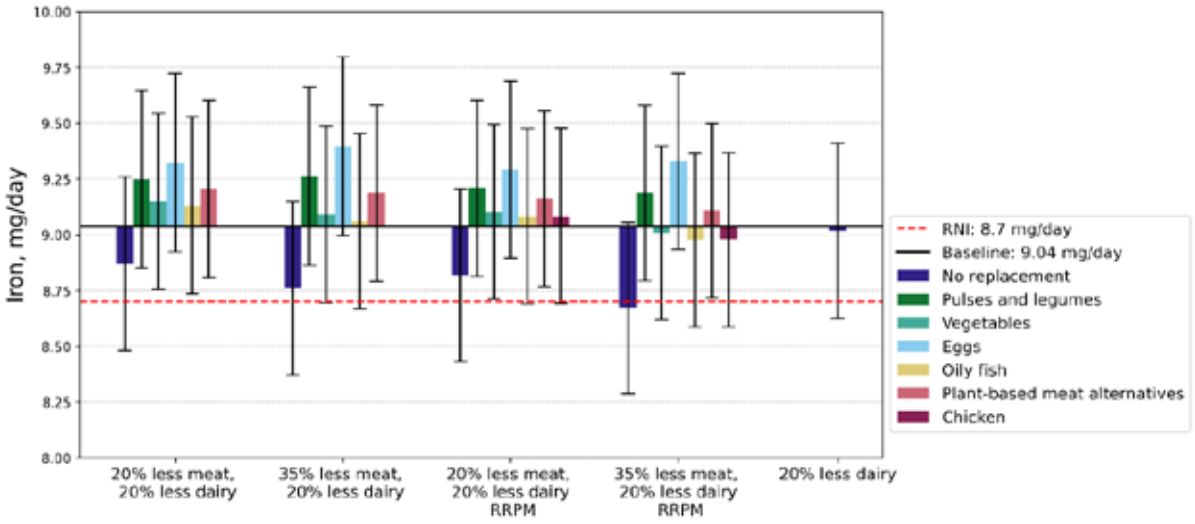

Protein, g/day
70
65
60
55
50
45
20% less meat, 20% less dairy
35% less meat, 20% less dairy
20% less meat, 20% less dairy RRPM
35% less meat, 20% less dairy RRPM
20% less dairy
RNI: 55.2 g/day
Baseline: 65.77 g/day
No replacement
Pulses and legumes
Vegetables
Eggs
Oily fish
Plant-based meat alternatives
Chicken

Figure 27. Impact of reducing meat and dairy on iron intake (mg/day) by age group among children and young people aged 2 to 15 years living in Scotland, 2024. RNI values correspond to the highest value in each age group.

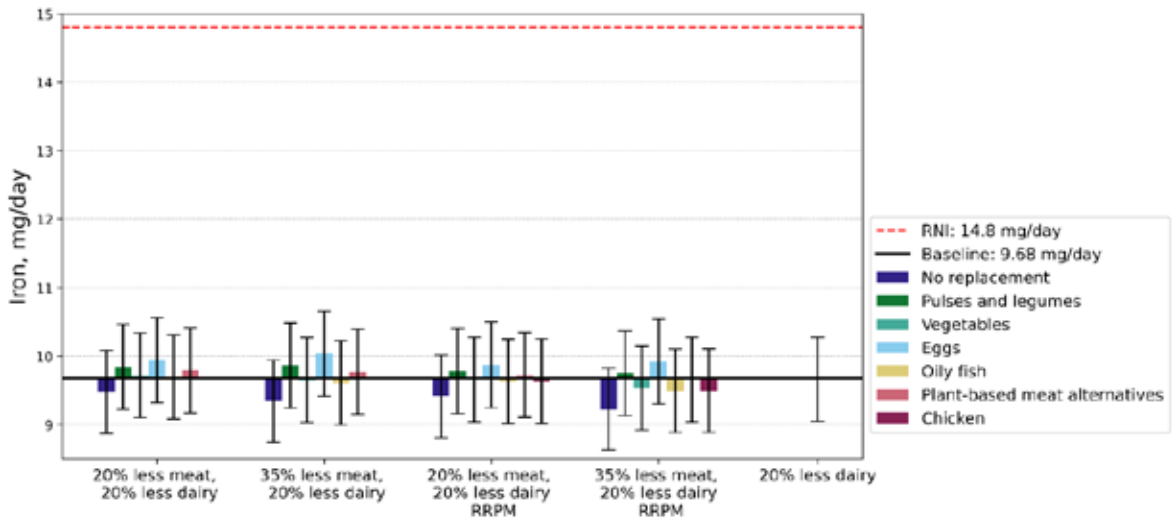
2-4 years



5-10 years



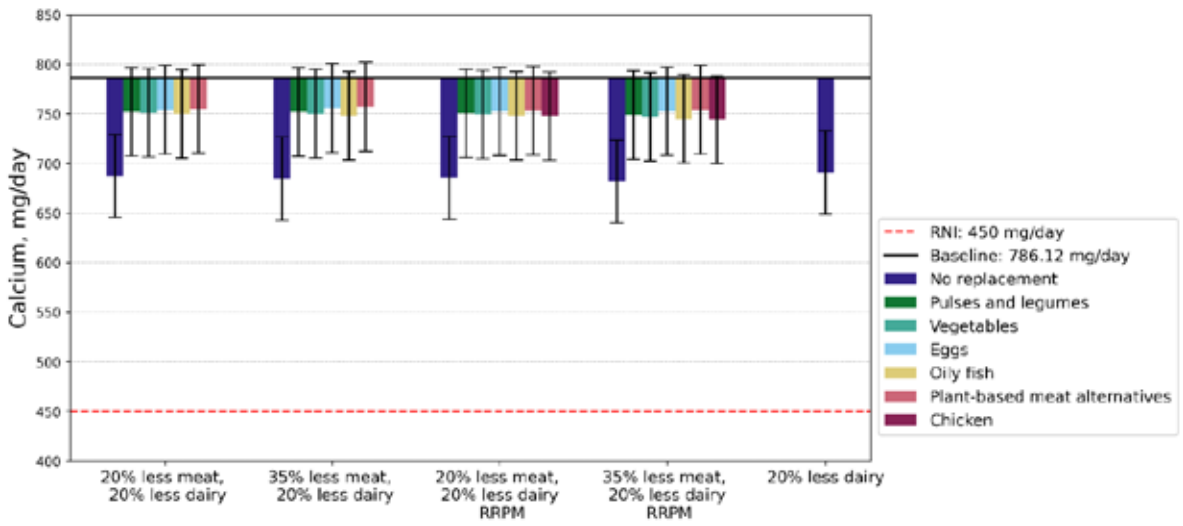
11-15 years*



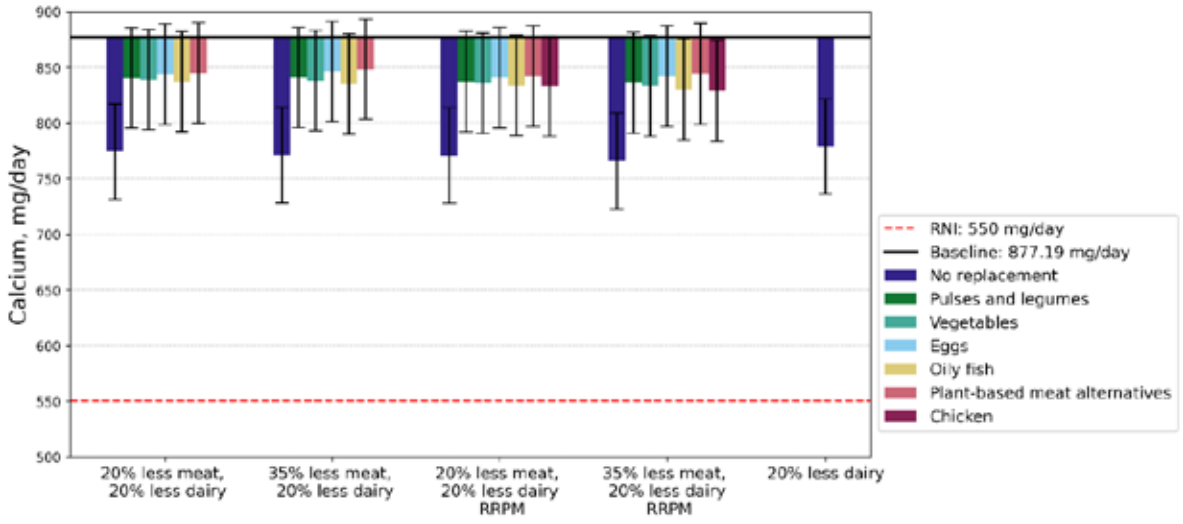
*Note: the RNI shown in the figure is for females. The RNI for males 11-15 years is 11.3 mg/day.

Figure 28. Impact of reducing meat and dairy on calcium intake (mg/day) by age group among children and young people aged 2 to 15 years living in Scotland, 2024. RNI values correspond to the highest value in each age group.

2-4 years



5-10 years



11 to 15 years

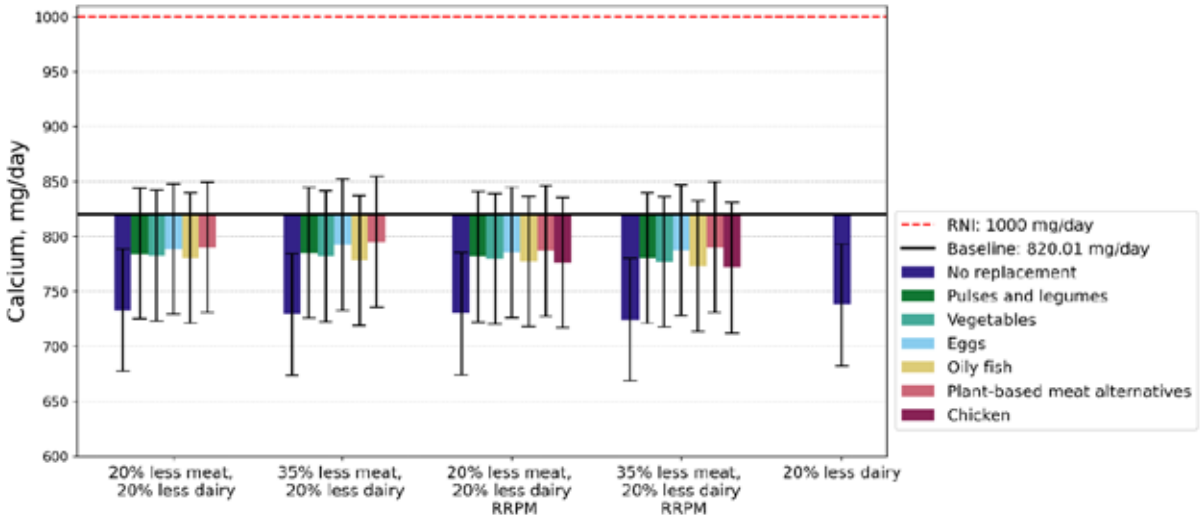
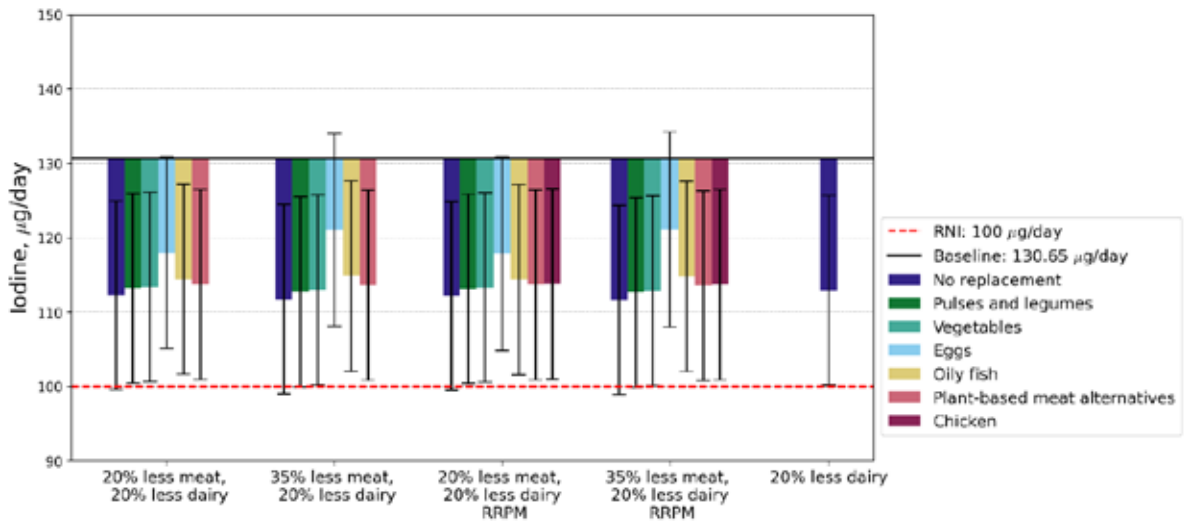
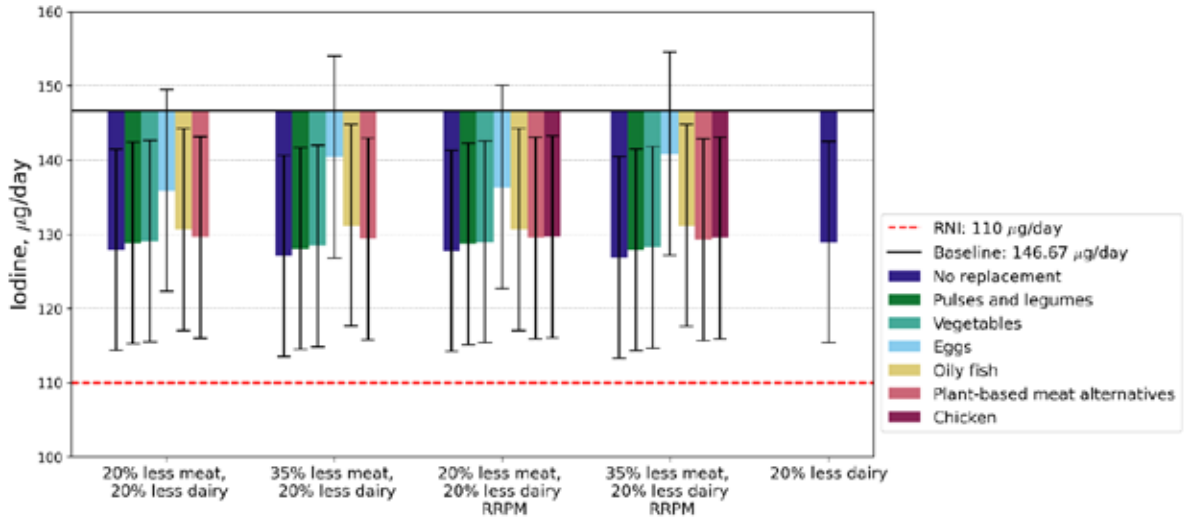


Figure 29. Impact of reducing meat and dairy on iodine intake (µg/day) by age group among children and young people aged 2 to 15 years living in Scotland, 2024. RNI values correspond to the highest value in each age group.

2 to 4 years



5 to 10 years



11 to 15 years

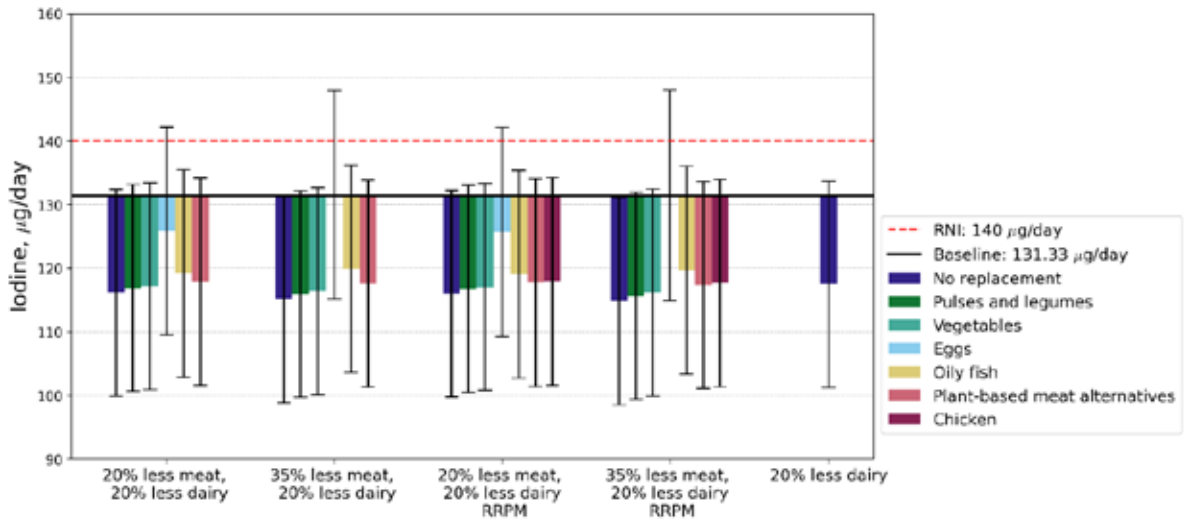
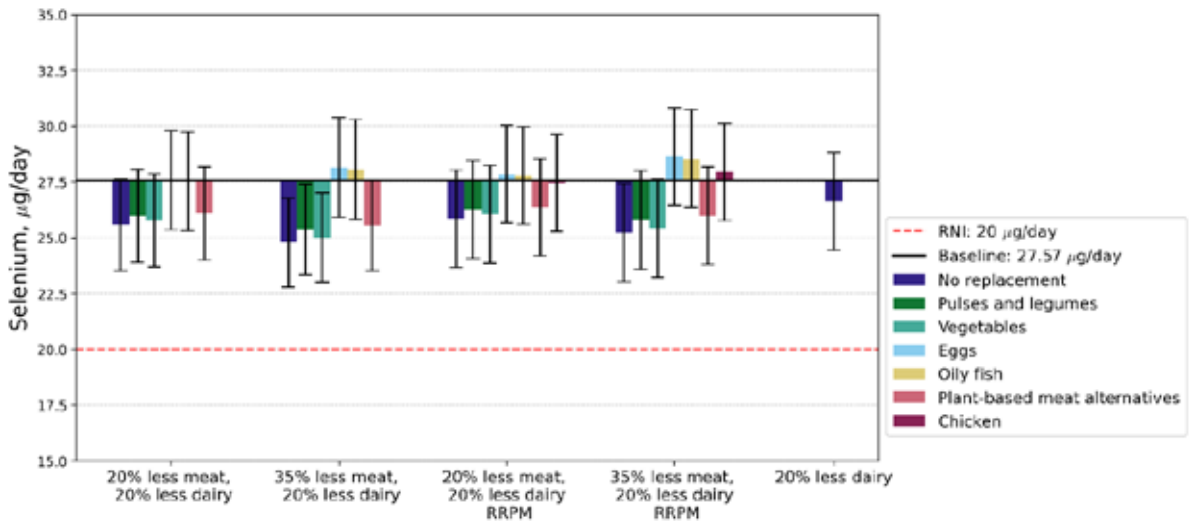
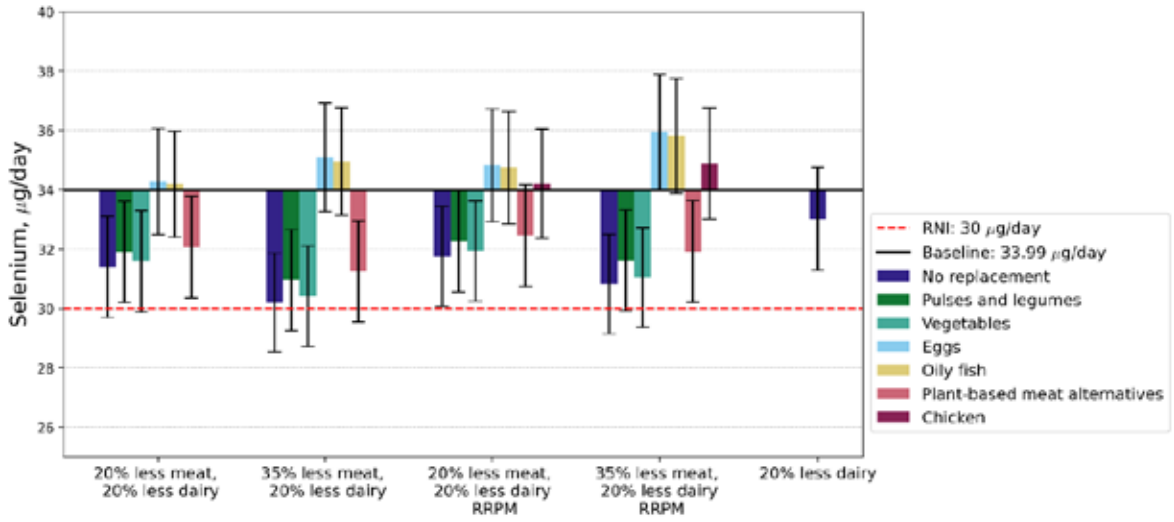


Figure 30. Impact of reducing meat and dairy on selenium intake (µg/day) by age group among children and young people aged 2 to 15 years living in Scotland, 2024. RNI values correspond to the highest value in each age group.

2 to 4 years



5 to 10 years



11 to 15 years

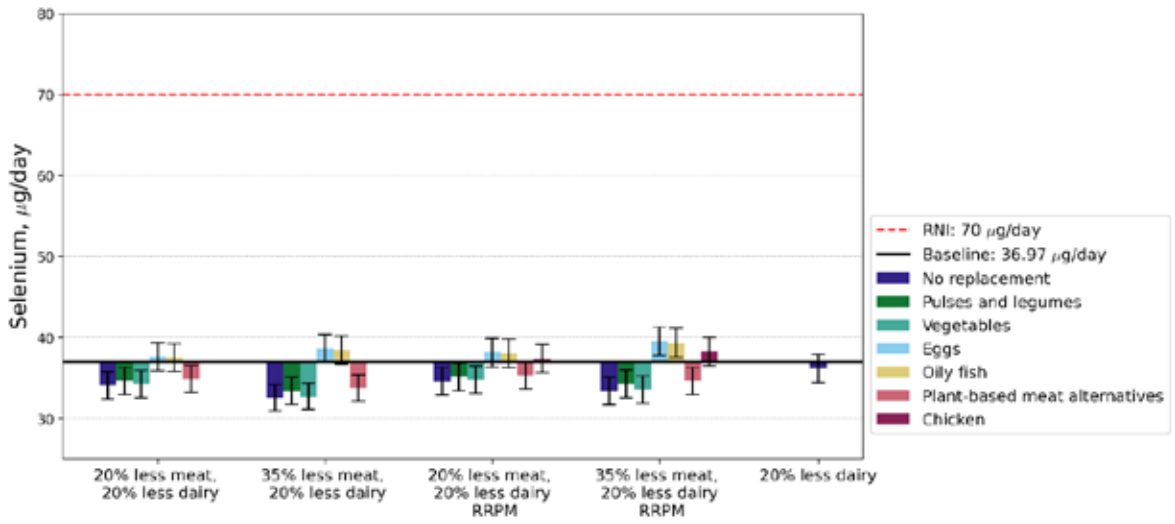
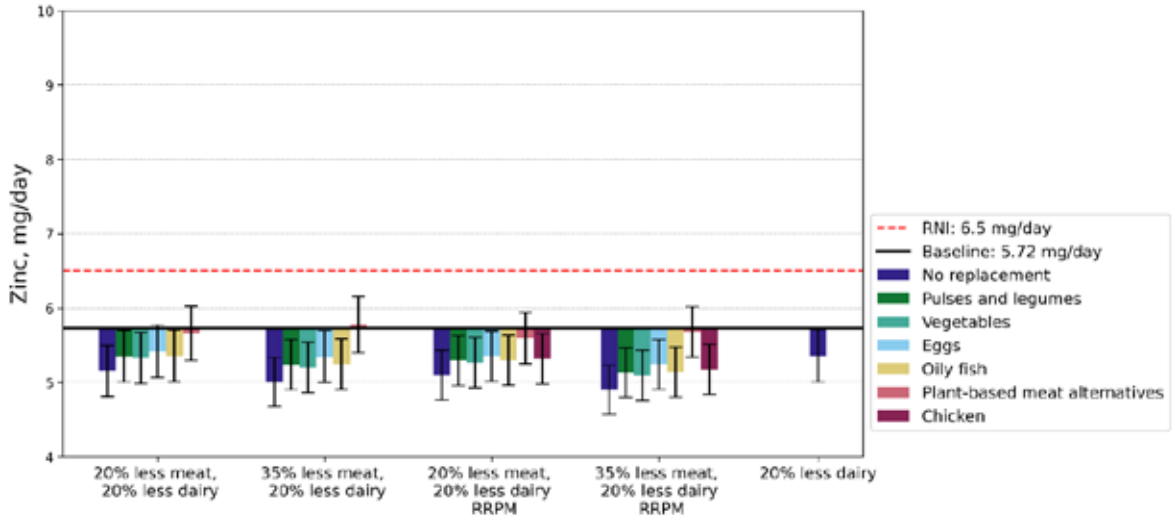
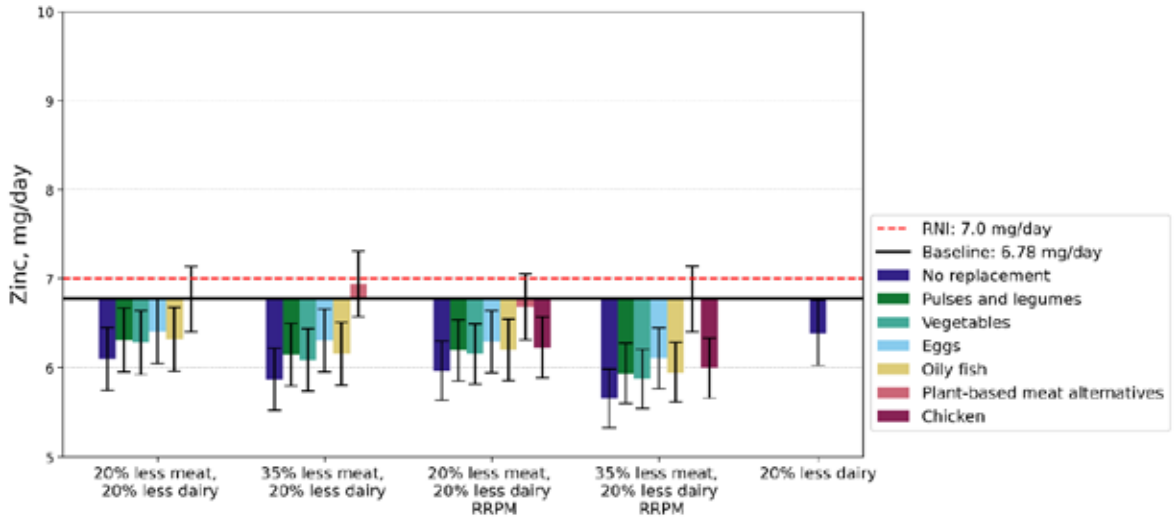


Figure 31. Impact of reducing meat and dairy on zinc intake (mg/day) by age group among children and young people aged 2 to 15 years living in Scotland, 2024. RNI values correspond to the highest value in each age group.

2 to 4 years



5 to 10 years



11 to 15 years

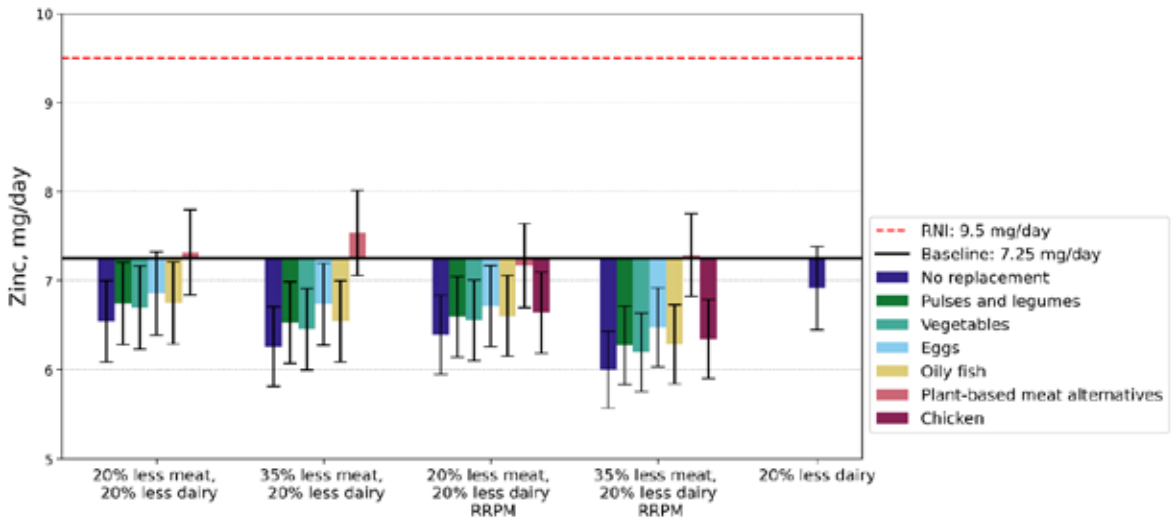
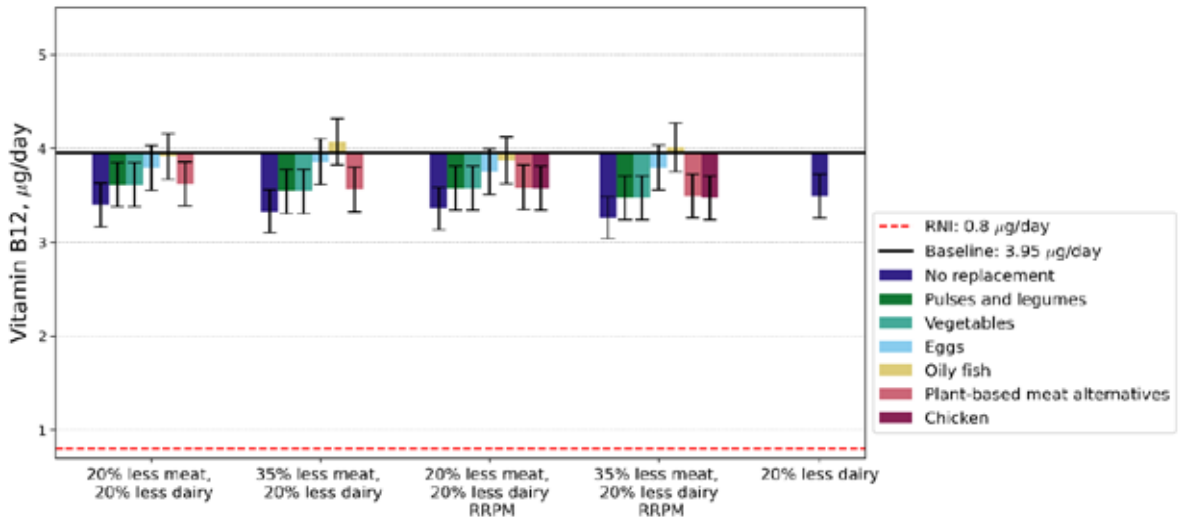
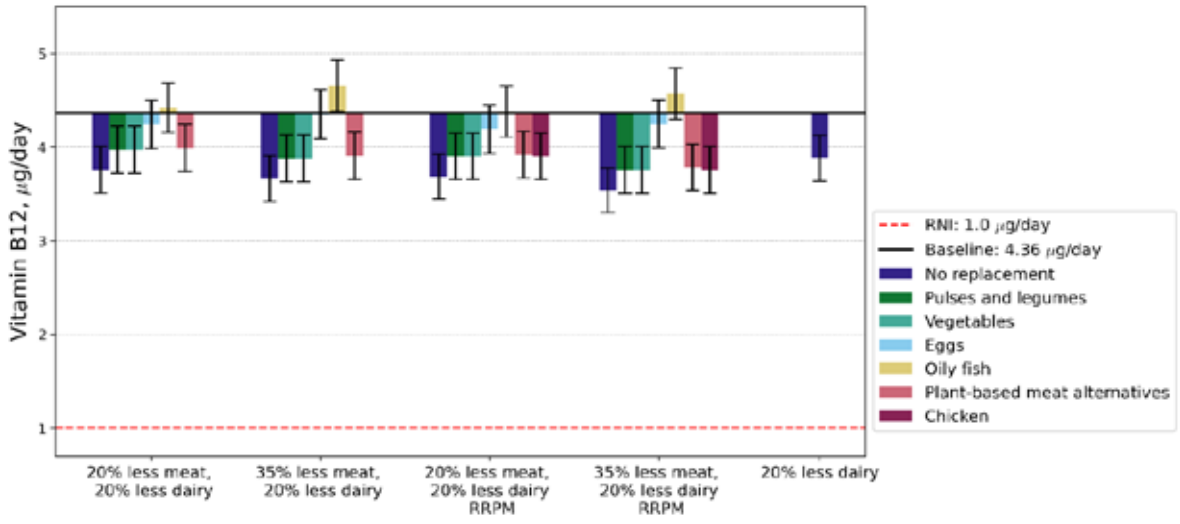


Figure 32. Impact of reducing meat and dairy on vitamin B_{12} intake (µg/day) by age group among children and young people aged 2 to 15 years living in Scotland, 2024. RNI values correspond to the highest value in each age group.

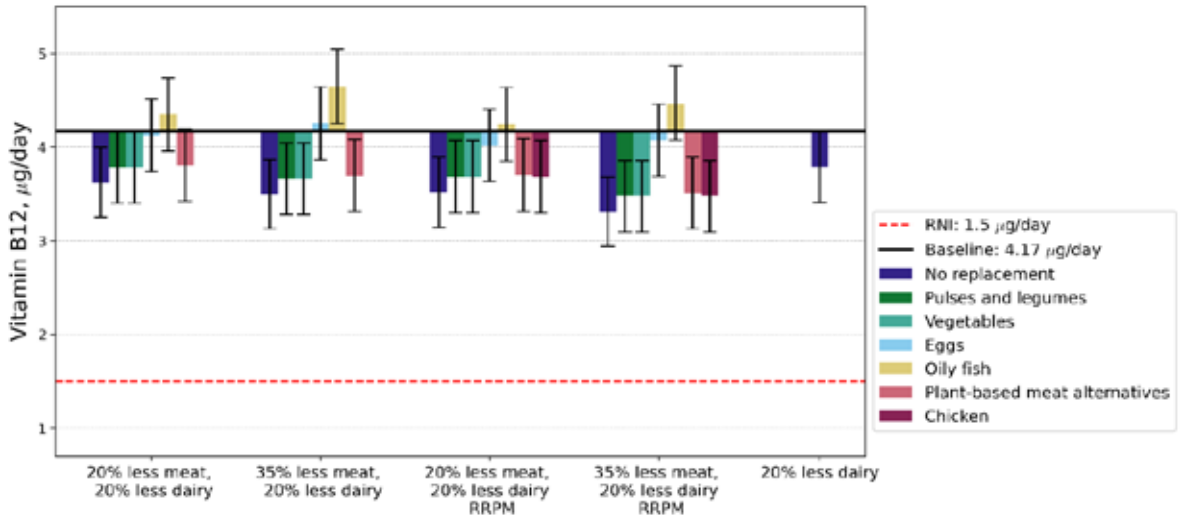
2 to 4 years



5 to 10 years



11 to 15 years



Annexe 5. Simulation Results: Scottish Dietary Goals, Figures

Figure 33. Impact of reducing meat and dairy on the percentage of children and young people aged 2 to 15 years living in Scotland (2024) meeting the Scottish Dietary Goal for energy density.

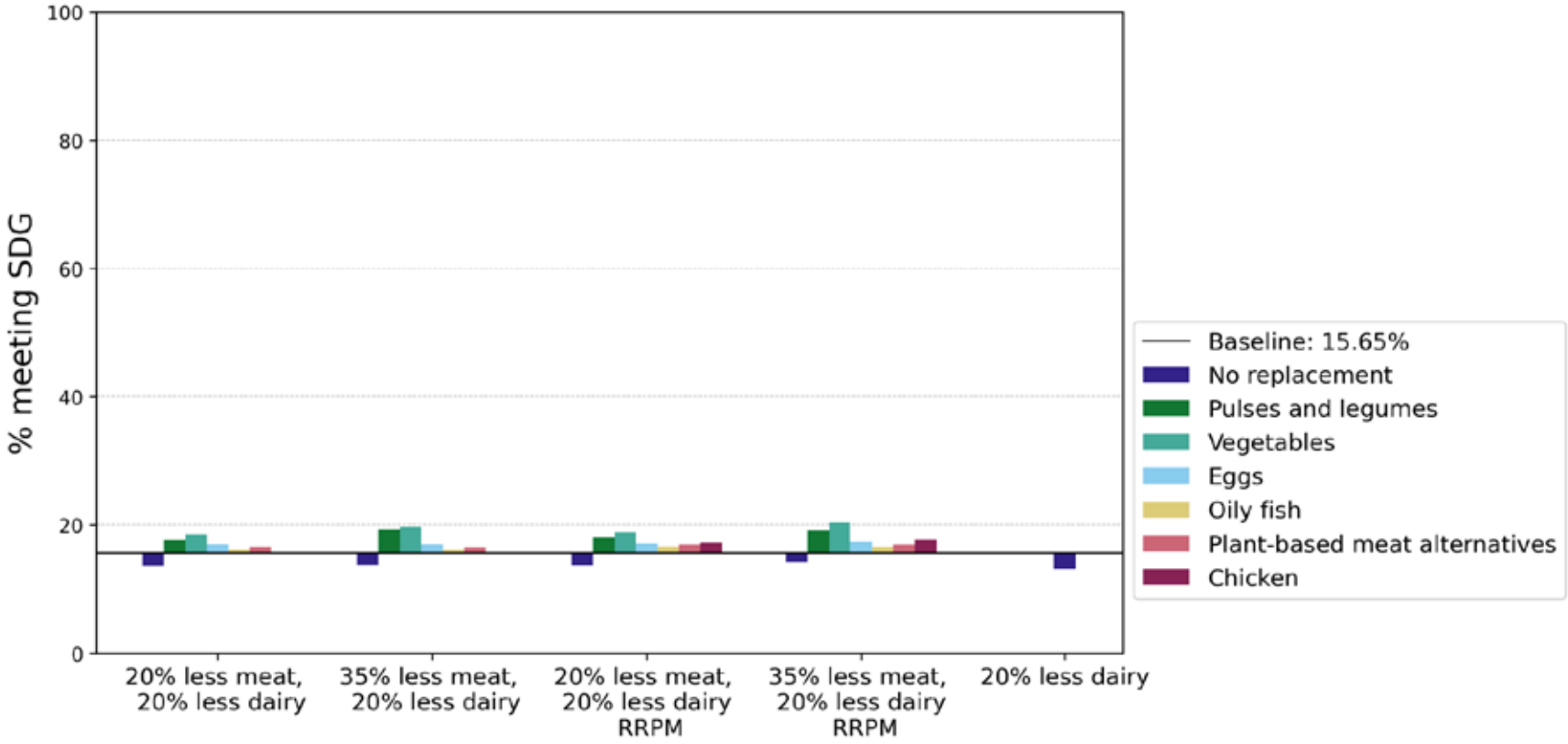


Figure 34. Impact of reducing meat and dairy on the percentage of children and young people aged 2 to 15 years living in Scotland (2024) meeting the Scottish Dietary Goal for total fat.

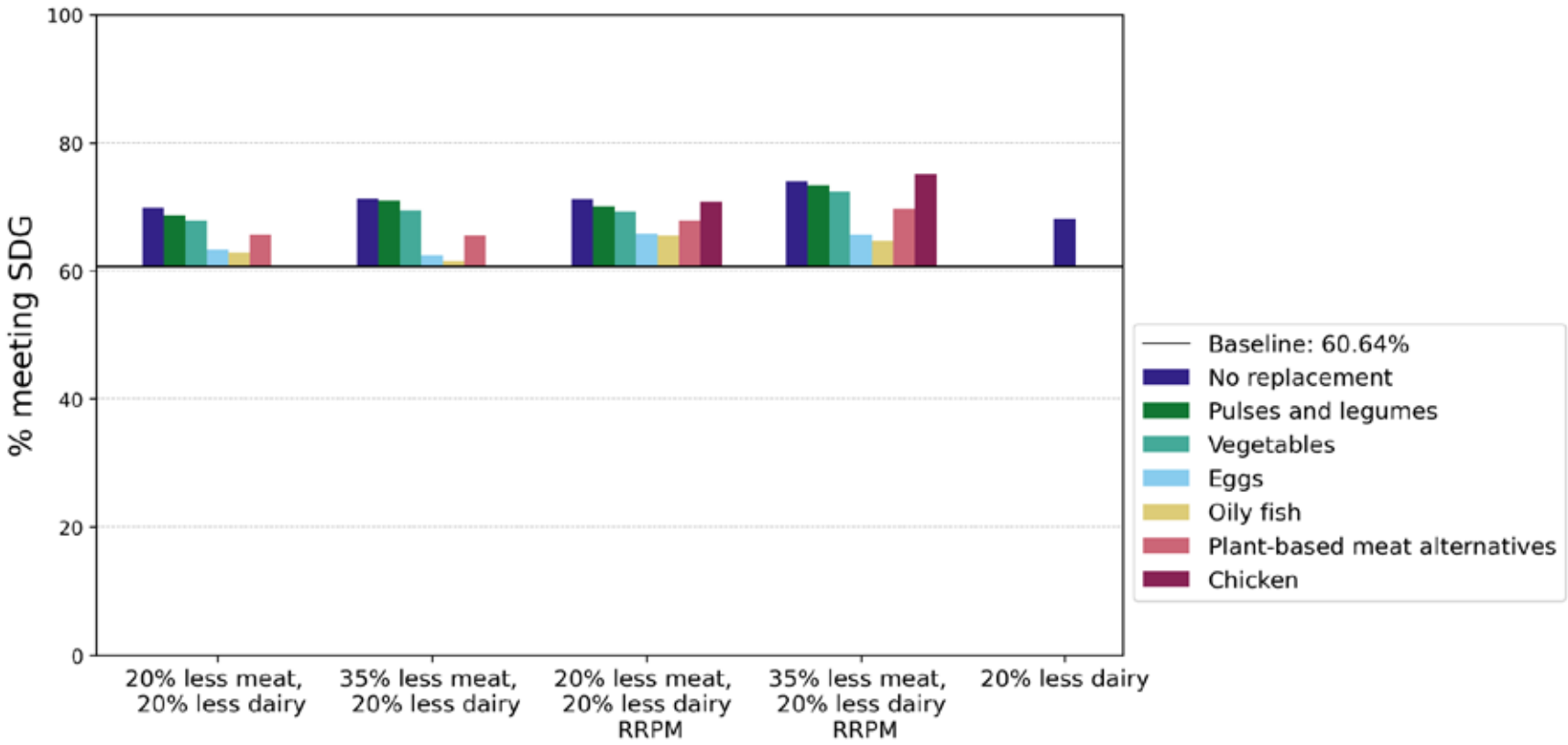


Figure 35. Impact of reducing meat and dairy on the percentage of children and young people aged 2 to 15 years living in Scotland (2024) meeting the Scottish Dietary Goal for saturated fat.

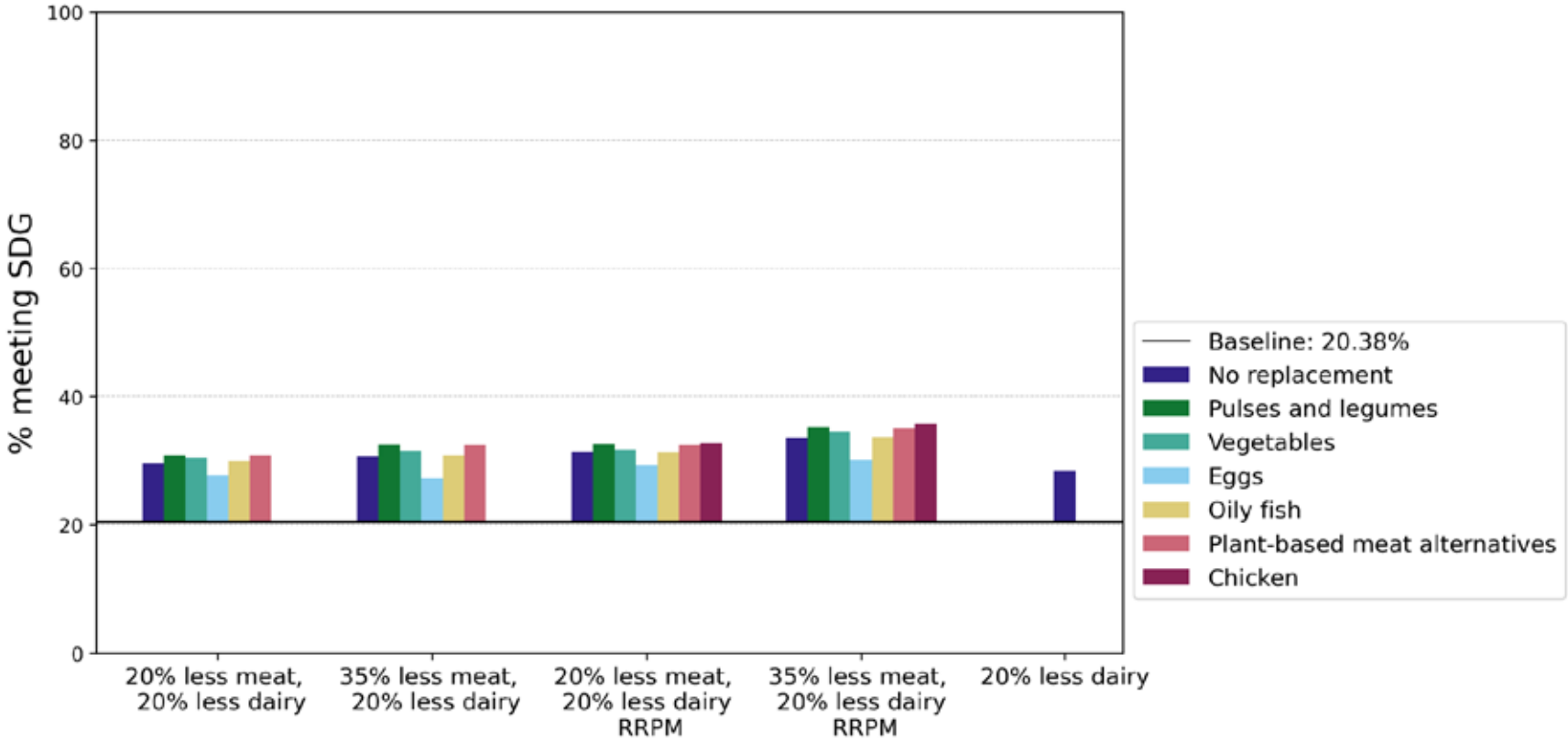


Figure 36. Impact of reducing meat and dairy on the percentage of children and young people aged 2 to 15 years living in Scotland (2024) meeting the Scottish Dietary Goal for free sugars.

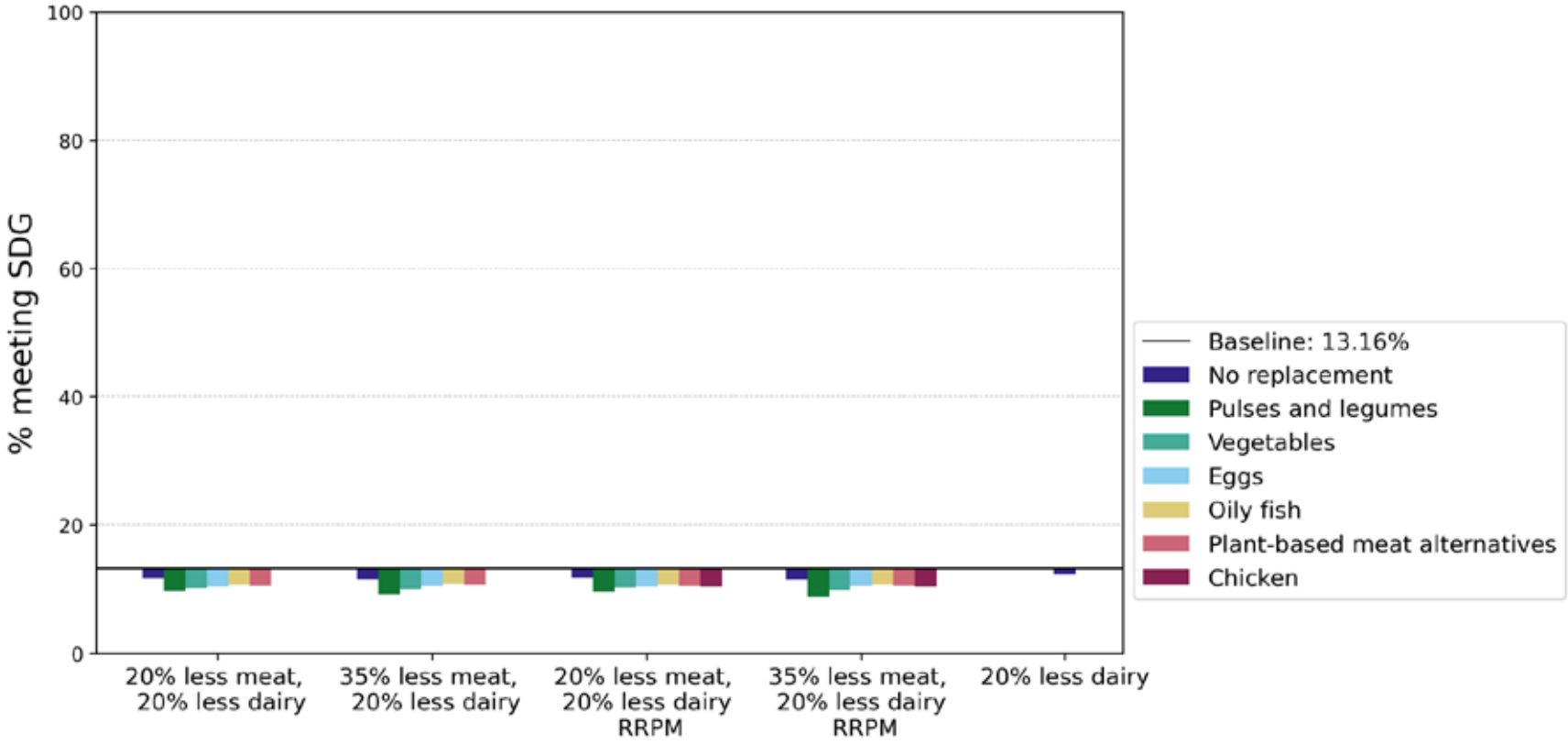


Figure 37. Impact of reducing meat and dairy on the percentage of children and young people aged 2 to 15 years living in Scotland (2024) meeting the Scottish Dietary Goal for total carbohydrates.

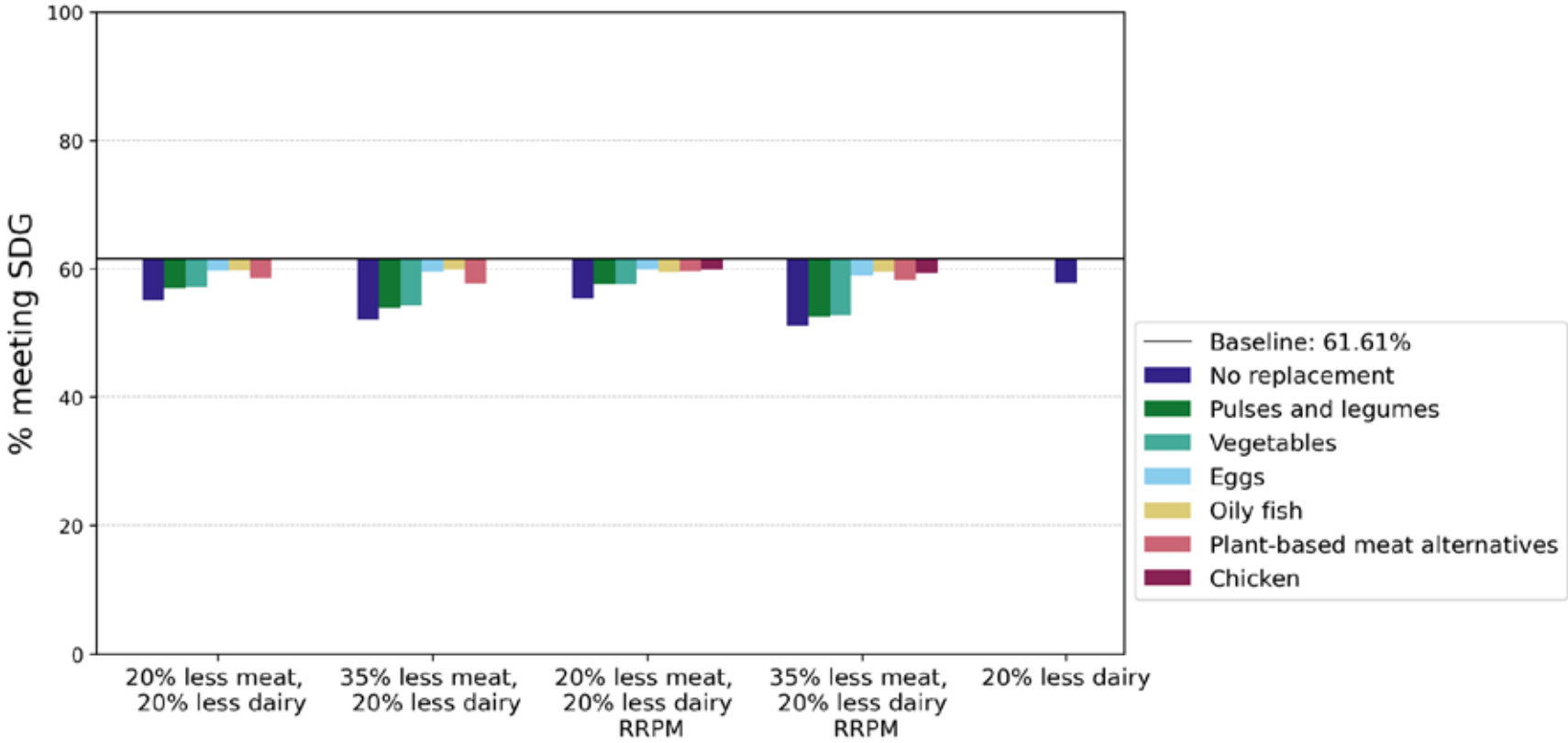


Figure 38. Impact of reducing meat and dairy on the percentage of children and young people aged 2 to 15 years living in Scotland (2024) meeting the Scottish Dietary Goal for fibre.

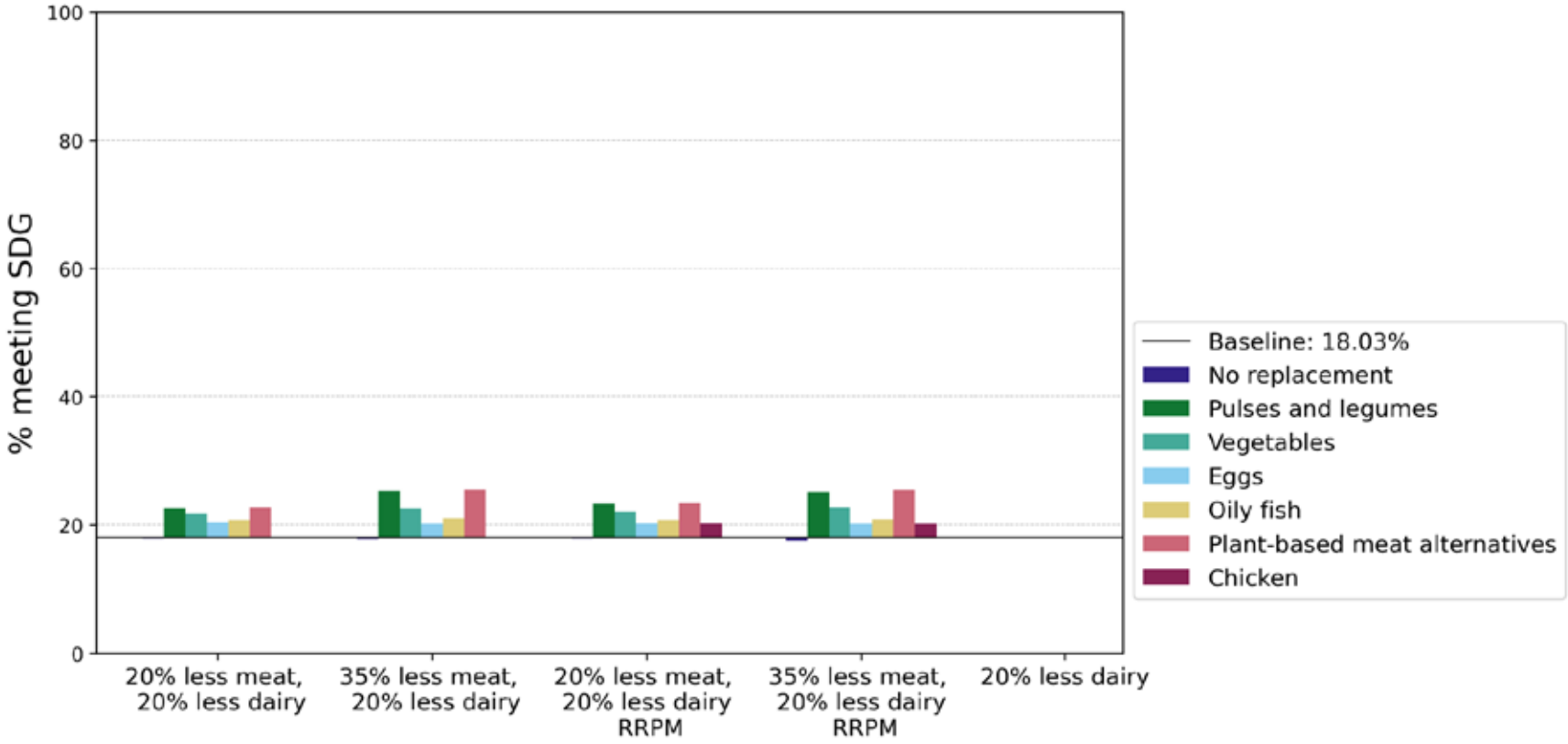


Figure 39. Impact of reducing meat and dairy on the percentage of children and young people aged 2 to 15 years living in Scotland (2024) meeting the Scottish Dietary Goal for salt.

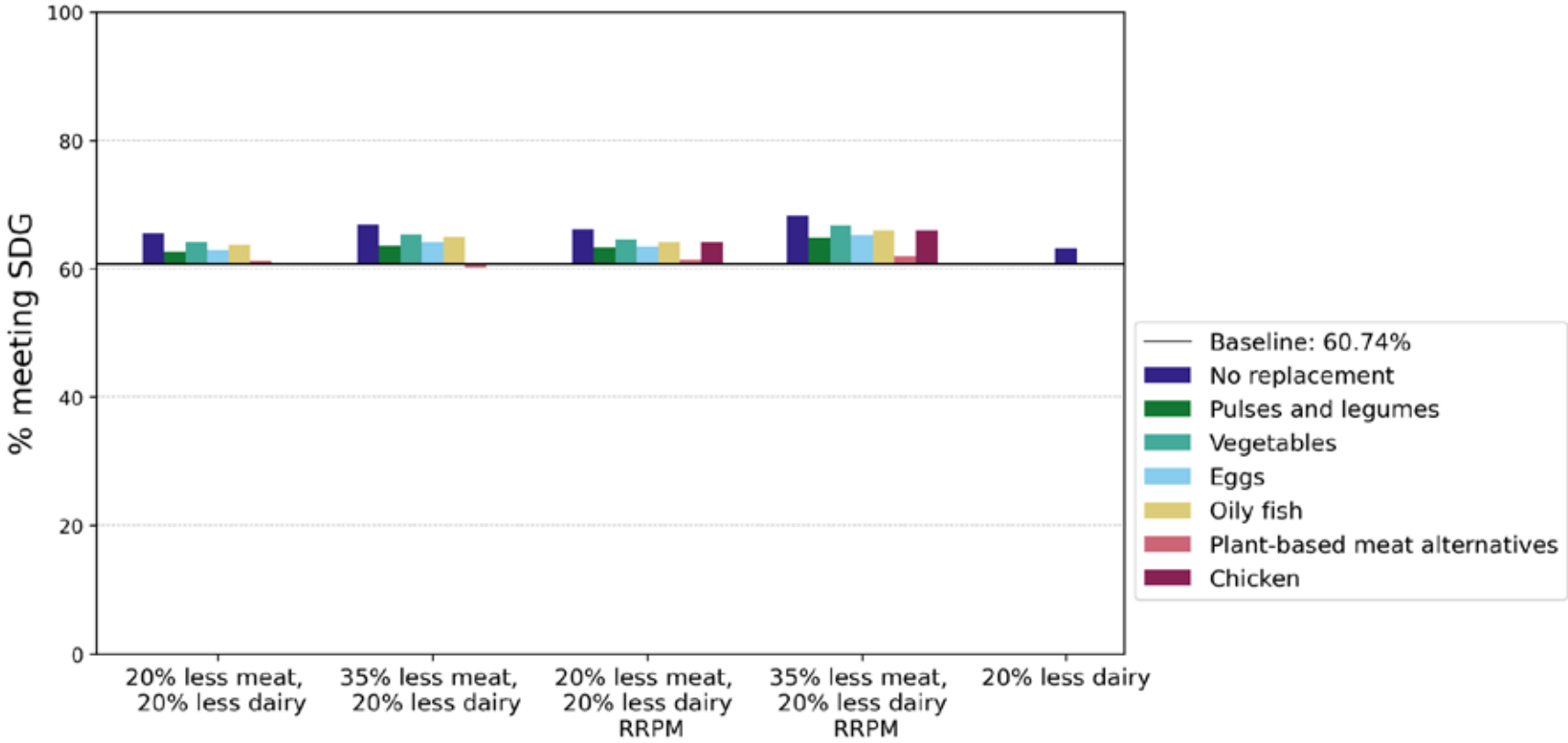


Figure 40. Impact of reducing meat and dairy on the percentage of children and young people aged 2 to 15 years living in Scotland (2024) meeting the Scottish Dietary Goal for fruits and vegetables.