Food Safety
AUTHORITY OF IRELAND

Nutrition

2021

Reformulation of Breakfast Cereals: The Accuracy of Nutrition Declaration on Food Labels for the Monitoring of Food Reformulation in Ireland

MONITORING & SURVEILLANCE SERIES

Reformulation of Breakfast Cereals: Accuracy of Nutrition Declaration on Food Labels for the Monitoring of Food Reformulation in Ireland

Published by:

Food Safety Authority of Ireland
The Exchange, George's Dock, IFSC,
Dublin 1, D01 P2V6

T +353 1 817 1300
E info@fsai.ie

www.fsai.ie

ISBN: 978-1-910348-51-2

Contents

List of Figures

List of Tables

Acronyms

Acronym	Definition
DRV	Dietary reference value
EC	European Commission
EFSA	European Food Safety Authority
EU	European Union
FSAI	Food Safety Authority of Ireland
g	gram
INFORMAS	International Network for Food and Obesity/Non-communicable Diseases (NCDs) Research, Monitoring and Action Support
Kcal	Kilocalorie
kJ	Kilojoule
NANS	National Adult Nutrition Survey
NCD	Non-Communicable Disease
NMR	Nuclear Magnetic Resonance
SPSS	Statistical Package for the Social Sciences
TE	Total energy
UK	United Kingdom
WHO	World Health Organization

Executive summary

Levels of overweight and obesity have doubled across the Irish adult population since the early 1980s (Department of Health, 2013). More than one-half of the Irish adult population are now overweight or obese, with only 40% of adults falling within a healthy weight range (Department of Health, 2015). The rates of overweight and obesity in Irish children is plateauing and, in some cases, reducing (O'Donnell et. al, 2020). A *Healthy Weight for Ireland: Obesity Policy and Action Plan 2016 – 2025* sets out a roadmap to reduce rates of overweight and obesity across the Irish population over a 10-year period (Department of Health, 2016). Reformulation of processed foods offers a cost-effective opportunity to reduce the saturated fat, sugar and salt content of many commonly eaten foods, which has been found to have a positive impact on obesity (McKinsey Global Institute, 2014). Action point 3.1 of *A Healthy Weight for Ireland: Obesity Policy and Action Plan 2016 – 2025* commits to setting food reformulation targets for total fat, saturated fat, sugar and salt with the food industry and monitoring progress in reaching these targets from 2016 to 2025.

In 2009, a reformulation framework was agreed to reduce salt by 16% over a 4-year period across the European Union (EU) (European Commission, 2009). In 2011, the reformulation approach was broadened under the European Commission's (EC's) National Initiatives on Selected Nutrients, starting with reducing saturated fat by 5% by 2016 and by a further 5% by 2020 (European Commission, 2011). In 2015, this framework addressed added sugar by promoting a voluntary reduction of 10% in processed food by 2020. Ireland has committed to the EC National Initiatives on Selected Nutrients and has made substantial progress in seeking voluntary commitment from industry on reformulation of salt and trans fats in processed foods, and in establishing a monitoring system to measure progress (Food Safety Authority of Ireland, 2016; 2018). The aims of this study were to examine the accuracy of the declared nutrition information in line with EC guideline nutrition labelling tolerances and to make a recommendation on the use of declared nutrition labels for the monitoring of food reformulation of total fat, saturated fat, and sugar in Ireland. The information collected as part of this study could also contribute to a baseline for monitoring food reformulation efforts of breakfast cereals sold in the Irish retail food environment.

Breakfast cereals identified in a 2016 cross-sectional market scan (n=453), were assigned a weighting based on manufacturer type ('branded', 'own brand'), product category (natural, flavoured and luxury) and declared nutrition content (Food Safety Authority of Ireland,2020). In 2019, breakfast cereals (n=200) were randomly selected from these weighted groups. Breakfast cereals were analysed in a laboratory using accredited methods for total fat, saturated fat sugar and salt.

The data was analysed using Microsoft Excel and IBM Statistical Package for Social Sciences (SPSS) (Version 25). As data was not normally distributed, median values were investigated for both label declarations and laboratory analysis using the Wilcoxon Signed-Rank test.

EC guideline nutrition labelling tolerances were calculated by setting the initial bounds, applying the tolerance permitted for the level nutrient, giving consideration to whether or not a claim was made on the food, and finally applying the rounding principle as set out in Section 6 of the guidance document.

Of the tested breakfast cereals, 14.1% (n=28), 5% (n=10), 9.6% (n=19) and 1.5% (n=3) were outside the EC guideline nutrition labelling tolerances for total fat, saturated fat, sugar and salt respectively (European Commission, 2012). In total, 51 breakfast cereals were found to be outside the EC guideline nutrition labelling tolerances, 9 of which were outside EC guideline nutrition labelling tolerances for two or more nutrients. Analysed nutrient content was lower than was stated on the label in 68.3% (n=41) of the analysed breakfast cereals that were found to be outside of EC guideline nutrition labelling tolerances. While this is a potential non-conformance with the labelling tolerance guidance, it is one that favours the consumer in terms of a healthier nutrient profile for breakfast cereals on the market. Non-conformances were equal between ‘branded’ and ‘own brand’ breakfast cereals with 76% (n=39) of breakfast cereals outside of the nutrition labelling tolerances were ‘branded’ and 34% (n=12) were ‘own brand’. This split is in keeping with the representation of ‘branded’ and ‘own brand’ in the study sample. There was a statistically significant difference between median declared and analysed energy, total fat, saturated fat and salt content per 100g of breakfast cereals.

This study found declared nutrition labels were mostly in line with EC guideline nutrition labelling tolerances for saturated fat, sugar and salt content of breakfast cereals. However, 14.1% (n=28) of breakfast cereals were outside EC guideline nutrition labelling tolerances for total fat. The study observed no systematic bias for placing breakfast cereals on the market with higher nutrient content than that shown on the label. The findings of this study indicate that the declared nutrition labels may not reflect food reformulation efforts.

Based on the findings of this study, the following recommendations are made:

- When EC guideline nutrition labelling tolerances are accounted for, it is possible that declared nutrition labels may not reflect food reformulation efforts. This finding needs to be considered when developing a reformulation monitoring programme.
- The nutrient content of a serving of breakfast cereals containing nuts and fruit depends on the distribution of nuts and fruit in the cereal. This needs to be accounted for when undertaking nutrition verification studies.
- There are numerous factors which influence variations in declared and analysed nutrient content of breakfast cereals, and this requires further investigation with the food industry as it could affect reformulation monitoring.
- Based on the findings of this study and a previous study which applied the same methodology to yogurts, reformulation monitoring programmes using declared nutrition labels need to be ‘fact checked’ at regular intervals using nutrition label verification.

1. Introduction and background

Levels of overweight and obesity have doubled across the Irish population since the early 1980s (Department of Health, 2013). More than one-half of the Irish population are overweight or obese, with only 40% of adults living in Ireland being a healthy weight (Department of Health, 2015). Recent surveys indicate that the rate of overweight and obesity may be plateauing or reducing in children, however, it is rising among lower socioeconomic groups (Bel-Serrat et al., 2018, O'Donnell, et al., 2020). Chronic diseases – particularly hypertension, coronary heart disease, stroke and type 2 diabetes – are on the rise in Ireland as a result of the growing overweight and obesity epidemic (World Health Organization, 2015).

A Healthy Weight for Ireland: Obesity Policy and Action Plan 2016 – 2025 sets out a road map to reduce rates of overweight and obesity across the Irish population over a 10-year period (Department of Health, 2016). The solutions to addressing overweight and obesity are multiple and complex. The Irish Obesity Policy and Action Plan seeks to address the key determinants of overweight and obesity as described by the World Health Organization (WHO), including the environment, access to healthy and affordable food, physical activity, exercise and leisure activity, cultural and societal norms, education and skill levels, genetic makeup and lifestyle choices (Commission on Social Determinants of Health, 2008).

A high and imbalanced fat, saturated fat and sugar intake is associated with an increase in non-communicable chronic diseases such as coronary heart disease, stroke, type 2 diabetes and cancer (Nettleton, Brouwer, Geleijnse and Hornstra, 2017) (Fiolet et al., 2018). Foods high in wholegrains, fruit and vegetables and low in saturated fat, sugar and salt are protective against non-communicable diseases. The European Food Safety Authority (EFSA) advises a reference intake of 30–35% of total energy (TE) from fat and as low as possible an intake of saturated fat for adults aged 18 years or older (European Food Safety Authority, 2017). The WHO advises that intake of saturated fat should be less than 10% of TE intake (World Health Organization, 2003). The WHO defines free sugars as "monosaccharides and disaccharides added to foods and beverages by the manufacturer, cook or consumer, and sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates" and recommends that intake of free sugars be less than 10% of TE intake; in addition, the WHO has a conditional recommendation, meaning that further stakeholder engagement is required before the recommendation is translated into a policy, of <5% of TE intake (World Health Organization, 2015). There is currently no dietary reference value (DRV) for sugar intake at European Union (EU) level. EFSA is in the process of reviewing the literature and drafting a scientific opinion on sugar intake; this is due to be published in 2021.The Irish *National Adult Nutrition Survey* (NANS), published in 2011, found that mean total fat and total sugar, combined, made up 51% of TE in the diets of Irish adults (Irish Universities Nutrition

Alliance; 2011). Fat contributed 34.1% of TE among Irish adults aged 18–64 years, which is marginally below the upper range of the DRV for fat from TE as set out by EFSA (EFSA, 2010). Saturated fat contributed 13.3% of TE intake among Irish adults aged 18–64 years (Walton et al., 2017). This is above the 10% limit set out by the WHO (World Health Organization, 2003). Additional analysis of the NANS dataset in 2017 found that overall sugar intake for Irish adults aged 18–65 years accounted for, on average, 17.1% of TE, with free sugars intake contributing 8.7% of TE (Tierney, McNulty, Nugent and Gibney, 2011) This is below the WHO recommended intake for free sugars of 10%, but above the conditional limit of 5% (World Health Organization, 2015). .

Reformulation of processed foods offers an opportunity to reduce the saturated fat, sugar and salt content of many commonly eaten foods and has been found to have a positive impact on obesity and related chronic diseases in terms of cost-effectiveness (McKinsey Global Institute, 2014). In 2009, the European Commission published a food reformulation framework to reduce the salt content of foods by 16% over a 4-year period across the EU (European Commission, 2008). In 2011, the reformulation approach was broadened under the European Commission's (EC's) National Initiatives on Selected Nutrients, starting with reducing saturated fat by 5% by 2016 and by a further 5% by 2020 (European Commission, 2011). In 2015, this framework addressed added sugar, promoting a voluntary reduction of 10% in processed food by 2020. Ireland has committed to the EC National Initiatives on Selected Nutrients and, to date, has made substantial progress in seeking voluntary commitment from industry on reformulation of salt and trans fats in processed foods, and in establishing a monitoring system to measure progress (Food Safety Authority of Ireland, 2018) (Food Safety Authority of Ireland, 2016).

Step three of *A Healthy Weight for Ireland: Obesity Policy and Action Plan 2016 – 2025* sets out to secure appropriate support from the commercial sector to play its part in obesity prevention (Department of Health, 2016). This step recognises the shift in the global and national food environment towards increased availability of processed and ready-to-eat foods and the need for food industry leaders to produce products that are broadly aligned with the nutrition guidance in order to improve population health outcomes (Monteiro et al., 2013). Specifically, action point 3.1 of *A Healthy Weight for Ireland: Obesity Policy and Action Plan 2016 – 2025* is to agree food industry reformulation targets for Ireland and review progress towards reaching these targets (Department of Health, 2016). This will see Ireland's approach to food reformulation broaden beyond salt to include energy, sugar and saturated fat. A Reformulation Sub-group of the Obesity Policy Implementation

Oversight Group has been established to set voluntary food reformulation targets for energy, saturated fat, sugar and salt in Ireland.

The Reformulation Subgroup has also been tasked with outlining a monitoring approach to measure progress towards achieving agreed voluntary food reformulation targets. Monitoring of food reformulation is complex and has been approached in different ways by different countries. A commonality between reformulation monitoring approaches is the use of declared nutrition labels to monitor nutrient content changes in foods over time.

In December 2014, Regulation (EU) No 1169/2011 came into effect. A requirement of this legislation is the provision of nutritional content (energy, total fat, saturated fat, carbohydrate, sugars, protein and salt) of pre-packaged food per 100 g. The availability of this nutrition information on all pre-packaged food potentially provides a readily available means for monitoring the reduction of saturated fat, sugar and salt in food. European regulations require that the labelled nutritional values are average values for the food as manufactured, and that these average values can be based on analytical measurement or published values. In addition, EC guidance with regard to tolerances for the average nutrient values declared on a label sets out the variability accepted for official controls purposes in relation to the measured nutritional content of a food sample in comparison to the declared nutrition content on the label of that food (European Commission, 2012). The range of what is allowable depends on the type of food, whether a claim is made on the food and the type and amount of the nutrient in the food, e.g. EC guideline nutrition labelling tolerances for total fat is defined as; <10 g of fat per 100 g ±1.5 g, and 10–40 g of fat per 100 g ±20%. Consequently, for official control purposes, it is acceptable for the actual nutrient value of a particular food item to differ from its labelled value, provided it is within the published tolerances. Research on the accuracy of declared nutrition labels for monitoring of nutrient content of food is an evolving field (Food Safety Authority of Ireland, 2010).

In 2016, the Food Safety Authority of Ireland (FSAI) undertook a market analysis of breakfast cereals, to determine total fat, saturated fat and sugar content based on declared nutrition labels (Food Safety Authority of Ireland, 2020). Breakfast cereals were chosen because they are a contributor of sugar intake in the Irish diet, despite being considered a ‘healthy food’ (Walton et al., 2017). Following this market scan it was decided to verify nutrition label declarations for a representative sample of breakfast cereals on the Irish market to determine their suitability for reformulation monitoring.

2. Aims and objectives

The aims of this study were to:

1. Examine the accuracy of the declared nutrition information in line with EC guideline nutrition labelling tolerances.
2. Make a recommendation on the use of declared nutrition labels for the monitoring of food reformulation of total fat, saturated fat, sugar and salt in Ireland.

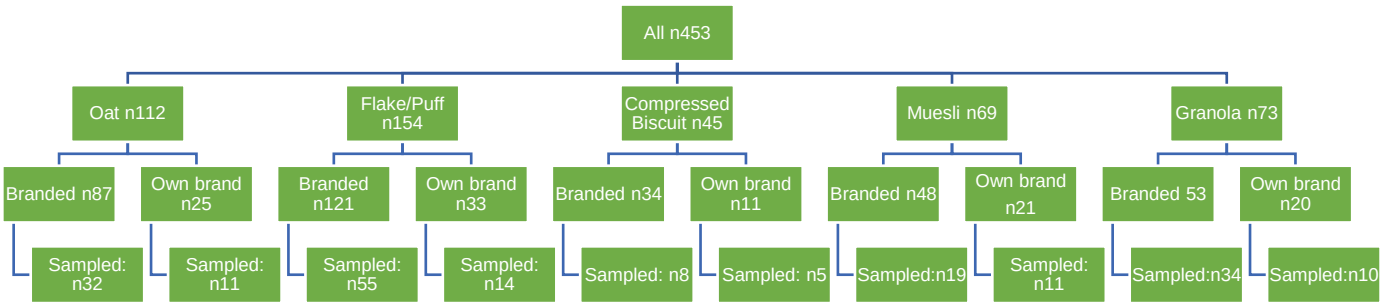
The objectives of this study were to:

1. Collect 200 breakfast cereals sold on the Irish market between February – May 2019 and determine their declared and analysed energy, total fat, saturated fat, sugar and salt content.
2. Examine whether the declared nutrition labels were in conformance with the EC guideline nutrition labelling tolerances for total fat, saturated fat, sugar and salt in 200 breakfast cereals sold on the Irish market between February – May 2019, and to see whether there was any systematic bias to those declarations.
3. Make a recommendation on the use of declared nutrition labels for monitoring food reformulation of total fat, saturated fat sugar and salt in Ireland.
4. Contribute to establishing a baseline for energy, total fat, saturated fat, sugar and salt in breakfast cereals sold on the Irish market in 2019 that could be used to monitor reductions against food reformulation targets to be set for Ireland.

3. Methodology

3.1 Sample selection, categorisation and collection

The product list from the Irish market scan of breakfast cereals undertaken by the FSAI in 2016 was used as the sampling frame (n=453) for this study. Breakfast cereals identified in the 2016 market scan (n=453) were weighted, using probability proportion to size, based on FSAI determine product category (Oat, Muesli, Granola, Flaked/Puffed and Compressed Biscuit) and manufacturer type ('branded', 'own brand'), both as assigned in the 2016 study (see Figure 1). Breakfast cereals (n=200) were randomly selected from the weighted groups to produce a list to include in this study. Breakfast cereals were collected from the Irish market, both from in-store and online retailers, between February – May 2019, by a third party. Where a product from the 2016 sampling frame was no longer available on the Irish market, a replacement product was sampled which was of the same category and manufacturer type and within 1.5 g of the declared nutrient content of the original sample.



.

Figure 1 Breakfast cereal sampling numbers per manufacturer type and category

3.2 Laboratory analysis of breakfast cereals

An Irish private accredited laboratory was contracted to analyse the samples for total fat, saturated fat, sugar and salt content. The analysis of total sugar was subcontracted to an accredited laboratory in the United Kingdom (UK). Details of the analytical methods used are outlined in Annex 1. Data were submitted to the FSAI in Microsoft Excel documents and as hard-copy reports.

3.3 Data and statistical analysis

Data were analysed using Microsoft Excel and IBM Statistical Package for Social Sciences (SPSS) (Version 25). As data were not normally distributed, median values were investigated for declared and tested energy, total fat, saturated fat and sugar content using the Wilcoxon Signed-Rank test.

To perform statistical analysis, samples with a nutrient below the level of detection (defined as trace) were coded as containing 0g of that nutrient. One sample was removed from statistical analysis, as it did not declare nutritional content per 100g on the product label. A second sample was removed for analysis relating to sugar as the declared sugar content was not legible on the product label.

EC guideline nutrition labelling tolerances were calculated by setting the initial bounds, applying the tolerance permitted for the nutrient type and amount (giving consideration to whether or not a claim was made on the food) and finally, applying the rounding principal as set out in Section 6 of the guidance document.

3.4 Study limitations

The study had the following limitations:

1. Due to budgetary restrictions, the study used one sample per product to measure the nutritional content, rather than a number of samples from different batches of the same product. Using a number of samples from different batches of the same product would have increased the reliability of the analysed values for each product and more accurately reflected the average nutrient value as declared on the label.
2. The 2016 market scan identified all breakfast cereals on the Irish market and was therefore considered representative of the market at that time. However, by 2019 (when samples were taken for this study), some products were no longer available and were swapped for similar products or flavours. These swaps could have affected the overall market representativeness of samples in this 2019 study. However, as this study examined the accuracy of the label nutrition content of breakfast cereals sampled, this would not have affected the overall outcome of the study.

4 Results

4.1 Description of samples

A breakdown of study samples by product category and manufacturer type is presented in Figure 2.

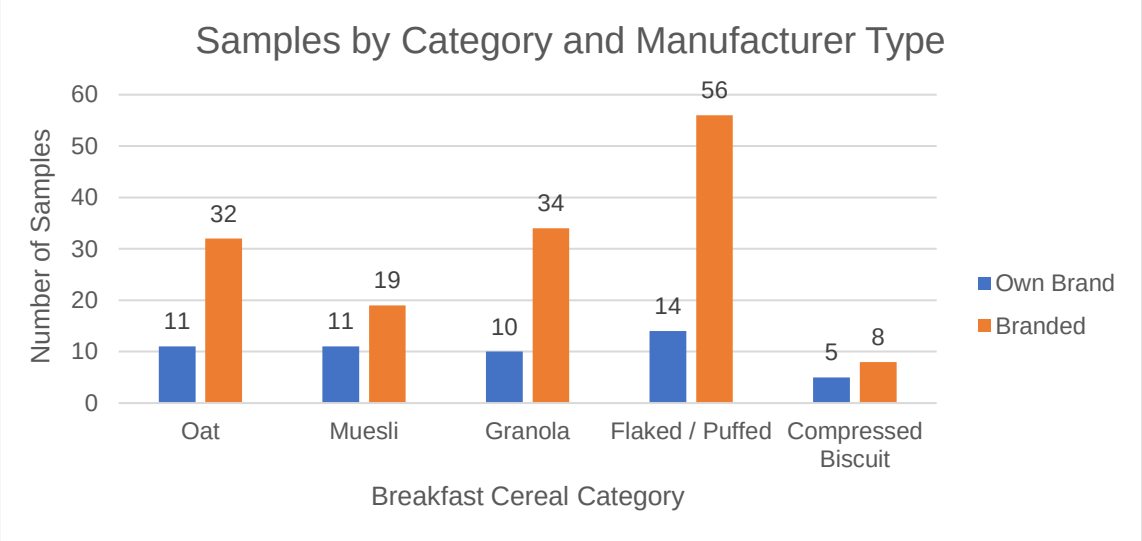


Figure 2 Number of breakfast cereals sampled disaggregated by product category and manufacturer type

Due to changes in the market since between 2016 cross-sectional market scan and when study data was collected in 2019, 64 product swaps and two flavour swaps were made to the samples selected. A summary of the product swaps is outlined in Table 1.

Table 1 Summary of sample swaps

Sample Type	Percentage
Original product	67.5% (n=135)
Product swap	31.5% (n=63)
Flavour swap	1% (n=2)

As the type of EC guideline nutrition labelling tolerances applied is dependent on whether a food makes a nutrition or health claim, breakfast cereal labels were reviewed for nutrition and/or health claims made in relation to fat, saturated fat, sugar and salt. The study found that 9.5% (n=19), 13%

(n=26), 6% (n=12) and 22% (n=44) made nutrition or health claims for fat, saturated fat, sugar and salt respectively.

Of the products included in this study, 10.5% (n=21) targeted children.

A comparison of the declared and analysed content of energy, total fat, saturated fat and salt content of 199 samples and sugar content of 198 samples is investigated in the following section.

4.2 Comparison of declared and analysed energy content of breakfast cereals

4.2.1 Comparison of energy content of all breakfast cereal

A comparison between the declared and analysed median energy content of all breakfast cereals (n=199) found a statistically significant difference in the declared and analysed energy content (p=<0.05). This is outlined in Table 2.

Table 2 A comparison of declared and analysed median energy content of all breakfast cereals

Category	Source of nutrition information	Median energy content (Kcal per 100 g)	Minimum and maximum energy content (Kcal per 100 g)	Statistical significance (Wilcoxon signed-rank test)
All categories (n=199)	Declared	375	92-609	p=0.00
	Analysed	387	166-656	

A comparison between the declared and analysed median energy content of breakfast cereals by manufacturer type found a statistically significant difference in the declared and analysed energy content for both. In both cases the declared amount was lower than the analysed amount. This is outlined in Table 3.

Table 3 A comparison of declared and analysed median energy content of breakfast cereals by manufacturer type

Manufacturer type	Source of nutrition information	Median energy content (kcal per 100 g)	Minimum and maximum energy content (kcal per 100 g)	Statistical significance (Wilcoxon signed-rank test)
Branded (n=148)	Declared	375.5	311–609	p=0.00

	Analysed	388	351–656	
Own brand (n=51)	Declared	371	92-488	*p*=0.00
	Analysed	383	166-491	

*NS=not statistically significant

4.3 Comparison of declared and analysed total fat content of breakfast cereals

4.3.1 Comparison by all breakfast cereals

The median declared total fat content was significantly higher than the median analysed total fat content of all breakfast cereals (*p*=0.000). This is outlined in Table 4.

Table 4 A comparison of declared and analysed median total fat content of all breakfast cereals

Category	Source of nutrition information	Median fat content (g per 100 g)	Minimum and maximum fat content (g per 100 g)	Statistical significance (using Wilcoxon signed-rank test)
All categories (n=199)	Declared	5.8	0.3–50.3	*p*=0.00
	Analysed	5.1	0.4-54.8	

4.3.2 Comparison by manufacturer type

A comparison of the declared and analysed median total fat content of all breakfast cereals, disaggregated by manufacturer type, found a statistically significant difference in 'own brand' and 'branded' breakfast cereals between the median declared total fat content and the median analysed total fat content (p=0.015, p=0.000). There was a trend for the median analysed total fat content to be lower than the median declared total fat content of 'branded' breakfast cereals. This is outlined in Table 5.

Table 5 A comparison of declared and analysed median total fat content of breakfast cereals by manufacturer type

Manufacturer type	Source of nutrition information	Median fat content (g per 100 g)	Minimum and Maximum fat content (g per 100 g)	Statistical significance (using Wilcoxon signed-rank test)
Branded (n=148)	Declared	5.85	0.30–50.3	*p*=0.000
	Analysed	5.1	0.40-54.8	
Own brand (n=51)	Declared	5	1.10-23.3	*p*=0.015
	Analysed	5.2	0.40-22.5	

*NS=not statistically significant

4.3.3 Comparison of declared and analysed total fat content of all breakfast cereals with EC guideline nutrition labelling tolerances

The EC guideline nutrition labelling tolerances for total fat is defined as <10 g of fat per 100 g ±1.5g, and 10–40 g of fat per 100 g ±20% for foods without a nutrition or health claim, and is dependent on condition of use for foods with a nutrition or health claim. Of all analysed breakfast cereals, 85.9% (n=171) were within the EC guideline nutrition labelling tolerances for total fat, meaning that 14.1% (n=28) of analysed breakfast cereals were outside the EC guideline nutrition labelling tolerances for total fat. There is a tendency for breakfast cereals with a fat content outside of EC guideline nutrition labelling tolerances to contain less fat when analysed than that declared on the label. The trend in nutrition labelling tolerances for fat is outlined in Figure 3.

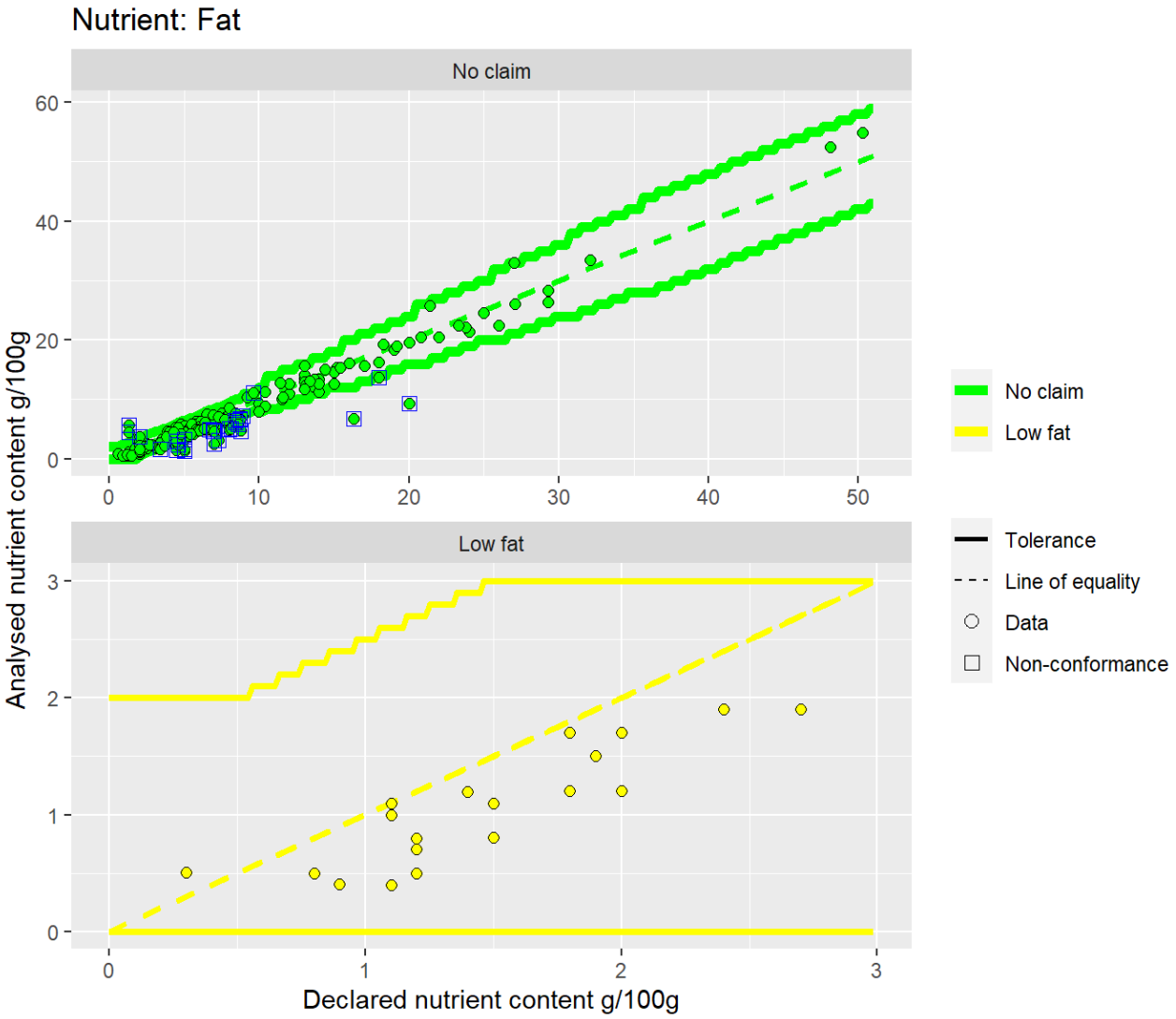


Figure 3 Trend in total fat nutrition labelling tolerances for all breakfast cereals

4.4 Comparison of declared and analysed saturated fat content of breakfast cereals

4.4.1 Comparison of all breakfast cereals

A comparison of the median declared and analysed saturated fat content of all breakfast cereals found a statistically significant difference in the median values of declared and analysed saturated fat content (p=0.000). There was a trend for the analysed content to be less than the declared saturated fat content. This is outlined in Table 6.

Table 6 A comparison of declared and analysed median saturated fat content of all breakfast cereals

Category	Source of nutrition information	Median saturated fat content (g per 100 g)	Minimum and maximum saturated fat content (g per 100 g)	Statistical significance (using Wilcoxon signed-rank test)
All categories (n=199)	Declared	1.0	0–21	*p*=0.000
	Analysed	0.96	0–19.9	

4.4.2 Comparison by manufacturer type

A comparison of median declared and analysed saturated fat content of breakfast cereals, disaggregated by manufacturer type, found a statistically significant difference (*p*=0.00) in 'branded' breakfast cereal median saturated fat content. There was a trend for median analysed saturated fat content to be lower than the median declared saturated fat content of 'branded' breakfast cereals. This is outlined in Table 7.

Table 7 A comparison of declared and analysed median saturated fat content of breakfast cereals by manufacturer type

Manufacturer type	Source of nutrition information	Median saturated fat content (g per 100 g)	Minimum and maximum saturated fat content (g per 100 g)	Statistical significance (using Wilcoxon signed-rank test)
Branded (n=148)	Declared	1.10	0.0–21	*p*=0.000
	Analysed	0.96	0.0-19.9	
Own brand (n=51)	Declared	0.80	0.2–7.2	NS*
	Analysed	0.86	0.1–7.0	

*NS=not statistically significant

4.4.3 Comparison of declared and analysed saturated fat content of all breakfast cereals with EC guideline nutrition labelling tolerances

The EC guideline nutrition labelling tolerances for saturated fat are defined as <4 g of saturated fat per 100 g ±0.8 g, and >4 g per 100 g ±20% for foods without a nutrition or health claim and is dependent on condition of use for foods with a nutrition or health claim. Of all breakfast cereals analysed, 95% (n=189) were within the EC guideline nutrition labelling tolerances for saturated fat, meaning that 5% (n=10) of breakfast cereals were outside of the EC guideline nutrition labelling tolerances for saturated fat. The trend in nutrition labelling tolerances for saturated fat is outlined in Figure 4. As observed with total fat, there is a tendency for breakfast cereals with a saturated fat content outside of EC guideline nutrition labelling tolerances to contain less saturated fat when analysed than that declared on the label.

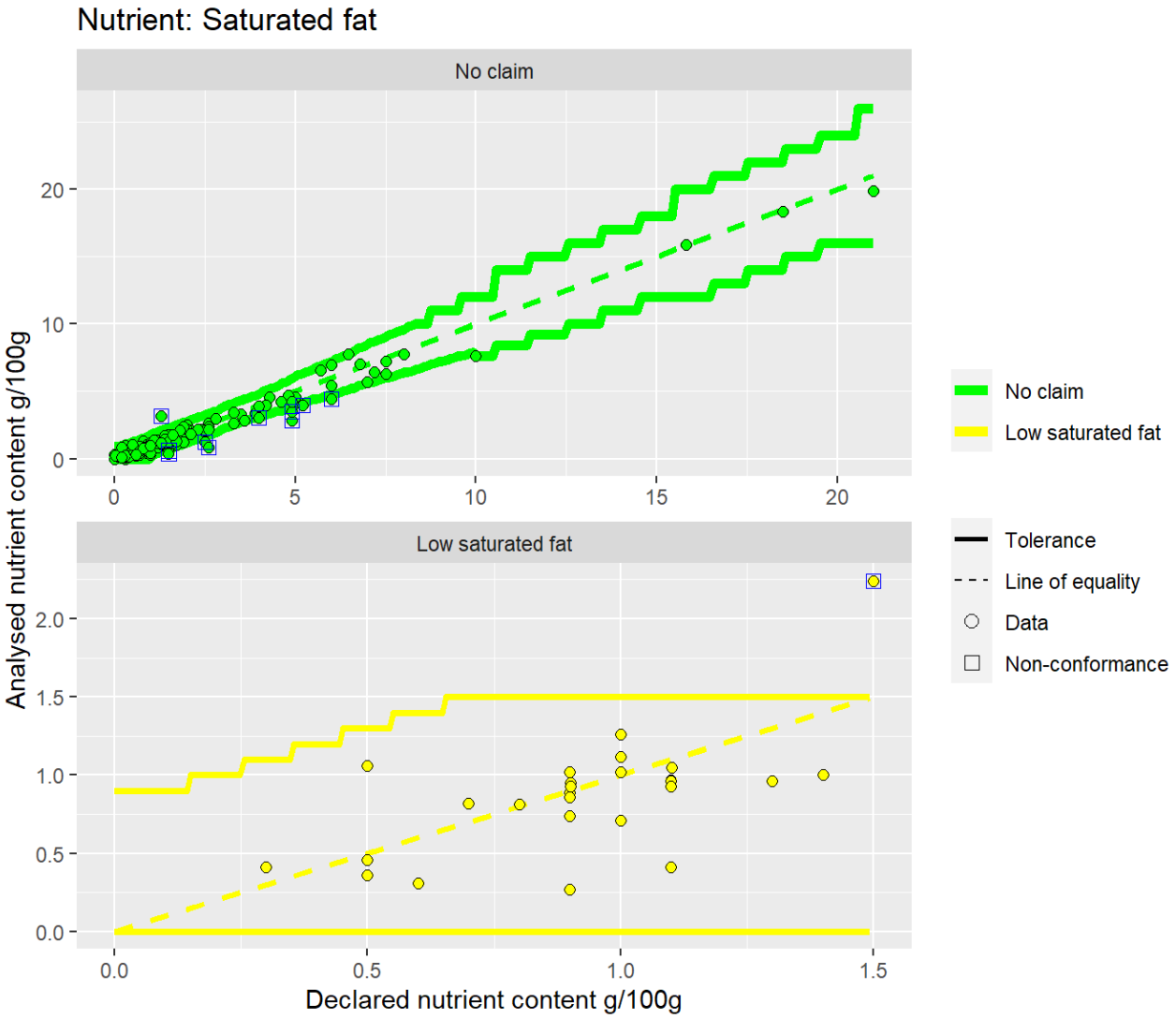


Figure 4 Trend in saturated fat nutrition labelling tolerances for all breakfast cereals

4.5 Comparison of declared and analysed sugar content of breakfast cereals

4.5.1 Comparison of all breakfast cereals

A comparison of the median declared, and analysed sugar content of all breakfast cereals found that there was no statistically significant difference in the median declared and median analysed sugar content in all breakfast cereals. This is outlined in Table 7.

Table 8 A comparison of declared and analysed median sugar content of all breakfast cereals

Category	Source of nutrition information	Median sugar content (g per 100 g)	Minimum and maximum sugar content (g per 100 g)	Statistical significance (using Wilcoxon signed-rank test)
All categories (n=198)	Declared	14.6	0.0-39.6	NS*
	Analysed	13.6	0.2-48.3	
	Analysed	13.6	8.6–21.5	

*NS=not statistically significant

4.5.2 Comparison by manufacturer type

A comparison of median declared and analysed sugar content of breakfast cereals, disaggregated by manufacturer type, found no statistically significant difference between the median declared and median analysed sugar content in both the 'branded' and 'own brand' breakfast cereal types. This is outlined in Table 9.

Table 9 A comparison of declared and analysed median sugar content of breakfast cereals by manufacturer type

Manufacturer type	Source of nutrition information	Median sugar content (g per 100 g)	Minimum and maximum sugar content (g per 100 g)	Statistical significance (Wilcoxon signed-rank test)
Branded (n=147)	Declared	15.0	0.0-39.6	NS*
	Analysed	13.2	0.2-39.7	
Own brand (n=51)	Declared	14.5	0.0-32.1	NS*
	Analysed	14.9	0.6-48.3	

*NS=not statistically significant

4.5.3 Comparison of declared and analysed sugar content of all breakfast cereals with EC guideline nutrition labelling tolerances

The EC guideline nutrition labelling tolerances for sugar are defined as <10 g of sugar per 100 g ±2 g, and 10–40 g per 100 g ±20% for foods without a nutrition or health claim, and is dependent on condition of use for foods with a nutrition or health claim. Of all breakfast cereals analysed, 90.4% (n=179) were within the EC guideline nutrition labelling tolerances for sugar, meaning that 9.6% (n=19) of breakfast cereals analysed were outside of the EC guideline nutrition labelling tolerances for sugar. The trend in nutrition labelling tolerances for sugar is outlined in Figure 5. Breakfast cereals with a sugar content outside of EC guideline nutrition labelling tolerances analysed value was equally as likely to be above or below the declared amount.

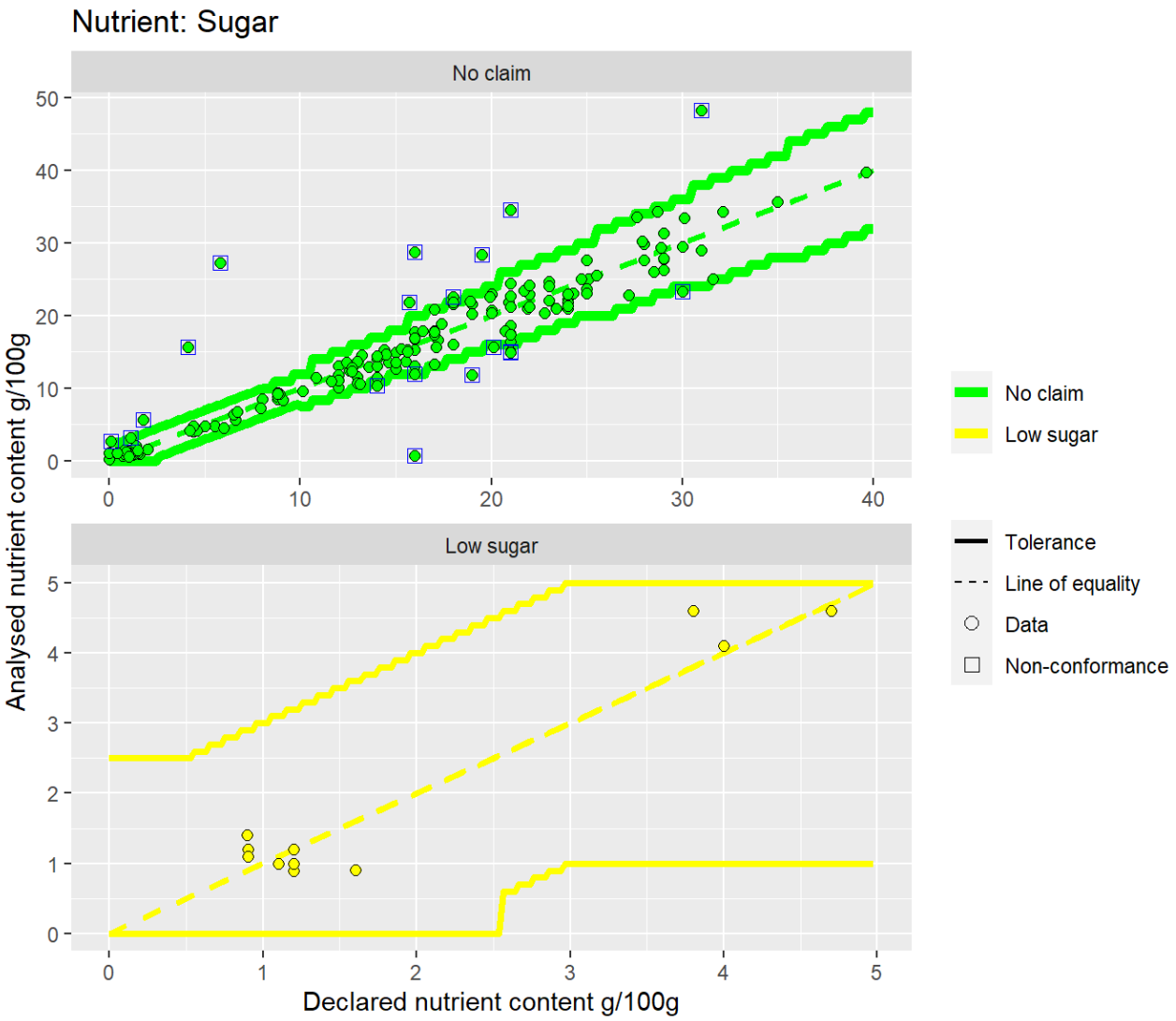


Figure 5 Trend in sugar nutrition labelling tolerances for all breakfast cereals

4.6 Comparison of declared and analysed salt content of breakfast cereals

4.6.1 Comparison of all breakfast cereals

A comparison of the median declared and analysed salt content of all breakfast cereals found that there was a statistically significant difference in the median declared and median analysed salt content in all breakfast cereals. There was a trend across all breakfast cereals for median declared salt content to be significantly higher than median analysed salt content. This is outlined in Table 10.

Table 10 A comparison of declared and analysed median salt content of all breakfast cereals

Category	Source of nutrition information	Median salt content (g per 100 g)	Minimum and maximum salt content (g per 100 g)	Statistical significance (using Wilcoxon signed-rank test)
All categories (n=199)	Declared	0.8	0.0-1.3	*p*=0.43
	Analysed	0.05	0.02-1.28	
	Analysed	13.6	8.6–21.5	

*NS=not statistically significant

4.6.2 Comparison by manufacturer type

A comparison of median declared and analysed salt content of breakfast cereals, disaggregated by manufacturer type, found a statistically significant difference between the median declared and median analysed sugar content of ‘branded’ breakfast cereals. There was a statistically significant trend for analysed salt content to be lower than declared salt content in ‘branded’ breakfast cereals. This is outlined in Table 11.

Table 11 A comparison of declared and analysed median salt content of breakfast cereals by manufacturer type

Manufacturer type	Source of nutrition information	Median salt content (g per 100 g)	Minimum and maximum salt content (g per 100 g)	Statistical significance (Wilcoxon signed-rank test)
Branded (n=148)	Declared	0.07	0.0-1.30	P=0.001
	Analysed	0.05	0.2-1.28	
Own brand (n=51)	Declared	0.10	0.0-0.93	NS*
	Analysed	0.07	0.05-0.88	

*NS=not statistically significant

4.5.3 Comparison of declared and analysed salt content of all breakfast cereals with EC guideline nutrition labelling tolerances

The EC guideline nutrition labelling tolerances for salt are defined as <1.25g of salt per 100 g ±0.375 g, and >1.25g of salt per 100 g ±20% for foods without a nutrition or health claim, and is dependent on condition of use for foods with a nutrition or health claim. Of all breakfast cereals analysed, 98.5% (n=196) were within the EC guideline nutrition labelling tolerances for sugar, meaning that 1.5% (n=3) of breakfast cereals analysed were outside of the EC guideline nutrition labelling tolerances for salt. The trend in nutrition labelling tolerances for salt is outlined in Figure 6 and 7. It was observed that there is a tendency for breakfast cereals to have a lower analysed salt content than that declared on the label.

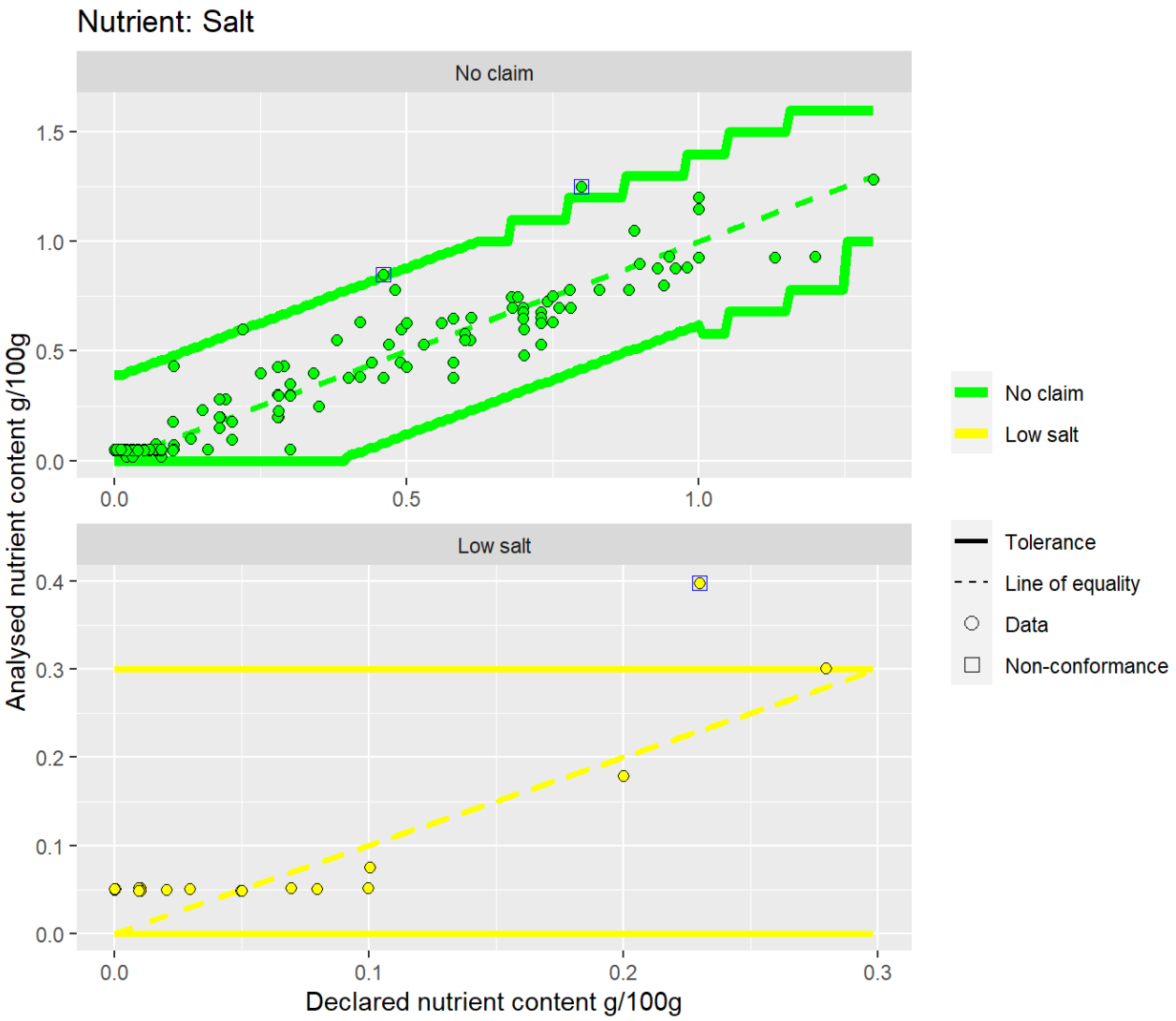


Figure 6 Trend in salt nutrition labelling tolerances for breakfast cereals with no claim and low salt claim

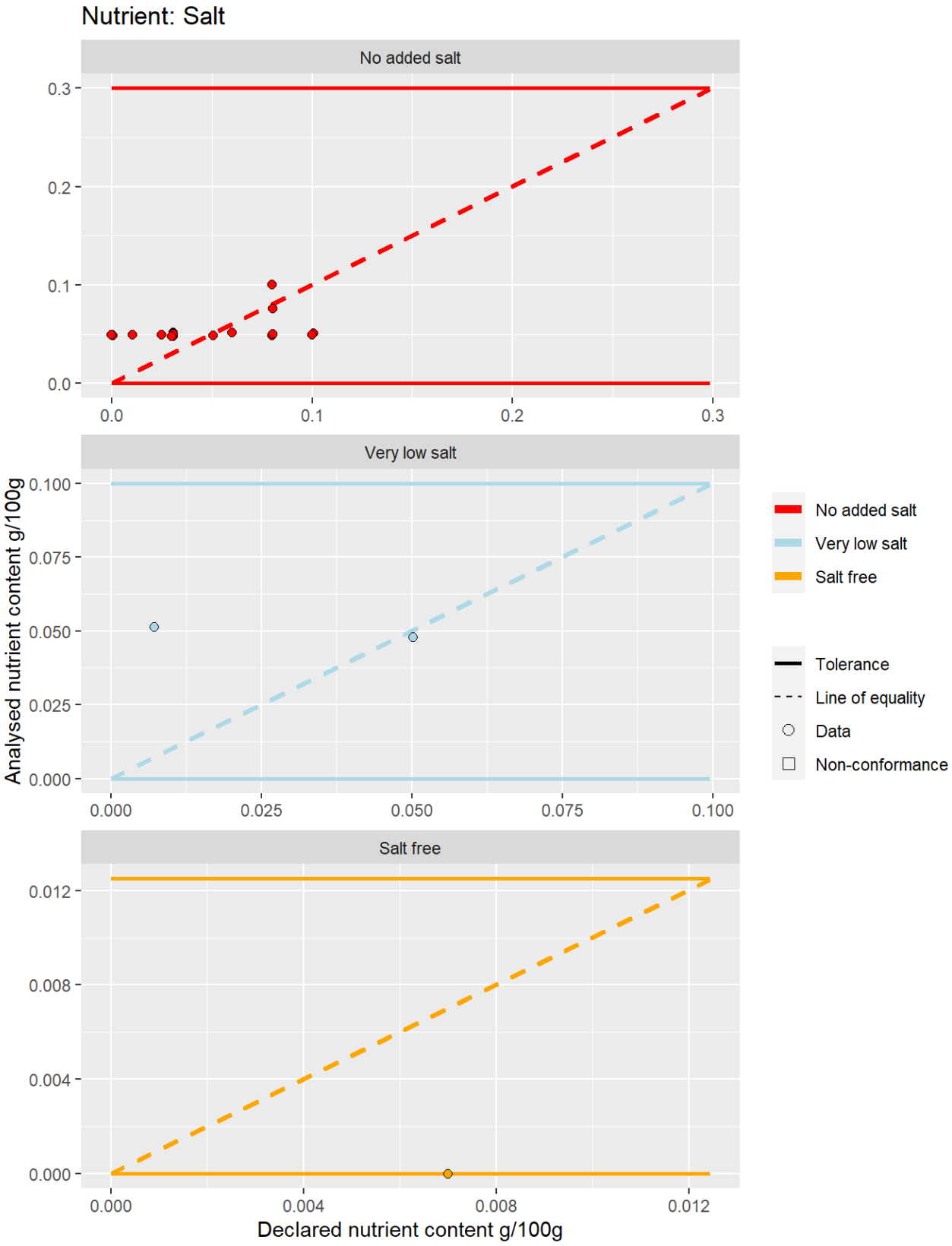


Figure 7 Trend in salt nutrition labelling tolerances for breakfast cereals with no added salt, very low salt, and salt free claims

5. Discussion

The aims of this study were to examine the accuracy of the declared nutrition labels of a sample of breakfast cereals sold on the Irish market between February and May 2019 in line with EC guideline nutrition labelling tolerances, and to make a recommendation on the use of declared nutrition labels for the monitoring of food reformulation of total fat, saturated fat, sugar and salt in Ireland.

5.1 Overview of breakfast cereal market and observed trends

The study observed a diversity in the types of breakfast cereals available on the Irish market that differ widely in their nutritional content. The study noted that granolas tended to be high in sugar and total fat. Oat cereals, such as porridge, tended to have lower sugar and fat content.

The findings of this study indicate that the breakfast cereal market in Ireland is rapidly changing. Over the 3-year period between the FSAI market scan in 2016 (which was used as the study sampling frame) and the sampling for this study in 2019, 35.5% of breakfast cereals were no longer available and 1.5% of breakfast cereals were available but in a different flavour. The study observed a shift towards more oat based and granola breakfast cereal.

The study observed fruit and nuts were the basis of a large variety of breakfast cereals. Depending on the fruit or nut content of the sample of breakfast cereal used for the nutrition declaration and then the verification analysis, this could affect the nutritional content and tolerances. In this study almost half of products outside of the EC guideline nutrition labelling tolerances contained fruit and nuts and half did not.

5.2 Comparability of declared and analysed nutrition content

The study observed a tendency for median declared total fat, saturated fat, sugar and salt content to be higher than median analysed content. Despite this declared energy content (Kcal) was lower than analysed.

Of the tested breakfast cereals, 14.1% (n=28), 5% (n=10), 9.6% (n=19) and 1.5% (n=3) were outside the EC guideline nutrition labelling tolerances for total fat, saturated fat, sugar and salt respectively (European Commission, 2012). There was a statistically significant difference between median declared and analysed energy, total fat, saturated fat and salt content per 100g of breakfast cereals.

When the EC guideline nutrition labelling tolerances were applied, the difference in declared and analysed saturated fat and salt was minimal. However, it was observed that this was not the case

for fat and sugar for which 14.1% (n=28) and 9.6% (n=19), respectively, were outside the EC guideline nutrition labelling tolerances.

In total, 51 breakfast cereals were found to be outside the EC guideline nutrition labelling tolerances, 9 of which were outside EC guideline nutrition labelling tolerances for two or more nutrients. Analysed nutrient content was lower than was stated on the label in 68.3% (n=41) of the analysed breakfast cereals that were found to be outside of EC guideline nutrition labelling tolerances. While this is a potential non-conformance with the labelling tolerance guidance, it is one that favours the consumer in terms of a healthier nutrient profile for breakfast cereals on the market. Non conformances were equal between 'branded' and 'own brand' breakfast cereals with 76% (n=39) of breakfast cereals outside of the nutrition labelling tolerances were 'branded' and 34% (n=12) were 'own brand'. This split is in keeping with the representation of 'branded' and 'own brand' in the study sample.

Other studies have found high levels of non-conformance with labelling tolerances. A study undertaken in Australia found that when a broad stroke tolerance of ±20% was applied to all declared nutrients on 350 samples of 70 different food products, 30% would not be compliant (Fabiansson, 2006). Similarly, a study in Malaysia found that 73% of 300 samples made up of a range of food categories were non-conformance with a labelling tolerance of ±20% (Kok and Mohamed Radzi, 2017). The findings of this study also agree with a previous study undertaken by the FSAI on yogurts which found similar levels of non-conformance with EC guideline nutrition labelling tolerances (FSAI, 2021).

5.3 The use of declared nutrition labels for reformulation monitoring

The introduction in 2016 of mandatory nutrition declaration of energy, total fat, saturated fat, carbohydrate, sugars, protein and salt of pre-packaged food per 100 g, under Regulation (EU) No 1169/2011 has led to the use of declared nutrition labels for monitoring food reformulation in Europe. This is a cost-effective way to monitor reformulation of foods. However, the findings of this study indicate that when EC guideline nutrition labelling tolerances are applied, it is possible that declared nutrition labels may not reflect food reformulation efforts. The International Network for Food and Obesity/Non-communicable Diseases (NCDs) Research, Monitoring and Action Support (INFORMAS) network recommends, where resources allow, the validation of declared nutrition information on food labels of food products surveyed in the monitoring of important nutrients in the food supply (Neal et al., 2013).

6. Conclusion and recommendations

This study found declared nutrition labels were mostly in conformance with EC guideline nutrition labelling tolerances for saturated fat, sugar and salt content of breakfast cereals. However, 14.1% (n=28) of breakfast cereals were outside EC guideline nutrition labelling tolerances for total fat. The study observed no systematic bias for placing breakfast cereals on the market with higher nutrient content than that shown on the label. The findings of this study are in agreement with a previous study undertaken by the FSAI on yogurts and adds to the weight of evidence indicating that the declared nutrition labels may not reflect food reformulation efforts.

Based on the findings of this study, the following recommendations are made:

- When EC guideline nutrition labelling tolerances are accounted for, it is possible that declared nutrition labels may not reflect food reformulation efforts. This finding needs to be considered when developing a reformulation monitoring programme.
- The nutrient content of a serving of breakfast cereals containing nuts and fruit depends on the distribution of nuts and fruit in the cereal. This needs to be accounted for when undertaking nutrition verification studies.
- There are numerous factors which influence variations in declared and analysed nutrient content of breakfast cereals, and this requires further investigation with the food industry as it could affect reformulation monitoring.
- Based on the findings of this study and a previous study which applied the same methodology to yogurts, reformulation monitoring programmes using declared nutrition labels need to be ‘fact checked’ at regular intervals using nutrition label verification.

7. References

Bel-Serrat S, Heinen MM, Mehegan J, O'Brien S, Eldin N, Murrin CM and Kelleher CC (2018) School sociodemographic characteristics and obesity in schoolchildren: does the obesity definition matter? BMC Public Health, 18: 337.

Commission on Social Determinants of Health (2008) Closing the gap in a generation: health equity through action on the social determinants of health. Final Report of the Commission on Social Determinants of Health. Geneva: World Health Organization.

Department of Health (2013) Healthy Ireland: A Framework for Improved Health and Wellbeing 2013–2025. Dublin: Department of Health.

Department of Health (2013) Healthy Ireland: A Framework for Improved Health and Wellbeing 2013–2025. Dublin: Department of Health.

Department of Health (2015) Healthy Ireland Survey 2015: Summary of Findings. Dublin: The Stationery Office.

Department of Health (2015) Healthy Ireland Survey 2015: Summary of Findings. Dublin: The Stationery Office.

Department of Health (2016) A Healthy Weight for Ireland: Obesity Policy and Action Plan 2016 – 2025. Dublin: The Stationery Office.

Department of Health (2016) A Healthy Weight for Ireland: Obesity Policy and Action Plan 2016 – 2025. Dublin: The Stationery Office.

Department of Health (2016) A Healthy Weight for Ireland: Obesity Policy and Action Plan 2016 – 2025. Dublin: The Stationery Office.

EFSA Panel on Dietetic Products, Nutrition, and Allergies (2010) Scientific Opinion on Dietary Reference Values for fats, including saturated fatty acids, polyunsaturated fatty acids, monounsaturated fatty acids, trans fatty acids, and cholesterol. EFSA Journal, 8(3): 1461.

European Commission (2009) EU Framework for National Salt Initiatives.

European Commission (2011) National Initiatives on Selected Nutrients.

European Commission (2012) Guidance with regard to the setting of tolerances for nutrient values declared on a label.

European Food Safety Authority (2017) Dietary Reference Values for nutrients Summary report. EFSA supporting publication, 14(12): e15121. doi: 10.2903/sp.efsa.2017.e15121

Fabiansson SU (2006) Precision in nutritional information declarations on food labels in Australia. Asia Pac J Clin Nutr, 15(4): 451–458.

Fiolet T, Srour B, Sellem L, Kesse-Guyot E, Allès B, Méjean C, Deschasaux M, Fassier P, Latino-Martel P, Beslay M and Hercberg S (2018) Consumption of ultra-processed foods and cancer risk: results from NutriNet-Santé prospective cohort. BMJ, 360: k322.

Food Safety Authority of Ireland (2010) Accuracy of Nutrition Labelling of Pre-Packaged Food in Ireland. Dublin: Food Safety Authority of Ireland.

Food Safety Authority of Ireland (2016) Survey of the trans fatty acid content in processed food products in Ireland. Dublin: Food Safety Authority of Ireland.

Food Safety Authority of Ireland (2018) Monitoring of Sodium and Potassium in Processed Foods. Period: September 2003 to December 2018.

Food Safety Authority of Ireland (2020) Finding Healthier Breakfast Cereals and Yogurts in Ireland. Dublin: Food Safety Authority of Ireland.

Food Safety Authority of Ireland (2021) Reformulation of yogurts: The accuracy of nutrition declaration on food labels for monitoring food reformulation in Ireland.

Irish Universities Nutrition Alliance (2011) National Adult Nutrition Survey. Dublin.

Kok SC and Mohamed Radzi CWJ (2017) Accuracy of nutrition labels of pre-packaged foods in Malaysia. British Food Journal, 119(2): 230–241.

McKinsey Global Institute (2014) How the World Could Better Fight Obesity. Available at: https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/how-the-world-could-better-fight-obesity.

Monteiro CA, Moubarac JC, Cannon G, Ng SW and Popkin B (2013) Ultra-processed products are becoming dominant in the global food system. Obesity Review, 14(Suppl 2): 21–28.

Neal B, Sacks G, Swinburn B, Vandevijvere S, Dunford E, Snowdon W, Webster J, Barquera S, Friel S, Hawkes C, Kelly B, Kumanyika S, L'Abbé M, Lee A, Lobstein T, Ma J, Macmullan J, Mohan S, Monteiro C, Rayner M, Sanders D, Walker C and INFORMAS (2013) Monitoring the levels of important nutrients in the food supply. Obesity Reviews, 14(Suppl. 1): 49–59. doi: 10.1111/obr.1207

Nettleton JA, Brouwer IA, Geleijnse JM and Hornstra G (2017) Saturated Fat Consumption and Risk of Coronary Heart Disease and Ischemic Stroke: A Science Update. Ann Nutr Metab, 70(1): 26–33.

O'Donnell, A., Buffini, M., Kehoe, L., Nugent, A., Kearney, J., Walton, J., Flynn, A. and McNulty, B. (2020) The prevalence of overweight and obesity in Irish children between 1990 and 2019, *Public Health Nutrition*, Cambridge University Press, 23(14), pp. 2512–2520.

Regulation (EU) No 1169/2011 of the European Parliament and of the Council of 25 October 2011 on the provision of food information to consumers.

Walton J, Kehoe L, McNulty BA, Nugent A and Flynn A (2017) Intakes and sources of dietary sugars in a representative sample of Irish adults (18–90y). Proceedings of the Nutrition Society, 76(OCE3): E65. doi: 10.1017/S0029665117001380

World Health Organization (2003) Diet, nutrition and the prevention of chronic diseases: Report of a Joint WHO/FAO Expert Consultation. WHO Technical Report Series, No. 916. Geneva: World Health Organization.

World Health Organization (2015) Global status report on noncommunicable diseases 2014. Geneva: World Health Organization.

World Health Organization (2015) Guideline: Sugars intake for adults and children. Geneva: World Health Organization.

8. Annex

8.1 Annex 1: Methods used for the determination of energy, total fat, saturated fat, sugar and salt content of breakfast cereals

Analysis	Method summary
Fat and moisture	This test utilises the CEM SMART Trac II™ Rapid Fat and Moisture/Solids Analyser. SMART Trac produces moisture results by removing water (evaporation) via microwave energy and measuring the weight loss on drying. The dried sample is transferred into a plastic sleeve using the Compression Station and inserted into the NMR instrument, where it then receives a pulse of radio-frequency energy from the NMR for analysis of fat content. It measures fat directly by using signal-to-mass ratio.
Fatty acid composition	Fat is extracted from a sample by microwave digestion – saponification in methanolic potassium hydroxide solution when fats are converted to free fatty acids (salts). The fatty acids are derivatised to their methyl esters by treatment with a methylation solution of sulphuric acid in methanol and then extracted with hexane. Identification and quantification of fatty acids is achieved by gas chromatography using flame ionisation detection and hydrogen as a carrier gas. Total fat content of the sample is obtained using the fat and moisture determination procedure outlined above.
Energy calculation for food	Energy is calculated in kcal and in kJ/100 g. The calculations are performed as follows: ENERGY (kcal/100 g) = (P×4) + (F×9) + (C×4) ENERGY (kJ/100 g) = (P×17) + (F×37) + (C×17)
Sugar	Sugars are determined on a hot water extract of the sample by ion chromatography with pulsed amperometric detection using a gold electrode, with calibration against an internal standard.
Salt	Food samples are digested using a microwave digestion unit. Sodium is quantified by analysis of the resulting solution using Atomic Absorption Spectrometry.

Food Safety
AUTHORITY OF IRELAND

Food Safety Authority of Ireland
The Exchange, George's Dock, IFSC,
Dublin 1, D01 P2V6

T +353 1 817 1300
E info@fsai.ie

Join us on LinkedIn
Follow us on Twitter @FSAIinfo
Say hi on Facebook
Visit us on Instagram
Subscribe to our YouTube channel

www.fsai.ie