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Monitoring Sodium and Potassium in Processed Foods

September 2003 to December 2023

Monitoring Sodium and Potassium in Processed Foods

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The Exchange, George's Dock, IFSC,
Dublin 1, D01 P2V6

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

www.fsai.ie

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Abbreviations

AOAC	Association of Official Agricultural Chemists
CRMs	certified reference materials
FSAI	Food Safety Authority of Ireland
GPAL	Public Analyst's Laboratory, Galway
K	potassium
Na	sodium
N/A	not available
NIST	National institute of Standards and Technology
NS	no statistically significant difference
NT	not tested
OOH	out-of-home
QC	quality control
SRP	salt reduction programme
SD	standard deviation

Version history

Title	Date published	Description
Monitoring Sodium and Potassium in Processed Foods: September 2003 to December 2022	29/05/2023	• 2022 sampling results added to breads. • Arrows changed to a blue colour in figures 1–10 when showing changes in potassium content of a food category. • Products labelled as “Oriental” relabelled as “Asian” when describing ready meals and snack products. • Following a full review of the report, changes made to improve consistency of language used and readability by elaborating on summary bullet points and providing more detail in table headings / figure titles. • Out-of-home monitoring section updated to remove subsection on fried foods due to the small sample size of products.
Monitoring Sodium and Potassium in Processed Foods: September 2003 to December 2023	18/06/2024	• 2023 sampling results added to processed cheese. • New subcategory called ‘Plant-based cheese alternative’ added to processed cheese. • Trend graph summarising the results of sodium sampling between 2003–2023 added.

Purpose

The purpose of this report is to provide an overview of the results obtained in the Food Safety Authority of Ireland (FSAI) salt monitoring surveys which have been conducted on an annual basis since 2003.

Introduction

The leading causes of death across the globe are non-communicable diseases such as cardiovascular disease, cancers, chronic respiratory diseases and diabetes (Hyseni *et al.*, 2017). Overconsumption of salt increases risk of morbidity and mortality from cardiovascular diseases (GBD 2015 Risk Factors Collaborators, 2016). Policies on salt reduction have led to improved health outcomes (Federici *et al.*, 2019). Salt reduction policies have also proved to be cost-effective, for example, a 5-year investment of £15 million by the United Kingdom's Food Standards Agency on a salt reduction programme is estimated to have prevented 6,000 cardiovascular deaths and saved approximately £300 million per year (NICE, 2010).

Acknowledging the importance of reducing salt intake in the Irish population, the FSAI established and was responsible for coordinating a voluntary Salt Reduction Programme (SRP) in 2003 (FSAI, 2016). The SRP was established in partnership with the food industry, Food Drink Ireland, Retail Ireland, and various state bodies and organisations, with the goal of achieving voluntary, gradual and sustained reductions in the salt content of processed foods. In 2013, responsibility for coordinating the SRP was passed to the food industry while the FSAI retained a monitoring role in terms of salt reformulation (FSAI, 2013).

Under the SRP the FSAI identified and monitored 11 categories of processed foods which contribute to population dietary salt intake. Each year, the FSAI samples products from these processed food categories and sends these samples to the Public Analyst's Laboratory, Galway (GPAL) for sodium and potassium analysis. Owing to the potential use of potassium salt substitutes in the reformulation of foods, it is important to assess the potassium content of these products as well as the sodium content. The FSAI has published guidance to assist food businesses in the use of potassium salt substitutes, titled *Guidance Note 36 Best Practice on the Use of Potassium-based Salt Substitutes for the Food Industry* (FSAI, 2021).

It is believed that processed foods and out-of-home (OOH) foods account for approximately 75% of an individual's salt intake (Harnack *et al.*, 2017). While the FSAI has collected extensive data in relation to the monitoring of processed foods, there is little information regarding salt sources in the OOH food environment in Ireland. Therefore, upon identifying this information gap, and in line with

the recommendations of the FSAI report *Salt and Health: Review of the Scientific Evidence and Recommendations for Public Policy in Ireland (Revision 1)* (2016), the FSAI undertook a pilot study in 2020 to investigate the feasibility of collecting OOH lunchtime food options for sodium and potassium monitoring purposes.

In 2021, the Department of Health published *A Roadmap for Food Product Reformulation in Ireland*, which recognises the work undertaken by the FSAI as part of the SRP and makes a commitment to build on it (Department of Health*, 2021*). The Food Reformulation Task Force, a strategic partnership between the FSAI and Healthy Ireland, was established in 2022 and has continued the SRP approach to monitoring the sodium and potassium content of foods.

Method

1. Sample collection

- Each year, some of the 11 categories of processed foods are sampled and categorised by sub-category (see Table 1).[1] Samples are collected from a range of supermarkets and convenience stores within the locality of the sampling officers.
- Following collection, samples are labelled with a unique identifier survey code and sample code which correspond to a populated Excel spreadsheet that includes the FSAI reference code, sample number and product label information.
- Photographs of all sides of the product label are taken, uploaded and stored electronically.
- Samples are transported by courier to GPAL for sodium and potassium analysis.

2. Sample analysis

- All samples are analysed by GPAL *Irish National Accreditation Board Registration Number: 009T*.
- Samples are initially homogenised (either directly or as aqueous slurries, depending on sample type), dried and then ashed in a muffle furnace (at a temperature of 520 °C, ± 20 °C). Nitric acid is added to the ash, which is then acid-digested in a steam bath. The solution is then diluted (if necessary) and analysed for sodium and potassium using flame photometry (also known as atomic emission spectrophotometry. Quality control (QC) checks are applied as part of monitoring method performance, including internal and external QC, analysis of certified reference materials (CRMs) and repeatability. The in-house method 1/40 was based

[1] Please note that there was no specific randomised approach employed for sampling.

on the Association of Official Agricultural Chemists' (AOAC's) Official Method 969.23 (*AOAC Official Method of Analysis*, 18th Edition, 2005).

- Methodology for laboratory analysis of food products for nutritional declarations such as sodium is not defined in legislation. Many methodologies of laboratory analysis are available that have different degrees of accuracy and applicability. However, allowances for differences between methodologies for analysis of food products are not applied to the current results.
- The limit of quantitation for samples tested is 10 mg/100 g for both sodium and potassium and are dependent on the initial sample weight taken for analysis.
- The average sodium recovery is 92% (range: 84–100%) based on combined CRM data (using *NIST 1546 Meat* and *LGC 7103 Biscuit reference materials*, and external QC data from proficiency testing schemes).
- The average potassium recovery is 95% (range: 92–104%) based on combined CRM data (using NIST 1546 Meat and LGC 7103 Biscuit reference materials).

3. Statistical analysis

- Results were analysed using RStudio v4.0.3 in 2021, v4.1.1 in 2022, v4.2.1 in 2023 and v4.3.0 in 2024.[2]
- Frequency statistics (means and standard deviations (SDs)) and independent t-tests are employed to assess both short- and long-term changes in the sodium and potassium content of processed foods.
- The percentage difference between two timepoints is calculated using the following formula: (timepoint 2 – timepoint 1)/(timepoint 1)*100. Given that these 11 food categories are sampled conveniently, the percentage differences between two timepoints applies to these convenient samples and is indicative of trends in the food category.

[2] Results from all samples collected since 2003 were re-analysed using R Studio.

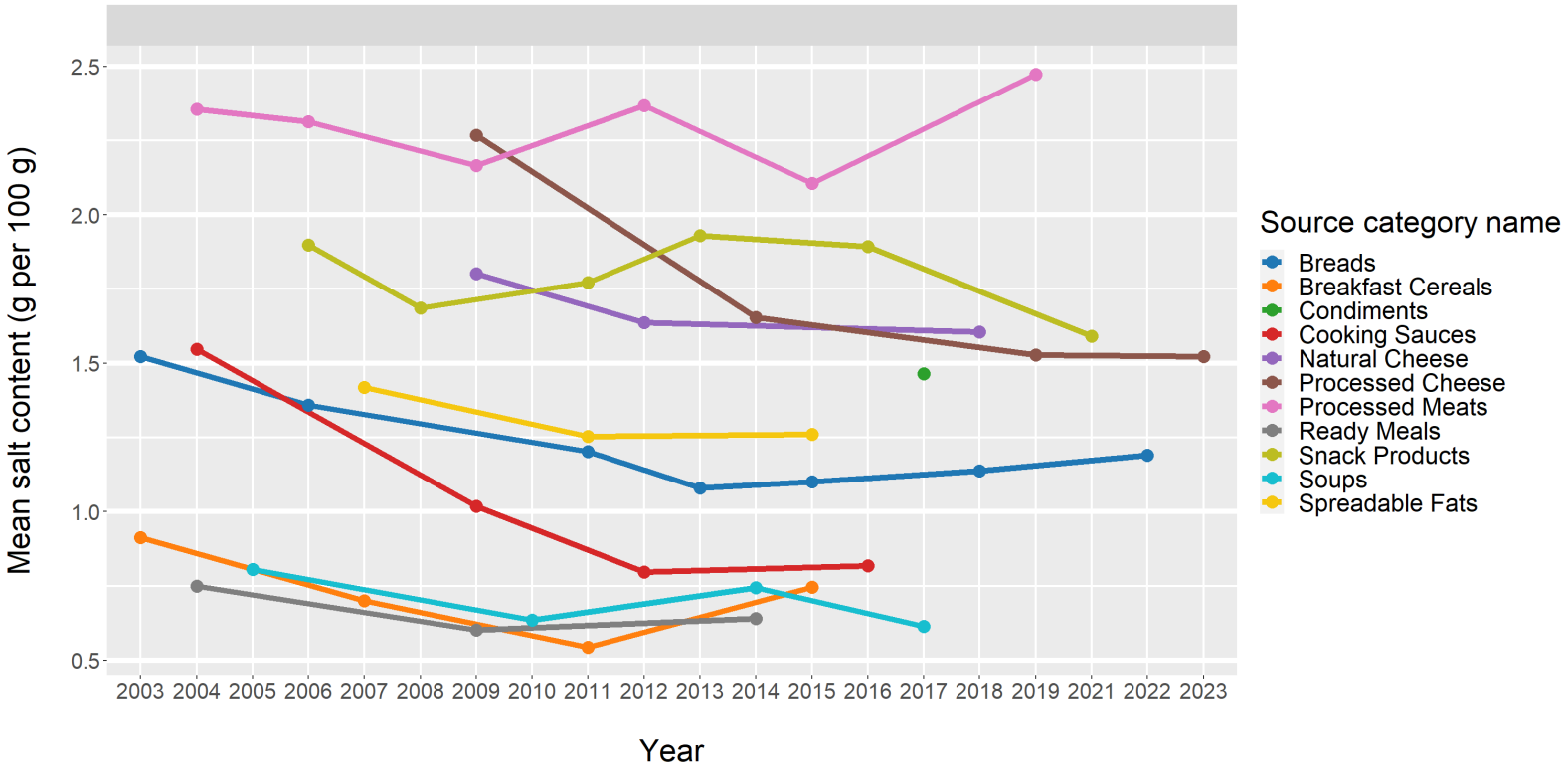
Table 1 Products sampled from 2003 to 2023

Category	Sub-categories											
Soups	Fresh soup	Ambient soup	Canned soup	Dried soup								
Ready meals	Asian dishes	Pasta dishes	Curry dishes	Pizza	Meat pies	Quiche						
Cooking sauces	Carbonara	Bolognese	Curry	Sweet and sour	Black bean							
Snack products	Corn chips	Extruded snacks	Luxury crisps	Pelleted snacks	Popcorn	Potato crisps	Salt and vinegar products	Healthier varieties	Asian-style snacks	Pretzel-shaped snacks	Savoury snack biscuits	Weaning snacks
Processed meats	Sausages	Rashers	Pudding	Cooked ham	Continental meats							
Bread products	White	Brown	Wholemeal	Wholegrain	Speciality	Mixed flour	Sourdough	Unpackaged				
Breakfast cereals	Rice-based cereals	Bran-based cereals	Cornflake-based cereals	Biscuit-based cereals	Multigrain cereals	Muesli	All other cereal products (no added salt/low salt)					
Spreadable fats	Butter	Half-fat butter	Margarine (fat content >80% but <90%)	Fat spread (fat content >62% but <80%)	Fat spread (fat content >41% but <60%)	Fat spread (fat content <39%)	Blended spread (fat content >80% but <90%)	Blended spread (fat content>62% but <80%)	Blended spread (fat content>41 % but <60%)			
Natural cheese	Regular cheese	Mature cheese	Reduced-fat cheese									
Processed cheese	Blocks, strips and slices	Reduced-fat blocks, strips and slices	Spreads	Reduced-fat spreads	Snack packs	Plant-based cheese alternative						
Condiments	Ketchup	Salad cream	Mayonnaise	Brown sauce								

Table 2 Number of samples collected from 2003 to 2023

Category	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2021	2022	2023	Total
Soups			126					114			42	103			44						**429**
Ready meals		51					51					181									**283**
Cooking sauces		52					71			48				88							**259**
Snack products				136		97			137		102			59				100			**631**
Processed meats		267		194			98			127			148				100				**934**
Bread products	100			178					186		123		142			97			97		**923**
Breakfast cereals	88				119				330				150								**687**
Spreadable fats					72				90				90								**252**
Natural cheese							34			56						93					**183**
Processed cheese							36					173					107			106	**422**
Condiments															157						**157**
Unreported data		122	82	12			2														**218**
Total	**188**	**492**	**208**	**520**	**191**	**97**	**292**	**114**	**743**	**231**	**267**	**457**	**530**	**147**	**201**	**190**	**207**	**100**	**97**	**106**	**5378**

Trends in the salt[3] (g/100 g) content of the 11 food categories are shown in Figure 1.



Note: Dried soup has been excluded from soups, as dried soup was not collected after 2014.

Figure 1: Trends in mean salt (g/100 g) content in 11 food categories monitored between 2003 and 2023

[3] Salt content displayed in Figure 1 is the salt equivalent for the mean analysed sodium content. .

Background: tables 3–24

- Eleven categories of processed foods were sampled and monitored between 2003 and 2023 to determine mean levels of sodium and potassium which is outlined in Table 2. These foods are monitored at intervals, which allows sufficient time for changes in salt content to filter down to the products available on the supermarket shelf. This is in line with the FSAI policy of encouraging gradual and sustained reductions in the salt content of processed foods. The interval for sampling typically ranges from 2 to 5 years. No processed foods were sampled in 2020 due to the Covid-19 pandemic.
- Levels of sodium and potassium in processed foods from 2003 to 2010 were based on single-product samples. From 2010 to 2018, a combination of single-product sampling and more representative sampling of products was undertaken where possible. In this case, two to three samples of each selected product (with different batch numbers and/or shelf-life declarations) were tested for sodium and potassium. Then in 2019, sampling of single products resumed.
- Some product formulations and labelling may have changed since these surveys were carried out. The analysis results presented in Tables 3–24 reflect the situation at the time of product sampling.
- Where possible, products are categorised based on their label description. In other cases, products are categorised based on industry practice and/or their legislative descriptor.
- Results relate to both branded and private label products.
- Results relate to products as sold (including those products requiring reconstitution before consumption, such as dried soups).
- All values are rounded to the nearest whole number.
- The term “statistical significance” is used in assessing if a set of results/observations reflects a real pattern or one related to chance. In all tables, statistical significance is set at $p=\leq 0.05$ (95% confidence interval). All values are rounded to the nearest whole number.
- To convert sodium to salt, multiply the value by 2.54.
- To convert salt to sodium, divide the value by 2.54.

Soups

This section looks at the sodium and potassium content of soup between 2005 and 2017. Figure 2 provides a summary of key trends in sodium and potassium content of the food category. Tables 3 and 4 outline the full details of short- and long-term trends in sodium and potassium content and should be referred to when interpreting Figure 2.

Figure 2: Statistically significant (and percentage change) and non-statistically significant changes in mean (SD) sodium and potassium (mg/100 g) content of soup between 2005 and 2017

- A statistically significant reduction in the sodium content of Canned soup (33%, p <0.001) was observed between 2005 and 2017, and Dried soup (25%, p <0.001) between 2005 and 2014 and Canned soup (26%, p=0.003) between 2014 and 2017, (see Table 3).
- A statistically significant increase in the potassium content of Dried soup (17%, p=0.037) was observed between 2005 and 2014, (see Table 4).
- No statistically significant change in the sodium content of Fresh soup was observed between 2005 and 2014 and Ambient Soup between 2005 and 2017, (see Table 3).
- No statistically significant change in the potassium content of Fresh soup was observed between 2005 and 2014 and Ambient Soup and Canned Soup between 2005 and 2017, (see Table 4).

Table 3 Mean (SD) sodium content of soups (mg/100 g)

Sub-category[a]	Mean (SD) sodium (mg/100g) content per year of survey				Statistical significance (2005 vs 2017)[g]	% sodium content change (2005 vs 2017)[g]	Statistical significance (2014 vs 2017)[g]	% sodium content change (2014 vs 2017)[g]
	2005	2010	2014	2017				
Fresh soup[b]	280 (76)	230 (66)	246 (57)[f]	NT	NS (2005 vs 2014)	▼12 (2005 vs 2014)	NS (2010 vs 2014)	▲7 (2010 vs 2014)
Ambient soup[c]	277 (65)	251 (77)	NT	241 (66)	NS	▼13	NS (2010 vs 2017)	▼4 (2010 vs 2017)
Canned soup[d]	362 (123)	268 (118)	324 (118)	242 (64)	<0.001	▼33	0.003	▼26
Dried soup[e]	4083 (1370)	3320 (1055)	3062 (806)	NT	<0.001 (2005 vs 2014)	▼25 (2005 vs 2014)	NS (2010 vs 2014)	▼8 (2010 vs 2014)
Total samples	126	114	145	44	Overall total = 429			

(a) Unless otherwise indicated, all samples were analysed as sold. Varieties of soup sampled within each category: mushroom, vegetable, tomato, and chicken. **(b)** Chilled soup. **(c)** Includes ambient soups packed in flexible retort packs, pouches, tetra-packs and plastic pots. **(d)** Some canned/tinned soups are condensed, and are to be diluted before cooking/consumption (dilution levels vary by manufacturer). **(e)** Includes dried packet, dried instant and concentrated liquid varieties. Dried and concentrated soups are to be diluted before cooking/consumption (dilution varies by manufacturer). **(f)** Samples taken at two time periods (from May to October 2013, and from April to May 2014). **(g)** Unless otherwise stated; **NS**, not statistically significant; **NT**, not tested.

Table 4 Mean (SD) potassium content of soups (mg/100 g)

Sub-category[a]	Mean (SD) potassium (mg/100g) content per year of survey				Statistical significance (2005 vs 2017)[g]	% potassium content change (2005 vs 2017)[g]	Statistical significance (2014 vs 2017)[g]	% potassium content change (2014 vs 2017)[g]
	2005	2010	2014	2017				
Fresh soup[b]	119 (47)	142 (43)	134 (42)[f]	NT	NS (2005 vs 2014)	▲13 (2005 vs 2014)	NS (2010 vs 2014)	▼6 (2010 vs 2014)
Ambient soup[c]	106 (49)	166 (94)	NT	135 (51)	NS	▲27	NS (2010 vs 2017)	▼19 (2010 vs 2017)
Canned soup[d]	99 (69)	106 (55)	118 (77)[f]	119 (61)	NS	▲20	NS	▲1
Dried soup[e]	623 (266)	762 (301)	732 (394)	NT	0.037 (2005 vs 2014)	▲17 (2005 vs 2014)	NS (2010 vs 2014)	▼4 (2010 vs 2014)
Total samples	126	114	145	44	Overall total = 429			

(a) Unless otherwise indicated, all samples were analysed as sold. Varieties of soup sampled within each category: mushroom, vegetable, tomato, and chicken. **(b)** Chilled soup. **(c)** Includes ambient soups packed in flexible retort packs, pouches, tetra-packs and plastic pots. **(d)** Some canned/tinned soups are condensed, and are to be diluted before cooking/consumption (dilution levels vary by manufacturer). **(e)** Includes dried packet, dried instant and concentrated liquid varieties. Dried and concentrated soups are to be diluted before cooking/consumption (dilution varies by manufacturer). **(f)** Samples taken at two time periods (May and October 2013, and from April to May 2014). **(g)** Unless otherwise stated; **NS**, not statistically significant; **NT**, not tested.

Ready meals

This section looks at the sodium and potassium content of ready meals between 2004 and 2014. Figure 3 provides a summary of key trends in sodium and potassium content of the food category. Tables 5 and 6 outline the full details of short- and long-term trends in sodium and potassium content and should be referred to when interpreting Figure 3.

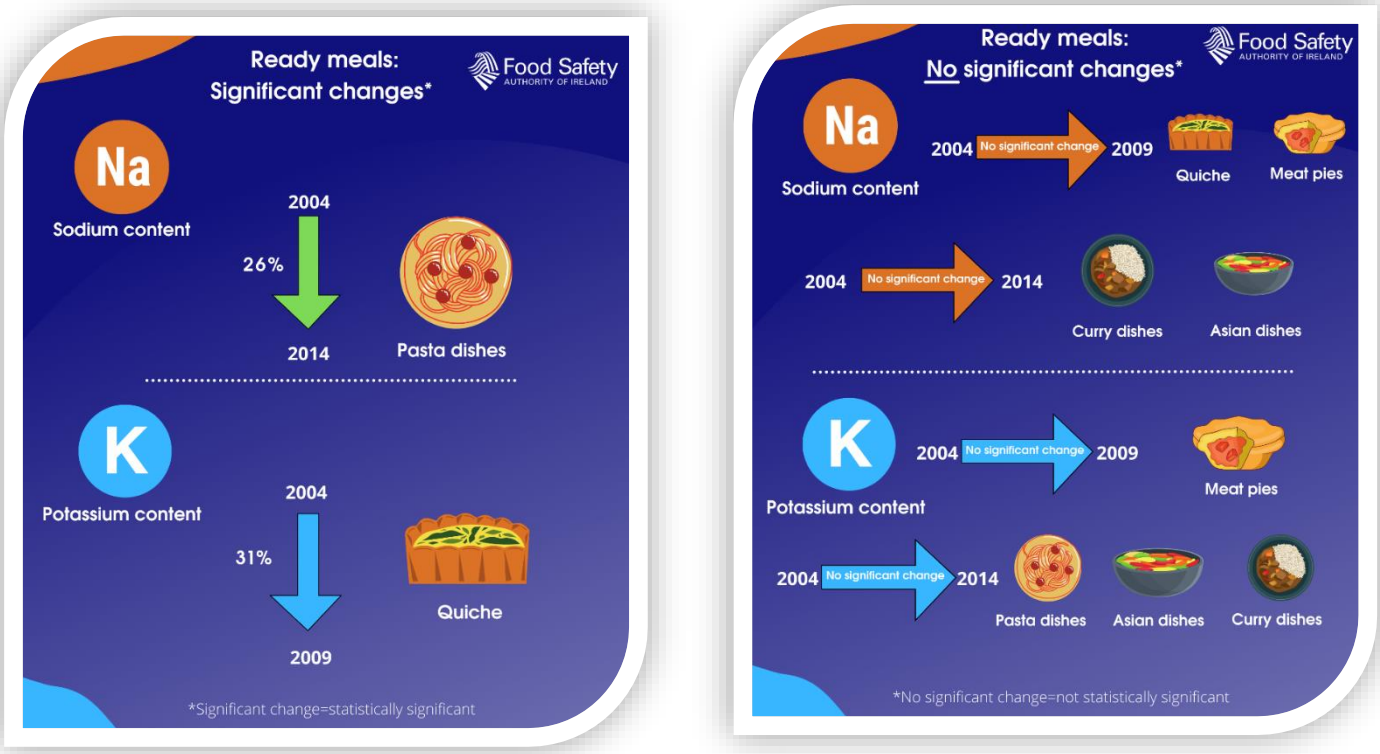


Figure 3: Statistically significant (and percentage change) and non-statistically significant changes in mean (SD) sodium and potassium (mg/100 g) content of ready meals between 2004 and 2014

- A statistically significant reduction in the sodium content of Pasta dishes (26%, p=0.003) was observed between 2004 and 2014, (see Table 5).
- A statistically significant reduction in the potassium content of Quiche (31%, p=0.02) was observed between 2004 and 2009, (see Table 6).
- No statistically significant change in the sodium content of Meat pies and Quiche was observed between 2004 and 2009 and Curry dishes and Asian dishes between 2004 and 2014, (see Table 5).
- No statistically significant change in the potassium content of Meat pies was observed between 2004 and 2009 and Pasta dishes and Curry dishes between 2004 and 2014, (see Table 6).
- No change in the potassium content of Asian dishes was observed between 2004 and 2014, (see Table 6).

Table 5 Mean (SD) sodium content of ready meals (mg/100 g)

Sub-category[a]	Mean (SD) sodium (mg/100g) content per year of survey			Statistical significance (2004 vs 2014)[h]	% sodium content change (2004 vs 2014)[h]	Statistical significance (2009 vs 2014)	% sodium content change (2009 vs 2014)
	2004	2009	2014				
Asian dishes[b]	203 (148)	193 (76)	203 (74)	NS	No change	NS	▲5
Pasta dishes[c]	298 (72)	231 (68)	222 (81)	0.003	▼26	NS	▼4
Curry dishes[d]	276 (140)	224 (85)	215 (61)	NS	▼22	NS	▼4
Pizza[e]	NT	NT	370 (96)	N/A	N/A	N/A	N/A
Meat pies[f]	364 (140)	248 (79)	NT	NS (2004 vs 2009)	▼32 (2004 vs 2009)	N/A	N/A
Quiche[g]	398 (153)	308 (82)	NT	NS (2004 vs 2009)	▼23 (2004 vs 2009)	N/A	N/A
Total samples	51	51	181	Overall total = 283			

(a) May include chilled and/or frozen samples. **(b)** May include chicken, beef, or sweet and sour pork; black bean; chow mein; noodle dishes; and others. **(c)** May include lasagne (beef, pork or vegetarian), cannelloni and others. **(d)** May include Indian, Thai and Chinese chicken, beef or pork curries such as tikka, korma, bhuna, balti, masala, tandoori, green and red curry, and others. **(e)** New category for 2014: samples include only cheese and Margherita varieties. **(f)** May include Shepherd's, cottage, steak and kidney, and steak pies, as well as one sample of beef stew for 2004 (discontinued sampling category). **(g)** Typically quiche Lorraine (discontinued sampling category). **(h)** Unless otherwise stated; **N/A**, results not available; **NS**, not statistically significant; **NT**, not tested.

Table 6 Mean (SD) potassium content of ready meals (mg/100 g)

Sub-category[a]	Mean (SD) potassium (mg/100g) content per year of survey			Statistical significance (2004 vs 2014)[h]	% potassium content change (2004 vs 2014)[h]	Statistical significance (2009 vs 2014)	% potassium content change (2009 vs 2014)
	2004	2009	2014				
Asian dishes[b]	131 (35)	124 (17)	122 (19)	NS	▼7	NS	▼2
Pasta dishes[c]	207 (54)	188 (55)	203 (40)	NS	▼2	NS	▲8
Curry dishes[d]	168 (68)	165 (59)	190 (67)	NS	▲13	NS	▲15
Pizza[e]	NT	NT	185 (50)	N/A	N/A	N/A	N/A
Meat pies[f]	200 (39)	234 (64)	NT	NS (2004 vs 2009)	▲17 (2004 vs 2009)	N/A	N/A
Quiche[g]	167 (21)	115 (38)	NT	0.02 (2004 vs 2009)	▼31 (2004 vs 2009)	N/A	N/A
Total samples	51	51	181	Overall total = 283			

(a) May include chilled and/or frozen samples. **(b)** May include chicken, beef, or sweet and sour pork; black bean; chow mein; noodle dishes; and others. **(c)** May include lasagne (beef, pork or vegetarian), cannelloni and others. **(d)** May include Indian, Thai and Chinese chicken, beef or pork curries such as tikka, korma, bhuna, balti, masala, tandoori, green and red curry, and others. **(e)** New category for 2014: samples include only cheese and Margherita varieties. **(f)** May include Shepherd's, cottage, steak and kidney, and steak pies, as well as one sample of beef stew for 2004 (discontinued sampling category). **(g)** Typically quiche Lorraine (discontinued sampling category). **(h)** Unless otherwise stated; **N/A**, results not available; **NS**, not statistically significant; **NT**, not tested.

Cooking sauces

This section looks at the sodium and potassium content of cooking sauces between 2004 and 2016. Figure 4 provides a summary of key trends in sodium and potassium content of the food category. Tables 7 and 8 outline the full details of short- and long-term trends in sodium and potassium content and should be referred to when interpreting Figure 4.

Figure 4: Statistically significant (and percentage change) and non-statistically significant changes in mean (SD) sodium and potassium (mg/100 g) content of cooking sauces between 2004 and 2016

- A statistically significant reduction in the sodium content of Carbonara sauce (36%, *p*=0.006) was observed between 2009 and 2016, Curry sauce (35%, *p* <0.001) between 2004 and 2016 and Black bean sauce (71%, *p*=0.05) between 2004 and 2012, (see Table 7).
- A statistically significant increase in the potassium content of Bolognese sauce (24%, *p*=0.001) was observed between 2012 and 2016, (see Table 8).
- No statistically significant change in the sodium content of Bolognese sauce and Sweet and sour sauce was observed between 2004 and 2016, (see Table 7).
- No statistically significant change in the potassium content of Sweet and sour sauce, Curry sauce and Carbonara sauce was observed between 2004 and 2016 and Black bean sauce between 2004 and 2012, (see Table 8).

Table 7 Mean (SD) sodium content of cooking sauces (mg/100 g)

Sub-category[a]	Mean (SD) sodium (mg/100g) content per year of survey				Statistical significance (2004 vs 2016)[f]	% sodium content change (2004 vs 2016)[f]	Statistical significance (2012 vs 2016)[f]	% sodium content change (2012 vs 2016)[f]
	2004	2009	2012	2016				
Carbonara[b]	444 (137)	443 (92)	NT	286 (85)	NS	▼36	0.006 (2009 vs 2016)	▼36 (2009 vs 2016)
Bolognese[c]	412 (105)	362 (160)	270 (86)	352 (219)	NS	▼15	NS	▲30
Curry[d]	505 (118)	353 (131)	316 (77)	331 (121)	<0.001	▼35	NS	▲5
Sweet and sour	379 (197)	340 (163)	270 (96)	260 (56)	NS	▼31	NS	▼4
Black bean	1635 (1258)	706 (329)	472 (235)	NT	0.05 (2004 vs 2012)	▼71 (2004 vs 2012)	NS (2009 vs 2012)	▼33 (2009 vs 2012)
Total samples	52	71	48	88[e]	Overall total = 259			

(a) Includes jarred, pouch and other forms of ambient packaged samples. No fresh cooking sauces were sampled. **(b)** Cream-based pasta sauces. **(c)** Tomato-based pasta sauces and, included in 2016, red pesto sauces. **(d)** Includes different varieties of curry sauce, such as tikka, korma, bhuna, balti, masala and tandoori. **(e)** Omitted black bean (n=2), chilli con carne (n=3), chow mein (n=2), hoisin (n=1) and Thai curry (n=2) sauces. All omitted results are available on request to the FSAI. **(f)** Unless otherwise stated. **NS**, not statistically significant; **NT**, not tested.

Table 8 Mean (SD) potassium content of cooking sauces (mg/100 g)

Sub-category[a]	Mean (SD) potassium (mg/100g) content per year of survey				Statistical significance (2004 vs 2016)[f]	% potassium content change (2004 vs 2016)[f]	Statistical significance (2012 vs 2016)[f]	% potassium content change (2012 vs 2016)[f]
	2004	2009	2012	2016				
Carbonara[b]	64 (26)	77 (43)	NT	45 (20)	NS	▼30	NS (2009 vs 2016)	▼41 (2009 vs 2016)
Bolognese[c]	353 (69)	315 (70)	282 (56)	349 (51)	NS	▼1	0.001	▲24
Curry[d]	186 (41)	180 (48)	211 (103)	171 (69)	NS	▼8	NS	▼19
Sweet and sour	109 (37)	99 (18)	103 (24)	115 (35)	NS	▲5	NS	▲12
Black bean	156 (124)	104 (29)	122 (21)	NT	NS (2004 vs 2012)	▼22 (2004 vs 2012)	NS (2009 vs 2012)	▲17 (2009 vs 2012)
Total samples	52	71	48	88[e]	Overall total = 259			

(a) Includes jarred, pouch and other forms of ambient packaged samples. No fresh cooking sauces were sampled. Some products sampled include potassium chloride as an ingredient. **(b)** Cream-based pasta sauces. **(c)** Tomato-based pasta sauces and, included in 2016, red pesto sauces. **(d)** Includes different varieties of curry sauce, such as tikka, korma, bhuna, balti, masala and tandoori. **(e)** Omitted black bean (n=2), chilli con carne (n=3), chow mein (n=2), hoisin (n=1) and Thai curry (n=2) sauces. All omitted results are available on request to the FSAI. **(f)** Unless otherwise stated, **NS**, not statistically significant; **NT**, not tested.

Snack products

This section looks at the sodium and potassium content of snack products between 2006 and 2021. Figure 5 provides a summary of key trends in sodium and potassium content of the food category. Tables 9 and 10 outline the full details of short- and long-term trends in sodium and potassium content and should be referred to when interpreting Figure 5.

Figure 5: Statistically significant (and percentage change) and non-statistically significant changes in mean (SD) sodium and potassium (mg/100 g) content of snack products between 2006 and 2021

- A statistically significant reduction in the sodium content of Extruded snacks (25%, p=0.026) was observed between 2006 and 2021 and Extruded snacks (24%, p=0.011) between 2016 and 2021, (see Table 9).
- A statistically significant increase in the sodium content of Luxury crisps (49%, p=0.044) was observed between 2011 and 2021, (see Table 9).
- A statistically significant increase in the potassium content of Luxury crisps (72%, p <0.001) and Pelleted Snacks (94%, p=0.047) was observed between 2006 and 2021, (see Table 10).
- No statistically significant change in the sodium content of Pelleted snacks, Salt and vinegar products, Potato crisps, Corn chips and Popcorn was observed between 2006 and 2021, (see Table 9).
- No statistically significant change in the potassium content of Potato crisps, Popcorn, Corn chips, Salt and vinegar products and Extruded snacks was observed between 2006 and 2021, (see Table 10).

Table 9 Mean (SD) sodium content of snack products (mg/100 g)

Sub-category	Mean (SD) sodium (mg/100g) content per year of survey						Statistical significance (2006 vs 2021)	% sodium content change (2006 vs 2021)	Statistical significance (2016 vs 2021)[i]	% sodium content change (2016 vs 2021)[i]
	2006	2008	2011	2013	2016	2021				
Corn chips	435 (171)	493 (248)	507 (156)	NT	NT	373 (137)	NS	▼14	NS (2011 vs 2021)	▼26 (2011 vs 2021)
Extruded snacks[a]	1036 (433)	895 (371)	1006 (161)	984 (277)	1030 (227)	780 (259)	0.026	▼25	0.011	▼24
Luxury crisps[b]	685 (280)	543 (134)	380 (135)	NT	NT	567 (208)	NS	▼17	0.044 (2011 vs 2021)	▲49 (2011 vs 2021)
Pelleted snacks[c]	846 (416)	778 (424)	778 (108)	880 (175)	755 (21)	571 (415)	NS	▼33	NS	▼24
Popcorn	796 (530)	575 (450)	758 (398)	NT	NT	566 (317)	NS	▼29	NS (2011 vs 2021)	▼25 (2011 vs 2021)
Potato crisps[b] [d]	588 (262)	479 (222)	534 (120)	557 (135)	540 (179)	556 (143)	NS	▼5	NS	▲3
Salt and vinegar products	890 (355)	836 (253)	759 (180)	852 (282)	794 (217)	710 (132)	NS	▼20	NS	▼11
Healthier varieties[e]	NT	NT	NT	NT	NT	662 (260)	N/A	N/A	N/A	N/A
Asian-style snacks[f]	NT	NT	NT	NT	NT	1084 (390)	N/A	N/A	N/A	N/A
Pretzel-shaped snacks	NT	NT	NT	NT	NT	1232 (493)	N/A	N/A	N/A	N/A
Savoury snack biscuits[g]	NT	NT	NT	NT	NT	705 (7)	N/A	N/A	N/A	N/A
Weaning snacks[h]	NT	NT	NT	NT	NT	72 (76)	N/A	N/A	N/A	N/A
Total samples	136	97	137	102	59	100	Overall total = 631			

(a) Food extrusion is a process in which a food material is forced to flow (under one or more varieties of conditions of mixing, heating and shear) through a die which is designed to form and/or puff-dry the ingredients (e.g. onion rings); extruded snacks can also be described as puffed snacks. There are many different raw materials which can be used for extruded snack production, including potato, rice, maize, wheat, corn, etc. **(b)** Potatoes (of various varieties) which are sliced (flat, crinkle cut, etc.), lightly fried in vegetable oil and then sprinkled with flavouring. **(c)** There are many different raw materials which can be used for pellet production, such as potato, rice, maize, wheat, corn, etc. The pellets are divided into two basic categories: those made from grain (rice, maize, wheat, corn) or those made from potato. The latter is the only one to give the authentic potato taste to the finished product. Pelleted snacks are produced when the raw material is extruded into a recognisable shape; this can be done using a process known as direct expansion or, alternatively, using a process known as indirect expansion. The directly expanded pellets are produced in a one-step extruder and are ready for consumption following the extrusion process. The indirectly expanded pellets are extruded and then generally sold on as a semi-manufactured product to companies that finish the process by frying them in hot oil and then flavouring or seasoning them before packaging. **(d)** The majority of potato crisps sampled were cheese and onion flavour or variations of that flavour. **(e)** Snack products presented as a healthier option due to the cooking method used or the primary ingredient being based on vegetable or lentil instead of grain. **(f)** Poppadom or prawn cracker-based snacks. **(g)** Miniature savoury biscuits or crackers sold in a single-serving portion pack. **(h)** Puffed and crisped snack products targeting infants and young children. **(i)** Unless otherwise stated**; N/A,** results not available; **NS**, not statistically significant; **NT**, not tested.

Table 10 Mean (SD) potassium content of snack products (mg/100 g)

Sub-category	Mean (SD) potassium (mg/100g) content per year of survey						Statistical significance (2006 vs 2021)	% potassium content change (2006 vs 2021)	Statistical significance (2016 vs 2021)[i]	% potassium content change (2016 vs 2021)[i]
	2006	2008	2011	2013	2016	2021				
Corn chips	205 (41)	235 (58)	220 (39)	NT	NT	240 (64)	NS	▲17	NS (2011 vs 2021)	▲9 (2011 vs 2021)
Extruded snacks[a]	362 (298)	377 (227)	304 (83)	371 (180)	312 (124)	357 (189)	NS	▼1	NS	▲15
Luxury crisps[b]	777 (153)	975 (246)	1208 (278)	NT	NT	1333 (145)	<0.001	▲ 72	NS (2011 vs 2021)	▲10 (2011 vs 2021)
Pelleted snacks[c]	368 (273)	331 (189)	858 (62)	890 (51)	960 (42)	716 (409)	0.047	▲94	NS	▼25
Popcorn	321 (347)	172 (64)	230 (18)	NT	NT	188 (60)	NS	▼41	NS (2011 vs 2021)	▼18 (2011 vs 2021)
Potato crisps[b] [d]	1072 (237)	1116 (224)	1082 (283)	1269 (261)	1139 (219)	1182 (245)	NS	▲10	NS	▲4
Salt and vinegar products	1030 (568)	872 (311)	994 (363)	1281 (292)	1139 (230)	1170 (419)	NS	▲14	NS	▲3
Healthier varieties[e]	NT	NT	NT	NT	NT	858 (565)	N/A	N/A	N/A	N/A
Asian-style snacks[f]	NT	NT	NT	NT	NT	264 (293)	N/A	N/A	N/A	N/A
Pretzel-shaped snacks	NT	NT	NT	NT	NT	246 (123)	N/A	N/A	N/A	N/A
Savoury snack biscuits[g]	NT	NT	NT	NT	NT	215 (35)	N/A	N/A	N/A	N/A
Weaning snacks[h]	NT	NT	NT	NT	NT	415 (184)	N/A	N/A	N/A	N/A
Total samples	136	97	137	102	59	100	Overall total = 631			

(a) Food extrusion is a process in which a food material is forced to flow (under one or more varieties of conditions of mixing, heating and shear) through a die which is designed to form and/or puff-dry the ingredients (e.g. onion rings); extruded snacks can also be described as puffed snacks. There are many different raw materials which can be used for extruded snack production, including potato, rice, maize, wheat, corn, etc. **(b)** Potatoes (of various varieties) which are sliced (flat, crinkle cut, etc.), lightly fried in vegetable oil and then sprinkled with flavouring. **(c)** There are many different raw materials which can be used for pellet production, such as potato, rice, maize, wheat, corn, etc. The pellets are divided into two basic categories: those made from grain (rice, maize, wheat, corn) or those made from potato. The latter is the only one to give the authentic potato taste to the finished product. Pelleted snacks are produced when the raw material is extruded into a recognisable shape; this can be done using a process known as direct expansion or, alternatively, using a process known as indirect expansion. The directly expanded pellets are produced in a one-step extruder and are ready for consumption following the extrusion process. The indirectly expanded pellets are extruded and then generally sold on as a semi-manufactured product to companies that finish the process by frying them in hot oil and then flavouring or seasoning them before packaging. **(d)** The majority of potato crisps sampled were cheese and onion flavour or variations of that flavour. Some brands of crisps sampled contained potassium chloride as an ingredient. **(e)** Snack products presented as a healthier option due to the cooking method used or the primary ingredient being based on vegetable or lentil instead of grain. **(f)** Poppadom or prawn cracker-based snacks. **(g)** Miniature savoury biscuits or crackers sold in a single-serving portion pack. **(h)** Puffed and crisped snack products targeting infants and young children. **(i)** Unless otherwise stated **N/A,** results not available; **NS**, not statistically significant; **NT**, not tested.

Processed meats

This section looks at the sodium and potassium content of processed meats between 2004 and 2019. Figure 6 provides a summary of key trends in sodium and potassium content of the food category. Tables 11 and 12 outline the full details of short- and long-term trends in sodium and potassium content and should be referred to when interpreting Figure 6.

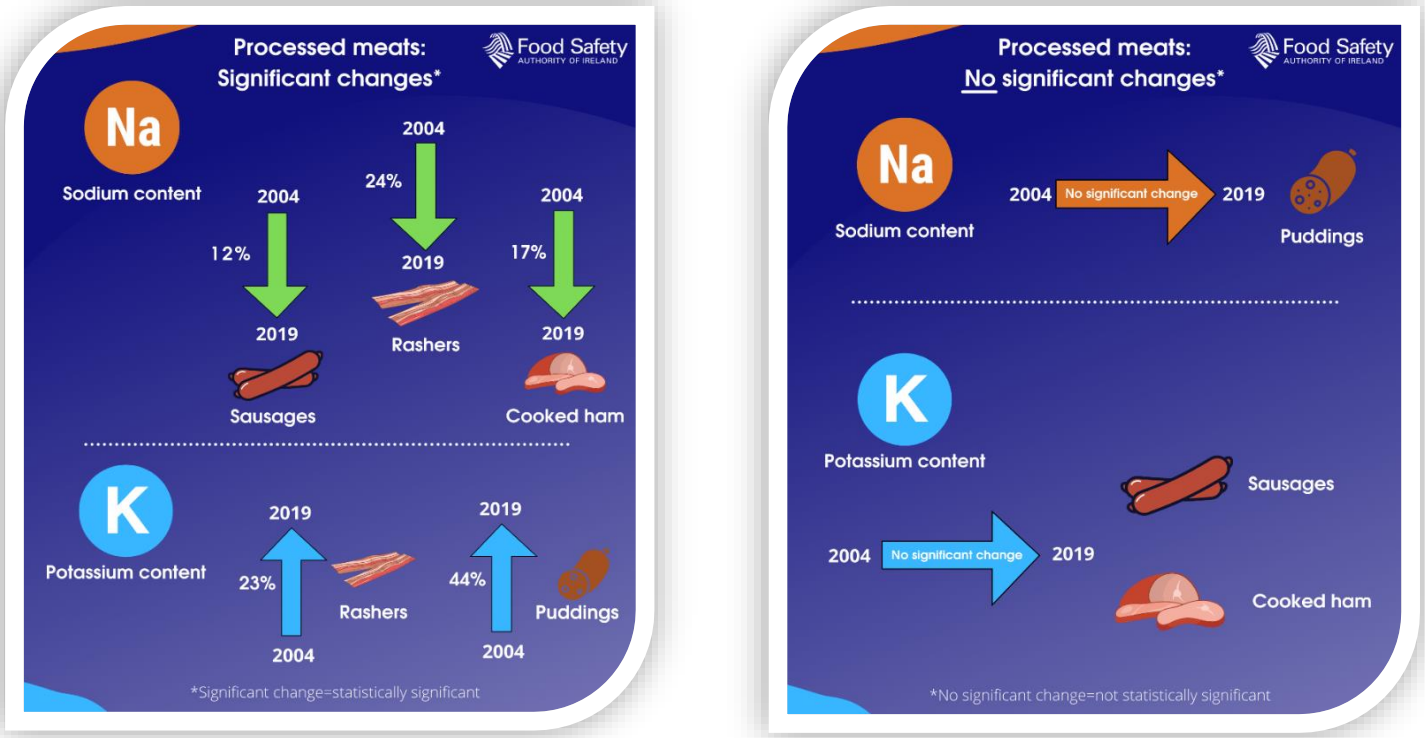


Figure 6: Statistically significant (and percentage change) and non-statistically significant changes in mean (SD) sodium and potassium (mg/100 g) content of processed meats between 2004 and 2019

- A statistically significant reduction in the sodium content of Sausages (12%, p=0.015), Rashers (24%, p <0.001), and Cooked ham (17%, p=0.008) was observed between 2004 and 2019, (see Table 11).
- A statistically significant increase in the potassium content of Rashers (23%, p=0.002) and Puddings (44%, p=0.007) was observed between 2004 and 2019, (see Table 12).
- No statistically significant change in the sodium content of Puddings was observed between 2004 and 2019, (see Table 11).
- No statistically significant change in the potassium content of Sausages was observed between 2004 and 2019, (see Table 12).
- No change in the potassium content of Cooked ham was observed between 2004 and 2019, (see Table 12).

Table 11 Mean (SD) sodium content of processed meats (mg/100 g)

Sub-category[a]	Mean sodium content per year of survey						Statistical significance (2004 vs 2019)	% sodium content change (2004 vs 2019)	Statistical significance (2015 vs 2019)	% sodium content change (2015 vs 2019)
	2004	2006	2009	2012	2015	2019				
Sausages[b]	881 (235)	950 (243)	810 (101)	823 (135)	782 (170)	776 (139)	0.015	▼12	NS	▼1
Rashers[c]	1315 (312)	1098 (297)	1150 (144)	1132 (365)	957 (185)	1002 (252)	<0.001	▼24	NS	▲5
Pudding[d]	868 (237)	670 (160)	771 (145)	832 (166)	747 (127)	758 (172)	NS	▼13	NS	▲1
Cooked ham[e]	985 (240)	938 (162)	954 (135)	967 (125)	840 (132)	819 (169)	0.008	▼17	NS	▼3
Continental meats	NT	NT	NT	NT	NT	1514 (163)	N/A	N/A	N/A	N/A
Total samples	267[f]	194[g]	98[h]	127	148	100	Overall total = 934			

(a) Unless otherwise indicated, all samples were analysed as sold raw. **(b)** Includes both pork and beef sausages. **(c)** Rashers of bacon are cured pork which may come from any part of the pig and may be smoked or unsmoked (i.e. green). The majority of samples analysed in the FSAI surveys were back and streaky rashers. **(d)** Includes both white and black varieties of traditional Irish blood puddings. **(e)** Ham is traditionally the cured product taken from the upper leg and buttock of the pig. However, the majority of samples analysed in the FSAI surveys were pre-sliced re-formed or restructured hams, including varieties such as crumbed, smoked, honey roast, deli and traditional which were loose, modified atmosphere or vacuum packed. **(f)** Results for cooked sausages (n=12), bratwurst sausages (n=1), cooked gammon ham (n=15), cooked pudding (n=23), cooked burgers (n=9), vegetarian burgers (n=1), cooked rashers (n=55), savoury steak (n=2), hot dogs in brine (n=1), canned cooked ham (n=3), raw burgers (n=71), gammon ham (n=4) and cooked beef (n=2) are omitted from the results shown above. However, all omitted results are available on request to the FSAI. **(g)** Results for cooked sausages (n=2), Polish sausages (n=1), turkey sausages (n=1), cooked rashers (n=3), cooked burgers (n=3), turkey rashers (n=2), raw burgers (n=7), gammon ham (n=8), cooked poultry (n=13), cooked beef (n=6) and miscellaneous (n=7) are omitted from the results shown above. However, all omitted results are available on request to the FSAI. **(h)** Results for chicken sausages (n=1), cooked burgers (n=1), raw burgers (n=9) and gammon ham (n=20) are omitted from the results shown above. However, all omitted results are available on request to the FSAI**. N/A,** results not available; **NS**, not statistically significant; **NT**, not tested.

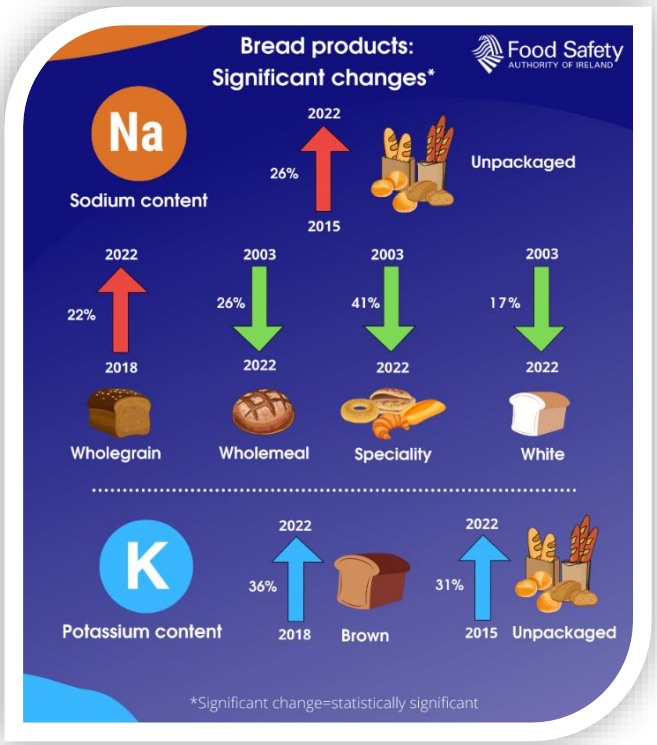
Table 12 Mean (SD) potassium content of processed meats (mg/100 g)

Sub-category[a]	Mean (SD) potassium (mg/100g) content per year of survey						Statistical significance (2004 vs 2019)	% potassium content change (2004 vs 2019)	Statistical significance (2015 vs 2019)	% potassium content change (2015 vs 2019)
	2004	2006	2009	2012	2015	2019				
Sausages[b]	161 (51)	162 (37)	139 (38)	144 (36)	158 (41)	196 (93)	NS	▲22	NS	▲25
Rashers[c]	281 (28)	302 (43)	281 (34)	302 (46)	318 (58)	345 (72)	0.002	▲23	NS	▲8
Pudding[d]	138 (41)	155 (33)	166 (33)	186 (30)	191 (36)	198 (32)	0.007	▲44	NS	▲4
Cooked ham[e]	334 (124)	310 (49)	338 (131)	313 (20)	341 (45)	334 (78)	NS	No change	NS	▼2
Continental meats	NT	NT	NT	NT	NT	408 (133)	N/A	N/A	N/A	N/A
Total samples	267[f]	194[g]	98[h]	127	148	100	Overall total = 934			

(a) Unless otherwise indicated, all samples were analysed as sold raw. Potassium may be present in some cured products as a result of the cure ingredient used (e.g. potassium nitrate). **(b)** Includes both pork and beef sausages. **(c)** Rashers of bacon are cured pork which may come from any part of the pig and may be smoked or unsmoked (i.e. green). The majority of samples analysed in the FSAI surveys were back and streaky rashers. **(d)** Includes both white and black varieties of traditional Irish blood puddings. **(e)** Ham is traditionally the cured product taken from the upper leg and buttock of the pig. However, the majority of samples analysed in the FSAI surveys were pre-sliced re-formed or restructured hams, including varieties such as crumbed, smoked, honey roast, deli and traditional which were loose, modified atmosphere or vacuum packed. **(f)** Results for cooked sausages (n=12), bratwurst sausages (n=1), cooked gammon ham (n=15), cooked pudding (n=23), cooked burgers (n=9), vegetarian burgers (n=1), cooked rashers (n=55), savoury steak (n=2), hot dogs in brine (n=1), canned cooked ham (n=3), raw burgers (n=71), gammon ham (n=4) and cooked beef (n=2) are omitted from the results shown above. However, all omitted results are available on request to the FSAI. **(g)** Results for cooked sausages (n=2), Polish sausages (n=1), turkey sausages (n=1), cooked rashers (n=3), cooked burgers (n=3), turkey rashers (n=2), raw burgers (n=7), gammon ham (n=8), cooked poultry (n=13), cooked beef (n=6) and miscellaneous (n=7) are omitted from the results shown above. However, all omitted results are available on request to the FSAI. **(h)** Results for chicken sausages (n=1), cooked burgers (n=1), raw burgers (n=9) and gammon ham (n=20) are omitted from the results shown above. However, all omitted results are available on request to the FSAI**. N/A,** results not available; **NS**, not statistically significant; **NT**, not tested.

Bread products

This section looks at the sodium and potassium content of bread products between 2003 and 2022. Figure 7 provides a summary of key trends in sodium and potassium content of the food category. Tables 13 and 14 outline the full details of short- and long-term trends in sodium and potassium content and should be referred to when interpreting Figure 7.



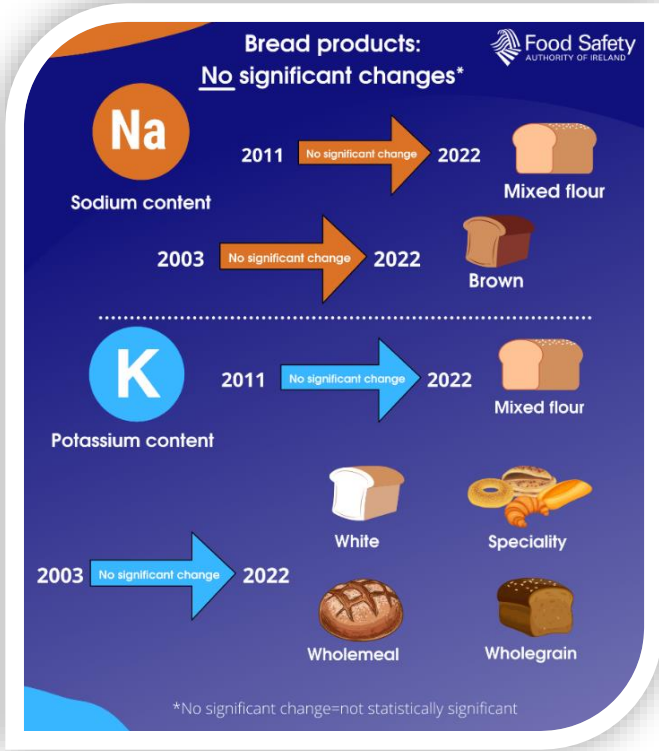


Figure 7: Statistically significant (and percentage change) and non-statistically significant changes in mean (SD) sodium and potassium (mg/100 g) content of bread products between 2003 and 2022

- A statistically significant reduction in the sodium content of White (17%, p <0.001), Wholemeal (26%, p <0.001), and Speciality (41%, p <0.001) breads was observed between 2003 and 2022, (see Table 13).
- A statistically significant increase in the sodium content of Unpackaged bread (26%, p <0.001) was observed between 2015 and 2022 and Wholegrain bread (22%, p=0.022) between 2018 and 2022, (see Table 13).
- A statistically significant increase in the potassium content of Brown bread (36%, p=0.009) was observed between 2018 and 2022 and Unpackaged bread (31%, p <0.001) between 2015 and 2022, (see Table 14).
- No statistically significant change in the sodium content of Mixed flour bread was observed between 2011 and 2022 and Brown bread between 2003 and 2022, (see Table 13).
- No statistically significant change in the potassium content of White, Speciality, Wholemeal, and Wholegrain bread was observed between 2003 and 2022 and Mixed flour bread between 2011 and 2022, (see Table 14).

Table 13 Mean (SD) sodium content of bread products (mg/100 g)

Sub-category[a]	Mean (SD) sodium (mg/100 g) content per year of survey							Statistical significance (2003 vs 2022)[i]	% sodium content change (2003 vs 2022)[i]	Statistical significance (2018 vs 2022)[i]	% sodium content change (2018 vs 2022)[i]
	2003	2006	2011	2013	2015	2018	2022				
White[b]	535 (71)	491 (81)	438 (84)	438 (33)	443 (89)	465 (99)	446 (75)	<0.001	▼17	NS	▼4
Brown[c]	534 (133)	449 (45)	490 (78)	428 (57)	499 (59)	483 (84)	480 (76)	NS	▼10	NS	▼1
Wholemeal[d]	595 (140)	456 (61)	478 (101)	419 (69)	449 (70)	432 (86)	438 (76)	<0.001	▼26	NS	▲1
Wholegrain[e]	588 (235)	417 (83)	457 (89)	NT	419 (20)	418 (73)	510 (60)	NS	▼13	0.022	▲22
Speciality[f]	634 (137)	NT	416 (77)	NT	370 (29)	NT	375 (114)	<0.001	▼41	NS (2015 vs 2022)	▲1 (2015 vs 2022)
Mixed flour[g]	NT	NT	408 (39)	393 (48)	399 (38)	386 (67)	419 (48)	NS (2011 vs 2022)	▲3 (2011 vs 2022)	NS	▲9
Sourdough	NT	NT	NT	NT	NT	NT	460 (82)	N/A	N/A	N/A	N/A
Unpackaged[h]	NT	NT	NT	NT	407 (102)	NT	512 (117)	<0.001 (2015 vs 2022)	▲26 (2015 vs 2022)	N/A	N/A
Total samples	100	178	186	123	142	97	97	Overall total = 923[j]			

(a) 2003 samples were taken in September 2003; 2006 samples were taken from November 2005 to January 2006; 2010–2011 samples were taken in July 2010, January 2011 and September 2011. Three samples of 37 plant (industrial) bakery products were taken for the 2011 survey, representing three distinct batches and/or best-before dates. Data on the sodium content of soda breads are available on request for the years 2003, 2006, 2011 and 2022 (n=77). Soda breads include all varieties with the word “soda” in their description, including both white and brown varieties. Some products included in this category did not have the word “soda” in their name/label, but soda (sodium bicarbonate) was included in their list of ingredients. Data on the sodium content of bread rolls are available on request for the years 2003, 2006 and 2011 (n=57). Rolls include white and brown varieties of products such as burger buns, baps, baguettes, hot dog rolls, etc. **(b)** White breads include all varieties with the word “white” in their main description – such as batch, Scotch batch, loaf, barrell, turnover, bloomer, pan, *chleb małopolski*, King’s bread, crusty and cob – excluding soda breads (white and brown). **(c)** Brown breads include all varieties with the word “brown” in their main description – such as batch, loaf, high-fibre, wheat germ, wholegrain, barrell, multigrain, crusty and pan – excluding soda breads (white and brown). **(d)** Wholemeal breads include all varieties with the word “wholemeal” in their description and/or which include descriptions such as “stoneground”, “high-fibre”, “wheaten”, “wheat”, “whole wheat” and “granary”, excluding soda breads (white and brown). **(e)** Wholegrain breads include all varieties with the word “wholegrain” in their description and/or which include descriptions such as “multigrain”, “healthy grain”, “granary-malted”, “granary”, “cob”, “rye”, “Scotch batch”, “malted”, “rustic grain”, “nutty”, “stoneground”, “high-fibre”, “kibbled”, “whole wheat”, “cracked wheat” and “Paco pan granary”, excluding soda breads (white and brown). **(f)** Speciality breads include ciabatta, panini, pitta breads, bagels, cornbread, Melba toast, crumpets, croissants and Procea. **(g)** Mixed-flour breads are those varieties which mix white, wholemeal or brown flours together. Products in this category are described as “best of both”, “50:50 white”, “two-in-one”, “goodness of both”, etc. **(h)** Unpackaged breads include various loose breads, baguettes, rolls (seed, multigrain, diamond, pumpkin, cheese/onion, etc.), baps, ciabatta, panini, whole unsliced loaves, etc. Many of these breads are bought in a prepared raw state and baked in-store. Many symbol group retailers and supermarket chains now sell these bread products from their in-store bakeries. **(i)** Unless otherwise stated. **(j)** Includes 77 soda bread samples and 57 bread roll samples. **N/A**, results not available; **NS**, not statistically significant; **NT**, not tested.

Table 14 Mean (SD) potassium content of bread products (mg/100 g)

Sub-category[a]	Mean (SD) potassium (mg/100 g) content per year of survey							Statistical significance (2003 vs 2022)[i]	% potassium content change (2003 vs 2022)[i]	Statistical significance (2018 vs 2022)[i]	% potassium content change (2018 vs 2022)[i]
	2003	2006	2011	2013	2015	2018	2022				
White[b]	141 (24)	137 (24)	134 (22)	119 (7)	128 (13)	139 (20)	145 (17)	NS	▲3	NS	▲5
Brown[c]	251 (43)	212 (32)	209 (27)	186 (29)	204 (16)	194 (37)	264 (61)	NS	▲5	0.009	▲36
Wholemeal[d]	248 (37)	221(25)	229 (33)	432 (72)	242 (14)	240 (36)	303 (114)	NS	▲22	NS	▲26
Wholegrain [e]	232 (31)	196 (41)	198 (71)	NT	256 (23)	202 (40)	228 (22)	NS	▼2	NS	▲13
Speciality[f]	156 (55)	NT	131 (24)	NT	196 (53)	NT	159 (34)	NS	▲2	NS (2015 vs 2022)	▼19 (2015 vs 2022)
Mixed flour[g]	NT	NT	167 (24)	400 (32)	172 (36)	162 (21)	193 (45)	NS (2011 vs 2022)	▲15 (2011 vs 2022)	NS	▲19
Sourdough	NT	NT	NT	NT	NT	NT	144 (34)	N/A	N/A	N/A	N/A
Unpackaged[h]	NT	NT	NT	NT	149 (42)	NT	195 (58)	0.001 (2015 vs 2022)	▲31 (2015 vs 2022)	N/A	N/A
Total samples	100	178	186	123	142	97	97	Overall total = 923[j]			

(a) 2003 samples were taken in September 2003; 2006 samples were taken from November 2005 to January 2006; 2010–2011 samples were taken in July 2010, January 2011 and September 2011. Three samples of 37 plant (industrial) bakery products were taken for the 2011 survey, representing three distinct batches and/or best-before dates. Data on the sodium content of soda breads are available on request for the years 2003, 2006, 2011 and 2022 (n=77). Soda breads include all varieties with the word “soda” in their description, including both white and brown varieties. Some products included in this category did not have the word “soda” in their name/label, but soda (sodium bicarbonate) was included in their list of ingredients. Data on the sodium content of bread rolls are available on request for the years 2003, 2006 and 2011 (n=57). Rolls include white and brown varieties of products such as burger buns, baps, baguettes, hot dog rolls, etc. **(b)** White breads include all varieties with the word “white” in their main description – such as batch, Scotch batch, loaf, barrell, turnover, bloomer, pan, *chleb małopolski*, King’s bread, crusty and cob – excluding soda breads (white and brown). **(c)** Brown breads include all varieties with the word “brown” in their main description – such as batch, loaf, high-fibre, wheat germ, wholegrain, barrell, multigrain, crusty and pan – excluding soda breads (white and brown). **(d)** Wholemeal breads include all varieties with the word “wholemeal” in their description and/or which include descriptions such as “stoneground”, “high-fibre”, “wheaten”, “wheat”, “whole wheat” and “granary”, excluding soda breads (white and brown). **(e)** Wholegrain breads include all varieties with the word “wholegrain” in their description and/or which include descriptions such as “multigrain”, “healthy grain”, “granary-malted”, “granary”, “cob”, “rye”, “Scotch batch”, “malted”, “rustic grain”, “nutty”, “stoneground”, “high-fibre”, “kibbled”, “whole wheat”, “cracked wheat” and “Paco pan granary”, excluding soda breads (white and brown). **(f)** Speciality breads include ciabatta, panini, pitta breads, bagels, cornbread, Melba toast, crumpets, croissants and Procea. **(g)** Mixed-flour breads are those varieties which mix white, wholemeal or brown flours together. Products in this category are described as “best of both”, “50:50 white”, “two-in-one”, “goodness of both”, etc. **(h)** Unpackaged breads include various loose breads, baguettes, rolls (seed, multigrain, diamond, pumpkin, cheese/onion, etc.), baps, ciabatta, panini, whole unsliced loaves, etc. Many of these breads are bought in a prepared raw state and baked in-store. Many symbol group retailers and supermarket chains now sell these bread products from their in-store bakeries. **(i)** Unless otherwise stated. **(j)** Includes 77 soda bread samples and 57 bread roll samples. **N/A**, results not available; **NS**, not statistically significant; **NT**, not tested.

Breakfast cereals

This section looks at the sodium and potassium content of breakfast cereals between 2003 and 2015. Figure 8 provides a summary of key trends in sodium and potassium content of the food category. Tables 15 and 16 outline the full details of short- and long-term trends in sodium and potassium content and should be referred to when interpreting Figure 8.

Figure 8: Statistically significant (and percentage change) and non-statistically significant changes in mean (SD) sodium and potassium (mg/100 g) content of breakfast cereals between 2003 and 2015

- A statistically significant reduction in the sodium content of Muesli (62%, p=0.03) was observed between 2003 and 2011 and Cornflake-based cereal (62%, p <0.001), Bran-based cereal (40%, p=0.003), Multigrain cereal (36%, p=0.015), and Rice-based cereal (48%, p <0.001) between 2003 and 2015, (see Table 15).
- A statistically significant reduction in the potassium content of Muesli (31%, p=0.002) was observed between 2003 and 2011, (see Table 16).
- A statistically significant increase in the potassium content of Biscuit-based cereal (24%, p=0.009) was observed between 2003 and 2015, (see Table 16).
- No statistically significant change in the sodium content of Biscuit-based cereal was observed between 2003 and 2015, (see Table 15).
- No statistically significant change in the potassium content of Rice-based cereal, Cornflake-based cereal, Multigrain cereal, and Bran-based cereal was observed between 2003 and 2015, (see Table 16).

Table 15 Mean (SD) sodium content of breakfast cereals (mg/100 g)

Sub-category	Mean (SD) sodium (mg/100g) content per year of survey				Statistical significance (2003 vs 2015)[i]	% sodium content change (2003 vs 2015)[i]	Statistical significance (2011 vs 2015)[i]	% sodium content change (2011 vs 2015)[i]
	2003	2007	2011[h]	2015				
Rice-based cereals[a]	555 (168)	535 (215)	301 (79)	290 (90)	<0.001	▼48	NS	▼4
Bran-based cereals[b]	544 (174)	409 (156)	146 (176)	327 (65)	0.003	▼40	<0.001	▲124
Cornflake-based cereals[c]	718 (213)	551 (101)	309 (117)	276 (74)	<0.001	▼62	NS	▼11
Biscuit-based cereals[d]	275 (141)	268 (48)	218 (39)	241(49)	NS	▼12	NS	▲10
Multigrain cereals[e]	534 (170)	348 (137)	277 (104)	343 (84)	0.015	▼36	NS	▲24
Muesli[f]	119 (121)	55 (67)	45 (60)	NT	0.03 (2003 vs 2011)	▼62 (2003 vs 2011)	NS (2007 vs 2011)	▼19 (2007 vs 2011)
All other cereal products[g] (no added salt/low salt)	5 (3)	26 (29)	32 (29)	NT	<0.001 (2003 vs 2011)	▲481 (2003 vs 2011)	NS (2007 vs 2011)	▲22 (2007 vs 2011)
Total samples	88	119	330	150	Overall total = 687			

(a) Includes products which are rice-based and/or have “rice” in their main product description. For the year 2003, this category also includes one corn-based product. This category may also include some adult/health cereals which are rice-based. **(b)** Bran is the outer layer of cereal grains including corn (maize), rice, oats, wheat, barley, etc., and is typically produced as a by-product of milling. This category includes products which have “bran” in their main description as well as other related cereals which contain bran, such as fruit and fibre cereals (2003 (n=3/9); 2007 (n=7/20); 2011 (n=15/39)), representing five individual products. **(c)** Includes products which have “cornflake” or “flake” in their main description and includes varieties such as frosted, honey and nut, etc. Excludes those cornflake-based products which have “bran” in their description. **(d)** Includes products which are predominantly wheat- or oat-based and biscuit-shaped. **(e)** Includes products which have more than one cereal grain in their ingredients list. This category may also include some cereals which contain other ingredients, such as nuts and fruit. **(f)** Includes products which have “muesli” in their product description and includes varieties with added fruit, added nuts and no added sugar or sweetener. **(g)** Includes all cereal products which have no added salt (i.e. the results obtained from the samples reflect natural sodium content and variation or levels of salt below 120 mg/100 g; Low Sodium/Salt Regulation 1924/2006). This category includes samples of porridge which are also described as “wheat bran”, “oat bran”, “oat flakes”, “oatlets”, “oatmeal”, “oat cereal”, “pinhead”, etc. Other products in this category include various muesli, crunch cluster, wheat puff, whole wheat, and rice- and bran-based cereals. **(h)** The majority of products surveyed in 2011 were sampled three times from three distinct batches and/or best-before dates to provide more representative sampling of products. The total number of samples taken in this survey was 330, with 14 of the samples being porridge products. Of the remaining 316 samples, 98 products were sampled three or more times (3 × 98 = 294 samples), nine products were sampled two times (9 × 2 = 18 samples) and two products were sampled just once (2 × 1 = 2 samples). Therefore, a total of 109 individual products were sampled in the 2011 survey, excluding porridge products. **(i)** Unless otherwise stated; **NS**, not statistically significant; **NT**, not tested.

Table 16 Mean (SD) potassium content of breakfast cereals (mg/100 g)

Sub-category	Mean (SD) potassium (mg/100g) content per year of survey				Statistical significance (2003 vs 2015)[i]	% potassium content change (2003 vs 2015)[i]	Statistical significance (2011 vs 2015)[i]	% potassium content change (2011 vs 2015)[i]
	2003	2007	2011[h]	2015				
Rice-based cereals[a]	182 (73)	161 (58)	195 (75)	181 (72)	NS	▼1	NS	▼7
Bran-based cereals[b]	522 (135)	538 (175)	489 (132)	552 (110)	NS	▲6	0.012	▲13
Cornflake-based cereals[c]	110 (61)	91 (31)	152 (104)	115 (90)	NS	▲5	0.038	▼25
Biscuit-based cereals[d]	333 (62)	360 (25)	385 (41)	412 (25)	0.009	▲24	0.010	▲7
Multigrain cereals[e]	237 (63)	274 (79)	307 (108)	285 (120)	NS	▲20	NS	▼7
Muesli[f]	479 (140)	507 (104)	331 (130)	NT	0.002 (2003 vs 2011)	▼31 *(2003* vs *2011)*	<0.001 (2007 vs 2011)	▼35 *(2007* vs 2011)
All other cereal products[g] (no added salt/low salt)	465 (256)	398 (189)	287 (87)	NT	0.010 (2003 vs 2011)	▼38 *(2003* vs 2011)	0.016 (2007 vs 2011)	▼28 *(2007* vs 2011)
Total samples	88	119	330	150	Overall total = 687			

(a) Includes products which are rice-based and/or have “rice” in their main product description. For the year 2003, this category also includes one corn-based product. This category may also include some adult/health cereals which are rice-based. **(b)** Bran is the outer layer of cereal grains including corn (maize), rice, oats, wheat, barley, etc., and is typically produced as a by-product of milling. This category includes products which have “bran” in their main description as well as other related cereals which contain bran, such as fruit and fibre cereals (2003 (n=3/9); 2007 (n=7/20); 2011 (n=15/39)), representing five individual products. **(c)** Includes products which have “cornflake” or “flake” in their main description and includes varieties such as frosted, honey and nut, etc. Excludes those cornflake-based products which have “bran” in their description. **(d)** Includes products which are predominantly wheat- or oat-based and biscuit-shaped. **(e)** Includes products which have more than one cereal grain in their ingredients list. This category may also include some cereals which contain other ingredients, such as nuts and fruit. **(f)** Includes products which have “muesli” in their product description and includes varieties with added fruit, added nuts and no added sugar or sweetener. **(g)** Includes all cereal products which have no added salt (i.e. results obtained from the samples reflect natural sodium content and variation or levels of salt below 120 mg/100 g; Low Sodium/Salt Regulation 1924/2006). This category includes samples of porridge which are also described as “wheat bran”, “oat bran”, “oat flakes”, “oatlets”, “oatmeal”, “oat cereal”, “pinhead”, etc. Other products in this category include various muesli, crunch cluster, wheat puff, whole wheat, and rice- and bran-based cereals. **(h)** The majority of products surveyed in 2011 were sampled three times from three distinct batches and/or best-before dates to provide more representative sampling of products. The total number of samples taken in this survey was 330, with 14 of the samples being porridge products. Of the remaining 316 samples, 98 products were sampled three or more times (3 × 98 = 294 samples), nine products were sampled two times (9 × 2 = 18 samples) and two products were sampled just once (2 × 1 = 2 samples). Therefore, a total of 109 individual products were sampled in the 2011 survey, excluding porridge products. **(i)** Unless otherwise stated; **NS,** not statistically significant; **NT**, not tested.

Spreadable fats

This section looks at the sodium and potassium content of spreadable fats between 2007 and 2015. Figure 9 provides a summary of key trends in sodium and potassium content of the food category. Tables 17 and 18 outline the full details of short- and long-term trends in sodium and potassium content and should be referred to when interpreting Figure 9.

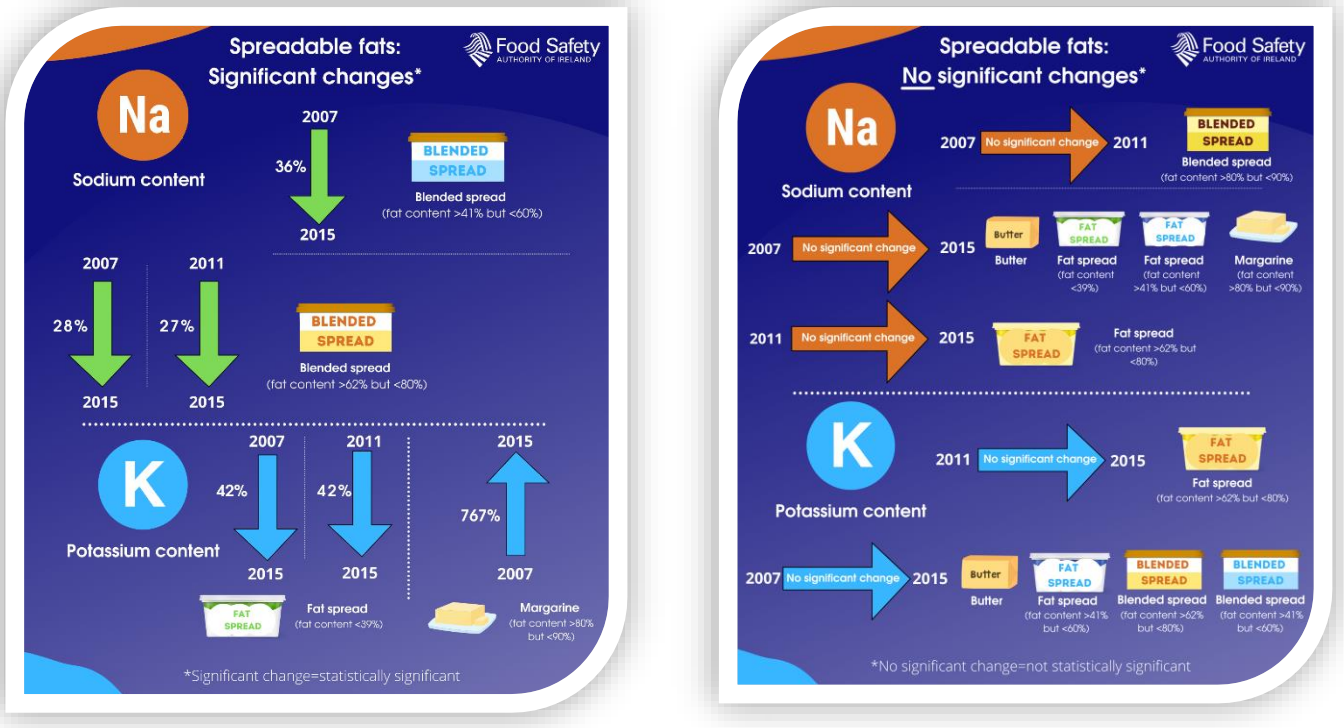


Figure 9: Statistically significant (and percentage change) and non-statistically significant changes in mean (SD) sodium and potassium (mg/100 g) content of spreadable fats between 2007 and 2015

- A statistically significant reduction in the sodium content of Blended spread *(fat content >41% but <60%)* (36%, *p*=0.018), and Blended spread *(fat content >62% but <80%) (*28%, *p* <0.001) was observed between 2007 and 2015 and Blended spread *(fat content >62% but <80%)* (27%, *p* <0.001) between 2011 and 2015, (see Table 17).
- A statistically significant reduction in the potassium content of Fat spread *(fat content <39%)* (42%, *p*=0.012) was observed between 2007 and 2015 and Fat spread *(fat content <39%)* (42%, *p*=0.010) between 2011 and 2015, (see Table 18).
- A statistically significant increase in the potassium content of Margarine *(fat content >80% but <90%)* (767%, *p* <0.001) was observed between 2007 and 2015, (see Table 18).
- No statistically significant change in the sodium content of Blended spread *(fat content >80% but <90%)* was observed between 2007 and 2011 and Margarine *(fat content >80% but <90%),* Butter, Fat spread (fat content >41% but <60%), and Fat spread *(fat content <39%)* between 2007 and 2015 and Fat spread *(fat content >62% but <80%)* between 2011 and 2015, (see Table 17).
- No statistically significant change in the potassium content of Fat spread *(fat content >62% but <80%)* was observed between 2011 and 2015 and Fat spread *(fat content >41% but <60%),* Blended spread *(fat content >41% but <60%),* Blended spread *(fat content >62% but <80%),* and Butter between 2007 and 2015, (see Table 18).

Table 17 Mean (SD) sodium content of spreadable fats (mg/100 g)

Sub-category[a]	Mean (SD) sodium (mg/100 g) content per year of survey			Statistical significance (2007 vs 2015)[p]	% sodium content change (2007 vs 2015)[p]	Statistical significance (2011 vs 2015)	% sodium content change (2011 vs 2015)
	2007	2011	2015				
Butter[b] [c]	631 (234)	518 (124)	588 (120)	NS	▼7	NS	▲14
Half-fat butter[d]	590 (127)	450 (14)	650[q]	N/A	N/A	N/A	N/A
Margarine[e] (fat content >80% but <90%)[f]	313 (191)	560 (138)	501 (82)	NS	▲60	NS	▼11
Fat spread[e] (fat content >62% but <80%)[g]	1150[q]	441 (107)	525 (126)	N/A	N/A	NS	▲19
Fat spread[e] (fat content >41% but <60%)[h]	537 (108)	478 (103)	498 (104)	NS	▼7	NS	▲4
Fat spread[e] (fat content <39%)[i]	502 (160)	459 (59)	509 (116)	NS	▲2	NS	▲11
Blended spread[j] (fat content >80% but <90%)[k]	390 (28)	393 (107)	NT	NS (2007 vs 2011)	▲1 (2007 vs 2011)	N/A	N/A
Blended spread[j] (fat content >62% but <80%)[l]	632 (48)	618 (26)	452 (33)	<0.001	▼28	<0.001	▼27
Blended spread[j] (fat content >41% but <60%)[m]	635 (35)	540[q]	406 (36)	0.018	▼36	N/A	N/A
Total samples	72	90[n]	90[o]	Overall total = 252			

(a) Sub-categories are based on sale descriptions outlined in Annex XV of Council Regulation (EC) No 1234/2007 establishing a common organisation of agricultural markets and on specific provisions for certain agricultural products (Single CMO Regulation). Link to Spreadable Fats Legislation. **(b)** Products with a milk fat content of more than 80% but less than 90%, a maximum water content of 16% and a maximum dry non-fat milk material content of 2%. **(c)** Includes one flavoured butter (garlic and herb) and excludes three unsalted butters for 2007 results. **(d)** Includes one product described as a low-fat butter with a 40% fat content. The terms “low-fat” or “light” may be used for products referred to in Annex XV of Council Regulation (EC) No 1234/2007 with a fat content of 41% or less. The term “reduced-fat” and the terms “low-fat” or “light” may, however, replace the terms “three-quarter” fat or “half-fat”, respectively, used in the Annex. **(e)** Products in the form of a solid, malleable emulsion, principally of the water-in-oil type, derived from solid and/or liquid vegetable and/or animal fats suitable for human consumption, with a milk fat content of not more than 3% of the total fat content. **(f)** Products obtained from vegetable and/or animal fats with a fat content of more than 80% but less than 90%. **(g)** Products obtained from vegetable and/or animal fats with a fat content of more than 62% but less than 80%. **(h)** Products obtained from vegetable and/or animal fats with a fat content of more than 41% but less than 60%. **(i)** Products obtained from vegetable and/or animal fats with a fat content of less than 39%. **(j)** Products in the form of a solid, malleable emulsion, principally of the water-in-oil type, derived from solid and/or liquid vegetable and/or animal fats suitable for human consumption, with a milk fat content of between 10% and 80% of the total fat content. **(k)** Products obtained from a mixture of vegetable and/or animal fats with a fat content of more than 80% but less than 90%. **(l)** Products obtained from a mixture of vegetable and/or animal fats with a fat content of more than 62% but less than 80%. **(m)** Products obtained from a mixture of vegetable and/or animal fats with a fat content of more than 41% but less than 60%. **(n)** 2011 samples comprise 90 individual samples representing 31 individual products. **(o)** Includes three samples of beef dripping, but these are not included in the values presented (*Guidance Note 30 The Use of the Term ‘Butter’ in the Labelling and Advertising of Fat Spreads*). **(p)** Unless otherwise stated; **(q)** No SD present due to sample size =1. **N/A**, results not available; **NS**, not statistically significant; **NT**, not tested.

Table 18 Mean (SD) potassium content of spreadable fats (mg/100 g)

Sub-category[a]	Mean (SD) potassium (mg/100 g) content per year of survey			Statistical significance (2007 vs 2015)	% potassium content change (2007 vs 2015)	Statistical significance (2011 vs 2015)[p]	% potassium content change (2011 vs 2015)[p]
	2007	2011	2015				
Butter[b] [c]	29 (17)	50 (74)	21 (8)	NS	▼28	NS	▼58
Half-fat butter[d]	32 (39)	30 (0)[q]	NT	N/A	N/A	N/A	N/A
Margarine[e] (fat content >80% but <90%)[f]	5 (0)[q]	52 (86)	43 (20)	<0.001	▲767	NS	▼16
Fat spread[e] (fat content >62% but <80%)[g]	40[r]	29 (14)	24 (15)	N/A	N/A	NS (2011 vs 2015)	▼15 (2011 vs 2015)
Fat spread[e] (fat content >41% but <60%)[h]	40 (20)	34 (16)	34 (15)	NS	▼13	NS	▲1
Fat spread[e] (fat content <39%)[i]	51 (26)	51 (24)	29 (20)	0.012	▼42	0.010	▼42
Blended spread[j] (fat content >80% but <90%)[k]	20 (0)[q]	20 (0)[q]	NT	N/A	N/A	N/A	N/A
Blended spread[j] (fat content >62% but <80%)[l]	42 (27)	58 (54)	28 (22)	NS	▼35	NS	▼53
Blended spread[j] (fat content >41% but <60%)[m]	55 (21)	60[r]	28 (11)	NS	▼49	N/A	N/A
Total samples	72	90[n]	90[o]	Overall total = 252			

(a) Sub-categories are based on sale descriptions outlined in Annex XV of Council Regulation (EC) No 1234/2007 establishing a common organisation of agricultural markets and on specific provisions for certain agricultural products (Single CMO Regulation). Link to Spreadable Fats Legislation. **(b)** Products with a milk fat content of more than 80% but less than 90%, a maximum water content of 16% and a maximum dry non-fat milk material content of 2%. **(c)** Includes one flavoured butter (garlic and herb) and excludes three unsalted butters for 2007 results. **(d)** Includes one product described as a low-fat butter with a 40% fat content. The terms "low-fat" or "light" may be used for products referred to in Annex XV of Council Regulation (EC) No 1234/2007 with a fat content of 41% or less. The term "reduced-fat" and the terms "low-fat" or "light" may, however, replace the terms "three-quarter" fat or "half-fat", respectively, used in the Annex. **(e)** Products in the form of a solid, malleable emulsion, principally of the water-in-oil type, derived from solid and/or liquid vegetable and/or animal fats suitable for human consumption, with a milk fat content of not more than 3% of the total fat content. **(f)** Products obtained from vegetable and/or animal fats with a fat content of more than 80% but less than 90%. **(g)** Products obtained from vegetable and/or animal fats with a fat content of more than 62% but less than 80%. **(h)** Products obtained from vegetable and/or animal fats with a fat content of more than 41% but less than 60%. **(i)** Products obtained from vegetable and/or animal fats with a fat content of less than 39%. **(j)** Products in the form of a solid, malleable emulsion, principally of the water-in-oil type, derived from solid and/or liquid vegetable and/or animal fats suitable for human consumption, with a milk fat content of between 10% and 80% of the total fat content. **(k)** Products obtained from a mixture of vegetable and/or animal fats with a fat content of more than 80% but less than 90%. **(l)** Products obtained from a mixture of vegetable and/or animal fats with a fat content of more than 62% but less than 80%. **(m)** Products obtained from a mixture of vegetable and/or animal fats with a fat content of more than 41% but less than 60%. **(n)** 2011 samples comprise 90 individual samples representing 31 individual products. **(o)** Includes three samples of beef dripping, but these are not included in the values presented (*Guidance Note 30 The Use of the Term 'Butter' in the Labelling and Advertising of Fat Spreads*). **(p)** Unless otherwise stated. **(q)** SD=0 due to no variation in the data values. **(r)** No SD present due to sample size =1. **N/A**, results not available; **NS,** not statistically significant; **NT**, not tested.

Natural cheese

This section looks at the sodium and potassium content of natural cheese between 2009 and 2018. Figure 10 provides a summary of key trends in sodium and potassium content of the food category. Tables 19 and 20 outline the full details of short- and long-term trends in sodium and potassium content and should be referred to when interpreting Figure 10.

Figure 10: Statistically significant (and percentage change) and non-statistically significant changes in mean (SD) sodium and potassium (mg/100 g) content of natural cheese between 2009 and 2018

- A statistically significant reduction in the sodium content of Mature cheese (6%, *p*=0.031) was observed between 2009 and 2018 and Mature cheese (4%, *p*=0.030) between 2012 and 2018, (see Table 19).
- A statistically significant increase in the potassium content of Regular cheese (5%, *p*=0.016) was observed between 2012 and 2018, (see Table 20).
- No statistically significant change in the sodium content of Reduced-fat cheese and Regular cheese was observed between 2009 and 2018, (see Table 19).
- No statistically significant change in the potassium content of Mature cheese and Reduced-fat cheese was observed between 2009 and 2018, (see Table 20).

Table 19 Mean (SD) sodium content of natural cheese (mg/100 g)

Sub-category[a]	Mean (SD) sodium (mg/100 g) content per year of survey			Statistical significance (2009 vs 2018)	% sodium content change (2009 vs 2018)	Statistical significance (2012 vs 2018)	% sodium content change (2012 vs 2018)
	2009	2012	2018				
Regular cheese[b]	731 (236)	641 (61)	633 (62)	NS	▼13	NS	▼1
Mature cheese[c]	667 (64)	651 (42)	625 (51)	0.031	▼6	0.030	▼4
Reduced-fat cheese[d]	756 (287)	637 (95)	652 (69)	NS	▼14	NS	▲2
Total samples	34	56	93	Overall total = 183			

(a) Samples are predominantly cheddar or cheddar-based cheese products, which are the most commonly consumed cheeses in Ireland. **(b)** Includes both white and red/coloured cheddars which are labelled as “smooth”, “creamy”, “medium” or “mild”. **(c)** Includes both white and red/coloured cheddars which are labelled as “mature”, “extra mature” or “vintage”. **(d)** Includes both white and red/coloured cheddars or cheddar-based cheese products which are labelled as “light”, “reduced-fat”, “half-fat”, etc, **NS**, not statistically significant.

Table 20 Mean (SD) potassium content of natural cheese (mg/100 g)

Sub-category[a]	Mean (SD) potassium (mg/100 g) content per year of survey			Statistical significance (2009 vs 2018)	% potassium content change (2009 vs 2018)	Statistical significance (2012 vs 2018)	% potassium content change (2012 vs 2018)
	2009	2012	2018				
Regular cheese[b]	96 (40)	76 (7)	80 (7)	NS	▼16	0.016	▲5
Mature cheese[c]	83 (6)	79 (7)	80 (5)	NS	▼4	NS	▲2
Reduced-fat cheese[d]	90 (13)	73 (6)	83 (6)	NS	▼8	NS	▲13
Total samples	34	56	93	Overall total = 183			

(a) Samples are predominantly cheddar or cheddar-based cheese products, which are the most commonly consumed cheeses in Ireland. **(b)** Includes both white and red/coloured cheddars which are labelled as “smooth”, “creamy”, “medium” or “mild”. **(c)** Includes both white and red/coloured cheddars which are labelled as “mature”, “extra mature” or “vintage”. **(d)** Includes both white and red/coloured cheddars or cheddar-based cheese products which are labelled as “light”, “reduced-fat”, “half-fat”, etc. **NS**, not statistically significant.

Processed cheese

This section looks at the sodium and potassium content of processed cheese between 2009 and 2023. Figure 11 provides a summary of key trends in sodium and potassium content of the food category. Tables 21 and 22 outline the full details of short- and long-term trends in sodium and potassium content and should be referred to when interpreting Figure 11.

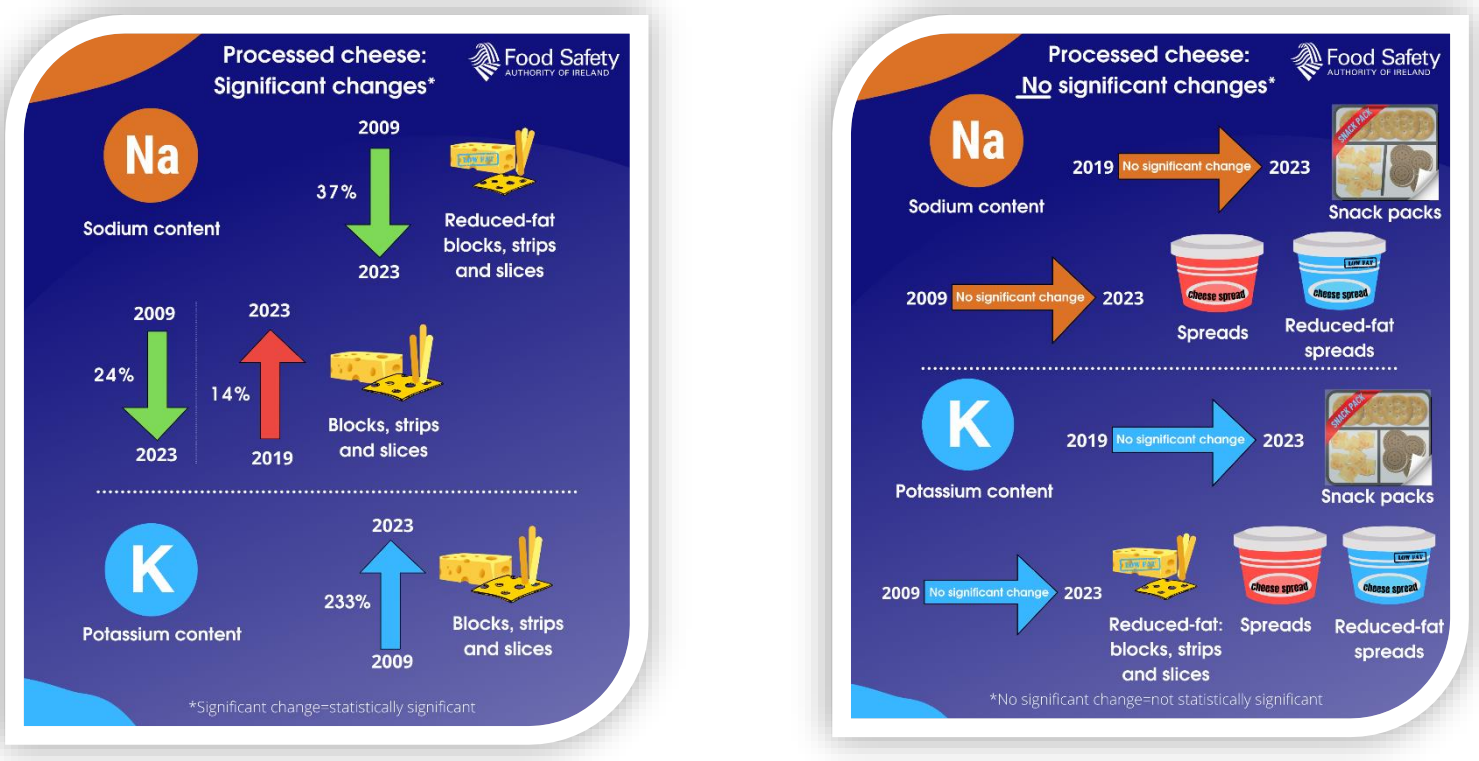


Figure 11: Statistically significant (and percentage change) and non-statistically significant changes in mean (SD) sodium and potassium (mg/100 g) content of processed cheese between 2009 and 2023

- A statistically significant reduction in the sodium content of Reduced-fat blocks, strips and slices (37%, p=0.014) and Blocks, strips and slices (24%, p=0.012) was observed between 2009 and 2023, (see Table 21).
- A statistically significant increase in the sodium content of Blocks, strips and slices (14%, p=0.048) was observed between 2019 and 2023, (see Table 21).
- A statistically significant increase in the potassium content of Blocks, strips and slices (233%, p=0.001) was observed between 2009 and 2023, (see Table 22).
- No statistically significant change in the sodium content of Snack packs was observed between 2019 and 2023, (see Table 21).
- No statistically significant change in the sodium content of Spreads and Reduced-fat spreads was observed between 2009 and 2023, (see Table 21).
- No statistically significant change in the potassium content of Snack packs was observed between 2019 and 2023, (see Table 22).
- No statistically significant change in the potassium content of Reduced-fat blocks, strips and slices, Spreads and Reduced-fat spreads was observed between 2009 and 2023, (see Table 22).
- In 2023, to reflect market trends a new sub-category called Plant-based cheese alternatives was added to the processed cheese category.

Table 21 Mean (SD) sodium content of processed cheese (mg/100 g**)**

Sub-category	Mean (SD) sodium (mg/100 g) content per year of survey				Statistical significance (2009 vs 2023)	% sodium content change (2009 vs 2023)	Statistical significance (2019 vs 2023)	% sodium content change (2019 vs 2023)
	2009	2014[g]	2019	2023				
Blocks, strips and slices[a] [b]	1095 (330)	867 (261)	732 (219)	835 (207)	0.012	▼24	0.048	▲14
Reduced-fat blocks, strips and slices[a] [b]	1298 (219)	836 (224)	942 (341)	820 (112)	0.014	▼37	NS	▼13
Spreads[c]	626 (392)	535 (252)	495 (294)	442 (198)	NS	▼29	NS	▼11
Reduced-fat spreads[d]	612 (310)	376 (238)	396 (223)	395 (216)	NS	▼35	NS	No change
Snack packs[e]	NT	NT	591 (205)	517 (57)	N/A	N/A	NS	▼12
Plant-based cheese alternative[f]	NT	NT	NT	641 (204)	N/A	N/A	N/A	N/A
Total samples	36	173	107	106	Overall total = 422			

Results are presented as means (SDs). **(a)** Includes white and red/coloured cheese slices, individually wrapped or not. **(b)** Includes white and red/coloured cheese slices which are light, reduced-fat or half-fat, individually wrapped or not. **(c)** Includes white and red/coloured cheese spreads (individually portioned or not), cheese spreads with added ingredients such as herbs, vegetables and meats, and spreads used as cooking sauces. **(d)** Includes white and red/coloured cheese spreads which are light, reduced-fat or half-fat (individually wrapped or not), reduced-fat cheese spreads with added ingredients such as herbs, vegetables and meats, and spreads used as cooking sauces. **(e)** Includes products containing crackers/bread sticks with a portion of cheese included, which are often aimed at children. Only the processed cheese portion of the product was analysed for sodium content. **(f)** Includes plant-based alternatives to processed cheese blocks, slices and spreads **(g)**Taken between October and December 2014, comprising 82 branded and 91 private label samples. **N/A**, results not available; **NS**, not statistically significant; **NT**, not tested.

Table 22 Mean (SD) potassium content of processed cheese (mg/100 g)

Sub-category	Mean (SD) potassium (mg/100 g) content per year of survey				Statistical significance (2009 vs 2023)	% potassium content change (2009 vs 2023)	Statistical significance (2019 vs 2023)	% potassium content change (2019 vs 2023)
	2009	2014[g]	2019	2023				
Blocks, strips and slices[a] [b]	88 (34)	162 (187)	232 (255)	293 (288)	0.001	▲233	NS	▲26
Reduced-fat blocks, strips and slices[a] [b]	150 (70)	255 (221)	148 (78)	208 (79)	NS	▲38	NS	▲40
Spreads[c]	164 (76)	206 (143)	162 (67)	194 (111)	NS	▲18	NS	▲20
Reduced-fat spreads[d]	192 (37)	181 (98)	238 (196)	225 (138)	NS	▲17	NS	▼6
Snack packs[e]	NT	NT	316 (189)	455 (181)	N/A	N/A	NS	▲44
Plant-based cheese alternative[f]	NT	NT	NT	69 (67)	N/A	N/A	N/A	N/A
Total samples	36	173	107	106	Overall total = 422			

Results are presented as means (SDs). **(a)** Includes white and red/coloured cheese slices, individually wrapped or not. **(b)** Includes white and red/coloured cheese slices which are light, reduced-fat or half-fat, individually wrapped or not. **(c)** Includes white and red/coloured cheese spreads (individually portioned or not), cheese spreads with added ingredients such as herbs, vegetables and meats, and spreads used as cooking sauces. **(d)** Includes white and red/coloured cheese spreads which are light, reduced-fat or half-fat (individually wrapped or not), reduced-fat cheese spreads with added ingredients such as herbs, vegetables and meats, and spreads used as cooking sauces. **(e)** Includes products containing crackers/bread sticks with a portion of cheese included, which are often aimed at children. Only the processed cheese portion of the product was analysed for potassium content. **(f)** Includes plant-based alternatives to processed cheese blocks, slices and spreads **(g)** Taken between October and December 2014, comprising 82 branded and 91 private label samples. **N/A**, results not available; **NS**, not statistically significant; **NT**, not tested.

Condiments

- As condiments were sampled for the first time in 2017, no changes in sodium and potassium content can be investigated until the next sampling time point.

Table 23 Mean (SD) sodium content of condiments (mg/100 g)

Sub-category[a]	Mean (SD) sodium (mg/100 g) content per year of survey
	2017[f]
Ketchup[b]	681 (294)
Salad cream[c]	581 (78)
Mayonnaise[d]	544 (125)
Brown sauce[e]	444 (325)
Total samples	157

Results are presented as means (SDs). **(a)** All products were sampled and analysed in triplicate (except one branded tomato ketchup product only available as a single sample). **(b)** Six branded products produced by 4 manufacturers and 12 private label products from 6 retailers. **(c)** Two branded products produced by one manufacturer and seven private label products from four retailers. **(d)** Four branded products produced by 2 manufacturers and 12 private label products from 6 retailers. **(e)** Four branded products produced by three manufacturers and six private label products from five retailers. **(f)** Samples taken in August 2017.

Table 24 Mean (SD) potassium content of condiments (mg/100 g)

Sub-category[a]	Mean (SD) potassium (mg/100 g) content per year of survey
	2017[f]
Ketchup[b]	386 (135)
Salad cream[c]	27 (8)
Mayonnaise[d]	29 (17)
Brown sauce[e]	144 (94)
Total samples	157

(a) All products were sampled and analysed in triplicate (except one branded tomato ketchup product only available as a single sample). **(b)** Six branded products produced by 4 manufacturers and 12 private label products from 6 retailers. **(c)** Two branded products produced by one manufacturer and seven private label products from four retailers. **(d)** Four branded products produced by 2 manufacturers and 12 private label products from 6 retailers. **(e)** Four branded products produced by three manufacturers and six private label products from five retailers. **(f)** Samples taken in August 2017.

Results from out-of-home sources of salt sampling

Pre-packed sandwiches

Table 25 Mean (SD) sodium and potassium content of pre-packed sandwiches (mg/100 g)

Sub-category	Mean (SD) sodium (mg/100 g) content per year of survey	Mean (SD) potassium (mg/100 g) content per year of survey
	2020	2020
Bacon, lettuce and tomato	492 (66)	199 (44)
Ham and cheese	541 (56)	186 (35)
Total samples	20	

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Údarás Sábháilteachta Bia NA hÉIREANN
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

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