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Compilation of an Australian database of manufactured and packaged food products containing wholegrain ingredients

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Abstract

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Keywords

Wholegrains, Database, Food composition, Food products, Food industry, Grains, Food data management, National nutrient database harmonisation

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Original research article

Compilation of an Australian database of manufactured and packaged food products containing wholegrain ingredients

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Abstract

Comprehensive food databases are critical components of translational nutrition research.

The food industry maintains proprietary data on the wholegrain content of manufactured food products which are available for collation. The aim of this study was to systematically collate wholegrain composition data on Australian manufactured and packaged food products.

Wholegrain content data (g) per 100g of product were retrieved from the Australian food

industry via the representative body the Grains & Legumes Nutrition Council™, direct data transfer from food manufacturers and product packaging. Products were coded according to the food grouping hierarchy applied in the AUSNUT (Australian food and nutrient) 2007 database. The mean, median, standard deviation and range of wholegrain (g) per 100g and serving of product were calculated for each food group. The mean and range in wholegrain content (g/100g) of major food groups were: flours/cereal-grains (uncooked) (100.0; -); regular breads/rolls (37.6; 5.1-70.0); muffins/flat/sweet breads (40.5; 6.0-64.0); pasta (86.0; 51.0-100.0); breakfast cereal, ready-to-eat (59.9; 6.0-100.0); breakfast cereal, porridge-type (74.5; 60.0-96.0); sweet biscuits (30.5; 9.0-44.0); savoury biscuits (69.1; 26.0-100.0); batter-based products (43.0; -); dairy substitutes (11.3; 10.0-15.0); soup (10.0; 7.0-11.0); corn snacks (48.8; 30.0-100.0); other snacks (58.1; 53.0-66.0); cereal bars (32.1; 2.0-56.0). This research establishes data for assessing the wholegrain content of Australian manufactured and packaged food products, for application in nutrition research and practice.

Key words: Wholegrains; Database; Food composition; Food products; Food industry; Grains; Food data management; National nutrient database harmonisation

1 Introduction

The consumption of wholegrains is associated with reduced risk of cardiovascular disease (CVD), type 2 diabetes mellitus (T2DM) and cancers of the digestive system (de Munter et al., 2007; Fung et al., 2002; Haas et al., 2009; Jacobs et al., 1998; Kasum et al., 2001; Liu et al., 1999, 2000, 2003). A recent meta-analysis of 45 prospective cohort studies and 21 randomised controlled trials found that participants consuming 48-80 grams wholegrains per day had a 26% lower risk of T2DM and 21% lower risk of CVD compared to those who rarely consumed wholegrains, suggesting a significant benefit from consumption (Ye et al., 2012). In Australia, the prevalence chronic disease is increasing and statistics suggest that the

number of people living with diabetes may double within 20 years, necessitating the rapid implementation of evidence-based preventative strategies to address the growing health concerns (AIHW, 2012; Magliano et al., 2009). However, while wholegrains offer putative protection against the development of chronic disease, little research has investigated the role of wholegrain consumption in the context of the Australian diet.

To facilitate this agenda, certain elements of research infrastructure must be implemented. The development of a wholegrain database, focusing on the content of manufactured and packaged food products is a useful starting point, as wholegrain composition data are required to fulfil a number of research tasks including quantification of wholegrain intakes in dietary studies and nutritional monitoring of the growing market of wholegrain products (Cleveland et al., 2000; Franz & Sampson, 2006; Hodgkins et al., 2010; Louie et al., 2012; Maras et al., 2009). In Australia the primary national nutrient databases available to support nutrition research and practice are the Australian Food, (Supplement) and Nutrient Database (AUSNUT) (FSANZ, 1999, 2007) and Nutrient Tables (NUTTAB) (FSANZ, 2010). However, while these databases are well established for the purpose of providing nutrient estimates of common Australian foods, they do not contain wholegrain content data, exposing a gap in the resource base for research.

As grains are typically consumed in the form of processed foods, characterisation of the wholegrain content of food products is an important aspect of developing a wholegrain database (McLennan, W., & Podger, A., 1999; Schakel et al., 2001; Slavin et al., 2001). “Wholegrain” is defined by Food Standards Australia New Zealand (FSANZ) as the “... the intact grain or the dehulled, ground, milled, cracked or flaked grain where the constituents – endosperm, germ and bran – are present in such proportions that represent the typical ratio of those fractions occurring in the whole cereal, and includes wholemeal” (FSANZ, 2005,

2009). This definition refers to grains from the Poaceae (Gramineae) grass family of plants, including wheat, barley, bulgur, corn, oats, rye, rice, millet, triticale, teff and sorghum (Kellogg, 2001; McKeown et al., 2013; McKeivith, 2004). However, accurately determining the proportion of wholegrain ingredients in a food product presents a specific challenge for researchers, as the wholegrain content of food products may vary considerably, product formulations may contain proprietary information and the wholegrain ingredient content of products may not be labelled on the product packaging (Jonnalagadda et al., 2011; Maras et al., 2009; Slavin et al., 2013). Furthermore, manufacturing processes such as baking and extrusion may influence the composition of foods, adding complexity to the task of characterising the wholegrain content of food products for research purposes (Slavin et al., 2001).

Food manufacturers are required to provide information about the nutritional content of foods on product labels, according to the specifications of the Australia New Zealand Food Standards Code (FSC) (FSANZ, 2013a). Standard 1.2.10 of the FSC stipulates the requirements for calculating and declaring the proportion of characterising ingredients in foods, with provisions made to account for weight and moisture changes that occur during processing (FSANZ, 2011). The term ‘characterising ingredients’ is defined in the FSC as ingredients associated with the name of a product, mentioned in the name of the food or emphasised on the food label, such as wholegrains in a product labelled as a “wholegrain food” (FSANZ, 2011). While the methods for calculating the percentage of characterising ingredients vary according to the compositional changes that occur during processing, standard 1.2.10 provides a framework for consistency in how the wholegrain content of products is calculated by manufacturers and a useful methodological framework for the development of a wholegrain database.

Previous studies report sourcing compositional data from the food industry to aid in the development of wholegrain databases, suggesting that the food industry is an important source of compositional data that may be drawn upon for research purposes (Franz & Sampson, 2006; Fung et al., 2002; Hodgkins et al., 2010; Jacobs et al., 1998; Jonnalagadda et al., 2011; Koh-Banerjee et al., 2004; Kyro et al., 2011; Liu et al., 2000; Maras et al., 2009; McKeown et al., 2002). Kyro (et al. 2011) report deriving wholegrain estimates based on data displayed on food product labels and by obtaining data shared from food manufacturers. Similarly, Jacobs (et al., 1998) estimated the wholegrain content of breakfast cereals consumed by a cohort of over 41000 women, through analyses of product labels and by obtaining wholegrain data shared from a major food manufacturer. In contrast other studies report utilising a recipe approach to derive wholegrain content estimates based on the analyses of food label data (Franz & Sampson, 2006; Kyro et al., 2011). Collaboration with stakeholders in the food industry thus represents a potential avenue to obtain wholegrain content data pertaining to food products in the Australian market (Hodgkins et al., 2010).

In response to the research gap in Australia and the primary need for wholegrain composition data, the aim of this study was to develop a wholegrain database which delineates the wholegrain content of Australian manufactured and packaged food products, utilising data systematically obtained from the Australian food industry.

2 Materials and methods

2.1 Identification of products containing wholegrain ingredients and development of a framework for data collection

For the purpose of this study, the term “wholegrain” was defined in accordance with that outlined by Food Standards Australia and New Zealand (FSANZ), as presented in the introduction of this manuscript (FSANZ, 2005, 2009). There was no lower limit on the

amount of wholegrain a product should contain to be included in the database and in accordance with the above definition, bran, germ, nuts, seeds, legumes and pearled barley were excluded from the definition.

To obtain a broad coverage of foods and gain a representative sample of food products on the Australian market, a framework was developed to guide the selection of food product data; this approach was adopted in previous research (Grimes et al. 2008; Webster et al., 2010). Firstly, all grain-containing foods listed in the most recent editions of the primary Australian food composition databases, AUSNUT 2007 and NUTTAB 2010, were used to create a list of target foods and food groups (FSANZ, 1999, 2007, 2010). The *Retail World's Australasian Grocery Guide* (Retail World) (Retail World, 2010) was then used to identify the top selling brands and food products across relevant categories, to ensure that products with the greatest market share were included in the database. With these data, a list of foods and food groups was built to target foods for inclusion in the database.

2.2 Data extraction and management

Data were obtained from the food industry between June and November in 2011 from three sources:

1. As a first point of contact, the nutrition research and communication organisation Grains & Legumes Nutrition CouncilTM (GLNC) was approached to seek assistance with contacting and requesting wholegrain data from the food companies and manufacturers listed as members of their organisation. Assistance from the GLNC was sought because they function as an intermediary for research and science communication in Australia and have a membership consisting of several major food companies which distribute grain-based food products in Australia. Companies that provided data through the GLNC included Campbell Arnott's, Cereal Partners

Worldwide, Nestle, Kellogg's, Bakers Delight, Sanitarium, George Weston Foods, Goodman Fielder and SunRice®.

2. Food companies and manufacturers were contacted via phone or through websites to request data, which was provided in the form of verbal feedback or as spreadsheets. Data were also transcribed directly from company websites if verbal feedback from the manufacturer confirmed that the website data were up-to-date and reflective of products available on the Australian market at the time of data collection.
3. Product data were obtained directly from the product packaging of food labels to identify products in the list and to cross-check data obtained using the previous collection methods. This process involved surveying the four primary local supermarkets (Woolworths, Coles, Franklins and Bi-Lo), located in the Illawarra region of New South Wales, Australia. The primary author (S. Dalton) collected the data by walking through each supermarket aisle to identify target products. Products were either purchased to enable subsequent analyses or permission was sought from the store manager to extract data directly from the product packaging in-store. Data were transcribed from the ingredients lists and nutrition information panels (NIPs) of product packaging. If the wholegrain content was not clearly listed on the food label, companies were contacted to verify the wholegrain content and if the wholegrain content could not be verified, the product was excluded from further analyses.

Data collected included the manufacturer, the brand and product name, the manufacturer-defined serving size, wholegrain content (g) per 100g, as well as the nutrient data listed on the NIP, including energy (kJ), protein (g), carbohydrates (g), sugars (g), dietary fibre (g) and sodium (mg), per 100g and per serving. Nutrient data for products sourced through the GLNC

were obtained through direct contact with individual food company representatives or company websites.

Product data were collated in a Microsoft® Excel® spreadsheet (version 14.0.7128.5000, © 2010 Microsoft Corporation, North Ryde, NSW, Australia), with columns established for each of the above-mentioned data variables. Only wholegrain content data are presented in this study. Estimated moisture content values corresponding to the total food were represented as a separate variable in the database. To verify the accuracy of the wholegrain data collected from the food industry, all data entered into the spreadsheet were double checked against the original values obtained on the product label or website or the original spread sheets by the primary author (S. Dalton). Data were examined for outliers and manufacturers were contacted to verify values where discrepancies were identified.

2.3 Wholegrain content calculation methods

The wholegrain content (g/100g) of food products was calculated by food manufacturers in accordance with Standard 1.2.10 of the FSC (FSANZ, 2011). There are two primary approaches to calculating the wholegrain content of products according to the FSC, determined by the way that a product is processed and the degree of water loss that occurs during processing (FSANZ, 2011). The first method involves calculating the “ingoing weight” of the ingredients expressed as a proportion of the total “ingoing weight” of all ingredients in the food. “Ingoing weight” refers to the weight of ingredients prior to the processing of the food. Using this approach any added water or volatile ingredients that are removed during processing are not included in the calculation. Wholegrain content was calculated using the “ingoing weight” method for breakfast cereal products such as muesli and raw oat-based products, pre-cooked brown rice products, soup products and uncooked microwave popcorn. Wholegrain content was calculated using the “ingoing weight” method,

discounting water lost from added water, for cereal bars that were reported to be processed with minimal heat treatment and without water loss from the grains, breads and crumpets, pasta products and milk alternative products.

For products that lose water from the grain ingredients during processing, the calculation is based on the “final weight” of ingredients, expressed as a proportion of the finished food (FSANZ, 2011). “Final weight” refers to the weight of the ingredients after food processing has occurred. This method was used for products that experience significant water loss during processing, primarily as a result of heat treatment and extrusion processing. This method was reported to be used for ready-to-eat breakfast cereals that lose significant amounts of water during heat and extrusion processing, savoury biscuit products and cereal bar products that undergo substantial heat treatments such as baking.

2.4 Wholegrain product classification

Food products were categorised primarily according to the AUSNUT 2007 food coding system (FSANZ, 2008a). The AUSNUT database categorises foods into a four-tier nested hierarchy of food groups, comprising broad categories sub-divided into major, sub-major and minor food sub-groups. To facilitate coding, the AUSNUT 2007 database is supported by ancillary documentation including food descriptor information, recipes and a brand match file (BMF) (FSANZ, 2008b). The BMF was used to link specific food products to their corresponding food group and food code. Food names were also assigned to products in accordance with the food names designated in AUSNUT 2007.

There were several products that could not be matched to a pre-existing AUSNUT food name and food group due to their unique combination of ingredients. For these additional products, food names were borrowed from the NUTTAB 2010 database where possible, as this more recently developed database contains new products and foods that were not captured in the

AUSNUT 2007 database (FSANZ, 2010). Alternatively, new food names were created based on the primary ingredients in the product and other relevant nutrition information. The product was then positioned within the AUSNUT food coding hierarchy according to its food type and ingredient content. For example, one type of product identified in NUTTAB 2010 that is not listed in the AUSNUT 2007 database is “grain waves”, a cereal based snack product made with wholegrain ingredients. Products under this category were named “grain waves” in accordance with the food name in NUTTAB 2010 and then were categorised within the AUSNUT food coding system as “snack foods/other snacks”, according to their designation as snack food items.

The table of foods (Table 1) displays the hierarchical categorisation of food groups included in this study. The broad food category is represented in capital letters and subsequent food groups are indented in the table. The categorisation of foods was double checked by the primary author (S. Dalton) to ascertain appropriate food classification.

2.5 Data analysis

The mean, median, standard deviation (SD) and range of wholegrain content (g) per 100g and per serving were calculated for each food group (Microsoft® Excel®, version 14.0.7128.5000, © 2010 Microsoft Corporation, North Ryde, NSW, Australia). Due to the marked variation in the serving size of products reported by food manufacturers and to facilitate comparison, the wholegrain content per serving was reported based on standardised serving sizes defined in the Australian Guide to Healthy Eating (NHMRC, 2013).

3 Results and discussion

This is the first study to provide quantitative estimates of the wholegrain content of Australian food products. Data were extracted from 46 food companies, including eight major

food companies sourced through the GLNC. The database comprises 385 products across 6 broad food categories, 14 major, 42 sub-major and 137 minor food groups, with data on the mean, median, SD and range in wholegrain content of food groups, per 100g and per standardised serving of food (Table 1). Bread products comprised 30% (n=117/385) of the sample, followed by hot and cold breakfast cereals and savoury biscuits, which accounted for 24% (n=94/385) and 16% (n=61/385) of all products, respectively. Wholegrains were also identified in pasta products, snack foods, cereal bars, soups and dairy substitute products; however products from the latter categories comprised only 30% of the total sample. The larger sample of bread and breakfast cereal products may reflect consumption patterns and consumer demand for grain foods in this form. However, it is also possible that products from the latter categories were not captured in the sampling frame, thus limiting the sample of products obtained from these alternative food categories.

Foods containing the highest mean wholegrain content were raw flours and grains (100.0 g/100g), pasta products (86.0 g/100g), hot and cold breakfast cereals (74.5 g/100g and 59.9g/100g, respectively), savoury biscuits (69.1 g/100g) and bread products (37.6 g/100g). However, while wholegrain-containing products were identified across a range of food categories, there was marked variation in the wholegrain content of products within major, sub-major and minor food groups. Bread products and breakfast cereals had the greatest variation. For instance, values for breads ranged from 5.1 g/100g wholegrain (bread, from rye flour, light, added folate) to 70.0 g/100g (bread roll, from wholemeal flour, added folate). Similarly, this was reflected on a per-serving basis, with breads ranging from 2.0 g per standardised serving (bread, from rye flour, light, added folate) to 28.0 g per serving (bread roll, from wholemeal flour, added folate). A wide range in the wholegrain content of foods was also noted among biscuits, snack foods and cereal bars, reflecting the diversity of products within the respective categories.

This study highlights the need for researchers to consider variability in the wholegrain content of food products when conducting dietary research. In particular, the findings demonstrate the challenge researchers may face in estimating the wholegrain intake of population groups, as similar product choices may lead to different levels of wholegrain intake. It is potentially erroneous to estimate wholegrain intake if product and time-specific data are not applied to the task of estimating the composition of foods as part of dietary research. Differences in product formulations and the methods of processing may largely account for the variation noted in this study; however, further research is required to characterise other factors that may influence the composition and nutritional value of wholegrain-containing products, such as grain genetics, phytochemical content, environmental influences and specific food manufacturing processes (Fardet, 2010). Further detailed characterisation of other nutritional variables would add value to a wholegrain database and enhance the capacity of researchers to investigate the relationship between wholegrain consumption and health or disease outcomes as part of dietary research.

For future users of the database it is important to note that the values presented in this study are in the form required for labelling food products in Australia, in contrast to a number of previous studies which have reported the wholegrain content of foods on a dry-weight basis (Franz & Sampson, 2006; Koh-Banerjee et al., 2004). This approach was deemed acceptable for the purpose of the current study as the data were obtained directly from food manufacturers, who calculate the wholegrain content of their products in accordance with the FSC (FSANZ, 2011). Representing the data in this format also enables direct comparison of the data against quantitative wholegrain intake recommendations (GLNC, 2013a), and provides a standardised format to communicate the wholegrain content of foods that is consistent between industry, researchers and within the consumer domain. Future researchers will need to determine if this is the appropriate form in which to measure the wholegrain

content of a food, or whether further adjustments should be made to obtain dry weight estimates.

There are limitations to the current study. Notably, the wholegrain data compiled in this study were calculated by third parties, and chemical analyses were not conducted to validate the accuracy of the data. This is a broad limitation for researchers, as there are no available chemical analysis techniques to quantify the wholegrain content of manufactured foods (Jacobs et al., 1998; Kyro et al., 2011; Maras et al., 2009; McKeown et al., 2013). However, in this study manufacturers calculated the wholegrain content of foods in line with the requirements of the FSC, which provided consistency in how wholegrain data were calculated and represented in the database. Wholegrain content estimates declared on food labels are similarly calculated based on the requirements of the FSC, providing confidence that the wholegrain data were calculated utilising a standardised approach.

Additionally, it was not possible to obtain data from all available products on the market at the time of data collection. In particular, obtaining data relating to private label brands was a challenge, as the major private label companies were not able to contribute wholegrain data for this study. Furthermore, obtaining data from smaller food companies was problematic, particularly for sweet biscuits and raw grain products. This suggests the need for alternative strategies to estimate the wholegrain content of some food products, such as recipe methods based on label data or recipe books (Franz & Sampson, 2006; Kyro et al., 2011). However, data were extracted from food companies who held primary market share in their respective categories, as reflected in Retail World (Retail World, 2010, 2011). Obtaining these data enabled the study to provide a snapshot of the supply of wholegrain foods on market at the time of data collection, with a primary focus on products most commonly consumed in Australia.

This database may be an important resource for epidemiological and intervention trials, as a lack of wholegrain data has been identified as a major impediment to conducting research in this context (McKeown et al., 2013). The database will be used by nutrition researchers to assist in characterising the wholegrain consumption patterns of Australian population groups including those studied in dietary intervention trials at the Smart Foods Centre, at the University of Wollongong and as part of the Australian Health Survey 2011-13 (FSANZ, 2013b). An additional application of the database is the analyses of the wholegrain content of products in the Australian market relative to dietary guidance and wholegrain food content standards. For this latter purpose, the database was utilised as a reference at a Round Table in 2013 to inform discussions concerning the development of the GLNC Code of Practice for Whole Grain Ingredient Content Claims (GLNC, 2013b). Future research is planned to systematically evaluate the wholegrain content of the products in the database, relative to dietary guidance.

A significant difference with the current study, compared to previous research, is the systematic data extraction process used to obtain wholegrain data pertaining to food products on the market. We chose to adopt this approach in response to the co-operation of a large body of food manufacturers in supplying wholegrain composition data, the facilitation of data collection by the GLNC and the availability of market data to ensure that products with the greatest market share were included in the database. The findings demonstrate the utility of this approach, because a significant proportion of the products were obtained through contact with representatives within the food industry; specifically, 63% (n=243/385) of the sample was sourced through the GLNC and 16% (n=61/385) sourced through direct contact with food companies. The success of the study in obtaining data directly from the food industry suggests that data sharing between research and food industry stakeholders represents a

productive collaborative opportunity and may be a viable option for future research endeavours in Australia.

4 Conclusion

This database provides a resource to assess the wholegrain content of manufactured and packaged food products, for application in a range of research and practice settings. However, researchers will need to be aware that the wholegrain content of products varies widely within the market and there is potential for erroneously estimating the wholegrain content of a food, if product and time-specific data are not available.

Importantly the study demonstrates that collaboration with the food industry is useful in obtaining wholegrain composition data pertaining to Australian manufactured and packaged food products. However, barriers relating to the proprietary nature of food composition data still exist, which may limit the capacity of researchers to comprehensively characterise the composition of wholegrain-containing food products in the Australian market.

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Table 1. Wholegrain composition of Australian manufactured and packaged food products

Food group ¹	n	Serving size		Moisture (g) per 100g ²	Wholegrain (g) per 100g ³			Wholegrain (g) per serving ⁴		
		Labelled ⁵ (mean)	Standard ⁶ (mean)		Mean ± SD ⁷	Median	Range ⁸	Mean ± SD ⁷	Median	Range ⁸
CEREALS AND CEREAL PRODUCTS⁹	237	-	-	-	-	-	-	-	-	-
Flours And Other Cereal Grains And Starches⁹	19	-	-	-	-	-	-	-	-	-
Cereal Flours, Dry Starch Powders	2	40.0	30.0	11.0	100.0 ± -	100.0	0.0	30.0 ± -	30.0	0.0
Flour, wheat, wholemeal, plain	2	40.0	30.0	11.0	100.0 ± -	100.0	0.0	30.0 ± -	30.0	0.0
Grains (Other Than Rice)	5	63.0	28.3	9.2	100.0 ± 0.0	100.0	0.0	28.3 ± 4.6	25.0	25.0 – 33.5
Couscous, whole wheat, raw	1	100.0	33.5	8.6	100.0 ± -	100.0	0.0	33.5 ± -	33.5	0.0
Oats, rolled, raw	3	38.3	25.0	9.3	100.0 ± 0.0	100.0	0.0	25.0 ± 0.0	25.0	0.0
Red Quinoa, raw	1	100.0	33.2	9.3	100.0 ± -	100.0	0.0	33.2 ± -	33.2	0.0
Grains, Rice⁹	12	-	-	-	-	-	-	-	-	-
Rice, brown, precooked ¹⁰	7	119.6	120.0	50.0	40.1 ± 6.9	37.0	31.0 - 49.0	48.2 ± 8.3	44.4	37.2 - 58.8
Rice, brown, raw	4	88.8	32.5	12.1	100.0 ± 0.0	100.0	0.0	32.5 ± 1.7	33.2	30.0 - 33.6
Rice, wild, raw	1	25.0	32.8	7.8	100.0 ± -	100.0	0.0	32.8 ± -	32.8	0.0
Regular Breads, And Bread Rolls (Plain/Unfilled/Untopped Varieties)	98	71.9	40.0	38.2	37.6 ± 23.5	45.1	5.1 – 70.0	15.0 ± 9.3	18.0	2.0 – 28.0
Breads, And Bread Rolls, Mixed Grain, Fortified	38	75.7	40.0	37.2	13.8 ± 4.1	14.2	6.0 – 23.8	5.5 ± 1.6	5.7	2.4 – 9.5
Bread roll, mixed grain, added folate	1	90.0	40.0	35.8	13.0 ± -	13.0	0.0	5.2 ± -	5.2	0.0
Bread, from white or wholemeal flour, soy & linseed, added folate	5	78.8	40.0	41.0	9.6 ± 3.3	9.0	6.0 - 15.0	3.8 ± 1.3	3.6	2.4 - 6.0
Bread, mixed grain, added folate	28	74.5	40.0	38.2	14.8 ± 3.8	15.0	6.9 - 23.8	5.9 ± 1.5	6.0	2.8 - 9.5

Food group ¹	n	Serving size		Moisture (g) per 100g ²	Wholegrain (g) per 100g ³			Wholegrain (g) per serving ⁴		
		Labelled ⁵ (mean)	Standard ⁶ (mean)		Mean ± SD ⁷	Median	Range ⁸	Mean ± SD ⁷	Median	Range ⁸
Bread, mixed grain, added iron	1	74.0	40.0	38.2	8.8 ± -	8.8	0.0	3.5 ± -	3.5	0.0
Bread, mixed grain, homemade from bread mix	1	75.0	40.0	38.2	13.3 ± -	13.3	0.0	5.3 ± -	5.3	0.0
Bread, mixed grain, seeds & oats, added folate	2	78.5	40.0	35.2	12.9 ± -	12.9	9.1 - 16.7	5.2 ± -	5.2	3.6 - 6.7
Breads, And Bread Rolls, Wholemeal, Fortified	51	68.6	40.0	38.9	57.0 ± 12.0	60.0	5.7 – 70.0	22.8 ± 4.8	24.0	2.3 – 28.0
Bread roll, from wholemeal flour, added folate	6	65.0	40.0	33.7	67.5 ± 2.3	68.0	63.0 - 70.0	27.0 ± 0.9	27.2	25.2 - 28.0
Bread roll, from wholemeal flour, grain & seeds	2	80.0	40.0	38.3	56.5 ± -	56.5	50.0 - 63.0	22.6 ± -	22.6	20.0 - 25.2
Bread, white and wholemeal wheat flour, pumpkin seeds	1	79.2	40.0	39.1	5.7 ± -	5.7	0.0	2.3 ± -	2.3	0.0
Bread, from wholemeal flour, added folate	21	66.6	40.0	41.1	61.0 ± 6.4	65.0	49.4 - 66.0	24.4 ± 2.6	26.0	19.8 - 26.4
Bread, from wholemeal flour, added iron	3	65.7	40.0	41.1	52.2 ± 6.1	49.4	48.0 - 59.1	20.9 ± 2.4	19.8	19.2 - 23.7
Bread, from wholemeal flour, added omega-3 polyunsaturates	1	74.0	40.0	41.1	50.0 ± -	50.0	0.0	20.0 ± -	20.0	0.0
Bread, from wholemeal flour, grain & seeds	10	69.4	40.0	38.3	52.0 ± 12.6	57.3	19.8 - 62.0	20.8 ± 5.0	22.9	7.9 - 24.8
Bread, from wholemeal flour, homemade from bread mix	1	85.0	40.0	41.1	47.0 ± -	47.0	0.0	18.8 ± -	18.8	0.0
Bread, from wholemeal flour, seeds, added folate	6	70.2	40.0	36.8	55.0 ± 11.3	60.0	31.9 - 60.0	22.0 ± 4.5	24.0	12.8 - 24.0
Breads, And Bread Rolls, Rye, Fortified	8	74.8	40.0	37.6	23.2 ± 12.3	21.8	5.1 – 48.0	9.3 ± 4.9	8.7	2.0 – 19.2
Bread, from rye flour, dark, added folate	1	75.0	40.0	37.1	22.9 ± -	22.9	0.0	9.2 ± -	9.2	0.0
Bread, from rye flour, light, added folate	6	78.0	40.0	37.2	19.1 ± 8.3	20.4	5.1 - 28.0	7.6 ± 3.3	8.1	2.0 - 11.2
Bread, pumpernickel	1	55.7	40.0	40.6	48.0 ± -	48.0	0.0	19.2 ± -	19.2	0.0
Breads, And Bread Rolls, Fibre-Increased, Fortified	1	70.0	40.0	39.5	66.0 ± -	66.0	0.0	26.4 ± -	26.4	0.0

Food group ¹	n	Serving size		Moisture (g) per 100g ²	Wholegrain (g) per 100g ³			Wholegrain (g) per serving ⁴		
		Labelled ⁵ (mean)	Standard ⁶ (mean)		Mean ± SD ⁷	Median	Range ⁸	Mean ± SD ⁷	Median	Range ⁸
Bread, from wholemeal flour, added fibre	1	70.0	40.0	39.5	66.0 ± -	66.0	0.0	26.4 ± -	26.4	0.0
English-Style Muffins, Flat Breads, And Savoury and Sweet Breads	19	69.8	38.5	34.0	40.5 ± 18.0	40.0	6.0 – 64.0	16.1 ± 7.3	16.0	2.4 – 25.6
English-Style Muffins	2	67.0	35.0	34.8	25.2 ± -	25.2	11.2 – 39.1	8.8 ± -	8.8	3.9 – 13.7
Muffin, mixed grain	1	67.0	35.0	35.8	11.2 ± -	11.2	0.0	3.9 ± -	3.9	0.0
Muffin, wholemeal	1	67.0	35.0	33.7	39.1 ± -	39.1	0.0	13.7 ± -	13.7	0.0
Flat Breads (E.g. Pita Bread)	9	63.1	40.0	33.3	50.0 ± 14.0	50.0	36.0 – 64.0	20.0 ± 5.6	20.0	14.4 – 25.6
Bread, flat (pita or Lebanese style), wholemeal	8	58.5	40.0	32.7	50.0 ± 15.0	50.0	36.0 - 64.0	20.0 ± 6.0	20.0	14.4 - 25.6
Pizza base, from wholemeal flour	1	100.0	40.0	38.0	50.0 ± -	50.0	0.0	20.0 ± -	20.0	0.0
Savoury Filled or Topped Breads And Bread Rolls, Fortified	3	113.3	40.0	36.6	48.3 ± 2.9	50.0	45.0 – 50.0	19.3 ± 1.2	20.0	18.0 – 20.0
Bread roll, from wholemeal flour, topped with cheddar cheese & vegemite	1	110.0	40.0	31.9	50.0 ± -	50.0	0.0	20.0 ± -	20.0	0.0
Bread roll, from wholemeal flour, topped with spinach & feta	1	120.0	40.0	32.5	50.0 ± -	50.0	0.0	20.0 ± -	20.0	0.0
Bread roll, from wholemeal flour, topped with cheese and herb	1	110.0	40.0	31.7	45.0 ± -	45.0	0.0	18.0 ± -	18.0	0.0
Sweet Breads, Buns and Scrolls, Fortified	2	84.0	40.0	34.2	24.4 ± -	24.4	7.8 – 41.0	9.8 ± -	9.8	3.1 – 16.4
Bread, from white and wholemeal wheat flour, added dried fruit	1	83.0	40.0	36.0	7.8 ± -	7.8	0.0	3.1 ± -	3.1	0.0
Bread, from wholemeal flour, added dried fruit	1	85.0	40.0	32.4	41.0 ± -	41.0	0.0	16.4 ± -	16.4	0.0
Tortilla, Taco Shells, And Corn Bread	3	38.7	40.0	33.2	24.9 ± 17.3	28.6	6.0 – 40.0	9.9 ± 6.9	11.4	2.4 – 16.0
Tortilla, corn flour	1	28.0	40.0	45.9	6.0 ± -	6.0	0.0	2.4 ± -	2.4	0.0
Tortilla, multigrain, wheat based	1	48.0	40.0	26.8	28.6 ± -	28.6	0.0	11.4 ± -	11.4	0.0

Food group ¹	n	Serving size		Moisture (g) per 100g ²	Wholegrain (g) per 100g ³			Wholegrain (g) per serving ⁴		
		Labelled ⁵ (mean)	Standard ⁶ (mean)		Mean ± SD ⁷	Median	Range ⁸	Mean ± SD ⁷	Median	Range ⁸
Tortilla, wholemeal, wheat based	1	40.0	40.0	26.8	40.0 ± -	40.0	0.0	16.0 ± -	16.0	0.0
Pasta And Pasta Products	7	104.6	34.6	9.6	86.0 ± 23.9	100.0	51.0 - 100.0	29.8 ± 8.5	33.6	17.5 - 36.8
Pasta, Including Plain, Flavoured and Egg Varieties	7	104.6	34.6	9.6	86.0 ± 23.9	100.0	51.0 - 100.0	29.8 ± 8.5	33.6	17.5 - 36.8
Pasta, wholemeal wheat flour, dry	7	104.6	34.6	9.6	86.0 ± 23.9	100.0	51.0 - 100.0	29.8 ± 8.5	33.6	17.5 - 36.8
Breakfast Cereals, Unfortified and Fortified Varieties	80	41.0	30.0	7.1	59.9 ± 20.7	61.5	6.0 – 100.0	18.0 ± 6.2	18.5	1.8 – 30.0
Breakfast Cereal, Oat Based	2	66.0	30.0	8.0	70.0 ± -	70.0	0.0	21.0 ± -	21.0	0.0
Breakfast cereal, oats, fruit juice, added fruit and flavours, unfortified	2	66.0	30.0	8.0	70.0 ± -	70.0	0.0	21.0 ± -	21.0	0.0
Breakfast Cereal, Oat Based, Fortified	1	30.0	30.0	3.0	44.0 ± -	44.0	0.0	13.2 ± -	13.2	0.0
Breakfast cereal, oat flakes, rice & wheat, added vitamins B1, B2, B3 & D & Fe	1	30.0	30.0	3.0	44.0 ± -	44.0	0.0	13.2 ± -	13.2	0.0
Breakfast Cereal, Wheat Based	3	39.0	30.0	6.4	99.0 ± 1.7	100.0	97.0 – 100.0	29.7 ± 0.5	30.0	29.1 – 30.0
Breakfast cereal, whole wheat, biscuit, organic, unfortified	1	30.0	30.0	5.9	97.0 ± -	97.0	0.0	29.1 ± -	29.1	0.0
Breakfast cereal, whole wheat, biscuit, small, unfortified	1	47.0	30.0	6.8	100.0 ± -	100.0	0.0	30.0 ± -	30.0	0.0
Breakfast cereal, whole wheat, puffed, unfortified	1	40.0	30.0	4.4	100.0 ± -	100.0	0.0	30.0 ± -	30.0	0.0
Breakfast Cereal, Wheat Based, Fortified	12	35.7	30.0	5.1	72.3 ± 20.8	67.5	42.0 – 99.0	21.7 ± 6.2	20.3	12.6 – 29.7
Breakfast cereal, wheat bran, flakes, added vitamins B1, B2 B3, & folate, Fe & Zn	1	40.0	30.0	4.6	53.0 ± -	53.0	0.0	15.9 ± -	15.9	0.0
Breakfast cereal, wheat bran, flakes, honey & almond, added vitamins B1, B2, B3 & folate, Fe & Zn	1	45.0	30.0	4.6	42.0 ± -	42.0	0.0	12.6 ± -	12.6	0.0

Food group ¹	n	Serving size		Moisture (g) per 100g ²	Wholegrain (g) per 100g ³			Wholegrain (g) per serving ⁴		
		Labelled ⁵ (mean)	Standard ⁶ (mean)		Mean ± SD ⁷	Median	Range ⁸	Mean ± SD ⁷	Median	Range ⁸
Breakfast cereal, wheat, extruded, chocolate coating, added vitamins B1, B2, B3, C & folate, Ca, Fe & Zn	1	30.0	30.0	3.7	61.0 ± -	61.0	0.0	18.3 ± -	18.3	0.0
Breakfast cereal, wheat, extruded, chocolate malt coating, added vitamins B1, B2, B3, C & folate, Ca, Fe & Zn	1	30.0	30.0	3.7	53.0 ± -	53.0	0.0	15.9 ± -	15.9	0.0
Breakfast cereal, wheat, flakes, sweetened, psyllium, added vitamins B1, B2, B3, C & folate, Fe & Zn	1	30.0	30.0	4.6	62.0 ± -	62.0	0.0	18.6 ± -	18.6	0.0
Breakfast cereal, whole wheat, biscuit, added vitamins B1, B2 & B3	1	33.3	30.0	6.8	99.0 ± -	99.0	0.0	29.7 ± -	29.7	0.0
Breakfast cereal, whole wheat, biscuit, added vitamins B1, B2, B3 & folate, Fe & Zn	1	30.0	30.0	5.9	97.0 ± -	97.0	0.0	29.1 ± -	29.1	0.0
Breakfast cereal, whole wheat, biscuit, bran, added B1, B2, B3 & folate & Fe	1	40.0	30.0	5.8	57.0 ± -	57.0	0.0	17.1 ± -	17.1	0.0
Breakfast cereal, whole wheat, biscuit, children's product, added vitamins B1, B2 & B3, Ca, Fe & Zn	1	30.0	30.0	5.0	96.0 ± -	96.0	0.0	28.8 ± -	28.8	0.0
Breakfast cereal, whole wheat, biscuit, small, honey, added vitamins B1, B2, B3 & folate, Fe & Zn	2	45.0	30.0	5.9	74.5 ± -	74.5	73.0 - 76.0	22.4 ± -	22.4	21.9 - 22.8
Breakfast cereal, whole wheat, flakes, added vitamins B1 & B3	1	30.0	30.0	5.4	99.0 ± -	99.0	0.0	29.7 ± -	29.7	0.0
Breakfast Cereal, Wheat Based, With Added Fruit/And Or Fortified	9	42.2	30.0	8.1	53.5 ± 20.4	55.0	23.5 – 74.0	16.1 ± 6.1	16.5	7.1 – 22.2
Breakfast cereal, wheat bran & oats, flakes, dried fruit, added vitamins B1, B2, B3 & folate & Fe	1	45.0	30.0	6.6	26.2 ± -	26.2	0.0	7.9 ± -	7.9	0.0

Food group ¹	n	Serving size		Moisture (g) per 100g ²	Wholegrain (g) per 100g ³			Wholegrain (g) per serving ⁴		
		Labelled ⁵ (mean)	Standard ⁶ (mean)		Mean ± SD ⁷	Median	Range ⁸	Mean ± SD ⁷	Median	Range ⁸
Breakfast cereal, wheat bran, flakes, sultanas, added vitamins B1, B2, B3 & folate, Fe & Zn	2	45.0	30.0	8.4	30.8 ± -	30.8	23.5 - 38.0	9.2 ± -	9.2	7.1 - 11.4
Breakfast cereal, wheat bran, flakes, sultanas, almonds, apple, added vitamins B1, B2, B3 & folate, Ca & Fe	1	40.0	30.0	8.3	55.0 ± -	55.0	0.0	16.5 ± -	16.5	0.0
Breakfast cereal, whole wheat, biscuit, small, fruit or fruit paste, added vitamins B1, B2, B3 & folate	2	40.0	30.0	9.8	73.5 ± -	73.5	73.0 - 74.0	22.1 ± -	22.1	21.9 - 22.2
Breakfast cereal, whole wheat, biscuit, small, fruit paste, added vitamins B1, B2, B3 & C & Fe	1	35.0	30.0	9.8	50.0 ± -	50.0	0.0	15.0 ± -	15.0	0.0
Breakfast cereal, whole wheat, biscuit, small, fruit, added vitamins B1, B2, B3 & folate, Ca & Fe	2	45.0	30.0	5.9	71.0 ± -	71.0	0.0	21.3 ± -	21.3	0.0
Breakfast Cereal, Mixed Grain, Fortified	14	37.8	30.0	5.5	59.6 ± 25.6	60.0	6.0 - 98.0	17.9 ± 7.7	18.0	1.8 - 29.4
Breakfast cereal, flakes of rice & wheat, sweetened, added vitamins B1, B2, B3 & folate, Ca, Fe & Zn	2	35.0	30.0	3.1	9.3 ± -	9.3	6.0 - 12.5	2.8 ± -	2.8	1.8 - 3.8
Breakfast cereal, mixed grain (wheat, corn, rice) flakes, added vitamins B1, B2, B3 & folate & Fe	2	45.0	30.0	11.0	60.0 ± -	60.0	57.0 - 63.0	18.0 ± -	18.0	17.1 - 18.9
Breakfast cereal, mixed grain (wheat, oat, corn, rice) extruded, added vitamins B1, B2, B3, C, E & folate, Ca, Fe & Zn	2	30.0	30.0	2.8	55.3 ± -	55.3	54.0 - 56.6	16.6 ± -	16.6	16.2 - 17.0

Food group ¹	n	Serving size		Moisture (g) per 100g ²	Wholegrain (g) per 100g ³			Wholegrain (g) per serving ⁴		
		Labelled ⁵ (mean)	Standard ⁶ (mean)		Mean ± SD ⁷	Median	Range ⁸	Mean ± SD ⁷	Median	Range ⁸
Breakfast cereal, mixed grain (wheat, rice, oats), biscuit, added vitamins B1, B2, B3 & Fe	1	48.0	30.0	5.9	72.0 ± -	72.0	0.0	21.6 ± -	21.6	0.0
Breakfast cereal, mixed grain (whole wheat and whole oats), biscuit, added vitamins B1, B2 & B4	1	41.7	30.0	6.8	98.0 ± -	98.0	0.0	29.4 ± -	29.4	0.0
Breakfast cereal, mixed grain (whole wheat and whole oats), biscuit, small, added bran, added sugar	2	30.0	30.0	5.8	70.0 ± -	70.0	62.0 - 78.0	21.0 ± -	21.0	18.6 - 23.4
Breakfast cereal, mixed grain (wholegrain cereals: wheat, corn, rice), extruded, chocolate malt coating, added vitamins including Ca and Mg	1	30.0	30.0	3.7	50.6 ± -	50.6	0.0	15.2 ± -	15.2	0.0
Breakfast cereal, mixed grain (wholegrain cereals: wheat, oats, rye, barley, triticale), biscuit, small, added vitamin e, niacin, riboflavin, thiamin, folate	1	40.0	30.0	6.8	93.0 ± -	93.0	0.0	27.9 ± -	27.9	0.0
Breakfast cereal, mixed grain (wholegrain cereals: wheat, oats, rye, barley, triticale), rice, wheat bran, oat fibre, added sugar	1	45.0	30.0	5.4	58.0 ± -	58.0	0.0	17.4 ± -	17.4	0.0
Breakfast cereal, mixed grain (whole wheat and brown rice flour), biscuit, small, with added sugar, cocoa, vitamins B1, B2, B3 and Fe, ca, zn, fe	1	45.0	30.0	5.9	74.0 ± -	74.0	0.0	22.2 ± -	22.2	0.0
Breakfast Cereal, Mixed Grain, With Fruit And/Or Nuts (Includes Muesli)	14	44.3	30.0	9.2	63.4 ± 9.6	63.5	33.0 - 70.0	19.0 ± 2.9	19.1	9.9 - 21.0
Muesli, commercial, untoasted or natural style, unfortified	14	44.3	30.0	9.4	63.4 ± 9.6	63.5	33.0 - 70.0	19.0 ± 2.9	19.1	9.9 - 21.0
Breakfast Cereal, Mixed Grain, With Fruit And/Or Nuts, Fortified (Includes Mueslis)	25	41.8	30.0	7.5	49.5 ± 15.7	51.0	10.6 - 73.0	14.9 ± 4.7	15.3	3.2 - 21.9

Food group ¹	n	Serving size		Moisture (g) per 100g ²	Wholegrain (g) per 100g ³			Wholegrain (g) per serving ⁴		
		Labelled ⁵ (mean)	Standard ⁶ (mean)		Mean ± SD ⁷	Median	Range ⁸	Mean ± SD ⁷	Median	Range ⁸
Breakfast cereal, flakes of rice & wheat, sweetened, berries, added vitamins B1, B2, B3 & folate, Ca, Fe & Zn	1	30.0	30.0	3.1	11.1 ± -	11.1	0.0	3.3 ± -	3.3	0.0
Breakfast cereal, mixed grain (wheat, corn, bran), flakes, sultanas & apple, added vitamins B1, B2, B3, & folate, Ca & Fe	1	45.0	30.0	4.5	44.0 ± -	44.0	0.0	13.2 ± -	13.2	0.0
Breakfast cereal, mixed grain (wheat, corn, oat, rice), flakes, tropical fruit, added vitamins B1, B2, B3 & folate & Fe	1	45.0	30.0	6.3	57.0 ± -	57.0	0.0	17.1 ± -	17.1	0.0
Breakfast cereal, mixed grain (wheat, corn, oat), clusters, fruit, added vitamins B1, B2 & folate & Fe	1	50.0	30.0	8.3	44.0 ± -	44.0	0.0	13.2 ± -	13.2	0.0
Breakfast cereal, mixed grain (wheat, corn, oat), clusters, nuts, added vitamins B1, B2 & folate & Fe	1	50.0	30.0	8.3	51.0 ± -	51.0	0.0	15.3 ± -	15.3	0.0
Breakfast cereal, mixed grain (wheat, corn, rice, oat), flakes, fruit & nuts, added vitamins B1, B2, B3, C & folate & Fe	3	38.3	30.0	8.3	32.9 ± 21.7	34.0	10.6 - 54.0	9.9 ± 6.5	10.2	3.2 - 16.2
Breakfast cereal, mixed grain (wheat, corn, rice, oat), flakes, fruit, added vitamins B1, B2, B3 & folate, Ca & Fe	2	40.0	30.0	7.0	46.5 ± -	46.5	43.0 - 50.0	14.0 ± -	14.0	12.9 - 15.0
Breakfast cereal, mixed grain (whole wheat, corn, rice, whole oat), flakes, nuts, added vitamins B1, B2, B3 & folate, Ca & Fe	2	40.0	30.0	8.3	49.5 ± -	49.5	47.0 - 52.0	14.9 ± -	14.9	14.1 - 15.6
Breakfast cereal, mixed grain (wheat, corn, rice), flakes, apple & berries, added vitamins B1, B2, B3 & folate & Fe	1	45.0	30.0	6.7	73.0 ± -	73.0	0.0	21.9 ± -	21.9	0.0

Food group ¹	n	Serving size		Moisture (g) per 100g ²	Wholegrain (g) per 100g ³			Wholegrain (g) per serving ⁴		
		Labelled ⁵ (mean)	Standard ⁶ (mean)		Mean ± SD ⁷	Median	Range ⁸	Mean ± SD ⁷	Median	Range ⁸
Breakfast cereal, mixed grain (wheat, corn, rice), flakes, sultanas, apricot, & apple, added vitamins B1, B2, B3 & folate, Ca & Fe	1	40.0	30.0	8.3	71.0 ± -	71.0	0.0	21.3 ± -	21.3	0.0
Breakfast cereal, mixed grain (whole wheat, whole oat and corn), flakes, fruit, seeds, added ca, fe, zn, B1, B2, niacin, B6, E and folate	1	40.0	30.0	8.3	41.0 ± -	41.0	0.0	12.3 ± -	12.3	0.0
Breakfast cereal, mixed grain (whole wheat and whole oats), clusters, added fruit and/or nut, fortified	3	33.3	30.0	8.3	67.3 ± 5.5	70.0	61.0 - 71.0	20.2 ± 1.7	21.0	18.3 - 21.3
Breakfast cereal, mixed grain (wholegrain cereals: wheat, oats, rye, barley, triticale, amaranth), flakes, nuts and seeds	1	45.0	30.0	8.3	49.0 ± -	49.0	0.0	14.7 ± -	14.7	0.0
Breakfast cereal, mixed grain (wholegrain cereals: wheat, oats, rye, barley, triticale), flakes, wheat, fruit, seeds, added sugar, oat fibre & wheat bran	1	45.0	30.0	7.0	51.0 ± -	51.0	0.0	15.3 ± -	15.3	0.0
Breakfast cereal, mixed grain (whole wheat and corn), flakes, fruit, added ca, fe, zn, vita A, B1, B2, niacin, B6, E and folate	1	40.0	30.0	8.3	36.0 ± -	36.0	0.0	10.8 ± -	10.8	0.0
Muesli, commercial, baked, dried fruit & nuts, added vitamins B1, B2, B3 & folate & Fe	1	45.0	30.0	9.4	47.0 ± -	47.0	0.0	14.1 ± -	14.1	0.0
Muesli, commercial, toasted, dried fruit, nuts & seeds, added vitamins E & folate	3	50.0	30.0	7.2	56.7 ± 5.5	57.0	51.0 - 62.0	17.0 ± 1.7	17.1	15.3 - 18.6
Breakfast Cereal, Hot Porridge Type	14	38.8	30.4	7.2	74.5 ± 8.8	74.5	60.0 – 96.0	22.7 ± 3.3	22.4	18.0 – 29.9

Food group ¹	n	Serving size		Moisture (g) per 100g ²	Wholegrain (g) per 100g ³			Wholegrain (g) per serving ⁴		
		Labelled ⁵ (mean)	Standard ⁶ (mean)		Mean ± SD ⁷	Median	Range ⁸	Mean ± SD ⁷	Median	Range ⁸
Breakfast Cereal, Hot Porridge Type, Made From Oats (Including plain, flavoured and added fruit varieties)	11	36.6	30.0	7.8	71.6 ± 6.1	73.0	60.0 – 80.0	21.5 ± 1.8	21.9	18.0 – 24.0
Oats, rolled, mixed with added fibre and protein	1	40.0	30.0	7.6	80.0 ± -	80.0	0.0	24.0 ± -	24.0	0.0
Oats, rolled, mixed with sugar & flavours	7	36.9	30.0	7.6	72.2 ± 5.1	73.0	64.0 - 78.0	21.7 ± 1.5	21.9	19.2 - 23.4
Oats, rolled, mixed with sugar, flavours & dried fruit	3	35.0	30.0	7.8	67.3 ± 6.7	69.0	60.0 - 73.0	20.2 ± 2.0	20.7	18.0 - 21.9
Breakfast Cereal, Hot Porridge Type, Made From Other Grains (Including plain, flavoured and added fruit varieties)	3	46.7	32.0	10.2	85.3 ± 9.7	83.0	77.0 – 96.0	27.3 ± 3.6	28.8	23.1 – 29.9
Brown Rice, rolled, added mixed with dried fruit	1	50.0	36.0	12.1	83.0 ± -	83.0	0.0	29.9 ± -	29.9	0.0
Breakfast cereal, hot porridge type, made with mixed grains (whole oats, rolled rye, oatmeal, rolled barley), added nuts, linseeds, sugar, vitamin e	1	45.0	30.0	7.2	77.0 ± -	77.0	0.0	23.1 ± -	23.1	0.0
Breakfast cereal, hot porridge type, made with mixed grains (whole oats, rolled rye, oatmeal, rolled barley), linseeds, vitamin e	1	45.0	30.0	7.2	96.0 ± -	96.0	0.0	28.8 ± -	28.8	0.0
CEREAL-BASED PRODUCTS AND DISHES	73	23.0	32.3	4.2	62.9 ± 23.0	69.0	9.0 – 100.0	20.6 ± 8.5	19.9	2.2 – 35.0
Sweet Biscuits	11	28.7	26.5	3.4	30.5 ± 14.4	39.3	9.0 – 44.0	8.2 ± 4.0	10.3	2.2 – 12.6
Sweet Biscuits, Plain Or Flavoured Including Short Bread Varieties	4	33.3	26.1	3.4	22.8 ± 14.1	18.0	12.5 – 42.6	5.9 ± 3.7	4.7	3.3 – 11.1
Biscuit, sweet, mixed wholegrains, plain	2	50.0	26.0	3.5	32.8 ± -	32.8	23.0 - 42.6	8.5 ± -	8.5	6.0 - 11.1
Biscuit, sweet, oatmeal	1	18.2	27.0	3.5	12.5 ± -	12.5	0.0	3.4 ± -	3.4	0.0

Food group ¹	n	Serving size		Moisture (g) per 100g ²	Wholegrain (g) per 100g ³			Wholegrain (g) per serving ⁴		
		Labelled ⁵ (mean)	Standard ⁶ (mean)		Mean ± SD ⁷	Median	Range ⁸	Mean ± SD ⁷	Median	Range ⁸
Biscuit, sweet, wheatmeal	1	15.0	25.1	3.0	13.0 ± -	13.0	0.0	3.3 ± -	3.3	0.0
Sweet Biscuits, Plain With Fruit Or Nuts	6	27.5	27.2	3.5	39.1 ± 8.2	12.4	22.8 – 44.0	10.7 ± 2.4	11.3	6.1 – 12.6
Biscuit, sweet, muesli cookie, with added fruit	6	27.5	27.2	3.5	39.1 ± 8.2	12.4	22.8 – 44.0	10.7 ± 2.4	11.3	6.1 – 12.6
Sweet Biscuits, Chocolate-Coated, Chocolate Chip	1	17.3	24.5	3.0	9.0 ± -	9.0	0.0	2.2 ± -	2.2	0.0
Biscuit, sweet, wheatmeal, chocolate topped	1	17.3	24.5	3.0	9.0 ± -	9.0	0.0	2.2 ± -	2.2	0.0
Savoury Biscuits	61	21.3	32.9	4.4	69.1 ± 19.0	75.0	26.0 – 100.0	22.8 ± 7.1	20.8	9.1 – 35.0
Savoury Biscuits, Plain, Low Fat (<6% Fat)	4	13.4	35.0	5.0	92.8 ± 2.2	93.0	90.0 - 95.0	32.5 ± .8	32.6	31.5 - 33.3
Biscuit, savoury crispbread, rye	4	13.4	35.0	5.3	92.8 ± 2.2	93.0	90.0 - 95.0	32.5 ± .8	32.6	31.5 - 33.3
Savoury Biscuits, Plain, High Fat (>6% Fat)	22	24.4	34.3	4.4	64.3 ± 21.9	73.5	26.0 – 90.0	22.2 ± 8.1	25.7	9.1 – 31.5
Biscuit, savoury crispbread, rye	3	22.3	35.0	5.0	79.3 ± 9.3	75.0	73.0 - 90.0	27.8 ± 3.3	26.3	25.6 - 31.5
Biscuit, savoury crispbread, wholemeal wheat flour	7	25.8	35.0	5.0	85.1 ± 5.3	85.0	74.0 - 89.0	29.8 ± 1.9	29.8	25.9 - 31.2
Biscuit, savoury crispbread, wholemeal wheat flour, added mixed grains	1	38.0	35.0	5.0	74.0 ± -	74.0	0.0	25.9 ± -	25.9	0.0
Biscuit, savoury crispbread, wholemeal wheat flour, added seeds	1	38.0	35.0	3.0	74.0 ± -	74.0	0.0	25.9 ± -	25.9	0.0
Biscuit, savoury, lavosh, wholemeal wheat flour, unflavoured	2	10.0	27.2	6.3	37.0 ± -	37.0	0.0	10.1 ± -	10.1	0.0
Biscuit, savoury, wholemeal wheat flour	7	22.1	35.0	3.2	40.7 ± 8.0	44.0	26.0 - 48.0	14.3 ± 2.8	15.4	9.1 - 16.8
Biscuit, savoury, wholemeal wheat flour with soy & linseed	1	38.0	35.0	3.0	73.0 ± -	73.0	0.0	25.6 ± -	25.6	0.0
Savoury Biscuits, Flavoured	1	15.0	35.0	5.3	80.0 ± -	80.0	0.0	28.0 ± -	28.0	0.0
Biscuit, savoury crispbread, rye with oats & dried fruit	1	15.0	35.0	5.3	80.0 ± -	80.0	0.0	28.0 ± -	28.0	0.0

Food group ¹	n	Serving size		Moisture (g) per 100g ²	Wholegrain (g) per 100g ³			Wholegrain (g) per serving ⁴		
		Labelled ⁵ (mean)	Standard ⁶ (mean)		Mean ± SD ⁷	Median	Range ⁸	Mean ± SD ⁷	Median	Range ⁸
Rice and Corn Crackers and Cakes	34	20.3	31.7	4.4	69.1 ± 16.3	75.5	42.0 – 100.0	21.9 ± 6.1	19.9	11.9 – 35.0
Biscuit, savoury cake, corn with grains or seeds, salted	2	12.0	35.0	8.3	50.0 ± -	50.0	0.0	17.5 ± -	17.5	0.0
Biscuit, savoury cake, rice & corn, unsalted	1	24.0	35.0	7.0	75.0 ± -	75.0	0.0	26.3 ± -	26.3	0.0
Biscuit, savoury cake, rice with other grains, salted	1	24.0	35.0	7.0	48.0 ± -	48.0	0.0	16.8 ± -	16.8	0.0
Biscuit, savoury cake, rice, salted	2	17.0	35.0	8.3	86.0 ± -	86.0	82.0 - 90.0	30.1 ± -	30.1	28.7 - 31.5
Biscuit, savoury cake, rice, unflavoured	2	22.0	35.0	8.3	100.0 ± -	100.0	0.0	35.0 ± -	35.0	0.0
Biscuit, savoury cake, with corn & seeds, salted	2	12.0	35.0	6.9	50.0 ± -	50.0	0.0	17.5 ± -	17.5	0.0
Biscuit, savoury cracker or cake, rice & corn, flavoured	9	17.7	35.0	3.0	71.3 ± 16.0	82.0	50.0 - 82.0	25.0 ± 5.6	28.7	17.5 - 28.7
Biscuit, savoury cracker, made with brown rice	15	23.9	27.5	3.0	67.6 ± 12.6	69.0	42.0 - 82.0	18.4 ± 2.7	19.8	11.9 - 20.9
Batter-Based Product	1	69.0	60.0	46.4	43.0 ± -	43.0	0.0	25.8 ± -	25.8	0.0
Crumpet	1	69.0	60.0	46.4	43.0 ± -	43.0	0.0	25.8 ± -	25.8	0.0
Crumpet, from wholemeal flour	1	69.0	60.0	46.4	43.0 ± -	43.0	0.0	25.8 ± -	25.8	0.0
MILK PRODUCTS AND DISHES	7	250.0	250.0	89.8	11.3 ± 2.0	10.0	10.0 – 15.0	28.2 ± 4.9	25.0	25.0 – 37.5
Dairy Substitutes	7	250.0	250.0	89.8	11.3 ± 2.0	10.0	10.0 – 15.0	28.2 ± 4.9	25.0	25.0 – 37.5
Dairy Milk Substitutes, Unflavoured	7	250.0	250.0	89.8	11.3 ± 2.0	10.0	10.0 – 15.0	28.2 ± 4.9	25.0	25.0 – 37.5
Milk, oat, fluid	2	250.0	250.0	93.9	12.5 ± -	12.5	10.0 - 15.0	31.3 ± -	31.3	25.0 - 37.5
Milk, rice, fluid, calcium & protein enriched	1	250.0	250.0	84.2	11.0 ± -	11.0	0.0	27.5 ± -	27.5	0.0

Food group ¹	n	Serving size		Moisture (g) per 100g ²	Wholegrain (g) per 100g ³			Wholegrain (g) per serving ⁴		
		Labelled ⁵ (mean)	Standard ⁶ (mean)		Mean ± SD ⁷	Median	Range ⁸	Mean ± SD ⁷	Median	Range ⁸
Milk, rice, fluid, calcium enriched	4	250.0	250.0	89.2	10.8 ± 1.5	10.0	10.0 - 13.0	26.9 ± 3.8	25.0	25.0 - 32.5
SOUP¹¹	5	250.0	250.0	86.4	10.0 ± 1.7	11.0	7.0 – 11.0	25.0 ± 4.3	27.5	17.5 – 27.5
Soup (Prepared, Ready to Eat)	5	250.0	250.0	86.4	10.0 ± 1.7	11.0	7.0 – 11.0	25.0 ± 4.3	27.5	17.5 – 27.5
Soup Containing Chicken	2	250.0	250.0	82.3	10.5 ± -	10.5	10.0 - 11.0	26.3 ± -	26.3	25.0 - 27.5
Soup, chicken, canned, with wholegrain ingredients	2	250.0	250.0	82.3	10.5 ± -	10.5	10.0 - 11.0	26.3 ± -	26.3	25.0 - 27.5
Other Vegetable-Based Soup	3	250.0	250.0	89.1	9.7 ± 2.3	11.0	7.0 - 11.0	24.2 ± 5.8	27.5	17.5 - 27.5
Soup, vegetable, canned, with wholegrain ingredients	3	250.0	250.0	89.1	9.7 ± 2.3	11.0	7.0 - 11.0	24.2 ± 5.8	27.5	17.5 - 27.5
SNACK FOODS	19	28.8	24.7	2.4	52.2 ± 22.8	53.0	30.0 – 100.0	13.3 ± 7.1	13.2	6.9 – 32.9
Corn snacks	12	26.3	24.7	2.7	48.8 ± 28.3	30.0	30.0 – 100.0	12.6 ± 9.0	7.1	6.9 – 32.9
Corn chips	8	27.0	23.4	1.4	30.0 ± 0.0	30.0	0.0	7.0 ± 0.1	7.0	6.9 – 7.1
Corn chip, toasted, unflavoured, salted	2	27.0	23.8	1.2	30.0 ± -	30.0	0.0	7.1 ± -	7.1	0.0
Corn chips, flavoured	6	27.0	23.3	1.4	30.0 ± 0.0	30.0	0.0	7.0 ± .1	7.0	6.9 - 7.1
Popcorn	4	25.0	27.2	5.4	86.3 ± 11.3	84.0	77.0 – 100.0	23.8 ± 6.8	22.0	18.5 – 32.9
Popcorn, unpopped kernels, no added ingredients	1	25.0	32.9	10.6	100.0 ± -	100.0	0.0	32.9 ± -	32.9	0.0
Popcorn, microwave, salted and flavoured varieties	3	25.0	25.4	3.7	81.7 ± 8.1	77.0	77.0 - 91.0	20.8 ± 3.9	18.7	18.5 - 25.3
Other snacks	7	33.1	24.8	1.9	58.1 ± 4.9	60.0	53.0 – 66.0	14.4 ± 1.2	14.8	13.2 – 16.3
Other snacks	7	33.1	24.8	1.9	58.1 ± 4.9	60.0	53.0 – 66.0	14.4 ± 1.2	14.8	13.2 – 16.3

Food group ¹	n	Serving size		Moisture (g) per 100g ²	Wholegrain (g) per 100g ³			Wholegrain (g) per serving ⁴		
		Labelled ⁵ (mean)	Standard ⁶ (mean)		Mean ± SD ⁷	Median	Range ⁸	Mean ± SD ⁷	Median	Range ⁸
Grain waves, flavoured	5	32.8	24.8	1.9	56.2 ± 4.0	54.0	53.0 - 61.0	14.0 ± 1.0	13.4	13.2 - 15.2
Grain waves, original	2	34.0	24.8	1.9	63.0 ± -	63.0	60.0 - 66.0	15.6 ± -	15.6	14.9 - 16.3
CONFECTIONERY AND CEREAL/NUT/FRUIT/SEED BARS	44	34.3	29.9	7.2	32.1 ± 14.8	33.0	2.0 - 56.0	9.6 ± 4.4	10.4	0.5 - 17.2
Cereal-, Fruit-, Nut- And Seed-Bars	44	34.3	29.9	7.2	32.1 ± 14.8	33.0	2.0 - 56.0	9.6 ± 4.4	10.4	0.5 - 17.2
Muesli Bars, Non-Chocolate (including drizzled/coated in yoghurt)	22	37.2	30.0	7.5	34.7 ± 10.7	33.0	19.0 - 56.0	10.3 ± 3.1	10.4	5.1 - 17.2
Bar, muesli, plain or with dried fruit	14	40.7	31.4	8.4	38.7 ± 10.5	38.0	27.6 - 56.0	11.9 ± 2.5	11.2	8.4 - 17.2
Bar, muesli, plain or with dried fruit, yoghurt-coated	8	31.0	27.5	8.2	27.8 ± 7.3	30.5	19.0 - 37.0	7.6 ± 2.0	8.4	5.1 - 10.0
Muesli Bars, Chocolate Coated or Chocolate Chip	9	31.2	29.3	5.8	36.8 ± 12.1	43.0	21.0 - 48.0	10.9 ± 3.8	12.5	5.6 - 15.5
Bar, muesli, chocolate chip	4	28.5	29.5	5.9	45.5 ± 2.9	45.5	43.0 - 48.0	13.4 ± 1.4	12.9	12.5 - 15.5
Bar, muesli, plain or with dried fruit, chocolate-coated	5	33.3	29.1	5.8	29.8 ± 12.2	22.0	21.0 - 48.0	8.8 ± 3.9	6.1	5.6 - 13.8
Muesli Bar, With Fruit And Nut (including drizzled/coated in yoghurt)	7	35.9	28.5	6.6	38.1 ± 17.4	46.0	7.0 - 52.0	11.1 ± 5.5	13.0	1.8 - 17.2
Bar, muesli, rice based, with added nuts, fruit and seeds	1	45.0	26.2	8.7	7.0 ± -	7.0	0.0	1.8 ± -	1.8	0.0
Bar, muesli, with added nuts	3	28.0	31.3	6.2	48.7 ± 3.1	48.0	46.0 - 52.0	15.2 ± 2.1	15.4	13.0 - 17.2
Bar, muesli, with added nuts (contains high proportion of almonds)	3	40.7	26.4	6.2	38.0 ± 15.7	41.0	21.0 - 52.0	10.0 ± 4.1	11.1	5.5 - 13.5
Bar, cake-based	4	25.0	35.0	14.7	12.0 ± 0.0	12.0	0.0	4.2 ± 0.2	4.3	3.9 - 4.3
Bar, muffin style, wholemeal flour, custard filled	2	25.0	33.8	14.7	12.0 ± -	12.0	0.0	4.1 ± -	4.1	3.9 - 4.2
Bar, muffin style, wholemeal flour, fruit flavoured	2	25.0	36.2	14.7	12.0 ± -	12.0	0.0	4.3 ± -	4.3	0.0
Cereal-, Fruit-, Nut- And Seed-Bars, Fortified	2	30.0	26.9	8.3	2.3 ± -	2.3	2.0 - 2.5	0.6 ± -	0.6	0.5 - 0.7

Food group ¹	n	Serving size		Moisture (g) per 100g ²	Wholegrain (g) per 100g ³			Wholegrain (g) per serving ⁴		
		Labelled ⁵ (mean)	Standard ⁶ (mean)		Mean ± SD ⁷	Median	Range ⁸	Mean ± SD ⁷	Median	Range ⁸
Bar, fruit, nut, seed & oats	2	30.0	26.9	8.3	2.3 ± -	2.3	2.0 - 2.5	0.6 ± -	0.6	0.5 - 0.7

¹ Food groups are divided into broad, major, sub-major and minor food categories

² Moisture values derived from AUSNUT 2007, NUTTAB, 2010 or imputed from a similar product; unless otherwise specified

³ Data reported as wholegrain (g) per 100g of product, with the exception of soup and dairy milk substitute products which are reported as wholegrain (g) per 100mL of product

⁴ Data reported as wholegrain (g) per standardised serving size

⁵ Labelled serving sizes are the average of values reported by manufacturers

⁶ Standardised serving sizes are based on the serving size defined in the Australian Guide to Healthy Eating (NHMRC, 2013); the approximate amount that delivers 500kJ

⁷ SD values are not reported for food groups with =< 2 products

⁸ Range values are the minimum and maximum values within the category. A range value of 0.0 indicates that the minimum and maximum wholegrain (g) values per 100g or per serving are the same

⁹ Summary statistics not reported due to the inclusion of pre-cooked grain products in the food group

¹⁰ Moisture value of pre-cooked rice was provided by a major food manufacturer

¹¹ Standardised serving size of soups based on manufacturer reported values