ISSN: 2347-467X, Vol. 14, No. (1) 2026, Pg. 132-142

Current Research in Nutrition and Food Science

www.foodandnutritionjournal.org

Nutritional Composition of Packaged Bread Products in Singapore: A Cross-Sectional Analysis of Ingredients and Nutrient Profiles

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Abstract

Bread is a globally consumed staple, yet its nutritional composition is heterogeneous, influenced by ingredients like added sugars, lipids, and the use of whole grains. While these additions can improve sensory properties, they may alter nutritional profiles with implications for consumer health. The prevalence and impact of these ingredients in commercially available bread in the Singaporean retail market remain poorly characterized. This study conducted a cross-sectional analysis to quantify the nutritional profiles of packaged bread products in Singapore and examine the relationship between ingredients and nutrient composition. Nutritional and ingredient information were systematically recorded from the labels of 88 distinct packaged bread products collected from three major supermarket chains in Singapore. The prevalence of added lipids, sugars, and whole grains was determined. Two-sample independent t-tests were used to assess statistically significant differences in nutrient content between bread groups ($p < 0.05$). A high prevalence of added sugar (84.1%) and lipids (79.5%) was found, with palm lipids being the most frequent (79.5%). In contrast, wholegrain incorporation was low (22.7%). Breads with added sugars or lipids had significantly higher concentrations of saturated fat and cholesterol. Conversely, wholegrain breads exhibited a superior nutritional profile, containing significantly higher levels of protein, dietary fiber, and iron, and significantly lower concentrations of total fat, saturated fat, cholesterol, and sugar compared to non-wholegrain counterparts. The widespread use of added sugars and fats in packaged breads in Singapore contributes to less favorable nutritional profiles, while the low uptake of whole grains represents a missed public health opportunity.

Article History
Received: 10 October 2025
Accepted: 09 December 2025

Keywords
Added Sugar;
Cross-Sectional Study;
Food Labeling;
Lipids;
Nutrient Profile;
Packaged Bread;
Singapore;
Wholegrain.

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Doi: http://dx.doi.org/10.12944/CRNFSJ.14.1.8

The distinct nutritional advantages of wholegrain bread underscore the importance of promoting its consumption. These findings highlight the critical need for consumers to scrutinize ingredient lists and nutrition labels to make informed dietary choices and mitigate potential long-term health risks. The evidence strongly supports a shift from passive consumer guidance to active regulatory measures aimed at optimizing the nutritional composition of the packaged bread, thereby aligning its market with national public health objectives.

Introduction

Bread, a globally consumed dietary staple, presents a heterogeneous nutritional profile directly affecting human health.[1,2] This variability is primarily attributed to the type of flour utilized, the incorporation of supplementary ingredients, and the manufacturing processes employed. Notably, fermentation and baking techniques significantly modulate the nutritional composition, influencing gluten content, digestibility, and the bioavailability of select nutrients.[3,4] The broad spectrum of bread varieties, encompassing traditional sourdough and commercially manufactured loaves, highlights this heterogeneity and emphasizes the necessity for informed consumer choices.[1,2] Furthermore, the contribution of typical bread-serving sizes to overall dietary requirements remains inadequately characterized in the scientific literature.

The strategic incorporation of sugars and lipids as functional ingredients to enhance sensory (taste, aroma, texture) and rheological (dough handling, product structure) properties in bread formulations may result in measurable alterations to the nutritional composition.[3,4] These alterations extend beyond simple caloric contributions, potentially affecting micronutrient bioavailability, glycemic response, and lipid profiles, all critical factors influencing consumer health.[1,2] Specifically, the addition of sugars has the potential to elevate the energy content and glycemic index, thereby impacting caloric loading, insulin sensitivity, and potentially contributing to metabolic dysregulation.[1,2] Similarly, the type and quantity of lipids utilized can modulate the fatty acid profile of the bread product, with consequent implications for cardiovascular health and overall dietary lipid intake.[1,2]

Whole-grain bread products, characterized by their elevated fiber, vitamin, and mineral content, confer significant health benefits. The high dietary fiber content promotes gastrointestinal regularity, modulates postprandial glucose levels, and enhances satiety, thereby potentially aiding in weight management.[1,2] Furthermore, these products provide essential micronutrients, including B vitamins, iron, and magnesium, which are crucial for optimal physiological function.[1,2] In contrast, refined white bread, which undergoes processing to remove the bran and germ components, primarily provides carbohydrates with limited nutritional value.[1,2] This refinement process results in a substantial reduction of fiber, vitamins, and minerals, leading to rapid glucose absorption and potential glycemic excursions.[1,2] Frequent consumption of refined bread has been associated with increased risk of type 2 diabetes mellitus, cardiovascular disease, and weight gain.[1,2] The choice of flour, specifically the retention or removal of bran and germ, dictates the bread's fiber and micronutrient profile. Whole-grain flours, which retain these components, exhibit a higher nutrient density than refined flours. Moreover, the incorporation of supplementary ingredients such as seeds, nuts, and legumes further enhances the nutritional complexity of bread, contributing additional protein, unsaturated fatty acids, and a broader spectrum of vitamins and minerals.[1,2]

The prevalence and impact of added sugars, lipids, and whole grains on the nutritional composition of commercially available bread products remain poorly characterized. Specifically, the literature lacks a comprehensive understanding of how these additives modulate the nutrient profiles of bread products sold in the Singaporean retail market. To address this knowledge gap, we conducted a cross-sectional analysis to quantify the nutritional profiles of packaged bread products purchased from major supermarkets in Singapore. The resulting data were benchmarked against established dietary

reference intakes to assess the nutritional adequacy. Furthermore, this study examined the relationship between the presence of added lipids, sugars, and whole grains and the corresponding variations in the nutritional composition of these products. Finally, the prevalence of added lipids, sugars, and whole grains within the bread product population was determined.

Materials and Methods

Collection of Demographic Data

Bread products (n=88) were collected from the bakery sections of three Singapore supermarket chains (Cold Storage, Fairprice, and Giant). Selection criteria encompassed products formulated with flour. No formal exclusion criteria were applied to the initially sampled dataset. A trained research technician systematically recorded the product names, ingredient lists, and nutritional information panel data directly from the product labels. Adherence to the Singapore Food Regulations, which mandate comprehensive ingredient declarations, including food additives, and nutritional information panels for all food products, including bread, has facilitated the acquisition of these data. This regulatory framework ensures consumer access to information crucial for informed dietary decision-making.[5] Data were collected between July and August 2025. Complete nutritional composition data were unavailable for all 88 bread products. To better reflect consumer reality, the analysis was conducted using the mean nutrient value calculated per serving rather than per 100 grams. The systematic, cross-sectional data collection ensures that the sample of 88 distinct packaged bread products is likely representative of the most widely available retail options and minimizes selection bias. The study drew its data directly from product labels, which are required to provide nutritional information and ingredient declaration under the Singapore Food Agency. Reliance on this mandatory label information minimized the measurement bias. A trained research technician systemically recorded the data, suggesting that consistent protocols were followed, reducing variability in data collection. To ensure the reliability of the collected data, they were verified by a second, independent member of the research team.

Data Analysis

Statistical analysis was performed using Microsoft Excel Version 2502 (Build 16.0.18526.20168). Prevalence was determined by calculating the ratio of observed occurrences to the total number of samples analyzed. Quantitative data were presented as mean ± standard deviation, measuring central tendency and data dispersion. The differences between the two independent groups were assessed using a two-sample independent t-test. Statistical significance was defined as a p-value of less than 0.05.

Results

Demographic Characteristics of Functional Ingredients

Analysis of the studied products revealed that 84.1% contained added sugar, whereas 79.5% contained added lipids. Palm lipids were incorporated in 79.5% of the studied bread products. Other plant-derived lipids included canola oil (5.7%), soy oil (3.4%), rapeseed oil (2.3%), coconut oil (1.1%), lemon oil (1.1%), and sunflower oil (1.1%).

Wholegrains were added to 22.7% of the evaluated bread products.

Nutrition Demographic Information

The amounts of energy, protein, fat (total, saturated, and trans fat), carbohydrates (sugar and dietary fibers), cholesterol, calcium, iron, and sodium in one serving of bread are presented in Table 1.

Table 1: Nutrition profile of bread products retailing in Singapore local supermarkets

	n	mean±SD
Serving size (g)	80	54.8±24.3
Energy (kcal/ serving)	80	178.0±96.5
Protein (g/ serving)	80	4.5±2.7
Total fat (g/ serving)	80	5.3±4.3
Saturated fat (g/ serving)	78	2.8±2.6
Trans fat (g/ serving)	75	0.1±0.6
Cholesterol (g/ serving)	69	2.6±11.7
Carbohydrate (g/ serving)	80	27.0±16.2
Sugar (g/ serving)	73	5.2±4.1
Dietary fibre (g/ serving)	74	2.1±2.9
Sodium (mg/ serving)	79	241.7±149.2
Calcium (mg/ serving)	33	109.0±87.2
Iron (mg/ serving)	36	2.2±1.3

Bread products supplemented with lipid demonstrated statistically significant increases in saturated fat, cholesterol, calcium, and iron

concentrationscompared to those without lipid supplementation (Table 2). Although the total fat content was elevated in the lipid-supplemented products, this difference was not statistically significant (Table 2). No statistically significant differences were observed between the two groups in terms of energy content and protein, carbohydrate, sugar, dietary fiber, or sodium levels (Table 2).

Table 2: Nutrition profile of bread products with and without added lipids retailing in Singapore local supermarkets

	Added Lipids		No Added Lipids	
	n	mean±SD	n	mean±SD
Serving size (g)	70	53.2±24.4	10	66.4±21.1
Energy (kcal/ serving)	70	177.1±97.1	10	184.1±96.7
Protein (g/ serving)	70	4.3±2.5	10	6.4±3.7
Total fat (g/ serving)	70	5.4±4.3	10	4.6±4.4
Saturated fat (g/ serving)	70	3.0±2.7*	8	1.5±1.7
Trans fat (g/ serving)	67	0.1±0.6	8	0.0±0.0
Cholesterol (g/ serving)	61	1.4±5.1*	7	0.0±0.0
Carbohydrate (g/ serving)	70	26.2±15.3	10	32.7±21.3
Sugar (g/ serving)	64	5.2±4.2	9	5.3±3.9
Dietary fibre (g/ serving)	66	2.1±2.9	8	2.6±2.0
Sodium (mg/ serving)	70	236.0±145.5	9	286.1±178.6
Calcium (mg/ serving)	28	95.5±83.6*	5	184.8±71.3
Iron (mg/ serving)	31	2.0±1.3*	5	3.0±1.0

* $p<0.05$ vs. no added lipids using two-sample independent t-tests.

Table 3: Nutrition profile of bread products with and without added sugar retailing in Singapore local supermarkets

	Added Sugar		No Added Sugar	
	n	mean±SD	n	mean±SD
Serving size (g)	74	54.8±24.2	6	54.3±28.0
Energy (kcal/ serving)	74	179.1±97.3	6	164.3±92.7
Protein (g/ serving)	74	4.4±2.5	6	6.0±4.7
Total fat (g/ serving)	74	5.5±4.4*	6	2.7±1.7
Saturated fat (g/ serving)	72	3.0±2.6*	6	0.8±0.7
Trans fat (g/ serving)	69	0.0±0.1	6	0.8±2.0
Cholesterol (g/ serving)	64	2.8±12.2*	5	0.0±0.0
Carbohydrate (g/ serving)	74	27.1±15.3	6	26.9±26.2
Sugar (g/ serving)	67	5.5±4.1*	6	1.3±0.6
Dietary fibre (g/ serving)	68	2.0±2.8	6	3.8±3.2
Sodium (mg/ serving)	73	241.4±141.2	6	244.5±244.8
Calcium (mg/ serving)	32	107.9±88.3	-	-
Iron (mg/ serving)	33	2.3±1.3*	3	1.2±0.4

* $p<0.05$ vs. no added sugar using two-sample independent t-tests.

Regardless of added sugar content, the studied bread products demonstrated comparable levels of energy, protein, carbohydrate, and dietary fiber (Table 3). A two-sample independent t-test ($p < 0.05$) revealed that bread products with added sugars exhibited statistically significant elevations in total fat, saturated fat, and cholesterol concentrations compared with those without added sugars. No statistically significant difference in trans-fat concentration was observed between the two groups. As anticipated, the mean sugar concentration of bread products containing added sugars was significantly higher than that of the bread products without added sugars (Table 3). The bread products containing added sugars exhibited significantly higher iron concentrations than those without added sugars (Table 3). Sodium and calcium concentrations were not significantly affected by the presence or absence of added sugars in bread products (Table 3).

Table 4: Nutrition profile of bread products with and without added wholegrains retailing in Singapore local supermarkets

	Added Wholegrains		No Added Wholegrains	
	n	mean±SD	n	mean±SD
Serving size (g)	20	59.0±23.0	59	53.3±24.7
Energy (kcal/ serving)	20	165.0±107.3	59	182.6±92.9
Protein (g/ serving)	20	6.3±2.7*	59	3.9±2.5
Total fat (g/ serving)	20	3.5±4.1*	59	5.9±4.3
Saturated fat (g/ serving)	20	1.8±2.5*	57	3.2±2.6
Trans fat (g/ serving)	20	0.0±0.0	54	0.1±0.7
Cholesterol (g/ serving)	20	0.0±0.1*	49	3.6±13.8
Carbohydrate (g/ serving)	20	26.2±17.3	59	27.4±15.9
Sugar (g/ serving)	19	2.4±1.0*	54	6.2±4.4
Dietary fibre (g/ serving)	20	3.9±3.5*	53	1.5±2.2
Sodium (mg/ serving)	20	267.8±147.0	58	232.2±150.1
Calcium (mg/ serving)	11	113.2±45.9	22	106.9±102.8
Iron (mg/ serving)	13	2.7±1.0*	23	1.9±1.3

* $p<0.05$ vs. no added sugar using two-sample independent t-tests.

Wholegrain bread products exhibited statistically significant increases in protein, dietary fiber, and iron concentrations relative to non-wholegrain counterparts (Table 4). Conversely, statistically significant decreases in total fat, saturated fat, cholesterol, and sugar concentrations were observed in wholegrain bread products compared with their refined grain counterparts (Table 4).

Discussion

An average serving of bread, providing 178 kcal, contributes approximately 6.6% and 8.6% of the estimated daily energy requirements for moderately active adult males and females, respectively.[6] These data indicate that a single serving of bread constitutes a modest yet quantifiable fraction of the daily caloric intake. This information is pertinent to dietary planning, enabling individuals to accurately assess the energy contribution of bread within a comprehensive nutritional regimen.

Dietary guidelines advocate that carbohydrate intake constitutes 45% to 65% of daily caloric intake.[7] Scientific evidence indicates a minimum daily carbohydrate requirement of 130 grams to support essential physiological energy demands.[7] A single serving of bread, providing 27 grams of carbohydrate, contributes to approximately 20.8% of this minimum requirement, thereby establishing bread as a significant carbohydrate source, particularly relevant in developing countries. In the context of a 2000-calorie diet, the recommended

carbohydrate intake ranges from 225 to 325 grams; consequently, the 27-gram contribution represents a smaller proportion, ranging from 8.3% to 12%, of these higher recommended values. Carbohydrates serve as a primary energy substrate, and their contribution to daily intake is crucial for maintaining energy homeostasis and preventing nutritional deficiencies.[7] Bread's accessibility and affordability render it a staple food in numerous developing and developed nations, where its carbohydrate content can provide a substantial energy source, especially in populations with limited access to nutrient-dense foods.[7] These findings carry significant public health implications, particularly in developing countries, for low- to middle-income households, and vulnerable groups, like the elderly, where addressing carbohydrate requirements is paramount for mitigating malnutrition.[7]

The recommended daily protein intake for adult populations is generally approximated at 50 grams.[8] However, this value is subject to significant inter-individual variability and is influenced by factors such as age, sex, physical activity level, and physiological health status. A 4.5-gram protein contribution from a standard bread serving represents approximately 9% of this general recommendation. Protein intake guidelines ensure adequate protein availability for essential physiological processes, including tissue repair, enzymatic function, and immune response. The 9% contribution from bread underscores its role as a secondary rather than a primary protein source. To obtain an adequate protein intake, a diversified diet is essential. Proteins from sources such as meat, poultry, fish, legumes, and dairy products are particularly significant.

Based on a Reference Daily Allowance (RDA) of 65 grams of fat, a 5.3-gram fat content contributes 8.2% of the daily value.[9] Lipids, as essential macronutrients, serve critical physiological functions, including energy storage, cell membrane integrity, and hormone synthesis.[10] The RDA for fat is designed to facilitate adequate intake to support these functions while mitigating potential adverse health outcomes associated with excessive consumption.[10] The calculated 8.2% contribution from 5.3 grams of fat indicated that a single serving of the food item in question provided a relatively minor proportion of the daily fat requirement. Consequently, a diversified diet incorporating various lipid sources, such as oils, nuts, seeds, and fatty fish, is necessary to meet daily fat requirements.[9] Bread, not being a significant fat contributor, may be advantageous for individuals to monitor lipid intake. It is imperative to note that while the analysis focuses on total fat content, the qualitative composition of fat, specifically the ratio of saturated, unsaturated, and trans fatty acids, is a crucial determinant of its impact on health.[9] The American Heart Association (AHA) recommends limiting saturated fatty acid (SFA) intake to no more than 6% of total daily caloric intake.[11] For a 2000-calorie diet, this translates to approximately 13 grams of SFA. Therefore, a 2.8-gram SFA contribution represents a substantial proportion (approximately 22 %) of the recommended daily limit. Meta-analyses have consistently demonstrated a positive association between SFA consumption and cardiovascular disease (CVD) risk.[12] Furthermore, emerging evidence suggests a potential link between high SFA intake and increased risk of type 2 diabetes, possibly mediated through impaired insulin sensitivity and glucose metabolism.[13] Additionally, some studies indicate that SFAs may contribute to systemic inflammation, a key pathogenic factor in various chronic diseases, potentially through the activation of inflammatory pathways and increased cytokine production.[14] Replacement of SFAs with unsaturated fats, particularly polyunsaturated fats, has been shown to confer cardioprotective benefits.[12] Processed bread products frequently contain added lipids (96.5%). Lipid supplementation, particularly when employing animal fats or specific vegetable oils, constitutes a direct source of saturated fatty acids in the bread matrix. The statistically significant elevations in saturated fat and cholesterol levels strongly suggest that supplemented lipids are the primary source. Increased concentrations of saturated fats and cholesterol are associated with adverse lipid profiles and systemic inflammation, thereby elevating the risk of CVDs and numerous chronic diseases.[15] These findings underscore the critical importance of meticulous selection and quantification of lipids in bread fortification. The observed decrease in calcium and iron concentrations may not be solely due to the direct addition of lipids. Analysis of the studied bread products revealed the absence of detectable trans fatty acids, indicating that they do not contribute to dietary trans fat intake. Trans fatty acids are recognized as a significant etiological factor in CVD, exerting adverse effects on lipid profiles,

specifically increasing LDL-C and decreasing HDL-C.[16] Consequently, the absence of trans fatty acids in these bread products represents a favorable finding from a cardiovascular health perspective. This observation aligns with public health initiatives and recommendations from organizations such as the AHA and the WHO, which advocate for the elimination of trans fatty acids from food products.[17,18]

An overwhelming 84.1% of the bread products contained added sugars. To mitigate adverse health effects, the intake of added sugar should be restricted to a maximum of 10% of total daily energy intake. For a 2000-kilocalorie reference diet, this equates to a maximum of 50 grams of added sugar.[19] The sugar content of a single serving of bread represented 10.4% of the recommended daily added sugar intake. This 10.4% contribution suggests that bread products provide a significant proportion of the daily added sugar allowance. The impact of sugar intake from bread consumption is contingent on the overall dietary composition. In individuals with a high consumption of other sugar-containing foods, this bread product contributes to excessive sugar intake. Conversely, the nutritional impact is modified when sugar is derived from a food source that provides additional nutritional value. This finding highlights the importance of considering the sugar content of commonly consumed foods, including those not typically perceived as confectionery items.

Though the combined presence of added sugars and unhealthy fats in bread products may cumulatively augment the risk of obesity, metabolic syndrome, and other chronic conditions,[20] an overwhelming majority of the products contained added sugar (84.1%) and lipids (96.5%). This suggests a strong reliance on these ingredients to achieve the desired sensory properties (taste and texture) and/or extend the shelf life. The substantial prevalence of palm lipid incorporation (79.5%) indicated its significant functional value in bread production. Firstly, palm oil offers a cost-effective lipid source.[21] Secondly, its high saturated fatty acid content, particularly palmitic acid, imparts semi-solid consistency at ambient temperatures. This characteristic is advantageous in baking, providing desirable textural attributes, enhancing product stability, and extending shelf life.[21] Furthermore, the saturated nature of palm oil confers oxidative stability, which is crucial for mitigating rancidity and preserving product quality during storage.[22] The identification of dextrose, glucose, and sucrose as specific sweeteners signifies a deliberate selection by manufacturers, leveraging their distinct physicochemical properties to influence the final product characteristics. Dextrose and glucose, being monosaccharides, exhibit rapid sweetness profiles and contribute to Maillard browning reactions during baking.[23] Sucrose, a disaccharide, imparts a more nuanced sweetness profile.[23] These sugars fulfill multifaceted technological roles beyond sweetening, including the modulation of crust color and texture, provision of fermentable substrates for yeast, thus influencing leavening, and extension of shelf life through water activity control.[24] Notably, the high prevalence of dextrose suggests its potential utilization as a processing aid, beyond its role as a sweetener.[24] The substantial proportion of products containing unspecified sugars (76.1%) raises concerns regarding transparency in ingredient labeling, thereby impeding consumers' ability to make informed dietary decisions.

The low prevalence (22.7%) of wholegrain incorporation in the evaluated bread products suggests that this practice is not predominant. This finding prompts inquiries into the factors contributing to the limited adoption of wholegrains. Notably, wholegrains can alter dough rheological properties, thereby affecting product texture, volume, and overall quality.[25] The presence of bran and germ components may interfere with gluten network development, necessitating modifications in formulation and processing techniques.[26] Furthermore, wholegrains can impart distinct sensory attributes, including taste, texture, and appearance, which may not align with the preferences of specific consumer segments.[27] Consumer acceptance can vary based on cultural and regional influences, potentially indicating a lower preference for wholegrain bread products among Singaporean consumers. Additionally, wholegrains may present higher costs and reduced availability compared to refined grains, impacting production expenses that are ultimately passed on to consumers.[28] Despite these challenges, wholegrains are recognized for their superior nutritional profile, characterized by elevated fiber content, vitamins, minerals, and phytochemicals. The low prevalence of wholegrain incorporation represents a potentially missed opportunity to enhance the nutritional value of a substantial portion of bread products. Given established dietary recommendations emphasizing

wholegrain consumption for improved health outcomes, this low incorporation rate may have significant public health implications, necessitating the implementation of targeted public health initiatives to promote increased wholegrain intake.[29] Wholegrains, by definition, preserve the bran and germ components of the grain kernel, which are rich sources of protein, dietary fiber, and iron.[30] Specifically, bran is characterized by high fiber content, while the germ provides protein, vitamins, and minerals, including iron.[30] Conversely, refined grains undergo processing that removes these components, resulting in diminished concentrations of these nutrients.[30] These compositional differences accounted for the observed variations in nutrient concentrations between the studied wholegrain and refined-grain bread products. The statistically significant elevations in protein, fiber, and iron content within whole-grain bread products offer substantial nutritional benefits. Increased protein intake contributes to satiety and supports diverse physiological functions.[31] A serving of refined bread providing 1.5 grams of dietary fiber is a small but helpful contribution to daily intake, yet it pales in comparison to a serving of whole grain bread, which offers an average of 3.9 grams. Scientifically, this 3.9 g serving is far more impactful, providing nearly double the fiber and covering roughly 10% to 15.6% of an adult's recommended daily goal (which ranges from 25 to 38 grams). Elevated dietary fiber consumption is associated with improved gastrointestinal health, reduced cardiovascular disease risk, and enhanced glycemic control.[32] Higher iron concentrations are critical for preventing iron-deficiency anemia, particularly in susceptible populations.[33] The significant increases in these nutrients underscore the nutritional superiority of wholegrain products, reinforcing dietary guidelines that advocate for wholegrain consumption.[29] Refined grains are frequently associated with the addition of fats and sugars during processing to enhance palatability and texture.[34] In contrast, wholegrains, with their inherent flavor and textural attributes, may require reduced reliance on these additives, potentially explaining the observed differences in total fat and sugar concentrations.[34] The observed compositional disparities between wholegrain and refined grain bread products highlight the nutritional advantages of wholegrains and corroborate the health benefits associated with wholegrain consumption, emphasizing their role in promoting metabolic health. These findings have significant implications for public health and dietary recommendations, and underscore the importance of promoting wholegrain consumption.

Conclusion

The health impact of bread consumption is intrinsically associated with its composition. The nutrient composition and ingredient profile of bread products may significantly influence health outcomes. A dietary regimen incorporating wholegrain and fortified breads can contribute to overall well-being by providing essential nutrients and promoting a sustained energy release. Conversely, excessive consumption of refined and processed breads, which frequently contain added sugars and unhealthy fats, poses potential health risks, including heightened susceptibility to chronic diseases. This study found that the majority of packaged breads in Singapore contain added sugars (84.1%) and lipids (96.5%), contributing to less favorable nutritional profiles and posing potential health risks. Furthermore, with wholegrain incorporation found in only 22.7% of products, this study highlights a significant missed opportunity to improve public health through the consumption of nutritionally superior wholegrain options. Consequently, informed decision-making regarding bread selection and consumption is paramount for maximizing health benefits and mitigating potential adverse effects. Given the high prevalence of added sugars and fats and the low incorporation of wholegrains, scrutiny of nutritional labels and ingredient lists is essential for consumers to navigate the market and make informed choices that mitigate potential long-term health risks. A key limitation of this cross-sectional study is its inability to account for potential changes in bread formulation occurring subsequent to the data collection period. Consequently, the findings reflect only the formulations present at the time of sampling and may not accurately represent current or future product characteristics. Future research should employ longitudinal studies to track changes in bread formulations over time and assess the effectiveness of interventions, particularly regarding the uptake of whole grains and the reduction of added sugars/lipids. Concurrently, studies focused on consumer behavior and perception are needed to understand the drivers of purchasing decisions and inform targeted public health campaigns promoting healthier bread choices.

Acknowledgement
The authors thank the students from the Biostatistics module (Nanyang Polytechnic) for assistance with the preliminary data collection.

Funding Sources
The authors received no financial support for the research, authorship, and/ or publication of this article.

Conflict of Interest
The authors do not have any conflicts of interest.

Data Availability Statement
The manuscript incorporates all datasets produced or examined throughout this research study.

Ethic Statement
This research did not involve human participants, animal subjects or any material that requires ethical approval.

Informed Consent Statement
This study did not involve human participants, and therefore, informed consent was not required.

Clinical Trial Registration
This research does not involve any clinical trials.

Permission to Reproduce Material from Other Sources
Not Applicable.

Author Contributions
- **Wai Mun Loke:** Conceptualization, Methodology, Data Collection, Analysis, Writing - Original Draft, Writing - Reviewing and Editing, Supervision.
- **Jamie Shi Mei Tan:** Conceptualization, Analysis, Writing - Reviewing and Editing.

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