

# **Composition of bread samples in Slovenian food supply – dataset description**

## **Overview**

This dataset includes analytical results for dietary fibre in bread products collected in 2022 from Slovenian food retailers and bakeries. The sampling strategy was developed to provide a nationally representative overview of the salt content in bread types available on the Slovenian market and was based on the methodology previously applied in 2012 by Blaznik et al. (2013) (1). As in the earlier study, bread types with higher household consumption based on Statistical Office of the Republic of Slovenia (SURS) data (2) were prioritized.

An ideal sampling frame would include precise market-share data for individual bread products; however, such information was not available. Therefore, the 2022 sampling approach followed the principles used in 2012 and relied on aggregate bread consumption estimates from SURS household consumption surveys (2010 and 2018) and available market-share estimate of major manufacturers to determine the number of samples required for each bread category. To ensure adequate statistical power for trend assessment, a power analysis was carried out to estimate the necessary number of white wheat bread samples to detect a 10% reduction in salt content between 2012 and 2022 (effect size 0.85;  $\alpha = 0.05$ ; power = 0.8; allocation ratio 2:1). The resulting required sample size for white wheat bread in 2022 was  $N = 28$ , and sample sizes for other bread categories were adjusted proportionally using consumption-based weighting derived from the 2018 SURS report(2).

## **1. Sampling design**

A stratified and purposive sampling approach was applied. Stratification was based on bread consumption categories reported in household consumption surveys conducted by the SURS. Bread types with higher reported consumption were prioritised to ensure adequate representation.

Sampling included two major retail formats:

- Large retail chains ( $n = 5$ )
- Small independent bakeries ( $n = 32$ )

Suppliers were selected to represent different statistical regions of Slovenia, covering approximately 97% of the national population according to the NUTS 3 classification. All NUTS 3 regions were included except the Lower Sava region, which was omitted due to logistical constraints.

## **2. Sample collection procedures**

## Large retail shops

- All bread types available within the selected retailers were included.
- Retail chains with >5% market share and bread manufacturers meeting minimum operational thresholds ( $\geq 30$  employees and  $\geq \text{€}2$  million annual revenue) were prioritized.
- Product selection, additionally considered breads with the highest in-store turnover, based on information from shop assistants.
- Products listed on the national government price-monitoring platform (MKGP) were included to ensure coverage of widely purchased items.

## Small bakeries

- Two bakeries per statistical region were randomly selected using publicly available listings (Google Maps).
- Sampling focused on non-prepacked white and wholegrain breads, specifically products with the highest turnover as indicated by bakery staff.
- Purchases were made discreetly, with researchers acting as regular customers requesting the “bestselling white bread” and “bestselling wholegrain bread.”

## Market coverage

- The combined estimated market share represented by sampled retail chains and small bakeries was >85% of the national bread market.
- Bread manufacturers represented in the sample accounted for an estimated  $\geq 75\%$  of total Slovenian bread production.

### **3. Sample size**

A total of 178 bread products were collected:

- 117 from large retail shops
- 61 from small bakeries

Bread categories were assigned according to the Slovenian Rules on the Quality of Bakery Products, which define compositional criteria (e.g., wholegrain  $\geq 80\%$  wholegrain flour).

### **Subsampling for fibre analyses**

From the full set ( $n=178$ ), 58 samples were selected for dietary fibre analysis.

### Selection criteria

- Inclusion of commonly consumed bread types (white, half-white, dark, mixed (with/without seeds), wholegrain).
- Oversampling of mixed and wholegrain breads to capture expected compositional variability.
- Breads offered as wholegrain in small bakeries were further categorized using criteria because technological and regulatory definitions do not always align with marketing claims.
- The bread samples were classified according to the Slovenian Rules on the Quality of Bakery Products. Under these regulations, mixed wheat bread must contain at least 51% wheat flour; rye wholegrain bread, at least 80% rye flour; and wholegrain wheat bread, a minimum of 80% wholegrain wheat flour. White, half-white, and dark wheat breads are differentiated based on the mineral (ash) content of the wheat flour used. While labelled packaging and regulated product names enabled reliable classification of the bread types in large retailers, this was more challenging for the non-prepacked breads sold in small bakeries. Visual inspection of products marketed as ‘wholegrain bread’ in these bakeries suggested that many likely did not meet the required 80% wholegrain flour threshold. In such cases, the bread type classification was based on the product name listed on the official invoice, the visual characteristics (e.g., the presence of seeds), and the sample’s composition. To support its classification, we also estimated a minimum expected dietary fibre content for wholegrain bread. This threshold was estimated by modelling the dietary fibre content, based on three key assumptions: (a) the regulatory minimum requirement of 80% wholegrain wheat flour in wholegrain bread, with the remaining 20% modelled as white wheat flour; (b) the minimum dietary fibre content of both wholegrain and white wheat flours, as derived from the national branded food composition database (CLAS—Composition and Labelling Information System), and (c) the maximum practical flour:water dissolution (1:0.7). Considering these conservative estimates, breads containing less than 5.3 g of dietary fibre per 100 g are unlikely to contain the required 80% wholegrain flour, and therefore do not meet the national criteria for being labelled as “wholegrain”. Following this methodology, the majority of samples offered as ‘wholegrain’ in small bakeries were re-categorised into other bread types, mostly mixed breads (with or without seeds).

#### Dietary fibre content analysis

Total dietary fibre (TDF) was quantified using the enzymatic–gravimetric AOAC Official Method 991.43 (*Total, soluble, and insoluble dietary fiber in foods: Enzymatic-gravimetric method, MES–Tris buffer*) [MP 2135 rev 6 2021] (3). Reported TDF includes soluble and insoluble fibre, and were expressed as g/100 g.

### Iodine content analysis

Iodine content was quantified using inductively coupled plasma (ICP-MS) method MP 1618 rev 6 2025; the content of iodine was expressed in mg/kg.

### **References**

1. Blaznik, U, Škrjanc, B, and Hlastan, RC. Končno poročilo o rezultatih analiz vsebnosti soli v kruhu, mesnih izdelkih in obrokih v letu 2012 [final report on the results of analyses of salt content in bread, meat products and meals in the year 2012]. Ljubljana: Inštitut za varovanje zdravja RS (2013). 8 p.
2. SURS-Statistični urad Republike Slovenije. Količina doma porabljenih živil in pijač na člana gospodinjstva, letno povprečje [Average annual quantity of food and beverages consumed per household member]. SiStat (2022). Available at: <https://pxweb.stat.si/SiStatData/pxweb/en/Data/-/0878705S.px/>
3. AOAC Official Method 991.43. *Total, soluble, and insoluble dietary fiber in foods: Enzymatic-gravimetric method, MES–Tris buffer*. In: *Official Methods of Analysis of AOAC International*; Latimer, G.W., Jr. (Ed.). Oxford University Press: Oxford, UK, 2023.