

RESEARCH LETTER

From French Gastronomy to Cardiovascular Health: Cutting Salt in the Baguette Has Saved Thousands of Lives in France

Clémence Grave¹, Laure Carcaillon-Bentata¹, Christophe Bonaldi¹, Jacques Blacher¹, Valérie Olié¹

Excessive sodium intake is a key modifiable risk factor for hypertension and cardio-cerebrovascular and renal disease. Despite the World Health Organization's recommendation to limit salt intake to <5 g/d, global consumption averages 10.8 g/d.¹ In France, the average daily salt consumption was 8.1 g in 2015 (9.2 g in men and 7.1 g in women), with over 90% of adults exceeding the recommended threshold. To address this, many countries have implemented salt reduction strategies. In France, the National Nutrition and Health Program 4 (2019–2023) set a target of reducing salt intake by 30%. Bread, particularly the French baguette, is a culturally and nutritionally central food in France, with an average daily consumption of 115 g per adult. In 2015, traditional French bread contained ≈1.7 g of salt per 100 g, contributing around 2 g of salt per day, roughly 25% of total daily intake. In March 2022, a voluntary agreement was signed between the Ministries of Health and Food and representatives of the bakery sector to progressively reduce the salt content in bread by 2025. The French salt targets apply to all major types of bread, including standard white bread, wholemeal bread, and sandwich bread (pain de mie), with specific maximum thresholds set for each category. The target levels range from 1.1 to 1.4 g/100 g depending on the type of bread. These targets cover all breads sold in France, whether produced by artisanal bakeries or industrial manufacturers, and apply to both packaged and unpackaged bread, including those sold in grocery stores and bakeries. Independent monitoring in January 2023 indicated that 80% of representative sampled breads, sampling by bread type and point of sale (N=559), were already compliant with

these targets, suggesting that the reformulation is being effectively implemented.²

To quantify the potential impact of this agreement and the avoidable burden of hypertension, including cardio-cerebrovascular, renal diseases, and dementia, we conducted a population-based modeling study. We estimated the potential impact fraction by an indirect approach using a comparative risk assessment framework to estimate the fractional reduction of cases that should occur from changing the current level of systolic blood pressure (SBP) in the population through this expected reduction in salt in bread.³ We accounted for differential reductions in SBP between hypertensive and normotensive individuals, based on the expected SBP decrease resulting from reduced salt intake (6.5 and 2.3 mmHg for 100 mmol/d of urinary sodium excretion, that is, around 5.7 g/d of salt intake).⁴ We used continuous distribution of SBP to the French population aged 35 years and older, and salt intake, derived from the nationally representative 2014 to 2016 ESTEBAN survey (Étude de santé sur l'environnement, la biosurveillance, l'activité physique et la nutrition). Salt intake was estimated from three 24-hour dietary recalls collected during the survey.⁵ These were combined with 2022 statistics from the French nationwide claims database (SNDS [Système national des données de santé]), which includes comprehensive data on hospitalizations, outpatient care, and mortality, for the entire French population. The algorithms for identifying diseases of interest, mainly based on hospitalization records and causes of death, are available in the article by Grave et al.⁶ We included all diseases with a well-established causal relationship with elevated blood

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Correspondence to: Clémence Grave, Direction des maladies non transmissibles, Santé Publique France, 12 rue du Val d'Osne, 94415 St-Maurice, France. Email clemence.grave@santepubliquefrance.fr

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Nonstandard Abbreviations and Acronyms

SBP systolic blood pressure

pressure, based on recent meta-analyses.⁷ Uncertainty intervals for the PIF were estimated using a Monte Carlo simulation with 1000 replicates per sex and age group, based on the probabilistic distributions of input parameters, and defined by the 2.5th and 97.5th percentiles. A sensitivity analysis was conducted under an alternative assumption of partial implementation, whereby only 80% of bread products comply with the reformulation, resulting in a proportionally reduced effect on SBP.

Assuming stable bread consumption patterns and full implementation of the measure, the reduction in salt content in bread is estimated to have decreased daily salt intake by 0.35 g, leading to an average reduction in SBP of 0.21 mmHg (0.39 mmHg in hypertensive individuals and 0.14 mmHg in normotensive individuals). This translates into a potential impact fraction of 0.78% (0.75%–0.85%) for cardio-cerebrovascular and renal diseases, corresponding to an avoided burden of 8400 inpatient hospitalizations annually and 136000 hospital

days (including dialysis sessions and day hospitalizations). More specifically, the intervention was estimated to have avoided 1.04% of ischemic heart disease hospitalizations, 1.05% of hemorrhagic stroke hospitalizations, 0.88% of ischemic stroke hospitalizations, and 0.58% of heart failure hospitalizations (Table). Moreover, we estimate that the intervention has decreased annual French deaths by 0.18% (n=1186); avoided nearly 11300 years of life lost. Our modeling suggests that the greatest benefits were observed in men across all age groups, with 0.87% (0.83%–0.96%) of cardio-cerebrovascular diseases avoided among men and in women aged 55 years to 64 years (PIF, 1.10% [1.01%–1.23%]). Assuming 80% compliance, the SBP reduction was 0.17 mmHg (0.31 mmHg in hypertensive individuals and 0.11 mmHg in normotensive individuals), yielding a potential impact fraction of 0.62% (0.60%–0.68%) with 6720 avoided inpatient hospitalizations, 108960 hospital days, and 949 deaths.

These findings highlight the public health impact of subtle food reformulation strategies in reducing disease burden without requiring individual behavioral change. A modest reduction in bread salt content, entirely unnoticed by consumers, may have contributed to avoiding thousands of hospitalizations and deaths in France. The impact of such a measure is difficult to quantify because this

Table. Modeled Impact of Reducing Bread Salt Content, France

	Potential impact fraction (95% uncertainty intervals)	No. of avoidable cases (annually)			
		Inpatient hospitalizations	Hospital days	Deaths	Years of life lost
By diseases					
Ischemic heart disease	1.04% (0.97%–1.16%)	3291	16 770	354	4085
Hemorrhagic stroke	1.05% (0.96%–1.2%)	357	4746	181	2121
Ischemic stroke	0.88% (0.81%–1.01%)	1011	10 860	136	1157
Chronic kidney disease	0.82% (0.75%–0.92%)	482	76 396	118	906
Rhythm and cond. disorders	0.67% (0.64%–0.74%)	1309	7156	84	740
Aortic aneurysm	0.62% (0.57%–0.7%)	169	1521	18	248
Heart failure	0.58% (0.54%–0.65%)	1439	15 183	139	1008
Peripheral artery disease	0.43% (0.40%–0.50%)	219	1639	11	98
Dementia	0.36% (0.31%–0.41%)	117	1811	147	913
By sex					
Women	0.63% (0.59%–0.71%)	2649	45 822	574	4483
Men	0.87% (0.83%–0.96%)	5744	90 261	612	6794
By age					
18–44 y–women	0.12% (0.05%–0.24%)	10	187	0	17
18–44 y–men	0.48% (0.22%–0.77%)	82	1319	4	174
45–54 y–women	0.54% (0.35%–0.78%)	109	1973	5	179
45–54 y–men	0.98% (0.82%–1.18%)	544	7086	26	820
55–64 y–women	0.81% (0.71%–0.98%)	343	6426	17	452
55–64 y–men	1.10% (1.01%–1.23%)	1327	17 435	67	1538
≥65 y–women	0.62% (0.57%–0.71%)	2188	37 236	552	3836
≥65 y–men	0.81% (0.76%–0.92%)	3792	64 421	514	4263
Total	0.78% (0.75%–0.85%)	8 393	136 083	1 186	11 277

effect cannot be isolated in real-world data due to complex interactions with other concurrent public health interventions and behavioral factors. However, theoretical impact assessments allow us to estimate their potential effects.

The main limitations of this study lie in the assumptions required for modelling and the availability of data to estimate the impact of salt reduction. Under cautious assumptions in sensibility analysis, the intervention remained impactful, though the estimated benefits have been reduced, still supporting the relevance of the measure. In addition, assumptions regarding the stability of consumption patterns and blood pressure levels since 2015 were necessary. Despite these constraints, such models provide a robust framework for evaluating gradual interventions whose effects are difficult to measure directly.

Given that hypertension contributes to over 400 000 hospitalizations and 55 000 deaths annually,⁶ our findings underscore the value of maintaining and assessing sodium reduction policies within broader public health strategies. Disseminating these results to policymakers is essential to support comprehensive strategies aimed at reducing excess sodium intake, while highlighting the critical role of agri-food stakeholders. Finally, providing constructive feedback on this intervention to stakeholders in the bakery sector could further encourage the development of similar proactive initiatives. This type of measure could probably be extended beyond national borders, given the high consumption of bread in many other countries.

ARTICLE INFORMATION

Affiliations

Direction des maladies non transmissibles (C.G.) and Direction Appui, Traitements et Analyses de données (C.B.), Santé publique, Saint-Maurice, France. University

of Bordeaux, Institut national de la santé et de la recherche médicale, centre d'investigation clinique plurithématique (INSERM CIC-P) 1401, France (L.C.-B.), Centre de diagnostic et de thérapeutique, Hôtel Dieu, Assistance Publique - Hôpitaux de Paris (AP-HP), Université Paris Cité, France (J.B.), EpiPhare, Caisse Nationale d'Assurance Maladie, Paris, France (V.O.).

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