Lower -sodium salt substitutes

Frequently asked questions

The World Health Organization (WHO) recommends decreasing population sodium intake to reduce hypertension and its associated disease burden. Lower-sodium salt substitutes (LSS), particularly potassium-enriched formulations, are increasingly recognized as a viable strategy, especially in populations where discretionary salt is a major source of sodium intake. Using LSS rather than regular salt reduces blood pressure, reduces the risk of stroke, heart attack, and death, and saves healthcare costs to governments and consumers. This document addresses common questions about LSS, with "LSS" referring specifically to potassium-enriched lower-sodium salt, the most common formulation.

General questions

1 **What is lower-sodium salt and/or potassium-enriched salt, and why should it replace regular salt?** Lower-sodium salt (LSS) is an edible salt that has less sodium than regular table salt. This is usually achieved by replacing some sodium chloride (NaCl) with another mineral, most commonly potassium chloride (KCl). Like regular salt, LSS can be fortified with iodine. Globally, nearly everyone consumes too much sodium and too little potassium, which, together, cause increased blood pressure.[1,2] Using LSS rather than regular salt reduces blood pressure, reduces the risk of stroke, heart attack, and death, and saves healthcare costs to governments and consumers.[3-5]

2 **What is potassium chloride and where does it come from?** Potassium chloride, also known as potassium salt, is a naturally occurring mineral salt and the primary component of potash. Potash refers to a group of potassium-bearing minerals and salts, primarily used in agricultural fertilizers. Most potash is naturally sourced from deep underground ancient seabeds. Potash mining occurs mainly in Canada (the largest producer), Russia, Belarus, and China.[6] While most potash is used for agricultural purposes, it is also processed for industrial, pharmaceutical, and food uses. Food-grade potassium chloride, the type used in LSS, represents a small fraction of the potash market.

3 **How much potassium versus sodium is in LSS?** The potassium chloride content in LSS varies by product and market. In high-income countries, LSS often contains 50-100% potassium chloride; in other settings, it typically ranges from 10-40%. The remainder consists of sodium chloride and sometimes other minerals.[7] Most health research on LSS has focused on formulations with 25-30% potassium chloride. The potassium-to-sodium ratio is influenced by taste preferences (higher potassium can taste bitter without additional processing), cost (potassium is more expensive), and concerns about the rare risk of severely high blood potassium ("hyperkalemia") for people living with chronic kidney disease.

4 **Does LSS taste and function like traditional salt?** LSS with up to 30% potassium chloride tastes like regular salt and can be used as a direct replacement for seasoning, preserving, and food manufacturing. Consumers consistently do not notice a taste difference when the potassium content is within this range.[7-11] Beyond 30%, taste adjustments may be needed, particularly in food processing. When food manufacturers use LSS in their product formulations as a direct substitute for regular salt, products maintain their texture and shelf life. Potassium chloride also provides similar microbial management functionality to sodium chloride.[12]

5 **How does LSS compare to other "specialty salts" like flaky sea salt and pink Himalayan salt?** Unlike widely available and popular (specialty) salts like pink Himalayan salt, flaky sea salt or black salt, which are mostly marketed for their trace minerals, unique colors or texture, LSS is specifically formulated to reduce sodium and increase potassium. Specialty salts often contain comparable sodium levels to regular salt and therefore contribute to high-sodium diets and associated diseases. Additionally, specialty salts are generally not fortified with iodine, unlike LSS which is often fortified to help prevent iodine deficiency.

6 **Who should use LSS and how can it be used?** LSS is a suitable replacement for regular table salt for most people. It is especially beneficial for people with high blood pressure and others at risk of cardiovascular diseases because seasoning and cooking with LSS lowers sodium intake and increases potassium intake, both of which lower high blood pressure and its associated risks.[4] In addition to replacing regular table salt used for home cooking, LSS can also help prevent hypertension in the general population when used as an ingredient in packaged foods and in food preparation by street food vendors, restaurants, small shops and community kitchens, as demonstrated by a study in Peru.[13]

Seasoning with LSS can be done at home, in restaurants, and in food manufacturing, making it an effective strategy for targeting sodium intake in all settings.[14] Food manufacturers are starting to incorporate LSS into products like bread, snacks, cereals, soups, and sauces to offer options with healthier sodium levels.[15] Its versatility makes LSS a useful public health tool, reducing sodium intake from multiple sources across the food supply.

7 **What is the potential impact of using LSS as a substitute for regular salt?** A large-scale study in China with over 20,000 participants found that replacing regular salt with LSS in home cooking reduced stroke incidence by 14%, major cardiovascular events by 13%, and deaths by 12% over five years without causing any side effects.[11] Scaling up LSS use could significantly reduce blood pressure, lower healthcare costs associated with hypertension and cardiovascular diseases, and improve life expectancy,[3,4,16,17] particularly in regions with high sodium intake from salt in home cooking. The overall impact will depend on the extent of adoption.

8 **How much does LSS cost? Why is it more expensive than regular salt?** LSS are between 1 and 15 times more expensive than regular salt, depending on the region and market conditions.[2] The higher price is due to the cost of raw potassium chloride (often around four times the price of sodium chloride), more complex processing (especially for higher potassium formulations), premium pricing for health-conscious consumers, and packaging expenses (LSS is often sold in smaller, consumer-friendly packs rather than more cost efficient bulk bags). Additionally, potassium chloride is often imported and therefore subject to import duties, contributing to higher LSS costs; on the other hand, regular salt is often not taxed.

9 **What is the availability of LSS globally?** LSS are available in approximately 50 countries — mostly high- and upper-middle-income — where there is greater awareness of its health benefits and ability to pay the premium price.[2,18] In lower-income countries, LSS availability is limited, partly due to higher production costs and limited distribution channels. Public health organizations and governments can promote healthier sodium consumption by expanding availability worldwide.

10 **What is needed to scale up and make LSS more accessible?** Scaling up LSS use requires addressing affordability, awareness, availability, and regulatory factors.[10] Subsidies, incentives, or tax reductions can help reduce costs and make LSS competitive with regular salt. Governments can play a pivotal role by integrating LSS into national health strategies and hypertension treatment guidelines, incentivizing local production, and strengthening distribution and supply chains to ensure consistent availability. Public awareness campaigns and healthcare provider education on LSS's health benefits are also crucial. Regulatory frameworks, such as labeling standards and legal definitions, are needed to ensure safety, particularly for at-risk groups, and to align products with public health goals. Collaboration between policymakers, manufacturers and civil society will create an enabling environment that supports widespread adoption.

11 **Why is LSS promotion and scale-up an important sodium reduction strategy for countries?** Countries are off track to meet the World Health Organization's (WHO) 30% sodium reduction target by 2030, and LSS provides a solution that reduces sodium intake without requiring major dietary changes or altering the taste of foods. LSS complements existing food policies to reduce sodium in packaged foods and foods consumed outside the home, as companies can use it to reformulate products to comply with mandatory restrictions. Additionally, LSS is crucial for sustainably reducing sodium consumption from salt added during home cooking, which can account for up to 80% of sodium intake in many LMICs. While education campaigns can help encourage consumers to use less salt, they are not enough — policies that create an enabling environment for LSS offer a more effective, scalable solution.

12 **What do WHO guidelines say about LSS, and what do they mean for countries?** In January 2025, WHO released guidelines[20] recommending the replacement of regular table salt with potassium-enriched LSS as a cost-effective strategy to prevent cardiovascular diseases. The conditional recommendation is based on strong evidence showing that LSS can significantly reduce blood pressure, cardiovascular disease, and deaths without adverse health effects in adults in the general population. WHO highlights that LSS is particularly effective in settings where discretionary salt — salt added during cooking or at the table — is a major source of sodium intake.

As a conditional recommendation, WHO advises that LSS be implemented in settings with adequate access to health care and where kidney disease would not go undiagnosed for long periods. The recommendation applies only to adults in the general population.

While WHO's guidance focuses on discretionary salt, replacing regular salt with LSS in processed and packaged foods could further enhance health benefits. The guidelines also provide key considerations for policymakers and program managers to support effective implementation.

13 **Does WHO's 'conditional' recommendation mean that LSS should not be a key action in sodium reduction strategies?** No. The WHO recommendation supports the use of LSS as a key intervention to reduce sodium intake from discretionary salt (i.e., salt added during cooking and at the table) and as an important part of an overall sodium reduction strategy. LSS is crucial for sustainably reducing

sodium consumption from discretionary salt use, which can account for up to 80% of sodium intake in many LMICs. The WHO recommendation exclusions do not mean LSS should be deprioritized; rather, they emphasize the need for responsible promotion and monitoring. To help ensure safe and effective implementation, public health messaging, targeting consumers and healthcare providers, should emphasize that LSS may not be suitable for people with chronic kidney disease; additionally, labeling standards for LSS can help consumers understand the health benefits and risks, particularly for those with kidney disease.

Health and Safety

14 **Are LSS safe?** Potassium-enriched LSS are generally safe for adults with normal kidney function and provide significant health benefits by reducing sodium and increasing potassium intake, as recommended by WHO. Potassium, naturally found in foods like fruits and vegetables, is an essential nutrient needed by all humans and has no adverse effects under normal dietary conditions. In healthy individuals, the kidneys regulate blood potassium levels efficiently, meaning higher potassium intake does not lead to increased blood potassium levels.

However, individuals with advanced kidney disease or those on potassium-raising medications should consult a healthcare provider before using LSS, as excess potassium intake can lead to severely high levels of potassium in blood, known as hyperkalemia. Importantly, many of the trials on LSS have been pragmatic, only excluding people with known chronic kidney disease (CKD), making it likely that some participants with undiagnosed CKD were included. Despite this, no adverse effects related to hyperkalemia were reported.

In many low-and middle-income countries, potassium intake is often below recommended levels, making the extra potassium in LSS desirable for most people. Furthermore, salt consumption often involves the entire household and randomized control trials (RCTs) conducted in these settings have not reported adverse effects.[3] While there is limited evidence on LSS safety in children and pregnant women, current data does not suggest it would be harmful.[4]

15 **Why are children and pregnant women excluded from the WHO recommendation?** WHO's exclusion of these groups is due to limited available evidence, not because of any demonstrated harm or any safety concerns. The WHO-commissioned systematic review and meta-analysis analyzing 26 trials (34,961 adults and 92 children) found no studies in pregnant women and only one small RCT in children. The evidence in children was inconclusive due to study limitations, such as low statistical power. However, there is no reason to believe that LSS would cause harm in healthy children and pregnant women. The lack of RCT evidence is expected as most interventions are not tested in research studies of these populations. Importantly, potassium — the main component of LSS that is not present in traditional dietary salt (NaCl) — is an essential nutrient needed by all humans and is part of a healthy diet, including for children and pregnant women; it has no adverse effects under normal dietary conditions.

Moreover, in many countries children and adolescents already consume sodium above recommended limits. Substituting a portion of that sodium with potassium through LSS could help reduce the risk of high blood pressure during and after childhood.

16 **Is there evidence that potassium consumption is safe and beneficial for children?** Yes. While specific evidence on LSS in children is limited, extensive research shows that higher potassium intake from foods is safe and beneficial. WHO recommends increasing potassium intake in children to help reduce blood pressure and lower future cardiovascular disease risk. Potassium also promotes bone health, supports muscle and nerve function, and helps maintain hydration and electrolyte balance. There is no reason to assume potassium from LSS would be any different from potassium from foods.

17 **Is there evidence that potassium consumption is safe and beneficial for pregnant women?** Yes. Potassium is essential for a healthy pregnancy, and intake is too low in many countries. Higher potassium and lower sodium intake support normal blood pressure and are associated with risk of hypertension, pre-eclampsia, and maternal deaths from pre-eclampsia.[21-24] Additionally, potassium is essential for fetal nerve, muscle, and heart development, making adequate intake particularly important during pregnancy. There is no evidence, nor reason to believe, that potassium-enriched LSS is harmful for pregnant women, so long as they do not have kidney disease or conditions affecting potassium regulation.

18 **Which is more important for health — higher potassium or lower sodium?** Both higher potassium and lower sodium intakes are important for health, but reducing sodium is typically prioritized due to its strong link to high blood pressure and overconsumption in most diets. Reducing sodium helps lower blood pressure and cardiovascular risks,[25] while increasing potassium intake helps to lower blood pressure and counteract sodium's adverse effects.[26] WHO recommends adults consume at least 3,510 mg of potassium and less than 2,000 mg of sodium per day, achieving an optimal sodium-to-potassium molar ratio of less than or equal to 1.0.[27,28]

19 **Will switching to LSS compromise iodine fortification programs and the prevention of iodine-deficiency disorders (IDD)?** Switching to LSS does not undermine universal salt iodization. LSS blends can — and should — be iodized. This is in line with WHO's 2025 guideline on LSS which states that LSS should be part of a sodium reduction strategy and its use should be aligned with country's fortification and iodization programs if required.[19] About half of LSS available globally are iodized, showing feasibility of iodized LSS.[7]

Program and policy implementation

General

20 **Is national and global LSS scale up feasible? Should salt substitution programs focus on at-risk, hypertensive populations?** National and global scale-up of LSS is feasible and cost-effective, but requires overcoming logistical, economic, and policy challenges including production capacity, consumer acceptance, government support and market dynamics. Initially, targeting hypertensive and high-risk groups (e.g., older adults or those with cardiovascular conditions) is recommended — they benefit most from sodium reduction,[11] as even small decreases in blood pressure can significantly lower their risk of adverse health outcomes. However, caution is needed for individuals with advanced kidney disease or those taking potassium-sparing medications. For long-term impact, wide adoption across the population is essential to prevent hypertension in those with normal blood pressure.

21 **What countries or jurisdictions have successfully scaled the use of LSS?** Some countries have made progress in scaling LSS use. In 2022, Singapore launched a national strategy to reduce sodium intake through LSS alternatives and lower-sodium sauces. The strategy includes: expanding LSS availability by partnering with supermarkets to develop affordable in-house brands; promoting lower-sodium sauces through the Healthier Ingredient Development Scheme, which provides grants to manufacturers and suppliers to create healthier products; and encouraging public adoption via education campaigns,[30] including taste tests, media promotions, and decals for hawkers and restaurants using lower-sodium ingredients. Early successes include a doubling of demand for LSS among food operators and 20% of sauces purchased being lower in sodium.[31]

In a large province in China, the Shandong Ministry of Health's SMASH project (2011-2016) promoted LSS through media campaigns, product promotion in markets and restaurants, and sodium reduction education including in schools. Evaluation results show reduced sodium consumption and lower blood pressure.[32]

These examples show that government-led initials can drive market demand and support sodium reduction at consumer and industry levels.

22 **LSS still contains sodium — shouldn't other measures be prioritized?** While LSS does contain some sodium, its goal is to reduce overall sodium intake compared to regular salt. Most people should consume less sodium to reduce or prevent cardiovascular health risks. LSS offers a practical way to cut sodium. It tastes like regular salt, so people can adopt it without noticing a difference. In many low-and middle-income countries, discretionary salt added at home during cooking and at the table is a major sodium source. LSS allows households to keep their cooking routines while lowering sodium.

LSS also complements existing policies to reduce sodium in packaged and out-of-home foods and helps manufacturers meet mandatory sodium reduction targets. While direct studies on LSS' impact in processed foods are lacking, it's expected to have a similar effect as in home use. Without LSS guidance, food manufacturers may delay sodium reduction efforts for commercial reasons, undermining the recommendations in WHO's SHAKE package. SHAKE is a framework of evidence-based policies and interventions designed to help countries reduce population salt intake, providing countries with implementation guidance.

23 **How should LSS be promoted given concerns about undiagnosed kidney disease?** While individuals with advanced kidney disease may need to limit potassium intake due to impaired excretion, undiagnosed kidney disease should not hinder promoting LSS for the general population. The largest RCT to date, with over 20,000 participants, excluded only those with self-identified kidney disease or potassium-sparing diuretics and found no harm from LSS.[3] Additionally, LSS helps reduce blood pressure, protecting kidney function in those with mild impairment. To ensure safe use, the following strategies are recommended:

- Public health messaging should highlight that LSS may not be suitable for individuals with chronic kidney disease.
- Labeling standards for LSS should clearly communicate health benefits and risks, especially for those with kidney disease. For example, "When used instead of regular salt, low sodium salt could be helpful to reduce blood pressure levels and cardiovascular disease risk. Patients with renal dysfunction should consult their doctor before use."

24 **How can LSS programs and scale-up be monitored and evaluated?** LSS programs can be monitored and evaluated by tracking changes in sodium and potassium intake and related health outcomes, such as hypertension rates. Measuring causality can be challenging due to multiple factors influencing hypertension and (ideally) concurrent sodium reduction interventions. Useful evaluation methods include tracking LSS sales and use of LSS as an ingredient in packaged foods, assessing diet and health outcomes in target populations before and after scale-up (with a control group if possible), incorporating monitoring into existing public surveys, and gathering consumer feedback.

Impact

25 **Is salt substitution cost-effective? Are higher prices offset by health care savings?** Salt substitution with LSS is cost-effective because the slightly higher manufacturing cost is offset by reduced healthcare costs from fewer cardiovascular diseases. Studies, including the largest RCT to date and multiple modeling studies in different countries that also take policy development costs into account, indicate that scaling up LSS is either cost-effective or cost-saving, and that the healthcare savings associated with lower rates of hypertension and related diseases outweigh the higher costs of LSS over time.[4,5,33-37]

26 **Is salt substitution equitable?** Equitable access to LSS requires addressing barriers to cost, availability, and awareness. LSS is often more expensive than regular salt, limiting accessibility for low-income populations. Measures like subsidies, price controls, and distribution through public systems can help make LSS more affordability. Availability is also a challenge, especially in rural areas and LMICs with underdeveloped LSS supply chains. Expanding distribution networks and encouraging local production are key to improving access. Additionally, targeted education campaigns can raise awareness and support broader access.

27 **Is salt substitution sustainable in the long term?** Salt substitution is a sustainable long-term strategy when supported by enabling policies, cost-reduction measures, and consumer demand. Studies, including the largest RCT to date, show that LSS can be cost-effective and even cost-saving by reducing healthcare costs related to hypertension and cardiovascular diseases.[5,28] While building demand and supply in the private sector may require higher initial investment (compared with a more targeted distribution approach), these costs are offset by long-term healthcare savings. Encouraging private-sector engagement and reducing production costs through economies of scale will further support sustainability. Over time, as demand stabilizes and costs decrease, subsidies can be reduced, making salt substitution a lasting public health solution.

28 **Would people use more LSS to make up for the reduction in sodium, and therefore consume more sodium overall (rebound effect)?** Since LSS tastes similar to regular salt, most users do not overconsume it. However, public health messaging should reinforce the importance of overall salt reduction while promoting LSS as a healthier alternative, and LSS should be part of a broader salt reduction strategy. In theory, people could consume more salt to compensate for reduced sodium levels in LSS; however, studies have not shown significant increases in total salt consumption, and sodium levels decrease when LSS is used.

Stakeholder roles

29 **What can governments do to promote LSS in countries?** Governments can promote LSS by implementing policies and strategies that make it affordable and accessible. Public health education campaigns can raise awareness about LSS benefits, targeting both consumers and healthcare providers to increase demand and understanding. Including LSS in government programs, such as school meals, public food distribution and healthcare facilities, can increase use and establish norms around healthier sodium consumption. Establishing labeling standards for LSS can help consumers understand the health benefits and risks, particularly for those with kidney disease. Additionally, subsidies can make LSS more affordable by reducing the price gap with regular salt, as demonstrated in a trial in China, where subsidies nearly doubled LSS use.[4,38]

30 **What is the role of salt and food manufacturers, food retailers, and food service providers in expanding the uptake of LSS?** Manufacturers play an essential role by making LSS products more affordable and accessible in stores. They can invest in producing LSS options that taste good and are reasonably priced, boost access to LSS by strengthening supply chains, and promote LSS through marketing that expands consumer awareness of its health benefits. Companies can also partner with retailers to increase LSS visibility and availability in stores.

Retailers play an important role in helping consumers access LSS when shopping for food, including by improving the shelf visibility and placement of LSS, promoting LSS, and working with distributors to keep LSS consistently available.

Additionally, restaurants and food service providers can adopt LSS in their menus, promoting healthier options.

31 **What is the role of non-governmental players in scaling up LSS use, including healthcare professionals and associations, and the public health sector?** Non-governmental players, including healthcare professionals, associations, and public health organizations, play a crucial role in scaling up LSS use. Healthcare providers, especially physicians, can educate patients on LSS benefits, particularly for hypertension management, and incorporate it into treatment plans. Medical societies can integrate LSS recommendations into clinical guidelines, as seen in the recent European cardiovascular health guidelines.[39] Public health organizations can raise awareness, advocate for policies to make LSS affordability and accessible, and support its inclusion in national health initiatives. Collaboration across these sectors, alongside government and industry, will create a supportive environment for LSS scale-up.

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