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Japanese cuisine and its health benefits: food bioactives, dietary features, and public health

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Abstract

Japan has the highest life expectancy and healthy life expectancy in the world. Interest in Japanese cuisine has increased globally due to its potential health benefits. The Japanese diet has been reported to reduce total mortality and extend disability-free survival time. Epidemiological studies have shown that relatively high consumption of seafood, soy-based foods, miso soup, and green tea in Japan may promote health and longevity. A low intake of red meat, milk, dairy products, sugar, and sweeteners is associated with low mortality rates from cancer and ischemic heart disease, as well as a low prevalence of obesity. Avoiding obesity appears to be a key factor in maintaining good health. Given the conflicting findings regarding the potential links between specific foods, dietary habits, and health and longevity, the composition of the typical Japanese diet may be of secondary importance, and its modest daily food energy intake may provide the greatest benefit. Japan's low incidence of chronic overeating, combined with a relatively high level of physical activity, is reflected in its low obesity rates. Japan has implemented various public health policies to support these lifestyle aspects.

Keywords: Japanese diet; Health benefits; Food bioactives; Dietary features; Public health policy.

1. Introduction

Interest in Japanese food culture has increased globally due to its health benefits. Studies have shown that Japanese-style diets reduce total mortality (Okada et al., 2018) and are linked to longer disability-free survival times (Zhang et al., 2019). Since the mid-20th century, Japan has consistently ranked at the top of global life expectancy, a position it has maintained ever since. In addition to having one of the longest life expectancies at birth worldwide, Japan also has the highest 'healthy' life expectancy (Tokudome et al., 2016). An increase in life expectancy at birth is related to several interlinked processes, such as nutritional improvements, family income, improved housing conditions, and educational attainment, as well as widely available preventive healthcare and effective medical treatment. While nutrition may not be the primary factor in disease suppression and life extension, it is clearly an important one. The present viewpoint argues that high consumption of certain foods and their bioactive compounds contributes to Japan's long life expectancy. However, the Japanese diet as a whole may play an even more important role.

2. Japanese foods and their bioactives

During the first decades of the 20th century, Japan transitioned from a largely rural to an increasingly urban society. Many people in Japan had adequate food energy supplies at best, while their protein intake was suboptimal. This was reflected in the health, morbidity, and life expectancy of the affected populations. Numerous studies have focused on the dramatic increase in life expectancy

since World War II and the unique aspects of the Japanese diet related to health, such as relatively high seafood, soy-derived foods, and green tea consumption. A qualitative systematic review categorized the characteristics of the Japanese-style diet as described in epidemiological publications (Suzuki et al., 2018). The study classified Japanese dietary constituents into 16 categories, finding that soybeans/soybean-based products, seafood, and vegetables were the top three, followed by rice and miso soup (made with fermented soybeans).

2.1. Soy foods

The average consumption of soybean foods in Japan is higher than in any other country worldwide. This includes both non-fermented products, such as tofu, and fermented products, such as miso and natto. Intake is particularly high among older adults (Messina et al., 2006). These soy foods contribute to the health benefits of Japanese-style diets (Lange and Nakamura, 2026). The daily soy protein intake in Japan ranges from 6 to 11 g, equivalent to approximately 25–50 mg per day of isoflavones. These bioactive components have received significant scientific interest due to their potential health benefits (Messina, 2016). In contrast, the mean daily isoflavone intake among adults in Europe and North America is less than 3 mg (Boker et al., 2002; van Erp-Baart et al., 2003; Bai et al., 2014). The three major isoflavone groups contained in soybeans are genistein, daidzein, and glycitein. These heterocyclic phenols, also known as phytoestrogens, bind to estrogen receptors (Isanga and Zhang, 2008). Other bioactive compounds found in soybeans include saponins, phytic acids, and phytosterols.

Regular consumption of soy-based foods has been associated with health benefits, including a reduced risk of coronary heart disease (possibly due to decreased serum cholesterol), reduced incidence of breast, prostate, stomach, intestinal, liver, and skin cancers, and prevention of bone loss (Messina, 2016). Isoflavones have also been claimed to be a safer alternative to hormone replacement therapy for postmenopausal women (Messina, 2016). However, some of the evidence supporting these claims is inconclusive.

A prospective cohort study reported a significant inverse association between soy food consumption and stomach cancer mortality when the highest and lowest daily soy intake levels were compared in adult men (Nagata et al., 2002). A meta-analysis of prospective studies found an inverse association between soy product intake and gastrointestinal cancer incidence in women, but not men (Lu et al., 2017). Soy isoflavones have also been associated with a significantly reduced risk of prostate cancer, probably due to their weak estrogenic activity (Nagata et al., 2007). A meta-analysis of observational studies confirmed this finding, showing that consuming soy products can reduce the overall risk of prostate cancer (Huang et al., 2024). Although prospective studies suggested that soy food consumption does not protect against breast cancer (Nishio et al., 2007; Wei et al., 2020), a more recent meta-analysis reported a reduction in breast cancer risk in premenopausal and postmenopausal women (Boutas et al., 2022; Yang et al., 2023).

A reduction in the risk of heart attacks and strokes was associated with a high intake of isoflavones in Japanese women (Kokubo et al., 2007). A meta-analysis of prospective cohort studies found that soy isoflavone intake was associated with a reduced risk of overall cardiovascular disease and coronary heart disease in adults, particularly in Western populations (Naghshi et al., 2024). A small number of studies exploring the efficacy of soy foods in alleviating menopausal symptoms, such as hot flashes, yielded conflicting results (Nagata et al., 2001; Levis and Griebeler, 2010).

Additionally, the potentially adverse effects of antinutritive factors in soy foods are poorly understood.

2.2. Seafood

The health benefits of consuming seafood are generally attributed to its high levels of omega-3 polyunsaturated fatty acids, such as eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), which have anti-inflammatory properties (Banaszak et al., 2024).

Studies have shown that fish consumption is associated with reduced mortality from all causes (Zhang et al., 1999; Zhao et al., 2016) and with a lower risk of ischemic heart disease and stroke (Zhang et al., 1999). A study of Mie Prefecture in Japan investigated the association between the diets of farming and fishing villages and the prevalence of arteriosclerotic disease (Yamada et al., 2000). Compared to the farming village, adults in the fishing community consumed 1.6 to 1.8 times more fish and had higher serum concentrations of omega-3 fatty acids. People in the fishing village had significantly fewer plaques in their carotid arteries: about 5% compared to 66% in men and less than 8% compared to about 52% in women (Yamada et al., 2000).

The protective effects of fish intake have been found against prostate cancer (Eshaghian et al., 2023) and colon cancer (Caini et al., 2022). Fish consumption has also been linked to maintaining mental health since higher consumption is inversely correlated with the risk and prevalence of various mental disorders (Lange, 2020).

However, possible negative effects of frequent seafood consumption need to be considered because fish and shellfish increase methylmercury (Endo et al., 2005) and dioxin (Sasamoto et al., 2006) intake. Whale meat, in particular, has high levels of mercury, polychlorinated biphenyls, and organochlorine pesticides (Simmonds et al., 2002). Mercury, methyl mercury and other mercury derived compounds can affect the central nervous system, causing a range of neurological symptoms, including paresthesia, muscle weakness, difficulty with coordination, speech, or hearing, mood changes, and memory loss (Tsubaki and Takahashi, 1986; Sanfeliu et al., 2003).

2.3. Miso soup

Miso is a semi-solid paste primarily made from soybeans. It is one of the most traditional and distinctive fermented foods in Japan. It is an essential ingredient in Japanese cuisine and is traditionally used as a flavoring agent. Miso soup is a Japanese staple consumed daily by many. It is produced by fermenting soybeans and grains with koji mold (*Aspergillus oryzae*), salt, and beneficial microbes (Kusumoto and Rai, 2017).

Miso is believed to have anticancer, anti-obesity, antihypertensive, and anti-inflammatory properties (Saeed et al., 2022). However, except for miso's effects on blood pressure, little research has been conducted to support these claims. The high salt content of ordinary miso soup has long been thought to underlie the high incidence of salt-sensitive hypertension in Japan. However, this assumption has been contradicted by several observational studies in humans, which found no association between miso soup consumption frequency and blood pressure or hypertension incidence (Lange and Nakamura, 2026). This has been confirmed by several controlled interventional studies in humans. In preclinical experiments, miso was shown to have antihypertensive effects in salt-sensitive hypertensive rats. In this animal model, miso intake did not increase blood pressure compared to an equivalent salt intake.

At the same salt level, blood pressure in rats was lower when they consumed ordinary miso soup than when they consumed salt. This may be due, in part, to a reduction in sympathetic nervous activity (Lange and Nakamura, 2026; Lange et al., 2022a). However, the association between the consumption of ordinary miso and lower blood pressure requires confirmation in large-scale human studies. In conclusion, miso appears to have health-promoting effects in the prevention and treatment of hypertension.

2.4. Green tea

The health benefits of green tea are primarily attributed to its polyphenolic flavonoids, particularly catechins (Lange et al., 2022a; Lange et al., 2022b; Wang et al., 2022). These compounds are believed to possess antioxidant properties that provide chemopreventive effects, such as inhibiting cancer cell growth, or disease-modifying effects (Halliwell, 2007).

Consumption of green tea has been found to be inversely related to all-cause mortality (Kuriyama et al., 2006). There is also some evidence suggesting a protective effect of tea on cardiovascular health (Lange, 2022). Habitual green tea consumption may protect against hypertension and reduce the risk of stroke (Kuriyama et al., 2006).

However, other specific health benefits of regularly drinking tea are unclear. In particular, evidence of green tea's benefits in preventing most cancers is inconclusive (Clement, 2009). A large prospective study of approximately 20,000 Japanese men found no evidence that green tea reduces the risk of prostate (Kikuchi et al., 2006) or stomach (Hoshiyama et al., 2004) cancer.

Furthermore, the association between tea consumption and depressive symptoms has been assessed. One study examined 1,058 older Japanese individuals and found that frequent green tea consumption was associated with a 52% decrease in severe depressive symptoms compared to infrequent intake (Niu et al., 2009).

The health benefits attributed to green tea may be due to its bioactive constituents; however, the fact that green tea is typically consumed unsweetened, as opposed to being consumed with sugar or in highly processed drinks containing sweeteners, artificial flavors, and preservatives, is also likely to play a role. These additives have been suggested as a possible cause of adverse health effects (Lane et al., 2024). Moreover, consuming highly processed foods and beverages may reduce the intake of more nutritious foods.

The associations observed between green tea consumption and positive health outcomes may be less meaningful than they appear at first glance. Green tea intake in Japanese males has been shown to be significantly associated with the consumption of ten other foods and four major nutrients (Tsubono et al., 1997). The strongest links were found with frequent consumption of vegetables, fruits, soy foods, and seaweed. Tea drinkers also showed lower lipid intake. Therefore, tea drinking may only be a marker for a diet that can modify disease risk. Additionally, coffee has been found to be the most significant source of polyphenols in the Japanese diet, providing 50 percent compared to 34 percent from green tea (Fukushima et al., 2009).

3. Japanese dietary features

Many studies have examined the impact of consuming individual components of Japanese cuisine on physical and mental health (Lange, 2021; Lange et al., 2015; Lange et al., 2020; Lange et al., 2021; Lange and Nakamura, 2025). However, people do not choose individual nutrients, but rather combinations of foods in varying quantities. Due to the complex and dynamic interaction between nutrition and health, it is more reasonable to attribute the health benefits and effects on longevity of the Japanese diet to its overall dietary patterns rather than to specific components.

Japanese dietary habits are characterized by a high consumption of soy foods, seafood, and plant foods, as well as a low intake of red meat, milk, dairy products, sugar, and sweeteners (Lange and Nakamura, 2024). These habits are associated with relatively low mortality from ischemic heart disease and cancer, as well as a low prevalence of obesity. However, the increasing consumption of highly processed foods is a growing concern (Shinozaki et al., 2023; Shinozaki et al., 2025). Highly processed foods have been associated with adverse health effects in Japanese children, adolescents, and adults, including cardiometabolic disease, mental health disorders in children, cognitive impairment in older adults, and increased all-cause mortality (Lane et al., 2024).

3.1. High salt intake

A notable characteristic of the Japanese diet is its high salt content, largely due to traditional seasonings. Historically, salt consumption was extremely high, likely contributing to higher mortality rates and shorter life expectancies. In some Japanese prefectures, traditional diets contained 20–25 g of salt per day (Sakata and Moriyama, 1990). Currently, Japanese salt intake remains high, averaging around 10 g per day, which exceeds the World Health Organization and Japanese government recommendations of less than 5–7.5 g daily (Ikeda et al., 2025). Nevertheless, this has not prevented a steady decline in diseases associated with elevated salt intake or affected the increase in life expectancy.

High salt intake has been identified as a major factor in high blood pressure, cardiovascular disease, and stroke (Strazzullo et al., 2009). From 1975 onward, Japan's age-adjusted stroke mortality rate fell significantly. By 2005, the rate was not starkly different from that in the United States, despite the fact that the average American's salt intake is less than one-third that of the average Japanese person. Therefore, the explanation for this cannot be simply an inverse relationship between salt intake and stroke mortality.

Some components of the Japanese diet may have a protective effect. Epidemiological studies have shown an inverse correlation between intake of green and yellow vegetables and fresh fruits and mortality from stroke and other cerebrovascular events (Nagura et al., 2009; Takachi et al., 2008; Sauvaget et al., 2003b). The Hiroshima/Nagasaki Life Span Study found that consuming animal products, such as dairy, eggs, and fish, may protect against intracerebral hemorrhage (Sauvaget et al., 2003a). This finding may be linked to the significant increase in dietary calcium intake in Japan. A large, prospective Japanese study found that higher dietary calcium intake was inversely associated with stroke risk (Umesawa et al., 2008).

3.2. Low lipid intake

Another characteristic of the Japanese diet is its low lipid content, particularly saturated animal fats. This dietary feature may positively impact the prevalence of diseases associated with high lipid and cholesterol consumption, such as coronary heart disease. A typical Japanese diet derives less than a quarter of its total energy from fats and oils (Shijo et al., 2019), whereas the average for most affluent nations is at least a third. However, low fish consumption

and high meat, poultry, and oil consumption have been recognized as major problems among younger generations in Japan (Ministry of Health, Labor and Welfare, 2015).

Japanese nutrition education recommends the consumption of the "Japan Diet", which has a fatty acid content mainly derived from seafood and plant foods. Consumption of meat, poultry, and sweets, including desserts and snacks, is reduced, while consumption of fish, soybeans, and seaweed is increased. The Japan Diet increases omega-3 polyunsaturated fatty acid intake and reduces saturated fatty acid intake (Wakai et al., 2014). The Japan Diet appears to rapidly improve fatty acid composition to an anti-arteriosclerotic profile.

The leanness of Japanese cuisine may be an important factor in explaining the beneficial effects of the typical Japanese diet on healthy aging and longevity.

3.3. Caloric restriction

Maintaining a healthy weight and avoiding obesity are key to good health. Given the conflicting findings about the potential links between specific foods, dietary habits, and health and longevity, one could argue that the composition of the Japanese diet is less important than the modest daily food energy intake in Japan.

The effects of significantly reducing energy intake to increase longevity are well documented in many animal species (Anderson et al., 2009). However, restricting specific nutrients without reducing overall food energy intake has no such effect. Okinawans' reduced calorie intake ("hara hachi bu" or eating until 80% full) over decades is thought to contribute to their higher life expectancies and lower rates of disability in old age compared to the Japanese average (Willcox et al., 2007).

For over 60 years, the Japanese food supply has been more than adequate, and no caloric restriction has been practiced. However, the contemporary Japanese diet appears to closely match expected food energy needs with average intake. Japan's lower prevalence of overweight and obesity compared to other G7 countries likely reduces and delays the onset of age- and diet-related diseases (NCD Risk Factor Collaboration, 2017).

4. Public health policies in Japan

Despite ongoing efforts, salt intake in Japan remains higher than in many other countries (Ikeda et al., 2025). Further intensified efforts are needed to reformulate food products and reduce salt content. This requires collaboration between government bodies, the food industry, academic institutions, and other stakeholders. Reducing the entire population's salt intake is a cost-effective approach to preventing cardiovascular disease. Implementing evidence-based strategies is crucial to substantially decreasing population salt intake, enhancing public health outcomes, and managing rising social security costs. This will significantly contribute to sustainable societal development (Ikeda et al., 2025).

As dietary habits in Japan have changed over time, the question arises as to what constitutes the Japanese diet. The cuisine we consider traditional today developed in the early 20th century as a fusion of Japanese, Chinese, and Western dishes. The Japanese government emphasizes the healthfulness of "Washoku" (literally "Japanese cuisine"), a term formally defined by a panel of government-appointed experts and recognized as an intangible cultural heritage by UNESCO in 2013 (Cang, 2018). The main aspect of Washoku related to health benefits is the "ichiju-sansai" dining style ("one soup, three dishes"). This style usually consists of one soup (often miso soup), one main dish, and two side dishes, with rice as the staple, and allows people to consume a variety of foods and plentiful nutrients and micronutrients. However, there is no scientific definition of the Japanese diet based on its relationship to health rather than food culture.

Avoiding obesity is an important nutritional factor in preventing non-communicable diseases. Japan has the lowest obesity rate among high-income countries (NCD Risk Factor Collaboration, 2017). The country's public health policy for obesity is characterized by a strong emphasis on preventive measures, food education, and lifestyle guidance rather than heavy regulation. A cornerstone of this approach is the Metabolic Syndrome (Metabo) Law, which was passed in 2008 (Onishi, 2008). This law requires employers and local authorities to monitor the waist circumference of adults aged 40–74 as part of annual health checks. Those with measurements above a certain level are referred for weight-loss counseling to reduce the risks associated with a high body mass index.

Every Japanese kindergarten and school is required by law to employ a professional nutritionist who designs school meals according to strict rules concerning fresh, healthy ingredients; supervises meal preparation; and educates children about nutrition. This ensures that children regularly receive a balanced and nutritious diet. A special Japanese lunch box containing a variety of healthy, functional foods high in fiber, micronutrients, and other bioactive compounds, such as polyphenols and carotenoids, can provide health benefits (Ide et al., 2022). Similarly, in 1985, the Japanese government introduced a slogan seeking to promote the daily consumption of 30 different foods from various categories, including vegetables, fruits, grains, proteins, and healthy fats, to improve population nutrition through balanced meals. Dietary diversity is inversely associated with all-cause mortality (Kobayashi et al., 2020), and consuming a wider variety of foods may have significant public health benefits.

5. Future directions

It is important to note that most evidence linking health outcomes to certain Japanese foods comes from epidemiological (observational) studies. These studies can only reveal statistical associations, not causal relationships. Studies with a controlled (interventional) design would be needed to confirm causality between food intake and outcome. However, such long-term investigations are not feasible.

In addition to consuming the aforementioned typical Japanese foods, balancing fish and meat consumption may promote health and longevity. For instance, Japan's stroke rate decreased when its citizens began eating more meat in the 1970s, following a century-long ban on meat consumption. However, consuming too much meat and dairy can be harmful because they contain saturated fat, which has been linked to cardiovascular disease (Maki et al., 2021). Eating highly processed red meat has been linked to an increased risk of stroke (Yang et al., 2016). However, consuming too little meat and dairy can also be unhealthy because these foods provide cholesterol, which is necessary for maintaining the integrity of blood vessel endothelial cell plasma membranes. However, these cells are highly susceptible to high cholesterol levels, which can contribute to plaque formation and arteriosclerosis. In a large British study, fish eaters and vegetarians had lower rates of ischemic heart disease but higher rates of stroke than meat eaters (Tong et al., 2019). Similar findings have been reported in Japan (Kinjo et al., 1999; Sauvaget et al., 2003a; Sauvaget et al., 2004;

Takeya et al., 1984).

Diet is only one of several lifestyle factors that are important for health (Nyberg et al., 2020). Another is regular physical activity (Lange, 2017, 2023, 2024), which is generally higher in Japan than in many other countries (Inoue et al., 2020). Public transport and walking are popular ways of getting to school or work in Japan. Further research is required to investigate how different lifestyle factors interact to improve health.

6. Conclusion

Interest in Japanese cuisine has increased globally due to its potential health benefits, including reduced total mortality and increased life expectancy. Epidemiological studies have shown that the relatively high consumption of seafood, soy-based foods, miso soup, and green tea in Japan may promote health and longevity. Key features of the Japanese diet include high salt intake, low lipid consumption, and modest calorie intake.

Avoiding obesity appears to be a key factor in maintaining good health. Given the conflicting findings regarding the potential links between specific foods, dietary habits, and health and longevity, the composition of the typical Japanese diet may be of secondary importance, and its modest daily food energy intake may provide the greatest benefit. Japan's low incidence of chronic overeating, combined with a level of physical activity that exceeds the typical European and North American norm, reflects its low obesity rates. The Japanese government has implemented various public health policies to support these lifestyle aspects.

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