

Iodized salt: Celebrating the centennial of a major US public health triumph



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Just over a century ago, much of the U.S. population experienced disfiguring and debilitating disorders related to iodine deficiency. In 2024, we celebrate 100 years of salt iodization – a tremendous public health achievement.

Soils across much of the upper Midwest and Pacific Northwest and throughout the Appalachians are poor in iodine, which resulted in iodine-deficient diets for humans and livestock in those areas at a time when foods were largely produced

locally. These regions were known as the “goiter belt.”

At the time of the draft for World War I, 31% of military candidates from one region in Michigan were considered unfit for service due to goiter too large to allow them to button a uniform. U.S. Public Health Service surveys in the 1920s reported goiter rates of 70% to 100% in school children in portions of Michigan, Minnesota and Wisconsin.

However, for a long time the underlying cause of this disorder was unknown. An 1867 publication cited a list of 42 different prevailing hypotheses regarding the cause of endemic goiter, including infection, lack of sunshine, nutritional deficiency, toxin exposure, poor air and consanguinity.

David Marine, MD, an Ohio pathologist, and Oliver Kimball, then a medical student, conducted a seminal clinical trial in Akron between 1917 and 1920. A total of 2,190 schoolgirls were treated

with iodine supplements twice annually. Controls were the 2,305 girls who declined the intervention. Goiter developed or worsened in only 0.2% in the treated group, compared with 14% of controls. This conclusively demonstrated that endemic goiter could be prevented with iodine.

Based on this work and on transatlantic reports of a salt iodization program instituted in Switzerland, David Cowie, MD, a pediatrician and chair of the Michigan Medical Society, proposed in 1922 that the U.S. adopt salt iodization to eliminate endemic goiter. Working with Marine and Kimball, Cowie engaged local stakeholders, including physicians, grocers and salt producers, to develop iodine deficiency prevention efforts.

Urged on by Cowie, in 1923, William Hale, PhD, a chemist at the Dow Chemical Company, developed a method for mass iodized salt production. In 1924, iodized salt was introduced in Michigan, and later that year Morton Salt became the first company to roll out iodized salt distribution nationally.

Critics resist salt iodization

Salt is a useful vehicle for iodine fortification because individuals tend to ingest stable amounts of salt daily, it is consumed across populations, and the salt iodization process is straightforward and inexpensive to implement.



Portrait of a man with goiter in 1900 John D. Strunk

U.S. salt iodization efforts initially met with strong opposition in some quarters, in part due to concerns about safety. Some of the most vocal initial pushback came from goiter surgeons, who may have seen a threat to their livelihood. However, when iodized salt was first introduced, there was clearly a transient increase in rates of hyperthyroidism. In 1926, Charles Hartsock, MD, a Cleveland Clinic thyroid surgeon and a leading critic of salt iodization, reported multiple cases of hyperthyroidism triggered by iodized salt use.

By 1934, these hyperthyroidism rates had subsided, and it was observed that although rates of thyroid surgery in Michigan hospitals had increased during the first 3 years after salt iodization, there was subsequently a rapid 60% decline.

In 1951, a survey of Michigan schoolchildren found that the prevalence of goiter had decreased from 38.6% in 1924 to only 1.4%. National public health advocacy and education efforts continued in the U.S. for the decades following iodized salt initiation. However, in 1948, U.S. legislation mandating iodized salt use failed to pass, and in the U.S., unlike most other countries today, salt iodization remains voluntary.

Iodization benefits go beyond goiter

Salt iodization programs were initially focused on the prevention of endemic goiter, but over the past century there has been a growing recognition that iodine deficiency causes not just goiter, but a whole spectrum of adverse health effects known as the iodine deficiency disorders that also encompass adverse obstetric outcomes, cretinism and impaired neurodevelopment.

Based on aptitude tests administered by the U.S. military, economists have estimated that for the one-quarter of the U.S. population that was initially the most iodine deficient, salt iodization raised average population IQ by 15 points. Similar gains have been seen in other regions more recently as iodized salt programs have been introduced in most countries around the globe over the past 3 decades. Due to these global public health efforts, led by organizations including UNICEF, WHO, and the Iodine Global Network (IGN; formerly the International Council for the Control of Iodine Deficiency Disorders, or ICCIDD), the worldwide prevalence of clinical iodine deficiency disorders as assessed by goiter rates fell from 13.1% in 1993 to 3.2% in 2019, while iodine deficiency disorders have been prevented in 20.5 million

newborns annually. The resulting improvement in population IQ has led to an approximate \$33 billion global economic benefit.

Return of the ‘goiter belt’

Much of the history of iodine deficiency in the U.S. history has been forgotten, and it is important not to become complacent. Because mild iodine deficiency has re-emerged in U.S. pregnant women over the last 15 years, the American Thyroid Association and the American Academy of Pediatrics now recommend daily iodine supplements for U.S. women who are planning pregnancy, pregnant or breastfeeding.

Only just over half of table salt sold in the U.S. is currently iodized, and commercially processed foods, the source of most of the salt in the U.S. diet, do not typically include iodized salt.

Dairy has become an important source of iodine in the U.S. diet but is not consumed as broadly as salt across the population. Growing use of plant-based milk substitutes, which do not contain iodine, may cause a further decline in U.S. iodine intakes.

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As we celebrate past public health successes, it is important to remember that the U.S. “goiter belt” could return if we do not remain mindful about the importance of optimal iodine nutrition for human health.

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