IDD NEWSLETTER

IODINE global network

VOLUME 47 **NUMBER 1 FEBRUARY 2019**

Iodine deficiency in Madagascar: time for action

IN THIS ISSUE

IODINE GLOBAL NETWORK is a nongovernmental organization dedicated to sustained optimal iodine nutrition and the elimination of iodine deficiency throughout the world.

Festo Kavishe IGN Regional Coordinator for Eastern and Southern Africa; **Isiye Ndombi** IGN Consultant; **Minoru Irie** IGN National Coordinator in Japan and Honorary Advisor, The Foundation for Growth Science; **Marie-Claude Desilets** Chief Nutrition, UNICEF Madagascar; **Bodo Rakotomalala** Nutrition Specialist, UNICEF Madagascar

A recent national survey showed that iodine deficiency remains a serious public health problem in Madagascar, putting babies at risk of being born with mental impairment. The government now has an opportunity to revitalize the national salt iodization program thanks to the generosity of Japanese donors, and ongoing support from UNICEF, USAID and IGN.

Madagascar introduced mandatory salt iodization in 1995, which resulted in swift growth in iodized salt coverage, reaching almost three-quarters of households by 2009. However, the implementation of USI, and of other public health programs, fell victim to a period of political instability, and the progress was lost.

The Government renewed its commitment to salt iodization in 2013, but several key implementation challenges remained, including insufficient capacity to monitor the quality of salt production/iodization and, among small-to-medium size salt producers, insufficient technical capacity to iodize salt. Most salt in Madagascar comes from two large-scale and eight medium-scale salt producers, while only about 20-25% of salt is sourced from 100+ small or artisanal salt enterprises.

In 2016, the Ministry of Health with technical support from UNICEF and IGN conducted a national iodine survey. It revealed poor iodine status among reproductive-age and pregnant women in most regions of Madagascar, particularly in some northern, central and western regions of the country. In response, IGN facilitated the procurement of a large quantity of the fortificant potassium iodate (KIO3) from a Japanese consortium of public and private sector donors: The Foundation for Growth Science, and Japan Iodine Industries Association (JIIA), Chiba Prefecture. After detailed planning and negotiation with the government and UNICEF, 850 kg of the generously donated iodate arrived safely in Madagascar in September 2018 and was followed by a donation ceremony on October 29 (*See Box*).

About the donors of KIO3 to Madagascar

The Japanese Foundation for Growth Science has been involved in the elimination of iodine deficiency disorders since 1975. Japan is the second largest producer of iodine, making up about 30% of the global production. The Japan Iodine Industries Association (JIIA) in Chiba Prefecture, a collective of iodine producers, has been engaged in iodine aid projects and has a long history of supplying iodine to countries struggling with iodine deficiency, such as Mongolia, Cambodia, and Sri Lanka.

The donation ceremony was held on Monday, October 29, 2018 at the Chiba Prefectural Government Offices. The occasion was attended by ***Ms. Mireille Rakotomalala*** (Embassy of Madagascar in Japan), ***Mr. Shinsuke Takigawa*** (Vice Governor of Chiba Prefecture), ***Mr. Takashi Fujino*** (President and CEO, ISE Chemicals Corporation and Chairman of JIIA), ***Mr. Yoshio Tachi*** (President and Representative Director, Godo Shigen Co., LTD. and Vice Chairman of JIIA), ***Mr. Takeshi Mori*** (President, Kanto Natural Gas Development Co., LTD. and Chairman of Keiyo Natural gas council), and ***Dr. Minoru Irie*** (Honorary Advisor, the Foundation for Growth Science, and the Iodine Global Network).

In his opening speech, Mr. Takigawa thanked everyone for their contribution in efforts to improve the health of the people of Madagascar.

Mr. Fujino said it was an honor to aid such a valuable cause and the future of the women and children in Madagascar who could be affected by iodine deficiency disorders.

On ending the ceremony, Ms. Rakotomalala thanked all the contributors and stated, "I hope this donation will help strengthen the relations between the prefecture of Chiba and Madagascar."

Left to right: Mr. Y. Tachi, Mr. T. Fujino, Dr. M. Irie, Ms. M. Rakotomalala, Mr. S. Takigawa, and Mr. T. Mori at the donation ceremony in Chiba Prefecture.

Efforts to revitalize USI

The donation is part of joint efforts undertaken in recent years by UNICEF, USAID, IGN and other stakeholders to reinvigorate the salt iodization program in Madagascar. Universal salt iodization has been included as a key action under the 2017–2021 Multisectoral Nutrition Action Plan, and the Government is finalizing a new implementation decree on salt iodization, which will enhance the existing legislation and enable more effective enforcement. To help salt producers comply with the legislation, the iodate will be provided to medium-scale producers and used to help establish a revolving fund so that future needs of the fortificant could be met. As part of the package, the medium-scale producers will also receive iodization and quality control equipment to improve their iodization and internal monitoring capacity. In parallel, external quality control measures are being put in place to grow capacity for regulatory monitoring and enforcement. It is hoped that these measures will help provide adequately iodized salt to around 80% of the population in 2019, preventing brain damage in thousands of babies who are currently at risk.

To raise awareness of iodine nutrition in Madagascar, promote iodized salt consumption, and recognize the Japanese donors, a second donation ceremony was held on February 14 in Morondava, Menabe Region. The fortificant was officially handed to the Menabe Iodized Salt Counter (Comptoir du Sel Iode du Menabe) to launch the production of iodized salt. The lively event was attended by all key stakeholders: the national Government, the regional Government of Morondava, UNICEF, USAID, IGN, and salt producers, among others. The technical and financial partners urged the government to fully commit to USI, especially the enforcement of quality control. They also addressed all salt producers, wholesalers, packers and sellers to emphasize their social responsibility for the health and well-being of the population and urged them to comply with the legislation and standards. IGN Regional Coordinator for Eastern and Southern Africa, Dr. Festo Kavishe, thanked the Government, our partners, and the Japanese donors for their commitment to USI in Madagascar. "Together, we can eliminate IDD in Madagascar if we all play our part," he said in his speech.

Festo Kavishe (IGN Regional Coordinator), and Daniele Nyirandutiye (USAID, Madagascar) are helping to make the first batch of iodized salt in Morondava.

The Leahaly band, at the ceremony in Morondava, singing about iodized salt.

Urgent need to translate political commitment into action

Prior to the event in Morondava, IGN regional representatives met with the Minister of Health, and separately with the Food Fortification Alliance Committee, and delegates from the Prime Minister's office to discuss the need to revitalize USI in Madagascar and the existing challenges. Although political will has been established, it is now critical to translate it into effective multisectoral coordination and public-private partnership with the salt industry.

In the immediate term, IGN, UNICEF and other technical and financial partners will continue to focus on establishing and improving iodization capacity and quality monitoring among the large- and medium-scale salt producers, and changing population behavior to improve the sales of iodized salt, improve coverage, and prevent the scourge of iodine deficiency among the most vulnerable populations.

India calls for a change in strategy to end IDD through the National Nutrition Mission

Kapil Yadav IGN National Coordinator for India; Centre for Community Medicine (CCM), All India Institute of Medical Sciences (AIIMS), New Delhi, India; **Chandrakant S Pandav** Former Professor and Head, CCM, AIIMS, New Delhi; IGN Regional Coordinator for South Asia; President, Indian Coalition for Control of Iodine Deficiency Disorders, New Delhi, India

India has made impressive progress in efforts to control iodine deficiency with the successful adoption and scaling up of universal salt iodization (USI). But to bring iodized salt to more than 90% of the country's population and to sustain optimal iodine intakes, India needs to strengthen its 'end game'.

According to WHO, the single most important cause of mental impairment is iodine deficiency. It is totally preventable by adopting universal salt iodization (USI). In addition to mental handicap, iodine deficiency is also responsible for spontaneous abortion, stillbirth, congenital anomalies, and it contributes to infant and neonatal mortality. Yet, as this causal relationship is not visible, it is not seen a priority. It seems that, with respect to iodine deficiency disorders, we have lost the sight but we should not lose the vision.

Today, we are within reach of the target of >90% household level coverage of adequately iodized salt. According to the National Iodine and Salt Intake (NISI) survey, 2014-2015, currently, 78% of households in India are consuming salt that is adequately iodized (1). However, a significant percentage of the population continues to consume salt with insufficient iodine (14%) or no iodine at all (8%). There is an urgent need to reach those populations and cover the 'last mile' of the road to USI success in India. This calls for developing and implementing the 'end game strategy' to accelerate, achieve, and sustain the elimination of IDD in India.

India has been at the forefront of global efforts to eliminate IDD by contributing to research, policies, and programs. The successful evolution of the IDD control program in India, written about extensively elsewhere, highlights some of the necessary factors for successful and sustainable implementation, and it offers lessons for other programs in health and nutrition in particular and in the social sector in general. Those experiences and lessons can be generalized to other countries as well.

Key milestones in IDD control in India

In hindsight, the critical factors which contributed to the success of the IDD control program in India can be summarized as follows:

(i) Generation of regular, representative and reliable scientific data – state and national-level data are needed to develop effective and efficient policy, program, and advocacy. From the earliest Kangra Valley study (1956–1972) (2) to the most recent NISI Survey (2014-2015) (1), generation of evidence has been an iterative process in India providing inputs for policymakers and program managers.

(ii) Stakeholder alignment and development of partnerships – partnership between various stakeholders such as government institutions, academic institutions, international and national non-governmental organization, civil society organizations, and salt producers has improved the sustainability of efforts towards achieving USI and elimination of IDD.

(iii) Institutional continuity and mentorship – active involvement of the All India Institute of Medical Sciences, New Delhi, in the IDD control program has provided institutional continuity and enabled mentorship for generations of researchers and workers in the field of IDD.

(iv) Addressing the value system of stakeholders – neglect by policymakers can lead to serious setbacks to program implementation (3). Addressing this issue through sustained advocacy has led to the reinstatement of the ban on non-iodized salt and eventual improvement in household coverage with adequately iodized salt.

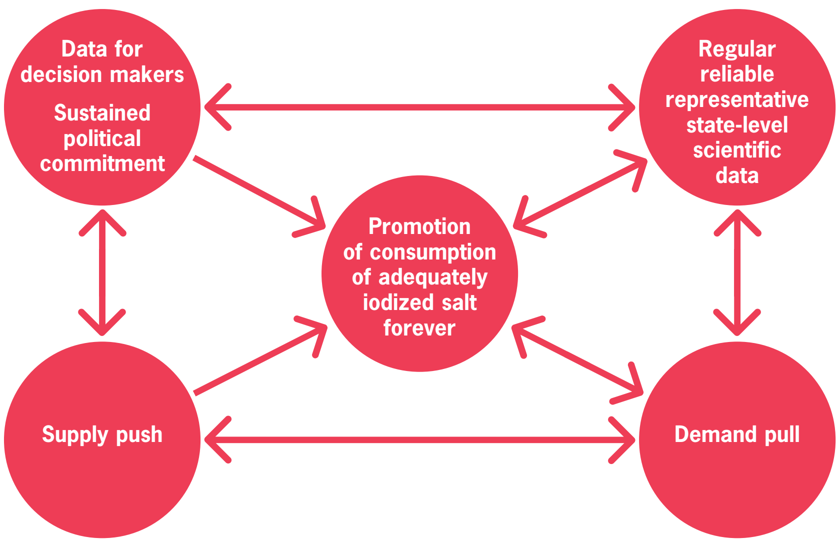
(v) Legislation for achieving public health goals – the PFA of 1954 and its successor, the Food Safety and Standards Act (FSSA) 2006, which prevents the sale of non-iodized salt for human consumption, have been instrumental in creating an enabling environment for USI in India.

(vi) Involvement of the private sector in public health efforts – cooperation with the salt industry has been one of the main factors in achieving high household coverage with adequately iodized salt. Engagement with medium- and small-scale salt producers and focus on improving the quality of iodized salt through quality assurance have been the prime drivers of improved household coverage with adequately iodized salt.

The challenge of sustaining IDD elimination

The USI program in India has entered a critical phase, and its long-term success depends on the commitment of all stakeholders today to its future sustainability. There is a need to invigorate the salt iodization efforts at the national and state levels. The first step should be to reposition the NIDDCP to ensure that IDD elimination is viewed through its role in developing human potential. The social process model (Figure 1) is applicable to IDD control and should be used to promote the consumption of adequately iodized salt.

FIGURE 1 **A multi-component model for the IDD control program (4).**



The technical guidelines of NIDDCP should be revised to reflect the maturity of the national IDD elimination program. The existing guidelines for district-based periodic IDD surveys should be revamped to focus on generating meaningful epidemiological data at the state level, which can guide the program and drive policy more effectively. The regulatory framework to ensure stringent implementation of mandatory salt iodization needs to be strengthened. For example, the FFSA should be accompanied by national guidelines and advisory for mandatory salt iodization.

At the state level, adequate resources including people need to be allocated to salt iodization regulation and use of the Management Information System (MIS) for monitoring of salt iodization at all stages. Consolidation, modernization, and mechanization of the salt industry have been an essential component of successful progress towards USI so far; policy should be adapted to enable this process to continue in order to improve access to adequately iodized salt for all sub-national population groups.

Strong government leadership and coordination amongst all stakeholders, which has been a cornerstone of the success to date, should be maintained. The success of the National Coalition for Sustained and Optimal Iodine Intake (NCSOII) and state USI coalitions in Bihar, Gujarat, Rajasthan and Uttar Pradesh highlights the key role of all stakeholders in USI. These partnerships should be sustained, strengthened, and replicated in other states. The initial stages of formation of district USI coalitions in 12 leading salt producing districts of the country (accounting for 90% iodized salt production) should also be accelerated.

The key importance of quality assurance

Strengthening quality assurance of salt iodization at the point of production is proven to be the most efficient way to achieve and sustain USI. There is a need to strengthen quality assurance at production facilities in India, particularly in the southern states. To achieve this, the FSSA provision regarding mandatory iodization of all edible salt needs to be implemented with zero tolerance. Significant augmentation of infrastructure and human capacity under the Act needs to be optimally harnessed to ensure stringent implementation. The success achieved in special campaigns on salt iodization by several Indian states (UP, Bihar and Gujarat) (5,6) needs to be replicated elsewhere in the country.

Reaching vulnerable populations

The non-availability of affordable iodized salt due to supply chain bottlenecks is responsible for the zonal difference in coverage. Reforms in iodized salt transportation policy are required to improve the availability of iodized salt throughout the country. A behavior change communication (BCC) strategy should be used to promote awareness of the linkage between iodine nutrition and iodized salt. The 2014-2015 national survey highlighted the large differentials across zones, rural-urban and socio-economic strata in iodized salt coverage (7). There is a need to conduct sub-national and state level USI surveys to build on this new evidence to further understand the causes and develop a strategy to address them. In addition, studies are needed to assess the iodine status in pregnant women in India and to develop appropriate strategies to ensure their optimal iodine intakes.

Mainstreaming IDD control with 'Poshan Abhiyan'

Poshan Abhiyan (the National Nutrition Mission) was launched by Hon'ble Prime Minister Shri Narendra Modi on 8th March 2018. Mainstreaming the IDD program with Poshan Abhiyan will ensure sustainability of the USI strategy and strengthen the monitoring and tracking of the USI program along with other key nutrition policies and programs at the highest level.

References

1. Pandav CS, et al. High national and sub-national coverage of iodised salt in India: Evidence from the first national iodine and salt intake survey (NISI) 2014-2015. Public Health Nutr 2018; 21 : 3027-36.
2. Sooch SS, Ramalingaswami V. Preliminary report of an experiment in the Kangra valley for the prevention of Himalayan endemic goitre with iodized salt. Bull World Health Organ 1965; 32 : 299-315.
3. Rah JH et al. Towards universal salt iodisation in India: achievements, challenges and future actions. Matern Child Nutr 2015; 11 : 483-96.
4. Pandav CS et al. Salt for freedom and iodized salt for freedom from preventable brain damage. 7th ed. New Delhi: Indian Coalition for Control of Iodine deficiency Disorders (ICCIDD); 2012.
5. Iodized salt coverage study 2010 conducted across eight States in India. Available from: www.micronutrient.org, accessed on December 7, 2018.
6. A State-level salt iodization coalition achieves success in Bihar, India. Available from: http://www.ign.org/newsletter/ idd_aug17_india.pdf, accessed on November 7, 2018.
7. International Institute of Population Sciences (IIPS). National Family Health Survey 4. 2015-16. Fact sheets. Mumbai: IIPS. Available from: http://rchiips.org/nfhs/factsheet_NFHS-4. shtml, accessed on July 6, 2018.

Progress towards optimal iodine nutrition in Eastern Europe

Gregory Gerasimov IGN Regional Coordinator for Eastern Europe and Central Asia

A regional update with a focus on Belarus, Moldova, Ukraine, and Russia.

Belarus: iodized salt in processed foods improves iodine status

Results of a national iodine survey, conducted in Belarus in 2017, have been recently published (1). The assessment covered a nationally representative cohort of 873 school-age children (SAC, 9–12 yrs) and 700 pregnant women (PW) at 16–36 weeks of gestation. The median urinary iodine concentration (mUIC) in SAC was 191 µg/L, which reflects optimal iodine nutrition in the general population. There were regional differences in the mUIC: the lowest value (117 µg/L) was recorded in the Brest region and the highest (287 µg/L) in the Mogilev region. Both of these medians lie within the optimal mUIC range. However, the design of the study and the relatively small number of schoolchildren recruited do not permit to draw definitive conclusions about the nature of these regional differences.

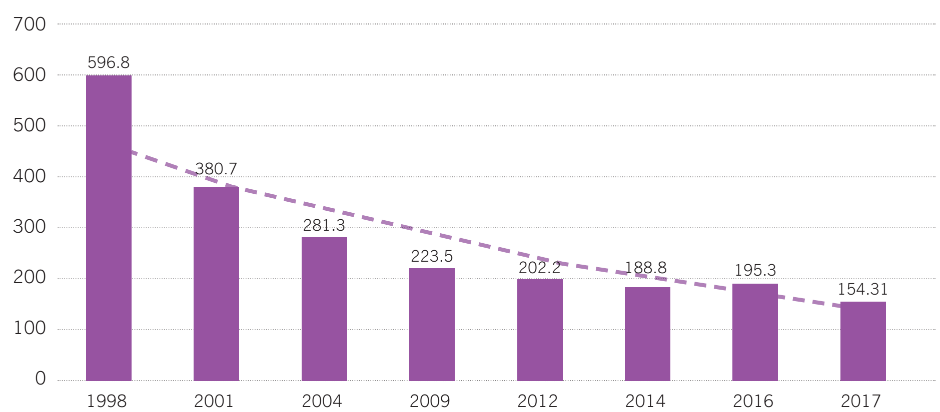
According to the survey, 81% of households in Belarus used iodized salt, including 75% of pregnant women. In Belarus, both iodized and non-iodized (common) salt is permitted in retail. However, use of iodized salt is mandated in bakery products and other industrially processed foods (cheeses, sausages, cured meats, etc.). Despite this relatively high penetration of iodized salt, the mUIC in PW was only 121 µg/L, which suggests that iodine nutrition is suboptimal in this population. A higher mUIC in PW was found in the Brest region and the city of Minsk. However, as in the case of SAC, it is unclear whether these regional differences are significant.

According to Ministry of Health data, between 1998 and 2017, the incidence of new cases of goiter in children decreased almost four-fold (from 596.8 to 154.3 cases per 100,000). The fastest decrease occurred during the first 7–8 years after the launch of the salt iodization program in 2001 (*Figure 1*). The authors of this analysis concluded that "hidden" iodized salt, i.e. iodized salt contained in processed foods, has been an important contributor to the optimal iodine status sustained over the past 20 years.

Republic of Moldova: adults are iodine sufficient but salt intakes are too high

A recently published "Dietary salt intake survey in the Republic of Moldova, 2016" provides an update on the status of iodine nutrition. Urinary iodine concentration was assessed in 1307 adults (aged 18–69 yrs) of both sexes, who were randomly selected from all administrative districts of Moldova, with the exception of the semi-autonomous Republic of Transnistria. The median urinary iodine concentration was 196 µg/24h without a significant difference between men and women. More than a half (57.2%) of the households consumed adequately iodized salt (with >15 mg/kg of iodine), but almost a quarter (23%) consumed salt that was not iodized. The salt intake in adults was more than double the WHO recommended maximum of 5 g per day. The proportion of the population achieving the target of 5 g or less per day was only 11.3% with similar proportions among men and women.

FIGURE 1 Declining incidence of goiter (cases per 100,000) in children in Belarus between 1998 and 2017 (1).



If salt iodization becomes mandatory in Russia, it could provide sufficient iodine to pregnant women and prevent the loss of IQ points associated with iodine deficiency.

Ukraine is ready to adopt mandatory salt iodization

The Public Health Center (PHC) of the Ministry of Health of Ukraine has used legislative initiative to introduce mandatory universal salt iodization (USI). The initiative was discussed and supported by the participants of an expert Round Table meeting: “Legislative changes in Ukraine concerning the iodization of food salt,” held in Kiev on December 14, 2018 (3).

“Iodine deficiency is widespread throughout Ukraine, and this problem requires an immediate solution. The most effective and at the same time most beneficial way to overcome iodine deficiency is USI, but today not every Ukrainian has access to iodized salt," said Vladislav Zbanatsky, Deputy Director General of the PHC. Ukraine remains one of few countries in the world that do not yet have a law on mandatory iodization of salt. Up to 382,000 children (80%) born each year in Ukraine could be at risk of iodine deficiency disorders and impaired development as a result.

Lyubov Loban, Chief Technologist of the major salt manufacturer “Artyomsil,” reported that his enterprise had a capacity to produce 7 million tons of salt, including 1.5 million tons of iodized salt, per year. At present, “Artyomsil” has 16 salt iodization machines, and it is using only 4% of its total capacity. The commercial sector is ready for a nationwide salt iodization project; only relevant legislative norms are needed. Representatives of Ukrainian businesses stressed that, in the future, the total production of iodized salt in the country can be easily increased by ten, or even 20 times. “Today we need political will to introduce legislation for USI", said Olga Dontsova, Head of the Department for Promotion of Healthy Nutrition and Physical Activity, Ministry of Health.

Russian government supports first ever iodization bill

The Ministry of Health, together with the endocrinological community, has recently developed a bill on iodization of edible salt. The ministry emphasized that salt iodization is the most effective and inexpensive way to prevent iodine deficiency disorders. Support for this bill was declared by Anna Popova, who is Head of the Russian Public Health Service (Rospotrebnadzor) during a meeting with deputies of the "United Russia" party faction in the State Duma (Russian Parliament) on January 23, 2019. “Today the Government and our supervising Deputy Prime Minister Tatiana Golikova absolutely support the bill that was developed by the Ministry of Health and, of course, we fully support it too,” said Popova. She also expressed hope that mandatory use of iodized salt will come into effect, and the severity of iodine deficiency in the population will decrease (4).

The Russian Deputy Prime Minister Alexei Gordeyev, in charge of agriculture and the food industry, instructed the government departments and the scientific community to compile a list of products that would need to be fortified with vitamins and microelements (5). His instruction followed an interdepartmental meeting on the implementation of the new “Strategy for the Improvement of Food Products Quality in Russia by 2030”. As part of the strategy, it is expected that salt iodization and milk fortification with vitamins A and D will be made mandatory. “Our task is to provide people with products enriched with the necessary vitamins and microelements,” said Gordeev.

This is not the first attempt to introduce mandatory salt iodization in Russia. Previously, a bill was submitted by "United Russia" party faction to the State Duma in 2013. At that time, the bill received little support from the government.

References

1. Mokhort T. et al. Assessment of iodine status among school age children and pregnant women of Belarus in 2017-2018. Clinical and Experimental Thyroidology 2018;14(3):149-155. doi: https://doi.org/10.14341/ket9732 (in Russian)
2. Cappuccio F. et al. Dietary salt intake survey in the republic of Moldova, 2016. WHO, 2018
3. https://phc.org.ua/news/show/cgz-iniciyuje-zakonodavchi-zmini-shchodo-obovyazkovogo-ioduvannya-soli-v-ukrajini (in Ukrainian)
4. https://ria.ru/20190123/1549753884.html (in Russian)
5. https://news.mail.ru/economics/36117153/?frommail=1 (in Russian)

Iodization of foods and condiments other than salt can increase population iodine intakes

Excerpted from: Santos JAR, Christoforou A, Trieu K, McKenzie BL, Downs S, Billot L, Webster J, Li M. Iodine fortification of foods and condiments, other than salt, for preventing iodine deficiency disorders. Cochrane Database of Systematic Reviews 2019, Issue 2. Art. No.: CD010734. doi: 10.1002/14651858.CD010734.pub2.

A systematic review assessed the effects of fortifying foods, beverages, condiments, or seasonings other than salt with iodine on iodine status and health-related outcomes in all populations.

Salt iodization is the preferred strategy for IDD prevention and control. However, in some instances where salt is not the major condiment, alternate vehicles for iodine fortification have been considered.

The authors searched for published research papers and unpublished reports through a systematic database search and communication with experts and organizations working to address iodine and micronutrient deficiency until January 2018. The reviewers included randomized controlled trials and observational studies that examined the effects of fortification of a food, beverage, condiment, or seasoning with iodine alone, or in combination with other micronutrients versus the same unfortified food, or no intervention. The following measures were considered: death (all-cause), goiter, physical development, mental development, cognitive function and motor skill development, cretinism, hypothyroidism, adverse effects, urinary iodine concentration, thyroid-stimulating hormone (TSH) concentration, and serum thyroglobulin concentration.

Eleven studies met the criteria, providing 14 comparisons, and capturing data on 4317 participants. Seven studies were carried out among school children (N = 3636), three among women of reproductive age (N = 648), and one among infants (N = 33). The studies used diverse types of food as vehicle for iodine delivery: biscuits, milk, fish sauce, drinking water, yoghurt, fruit beverage, seasoning powder, and infant formula milk. The amount of iodine provided to participants ranged from 35 μg/day to 220 μg/day, and study duration ranged from 11 days to 48 weeks. Five studies examined the effect of iodine fortification alone, two against the same unfortified food, and three against no intervention. Six studies evaluated the effect of co-fortification of iodine with other micronutrients. Of the eleven studies, seven were assessed to be at high overall risk of bias. No study assessed the primary outcomes of death, mental development, cognitive function, cretinism, or hypothyroidism, or secondary outcomes of TSH or serum thyroglobulin concentration. Two studies reported the effects on goiter, one on physical development measures, and one on adverse effects. All studies assessed urinary iodine concentration.

Consumption of foods with added iodine increases urinary iodine concentration.

Findings

The authors combined eligible data in a meta-analysis. The effects of iodine fortification compared to control on goiter prevalence (OR 1.60, 95% CI 0.60 to 4.31; 1 non-RCT, 83 participants; very low-quality evidence), and five physical development measures were uncertain (1 non-RCT, 83 participants; very low-quality evidence): weight (MD 0.23 kg, 95% CI -6.30 to 6.77); height (MD -0.66 cm, 95% CI -4.64 to 3.33); weight-for-age (MD 0.05, 95% CI -0.59 to 0.69); height-for-age (MD -0.30, 95% CI -0.75 to 0.15); and weight-for-height (MD -0.21, 95% CI -0.51 to 0.10). One study reported that there were no adverse events observed during the cross-over trial (low-quality evidence). Pooled results from RCTs showed that urinary iodine concentration significantly increased after iodine fortification (SMD 0.59, 95% CI 0.37 to 0.81; 6 RCTs, 2032 participants; moderate-quality evidence). This is equivalent to an increase of 38.32 μg/L (95% CI 24.03 to 52.61 μg/L). This effect was not observed in the meta-analysis of non-RCTs (SMD 0.25, 95% CI -0.16 to 0.66; 3 non-RCTs, 262 participants; very low-quality evidence).

Conclusions

Overall, there is no clear evidence on the effect of the intervention on reducing the proportion of people with goiter, improving physical growth, or adverse events. However, these results show that adding iodine to foods likely increases urinary iodine concentration. Additional, adequately powered, high-quality studies on the effects of iodine fortification of foods on these, and other important outcomes, as well as its efficacy and safety, are required.

Achieving USI in Ghana: challenges and lessons

Excerpted from: Abu BAZ et al. Annals of the New York Academy of Sciences 2018 Nov 29. doi: 10.1111/nyas.13988. [Epub ahead of print]

This paper reviews existing evidence on exposure to iodine in the food system in Ghana and describes policies, strategies, and programs linked with iodine nutrition in the country.

The salt iodization program in Ghana was much needed at the time of its inception in 1996. A survey had reported iodine deficiency disorders (IDD) in a third of Ghana's 110 districts. The program mandates that all salt produced, imported, distributed, and marketed in Ghana should be iodized and meet standards of quality. In addition, commercial food processors across Ghana may choose to fortify food products with iodine on a voluntary basis, by adding iodized salt as an ingredient (if the product includes salt) or including iodine in food processing, e.g., washing of grains. There is currently no national data in Ghana investigating whether a combination of mandatory and voluntary strategies may lead to iodine intakes in excess of requirement.

To identify current implementation challenges and potential risks of exposure to excess iodine, the authors of this report conducted a scoping review of policies and guidelines, a systematic review of peer-reviewed publications on fortification and iodine consumption in Ghana, and consulted with key stakeholders, including government agencies (e.g., implementing and regulatory), salt and food producers, and medical facilities. They conducted 23 interviews (17 with key public health stakeholders and six with clinical staff from three training hospitals), identified 13 peer-reviewed publications from 1998 to 2017 and additional 13 organizational reports or national surveys, and reviewed policies. Their findings are summarized below.

A favorable policy environment

In 2005, Ghana renewed its commitment to salt iodization, and the National Food Fortification Alliance (NFFA) was formed. The 2005–2007 policy strategy set the target of reaching at least 90% of households with iodized salt. The 2009–2011 policy emphasized that USI remained a national priority, and linked USI to child survival, universal education, and the millennium development goals. The third and current policy (2016–2020) focuses on expanding production of iodized salt, improving the quality of iodization, and strengthening government commitment. It is worth noting that, although the government supports the voluntary fortification efforts of commercial food producers, there is no legislation regulating it.

Intake of iodized condiments and iodine status

Although Ghana could meet its annual target of 5 million tons of salt, currently it averages 300,000 tons per year from 82 licensed producers. There are three types of salt producers in Ghana: (i) medium-scale salt factories, (ii) small-scale producers, and (iii) artisanal (micro) producers. Most iodized salt in Ghana is either produced by informal, small- and microscale producers or is imported. Households in rural northern Ghana commonly consume bouillon cubes, providing an estimated 88.3 (50.9–110.4) μg of iodine per day (1). The use of iodine-fortified foods may be more common in urban and peri-urban settings (*See Example 1*). Other iodine-fortified commercial products include cereals, canned tomato paste, and canned fish.

Example 1: Iodine fortified foods

A food-based initiative, the Affordable Nutritious Foods for Women (ANF4W), is jointly implemented by the German Development Corporation (GIZ), private food processors, and the government of Ghana. ANF4W has introduced three fortified novel food (biscuits, breakfast cereal, and hot sauce) products that aim to improve micronutrient (18 minerals and vitamins, including iodine) intake among urban and peri-urban women in Ghana. The initiative has developed a micronutrient quality seal known as Obaasima (5). The new foods are available in the markets in the Brong Ahafo and Northern Regions on a pilot basis. The current implementation of ANF4W provides no incentives or subsidies for women to purchase them. However, the project embarked on demand creation activities to raise awareness and encourage repeated purchase through education and branded flyers.

A food-based initiative, the Affordable Nutritious Foods for Women, has developed a micronutrient quality seal known as Obaasima.

The government has supported small-scale salt producers to acquire technology to ensure adequate fortification using KIO3. However, in 2014 only about a third of the population were consuming adequately iodized salt (15 ppm and above). This correlates with the findings of sub-national studies, reporting varying household coverage of iodized salt. In the Volta Region, a third of salt in the markets and 21.1% in households was adequately fortified (2). In the Central Region of Ghana, studies have reported higher coverage (67%), but also greater variation in the urinary iodine concentration (UIC) among pregnant women: from 5.2 to 1165.9 μg/L, and a positive correlation between individual UIC in excess of 500 μg/L and consumption of iodized salt (3). In the Northern Region, the median UIC in school-age children was 242 (163–365) μg/L. Although this is optimal, household testing showed that 18% and 10% of these children were exposed to iodine levels in excess of 40 mg/kg from salt and bouillon cubes, respectively (1). In the Central Region, IDD prevalence was 42.5% among pregnant women. Another study found that 93.8% of children (2–10 year-olds) had a UIC <100 μg/L in the rural Eastern Region of Ghana (4).

Other sources of iodine

Iodine content was recently measured in household water and milk products in the Northern Region of Ghana, but only negligible concentrations were found (1). Studies have indicated that fish and shellfish may be a good source of iodine, especially mackerel (4.0 μg/g) and shrimp (3.5 μg/g). High iodine intakes from saltpeter (potassium nitrate) have also been reported, which is used as a food additive.

Advocacy and awareness about iodine nutrition

Mass media is currently one of the major sources of education for many people in Ghana. In 2014, the GHS and its partners developed a USI advocacy campaign to target consumers and address misperceptions related to iodized salt. The messages were mainly disseminated at the national level, and they did not specify the amount of iodized salt that should be consumed. Available evidence suggests that the campaign had mixed results. In the Volta Region, two-thirds of traders reported knowledge of the importance of consuming iodized salt, and 75% of households consumed iodized salt (1). However, in the Northern Region, only 20% of households reported iodized salt use. The awareness of the fortification law in both regions was low among traders and households (6).

Challenges and barriers to USI implementation

The enforcement of the regulation on iodization is weak due to multiple factors: the activities of the small-scale artisanal producers are monitored infrequently, the cost of importing KIO3 is high, the availability of iodine rapid test kits is limited and inconsistent (*See Example 2*), and there is poor enforcement of quality assurance along the value chain. In addition, while the medium-scale producers are more likely to implement quality control, a proportion of their salt is exported to markets outside Ghana. There appears to be inadequate communication and coordination between the regulators and enforcers of the iodization law. The review also highlights some misconceptions about iodine among salt producers, e.g., that the amounts of iodine occurring naturally in mined salt already meet the dietary needs, hence there is no need to fortify salt.

Example 2: Quality control and capacity gaps

In Nyanyano, a village with a cooperative of microscale producers, the government piloted a salt bank strategy to improve the quality in iodized salt. Artisanal salt produce was aggregated and iodized at centralized locations. Although the pilot was considered successful, the project was not continued due to limited funding. The high cost of the fortificant (KIO3) was a challenge. To enforce the iodization standards, the government of Ghana with support from UNICEF have provided iodine rapid test kits (iCheck™ from BioAnalyt, Germany). However, it has been challenging to ensure that they are available and used consistently by regulatory agencies to enforce the standards across all salt production and marketing stages.

Key findings and recommendations

The authors conclude that the government support for USI, specifically financial and structural support, remains a challenge. There is a need to translate the favorable policy for controlling IDD into a functioning iodized salt production and distribution system with adequate quality control mechanisms in place. There is currently limited coordination and insufficient human capacity to reach 90% of households with adequately iodized salt. Ghana requires a renewed commitment to salt iodization through the National Salt Iodization Committee and the NFFA. All stakeholders should be brought together (government, relevant non-government and international agencies, salt producers and distributors, medical personnel, advocacy agencies and the media) to reflect on the 20 years of salt fortification implementation in Ghana.

Limited evidence suggests that there is potential exposure of households to iodine in amounts greater than 25 ppm from a combination of iodized salt and condiments at the household level. However, it is unlikely that this would result in the intake of iodine above the daily upper limit of 1100 µg. A nationally representative survey should be conducted to capture the total salt intake at the household level in Ghana. Similarly, a national survey on iodine status would capture all sources of dietary iodine (soil, processed foods, extruded snacks, condiments, and salt) and provide data on the effectiveness of the USI program throughout the value chain and identify the implementation gaps.

Future behavior change communication strategies should include specific messages to prevent overconsumption of salt in households and from commercial foods. Consumer education about the risk of excess iodine in meals prepared with condiments is warranted.

References

1. Abizari A-R et al. More than two-thirds of dietary iodine in children in northern Ghana is obtained from bouillon cubes containing iodized salt. Public Health Nutr 2017, 20:1107–1113.
2. Agbozo F et al. Household and market survey on availability of adequately iodized salt in the Volta region, Ghana. Int J Health Promot Educ. 2017, 55: 110–122.
3. Simpong DL et al. Assessment of iodine status among pregnant women in a rural community in Ghana—a cross sectional study. Arch Public Health 2016, 74: 8.
4. Egbi, G. Prevalence of vitamin A, zinc, iodine deficiency and anemia among 2–10 year-old Ghanaian children. Afr J Food Agric Nutr Dev 2012, 12: 5946–5956.
5. Affordable Nutritious Foods for Women' (ANF4W) Brochure. Food fortification as an approach to reduce micronutrient deficiencies of women. Experiences of the developPP.de—Project 'Affordable Nutritious Foods for Women'. Eschborn, Germany: GIZ; 2017.
6. Chirawurah D et al. Assessing iodized salt use in rural Northern Ghana: a mixed method approach. Food Public Health 2015, 5: 70–76.

A nationally-representative survey is the only way to capture regional variation in total salt and iodine intake among Ghanaian children.

Common factors determining iodine status in pregnancy across Europe

Excerpted from: Dineva M et al. Similarities and differences of dietary and other determinants of iodine status in pregnant women from three European birth cohorts. European Journal of Nutrition 2019 Feb 8:1-7.

A study funded by the EUthyroid project identified the determinants of iodine status during early pregnancy in three European populations of differing iodine status.

The early stages of pregnancy mark the beginning of crucial fetal brain development processes such as neuron proliferation, migration, and differentiation. These processes are thyroid hormone-dependent, therefore, the mother needs sufficient iodine to maintain optimal thyroid function. Even mild-to-moderate maternal iodine deficiency in early pregnancy has been associated with suboptimal offspring cognitive outcomes (1-3). Better knowledge of factors that determine the iodine status in pregnancy in iodine deficient and sufficient areas may help to identify women at particular risk of low iodine status.

The objectives of the study were: (1) to establish whether iodine status during early pregnancy is associated with maternal socio-demographic, anthropometric, lifestyle factors, and pregnancy characteristics; (2) to determine how maternal iodine status is influenced by dietary intake during pregnancy; and (3) to identify similarities and differences in the main determinants of iodine status between deficient and sufficient pregnant populations.

Pooling ALSPAC, Generation R, and INMA studies

Data from three prospective population-based birth cohorts were pooled: (i) the Avon Longitudinal Study of Parents and Children (ALSPAC) in the United Kingdom (UK) (4); (ii) Generation R in the Netherlands (5); and (iii) INfancia y Medio Ambiente (INMA) in Spain (6) (*Table 1*). Urinary iodine concentration (UIC, µg/L) was measured in spot-urine samples collected at a median (25–75th percentile) gestational age of 11.0 (8.0–15.0) weeks in ALSPAC, 13.1 (12.1–14.6) weeks in Generation R, and 13.0 (12.4–13.9) weeks in INMA.

Iodine status in pregnant women

The population of pregnant women from the Netherlands was iodine-sufficient, while the women from the UK and Spain were mildly-to-moderately deficient (*Table 2*).

Differences in iodine status among pregnant women across European countries may be partly explained by differing use of iodized salt.

TABLE 1 **Three prospective population-based birth cohorts were included in this study**

Study	No. of pregnant women in the final study population	From	Expected delivery date
ALSPAC	2,852	Avon area, South West of England	Apr 1991 – Dec 1992
Generation R	2,254	Rotterdam, Netherlands	Apr 2002 – Jan 2006
INMA	1,460	Valencia, Sabadell and Gipuzkoa regions, Spain	Nov 2003 – Jan 2008
Total	**6,566**		

TABLE 2 **Iodine status in early pregnancy (≤ 18 gestational weeks) expressed as urinary iodine concentration (UIC) and urinary iodine-to-creatinine ratio (UI/Creat)**

	ALSPAC (n = 2852)	Generation R (n = 2254)	INMA (n =1460)
Gestational age at urine sampling, weeks	11.0 (8.0–15.0)	13.1 (12.1–14.6)	13.0 (12.4–13.9)
UIC, μg/L	95 (56–151)	165 (94–277)	130 (76–219)
UI/Creat, μg/g	121 (81–193)	210 (140–303)	151 (96–255)

Data presented as median (25–75th percentiles)

Milk, dairy, fish, and cereals

Several dietary (milk and dairy products) and maternal factors (maternal age, BMI, and gestational week) were associated with maternal iodine status (expressed as the urinary iodine-to-creatinine ratio, UI/Creat) across all cohorts. Milk and dairy products have been previously identified as important determinants of iodine status in pregnancy in studies in Norway, Iceland, Italy, Spain, the UK, and Australia. In the present study, a portion of "milk and dairy products" equivalent to a glass of milk (200 g) was associated with 5–14 µg/g increase in UI/Creat across cohorts. This result might be different if repeated now, especially in the UK, where the iodine concentration in milk is now higher than estimated when ALSPAC women were recruited in 1990/1991, i.e., 427 vs. 150 µg/kg.

Important cohort-specific dietary determinants were identified, such as fish intake in the UK, egg and cereal/cereal product intake in the Netherlands, and fish, salt, and meat intake in Spain. An average portion of fish (120 g) was associated with some 6–34 µg/g increase in UI/Creat, across cohorts. Variation in the effect size could partly reflect the variability in average fish consumption (e.g., women in Spain consumed more white fish than women in the UK). Consumption of cereal products was a statistically significant determinant of UI/Creat only in the Netherlands; this association is probably driven by consumption of bread which is made with iodized salt in the Netherlands (7).

Iodized salt

Intake of iodized table salt was measured only in pregnant women from Spain; 1 g of salt was associated with around 32 µg/g increase in UI/Creat. It suggests that iodized salt consumed either discretionarily (e.g., as table salt in Spain), or as part of processed foods (e.g., in bread in the Netherlands) is an important dietary determinant of iodine status. The differences in iodine status between the countries may be partly explained by differing use of iodized salt. The iodized salt penetration rate in households and the food industry (e.g., bread-making) in the Netherlands has been estimated as 60% and 70%, respectively, while a 16% penetration rate has been reported in Spanish households (8). By contrast, iodization of salt was never common in the UK, and even nowadays, its availability is very limited (21.5%); furthermore, the iodine concentration of the major UK brands is low (9).

Ethnicity

The iodine status of pregnant women from the Netherlands varied by ethnic origin, with higher iodine status in Moroccan, Turkish and other non-Western women, and lower iodine status in Surinamese and Dutch Antilles women, even after adjusting for socio-demographic factors. Variation in diet may partially explain these differences, as some of the effect estimates were attenuated when adjusting for dietary intake. Ethnicity was not significantly associated with iodine status in ALSPAC or INMA, but this may reflect the small sample sizes of other ethnic groups in these cohorts. Ethnic differences in iodine status could help to identify subgroups at high-risk for iodine insufficiency; in countries with a large proportion of diverse ethnic groups, culturally-specific approaches to improve dietary adequacy may be more suitable than a single solution for the whole population.

Conclusions

The cohort-specific dietary determinants probably reflect not only dietary habits but iodine fortification policies. Therefore, public-health interventions to improve iodine intake in pregnancy may need to be country-specific. Between countries, but also within countries with a large proportion of different ethnic groups, culturally-specific recommendations are probably necessary. Achieving and maintaining iodine sufficiency in populations require monitoring dietary determinants of iodine status so that appropriate action can be taken, where necessary.

References

1. Bath SC et al. Effect of inadequate iodine status in UK pregnant women on cognitive outcomes in their children: results from the Avon Longitudinal Study of Parents and Children (ALSPAC). Lancet 2013;382:331–337.
2. Hynes K et al. Reduced educational outcomes persist into adolescence following mild iodine deficiency in utero, despite adequacy in childhood: 15-year follow-up of the gestational iodine cohort investigating auditory processing speed and working memory. Nutrients 2017;9:1354.
3. Murcia M et al. Iodine intake from supplements and diet during pregnancy and child cognitive and motor development: the INMA Mother and Child Cohort Study. J Epidemiol Community Health 2017; 0:1–7.
4. Fraser A et al. Cohort profile: The AVON longitudinal study of parents and children: ALSPAC mothers cohort. Int J Epidemiol 2013;42:97–110.
5. Kooijman MN et al. The generation R Study: design and cohort update 2017. Eur J Epidemiol 2016;31:1243–1264.
6. Guxens M et al. Cohort profile: the INMA—INfancia y Medio Ambiente—(Environment and Childhood) Project. Int J Epidemiol 2012; 41:930–940.
7. Verkaik-Kloosterman J et al. The iodine intake of children and adults in the Netherlands: Results of the Dutch National Food Consumption Survey 2007–2010—RIVM. 2012.
8. World Health Organisation. Iodine deficiency in Europe: a continuing public health problem. 2007.
9. Bath SC et al. Availability of iodised table salt in the UK—is it likely to influence population iodine intake? Public Health Nutr 2014;17:450–454.

Inadequate iodine intake in large groups of the Norwegian population

Henjum S, Abel MH, Meltzer HM, Dahl L, Alexander J, Torheim LE, Brantsæter AL

A recently published review suggests that, in Norway, inadequate iodine intakes are widespread among women of childbearing age, pregnant and breastfeeding women, infants who are exclusively breastfed, the elderly, vegans and some immigrant groups. There are few sources of iodine in the diet, and individuals who avoid milk and white fish, or have increased iodine needs, are particularly at risk.

Prior to 1950, endemic goiter was widespread in inland regions of Norway. From 1950 onwards, iodine fortification of cow fodder became mandatory to improve livestock fertility, a measure that resulted in a dramatic increase in iodine concentrations in milk and dairy products. Since then, Norway has been considered iodine-replete. However, recent studies have documented suboptimal iodine status in pregnant and lactating women, elderly, vegans, and non-pregnant women of childbearing age (1) (*Figure 1 and 3*). On the other hand, iodine intake was sufficient among infants and toddlers who received either iodine-enriched infant formula or cow's milk (2), and among children, adolescents, adult men and vegetarians who included milk in their diet (1). Figure 1 shows an overview of iodine concentrations in urine or breastmilk of women of childbearing age, pregnant or lactating women, and Figure 2 shows the calculated iodine intake from food in adult women and men in the national dietary survey (*Figure 1 and 2*).

There are few dietary iodine sources in Norway; milk contributes up to 60% of the iodine intake and seafood up to 15%. Other foods such as eggs and whey cheese contribute small amounts, while table salt contributes negligible amounts. During the last decade, consumption of milk and dairy products has declined while plant-based milk alternatives are becoming increasingly popular (3). Individuals who limit or avoid cow's milk will not get sufficient iodine unless they use iodine-containing supplements. Universal salt iodization is the first-line strategy for the elimination of severe iodine deficiency; however, in Norway, no public strategy to ensure adequate iodine status currently exists. The food industry is not allowed to use iodine-fortified salt. Voluntary addition of 5 μg iodine/g household salt was introduced in 1937, but this is too low to have any significance and is considerably lower than WHO's recommended minimum enrichment level of 15 μg iodine/g salt.

It is well documented that severe iodine deficiency in pregnancy results in lasting damage to children's development. The consequences of milder forms of deficiency are, however, more uncertain. Results from the Norwegian Mother and Child Study (MoBa) have shown that low iodine intake in pregnancy is associated with delayed language development and reduced fine motor skills at age 3 yrs, increased behavioral problems at 3 and 8 yrs, and poorer school performance at 8 yrs (4–6). Low maternal iodine intake was also associated with symptoms of attention-deficit hyperactivity disorder in offspring in MoBa (6). None of the MoBa studies showed any protective effects of iodine supplement use initiated during pregnancy. On the contrary, a negative effect on child neurodevelopment at age 3 was found in a group of pregnant women with a low intake of iodine (i.e. $<$160 μg/d) who were using iodine-containing supplements. This suggests that an abrupt increase in the supply of iodine during pregnancy might be problematic, and indicates that iodine intake prior to pregnancy and adequate iodine stores is more important than the iodine supply during pregnancy. In MoBa, a habitual iodine intake from food in quantities corresponding to the recommended daily intake before pregnancy (150 μg/d) was protective against adverse child neurodevelopmental outcomes. The Little in Norway study found that an insufficient iodine intake in pregnancy, reflected in a UIC below 100 μg/L, was associated with lower infant language skills up to 18 months. The use of iodine-containing supplements was not associated with beneficial effects. However, there are only few studies, and it cannot be ruled out that these results are due to other systematic differences between the groups than their intake of iodine.

FIGURE 1 **Median iodine concentration in urine and breast milk in Norwegian women of childbearing age (1). Dotted line represents the lowest population median recommended by WHO.**

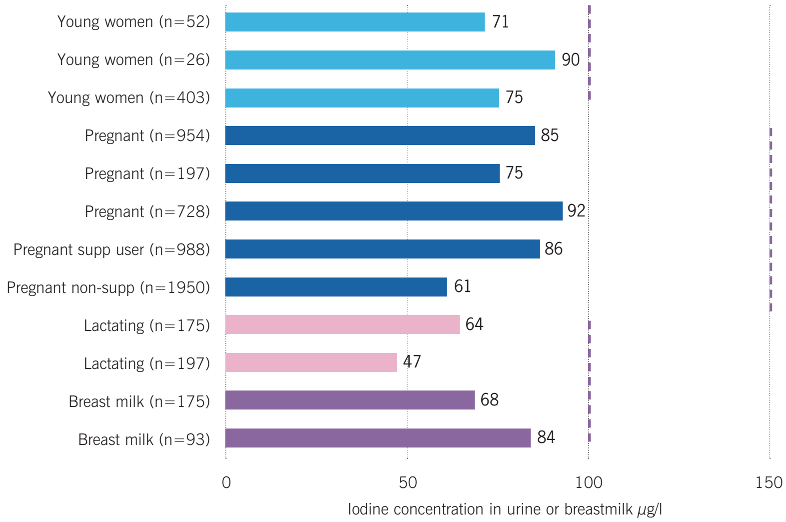


FIGURE 2 **Median dietary iodine intake in Norwegian adults in different age groups in the National Dietary Survey «Norkost 3» conducted in 2010-2011 (3).**

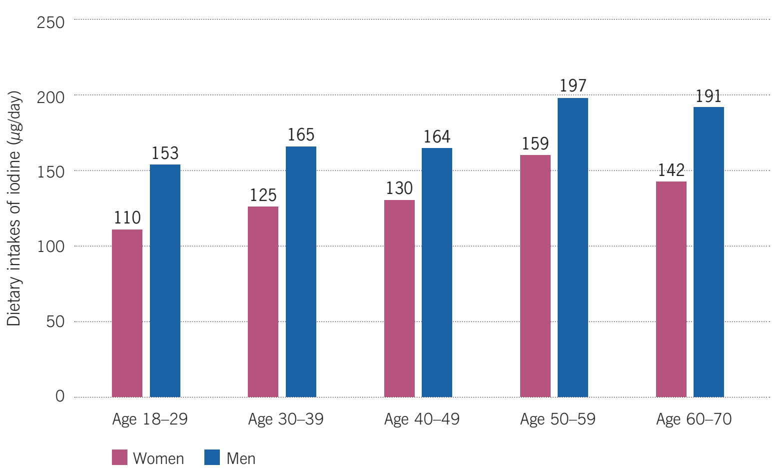
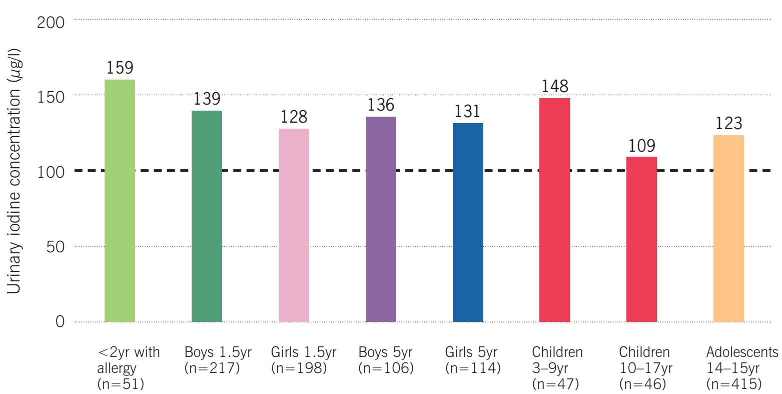


FIGURE 3 **Median urinary iodine concentration in children from five different Norwegian studies (1). Dotted line represents the lowest population median recommended by WHO for children (≥6 y.o.).**



The Norwegian health authorities have recently implemented actions to increase the population iodine intake. They advise to include three daily portions of milk and dairy products, of which at least two portions should be milk or yogurt. Furthermore, iodine supplements of 100 µg/day are recommended for women of childbearing age who have a lower daily intake than 3–5 dL milk/yoghurt (depending on fish intake), and iodine supplementation of 150 µg/day for pregnant and breastfeeding women who have a lower daily intake than 6–8 dL milk/yogurt. In practice, this means that many will need iodine-containing supplements. A benefit-risk assessment of increasing iodine levels in table salt and adding iodine to plant-based alternatives to cow's milk, and using iodized salt in bread products is ongoing.

In conclusion, many groups, in particular women, exclusively breastfed infants and the elderly in Norway have insufficient iodine intakes. Today, only Norway and a few other countries in the world have milk and fish as the main iodine sources in their diet. Because of increasingly diverse food consumption patterns and a reduction in milk and fish intakes, these sources are no longer sufficient to ensure an adequate iodine intake among vulnerable groups of Norwegians, and this is of particular concern in women of childbearing age.

References

1. Henjum S et al. Er inntaket av jod i befolkningen tilstrekkelig? Tidsskr Nor Laegeforen. 2019 Jan 28;139(2) https://tidsskriftet.no/2019/01/oversiktsartikkel/er-inntaket-av-jod-i-befolkningen-tilstrekkelig In Norwegian.
2. Aakre I et al. Sufficient iodine status among Norwegian toddlers 18 months of age - cross-sectional data from the Little in Norway study. Food Nutr Res. 2018 Oct 25;62. https://doi.org/10.29219/fnr.v62.1443
3. Carlsen MH et al. New iodine food composition database and updated calculations of iodine intake among Norwegians. Nutrients 2018; 10: 930 https://doi.org/10.3390/nu10070930
4. Abel MH et al. Suboptimal maternal iodine intake is associated with impaired child neurodevelopment at 3 years of age in the Norwegian Mother and Child Cohort Study. J Nutr 2017; 147: 1314–24. https://doi.org/10.3945/jn.117.250456
5. Abel MH et al. Language delay and poorer school performance in children of mothers with inadequate iodine intake in pregnancy: results from follow-up at 8 years in the Norwegian Mother and Child Cohort Study. Eur J Nutr 2018; 57 https://doi.org/10.1007/s00394-018-1850-7
6. Abel MH et al. Maternal iodine intake and offspring attention deficit/hyperactivity disorder: Results from a large prospective cohort study. Nutrients 2017; 9: 1239 https://doi.org/10.3390/nu9111239

Global Nutrition Report: A strong case for salt iodization

Excerpted from: Garrett GS, Gorstein J, Kupka R and Martinez H. Spotlight 3.2: Large-scale fortification as a means of addressing micronutrient deficiencies. In: Development Initiatives. 2018 Global Nutrition Report: Shining a light to spur action on nutrition. Bristol, UK: Development Initiatives; 2018. Available from: https://globalnutritionreport.org/reports/global-nutrition-report-2018/

According to the 2018 Global Nutrition Report, micronutrient deficiencies impact a significant number of people around the world. Yet, there is far too little information on micronutrient status and deficiencies. More essential information and surveillance need to be gathered to make substantial progress on global targets.

Large-scale food fortification aims to improve nutrient intake by adding essential vitamins and minerals to foods that need to undergo some form of processing to get to market. It has been practiced for almost a century, starting in the 1920s with the voluntary fortification of salt with iodine in Switzerland and the U.S. The UK and Canada were the first countries to legislate for mandatory fortification of wheat flour and salt in 1940 and 1949, respectively. There have been significant advances in this area in recent years: 86 countries now require at least one type of cereal grain to be fortified with iron and/or folic acid (13 introduced legislation between 2014 and 2017), and 29 now have national programs to fortify edible oils with vitamin A (12 mandated legislation in this timeframe).

A systematic review of 41 reports and 76 research papers concluded that, in low and middle-income countries, there is strong evidence of health impact where food fortification achieved both high coverage and compliance (1). The most notable advance has been in the area of salt iodization. Table 1 shows that mean household coverage of iodized salt is 83% in the 52 countries for which there is data. The number of countries with mandatory salt iodization has steadily risen over time and is now 108 (*Figure 1*). Between 2014 and 2017, for example, six countries passed new salt iodization legislation (2). Based on available information on the use of iodized salt, the Iodine Global Network and UNICEF estimate that, globally, over 6 billion people now consume iodized salt (*see Box*).

TABLE 1 Coverage of salt iodization

Coverage/ practice indicator	Number of countries with data	Minimum %	Maximum %	Mean %	Median % for countries with data
Household consumption of any iodized salt	52	18.0	99.8	82.7	90.9

Source: Kothari M, and Huestis A, based on 2016 Global Nutrition Report and UNICEF global databases, 2018.
Notes: Data is compiled using STATcompiler and taken from country Demographic and Health Surveys for 2005–2017.

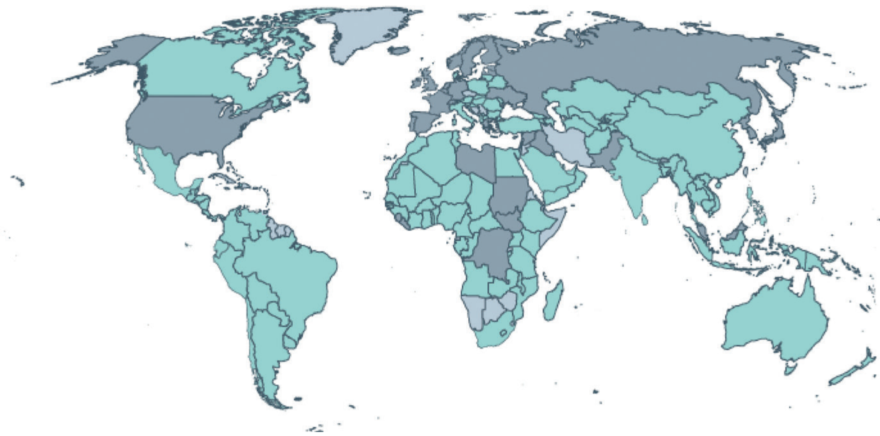
This represents the most significant achievement to date of large-scale food fortification (3).

How many people in the world consume iodized salt?
UNICEF estimates that 86% of the population in low and middle-income countries has access to salt containing iodine. The population in these countries is 6.3 billion x 86% = 5.42 billion people using iodized salt. The Iodine Global Network estimates that the population in industrialized countries is 1.3 billion, and about half of the salt used is iodized, primarily in processed foods and condiments = 650 million people using iodized salt. Thus, the total is 6.1 billion people.

Salt iodization is credited with preventing 750 million cases of goiter over the past 25 years (4). Ethiopia is an example of national progress: in 2005, national coverage of iodized salt was 4.2% (5).

By the end of 2014, 95% of households had access to iodized salt (containing any amount of iodine), and 42.7% of households had access to adequately iodized salt (6). This was a result of a dedicated, multi-level and multi-sector effort involving public-private partnerships that focused on improving supply chains, engaging the private sector, reinstating public commitments to enforce iodization legislation and accessing technical assistance provided by international agencies.

FIGURE 1 **Country legislation for salt iodization**



Defining a successful fortification program

A recent review of national large-scale food fortification programs points towards a number of key lessons for success (7).

- They take into account how many people are malnourished and where they live, as well as what food they eat. Success depends on which food is fortified and how much of it is industrially processed.
- They integrate fortification into broader national nutrition strategies.
- National governments commit the requisite capacity, resources and sustained commitment for effective quality control.
- They carry out periodic reviews to check assumptions about dietary patterns.
- They mandate fortification to address a significant public health need or risk.

Yet a number of barriers keep large-scale food fortification from achieving its full public health impact. First, many countries with a high burden of hidden hunger have not yet started a fortification program. For example, 62 low and middle-income countries do not yet have mandatory wheat, maize or rice fortification programs, yet these meet the general criteria for establishing the intervention. Similarly, an appropriate selection of food vehicles – those regularly consumed by a large proportion of the population, particularly the most vulnerable people – coupled with effective compliance mechanisms will result in substantial increases in the potential impact of a fortification program (7).

Second, the quality and compliance of fortified foods must be strengthened and integrated into routine food control systems. One review of external quality assurance activities of staple food fortification programs from 25 countries found that the percentage of foods meeting national standards averaged between 45 and 50% (8). Similarly, surveys conducted in nine locations in seven low and middle-income countries between 2014 and 2017 found that coverage rates are not strong (7). On average only 35% of wheat flour consumed is fortifiable (industrially processed) in the nine locations and yet only 18.5% of available wheat flour was fortified. Nearly three quarters of people (72%) consume fortifiable edible oil but only 42% of all oil was fortified. For maize flour, 48% of people consume fortifiable maize but only 29% was actually fortified (7).

This low coverage coupled with poor compliance to national standards is arguably the most critical issue facing countries that are already implementing mandatory large-scale food fortification programs, because these will not achieve the intended health outcomes.

Third, most fortification programs have been treated as vertical interventions with limited alignment or harmonization. Although many of the same actors and stakeholders are involved with the fortification of different foods vehicles, the programs have not been linked to identify potential synergies and opportunities for greater efficiency in design, implementation and monitoring.

Lastly, few national program assessments have measured the impact of fortification on biological and functional (e.g. child development) outcomes (8).

References

1. Osendarp SJM. Large-Scale Food fortification and Biofortification in Low- and middle-Income Countries: A Review of Programs, Trends, Challenges, and Evidence Gaps. Food and Nutrition Bulletin 2018, 39(2):175–205.
2. Global Fortification Data Exchange. Providing actionable food fortification data. Available at: www.fortificationdata.org
3. Pearce EN et al. Global iodine nutrition: where do we stand in 2013? Thyroid 2013, 23(5):523–528.
4. Gorstein J et al. Estimating the impact of salt iodization on clinical iodine deficiency over the past 25 years. Submitted for publication, 2018.
5. Chuko T et al. Ethiopia's long road to USI. IDD Newsletter May 2015, Vol 43-2. Available at: www.ign.org/cm_data/IDD_may15_1.pdf
6. IFPRI. Global Nutrition Report 2016. From Promise to Impact: Ending Malnutrition by 2030. Washington, DC: IFPRI; 2016. Available at: www.ifpri.org/publication/global-nutrition-report-2016-promise-impact-ending-malnutrition-2030
7. Aaron GJ et al. Coverage of large-scale food fortification of edible oil, wheat and maize flours varies greatly by vehicle and country but is consistently lower among the most vulnerable: results from coverage surveys in eight countries. J Nutr 2017, 147(5):984S–94S.
8. Luthringer CL et al. Regulatory monitoring of fortified foods: Identifying barriers and good practices. 2015. Available at: www.ghspjournal.org/content/3/3/446

Food fortification could be the next global health success story – if countries close the gaps

Excerpted from a GFDx press release, February 2019.

Global Fortification DATA EXCHANGE

Two-thirds of the world's countries mandate food fortification, yet many of those countries are not translating policy into improved nutrition, according to new data from the Global Fortification Data Exchange (GFDx) – and may be missing an immense opportunity to support healthier children and mothers, bolster communities, and boost national economies.

The GFDx pools and visualizes data for 196 countries. In its latest iteration, released this week, GFDx allows users to track and map population coverage of food fortification, including iodization of household salt, a proxy measure for international progress toward the elimination of iodine deficiency. Despite the overwhelmingly positive reasons to fortify foods, the new GFDx data visualizations reveal notable disparity between policy and implementation.

"Look at the global map for policy and it's nearly solid," says Helena Pachón, Senior Nutrition Scientist at the Food Fortification Initiative, from the GFDx team. "But toggle over to the coverage map – how many people are actually accessing fortified foods – and it looks pretty sparse. Countries are on board with food fortification, but they're struggling to implement it, or at least not collecting the data on program performance."

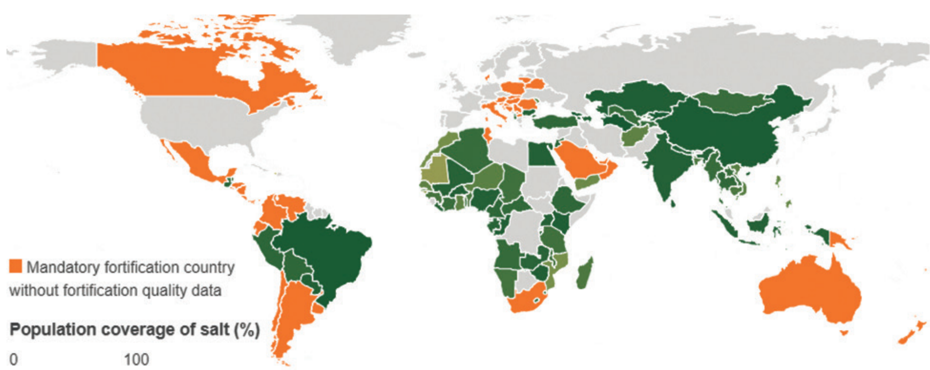
Identifying those information gaps can be the first step toward impacting people affected by hidden hunger.

Patrizia Fracassi, Senior Nutrition Analyst and Strategy Advisor of Scaling Up Nutrition (SUN) Movement describes GFDx as "an immense opportunity for country governments to inform interventions against micronutrient malnutrition. We're relying on GFDx to show us (…) concrete cases (…) to encourage countries to learn from each other."

Fracassi cites the GFDx as a model of SUN's own theory of change: that when multiple stakeholders from multiple sectors and at multiple levels work together, collective action can help end suffering due to malnutrition. "GFDx could be a great model for other areas of nutrition."

About the GFDx

GFDx is led by a nutrition coalition comprised of the ***Food Fortification Initiative, Global Alliance for Improved Nutrition, Iodine Global Network,*** and ***Micronutrient Forum,*** and supported by the ***Bill & Melinda Gates Foundation.***



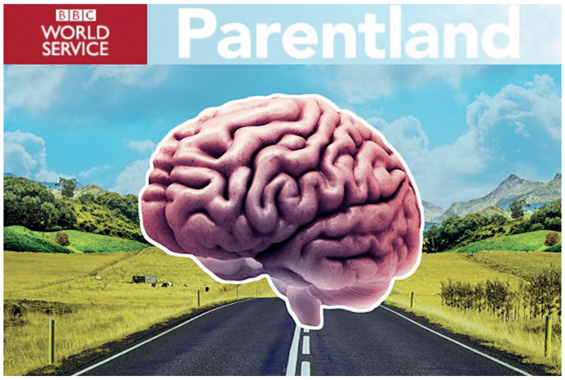
Map displays only the most recent year for which data are available. The use of particular designations of countries or territories does not imply any judgement by GFDx or partner organizations about the legal status of such countries or territories, of their authorities and institutions, or of the delimitation of their boundaries. Global Fortification Data Exchange *(https://fortificationdata.org)*

Introducing global #DataMaps on coverage of fortified foods like salt, as well as maize flour, wheat flour, and oil.

MEETINGS AND ANNOUNCEMENTS

Parentland: a new BBC podcast discusses iodine nutrition

The BBC World Service has launched a new global parenting podcast series. In episode 2 of the podcast, aired on 4 March, Prof. Michael Zimmermann (Swiss Federal Institute of Technology, Zurich and Chair of the Iodine Global Network's Board of Directors) talks about how iodine nutrition affects the brain, IQ, and cognitive ability during the earliest stages of child development. He discusses the evidence for the effectiveness of iodized salt in eliminating iodine deficiency, and advice to parents-to-be on preventing iodine deficiency disorders.



Listen to or download episodes from the BBC World Service website: *https://www.bbc.co.uk/sounds/play/p072bsz7*
or join the conversation on Facebook: *https://www.facebook.com/groups/parentland/*

UK Iodine Group's letter in The Times

THE TIMES

"Sir, We were surprised by the omission of an important and vital nutrient, namely Iodine, in the article on nutritious extras by Wallop ("Extra fibre and more protein — are fortified foods really healthier?" Jan 15). Iodine, essential for the manufacture of thyroid hormone in the thyroid gland, is particularly important for pregnant women: lack of iodine adversely affects foetal brain development and growth during pregnancy.

At least half of all pregnant women in the UK have inadequate iodine nutrition in the first trimester (when it is most vital). The Department of Health and Social Care has recorded that iodine levels in women of childbearing age are insufficient for pregnancy but no attempt has been made to rectify this by adding iodine to salt or bread (as is done in Australia and New Zealand). A campaign to encourage women of childbearing years to supplement their diet with iodine is essential."

Professor John Lazarus,
Cardiff University, chair, UK Iodine Group
Dr Sarah Bath, University of Surrey
Dr Emilie Combet, University of Glasgow
Professor Kate Jolly, University of Birmingham
Janis Hickey, British Thyroid Foundation
Mike Marsh, Kings College Hospital, London
Professor Margaret Rayman,
University of Surrey
Dr Malcolm Prentice, Croydon NHS Trust
Dr Alex Stewart, Public Health England (retired)
Dr Peter Taylor, Cardiff University
Dr Mark Vanderpump, past president,
British Thyroid Association

IGN Management Council Meeting, 13–15 March, New Delhi

The annual meeting of IGN's Regional Coordinators will take place in March in New Delhi, India. The three-day event will be an opportunity to share and summarize regional work and key achievements in the past year, and to prioritize and plan activities in 2019. As countries move toward sustainable elimination of iodine deficiency through salt iodization, IGN's programmatic focus is expanding to include iodized salt in processed foods (guidelines for quality control and program monitoring; collaboration with INCAP, Panama), considerations on double-fortified salt (technical consultation), closer alignment of salt iodization and sodium reduction strategies in public health (collaboration with WHO and the George Institute, Australia), and closer partnerships among different fortification programs (GFDx group collaboration).

In addition, a special symposium will be held on March 13 to celebrate the success story of universal salt iodization in India and South Asia, and to recognize the life's work of Dr. Chandrakant S Pandav and his contribution to the elimination of IDD in India and the South Asia region.

ABSTRACTS

Thyroglobulin is markedly elevated in 6- to 24-month-old infants at both low and high iodine intakes and suggests a narrow optimal iodine intake range

Few data exist on the risk of excessive iodine intake in infants and children aged 6–24 months weaning from breast milk. This multicenter cross-sectional study assessed the association of low and high iodine intakes with thyroglobulin (Tg) and thyroid function in weaning infants. The study recruited weaning infants (n = 1543) from seven countries previously classified as having deficient, sufficient or excessive iodine intakes in schoolchildren or pregnant women. Median UIC ranged from 48 (IQR 31–79) μg/L to 552 (IQR 272–987) μg/L across the study sites. Median Tg using dried blood spot testing was high (>50 μg/L) at estimated habitual iodine intakes <50 μg/day and >230 μg/day. Prevalence of overt thyroid disorders was low (<3%). Yet, subclinical hyperthyroidism was observed in the countries with the lowest iodine intake. The authors concluded that Tg is a sensitive biomarker of iodine intake in 6- to 24-month-old infants and follows a U-shaped relationship with iodine intake, suggesting a relatively narrow optimal intake range. In population monitoring, assessment of iodine status using UIC and Tg may be valuable in this age group.

Farebrother J et al. Thyroid. 2019 Feb;29(2):268-277. doi: 10.1089/thy.2018.0321.

Iodine status, and knowledge about iodine deficiency disorders in adolescent school girls aged 14-19 years, 2016

This cross-sectional study was conducted among 223 female students (14–19 years old) selected through multi-stage cluster sampling from 12 schools in Shahriar, Iran. Iodine and creatinine concentrations were measured in casual urine samples, and iodine content of household salts was assessed. Data on intake of salt and iodine-rich food sources were collected using an FFQ, and knowledge about iodine and IDD were assessed. The median urinary iodine concentration was 129 μg/L. The mean salt iodine concentration was 21.69 (SD=10.56) ppm. About half of the students had poor (25.1%) or fair (24.2%) knowledge about iodine deficiency. Adjusting for confounders, there was no significant association between knowledge about iodine-rich food sources/goitrogens and urinary iodine excretion.

Heidari Z et al. Health Promot Perspect. 2019 Jan 23;9(1):77-84. doi: 10.15171/hpp.2019.10. eCollection 2019.

Poor iodine knowledge, coastal region, and non-iodized salt consumption linked to low urinary iodine excretion in Zhejiang pregnant women

A cross-sectional study investigated 2642 pregnant women during 2016–2017 in Zhejiang province, China. A 3-point Likert scale questionnaire was used to record knowledge. The UIC and iodine content in household salt were measured. The study found that the coastal participants were iodine deficient (median UIC 127.6 μg/L) while the inland participants were iodine sufficient (median UIC 151.0 μg/L). The average knowledge scores were significantly lower among the coastal participants (24.2 points vs. 25 points for the inland participants; p < 0.001). Consumption of iodized salt was significantly lower among the coastal participants (88.9% vs. 96.0%; p < 0.001). A generalized linear model analysis showed that non-iodized salt consumption, coastal region, and low knowledge scores were independently associated with a low UIC. Coastal pregnant women should take iodine supplements based on their consumption of iodized salt, and improvement of iodine-related knowledge.

Wang X et al. Nutrients. 2019 Feb 15;11(2). pii: E413. doi: 10.3390/nu11020413.

Increased incidence rate of hypothyroidism after iodine fortification in Denmark. A 20 year prospective population-based study

Danish authors performed a 20 year (1997–2016) prospective population-based study that identified all new cases of diagnosed overt biochemical hypothyroidism in two Danish adult cohorts: a Western cohort with moderate ID (n=309,434) and an Eastern cohort with mild ID (n=224,535). Iodization of salt was initiated in Denmark in mid-2000 (at a fortification level of 13 ppm). At baseline, standardized incidence rate (SIR) of hypothyroidism was 32.9 and 47.3/100,000/year in the cohort with moderate and mild ID, respectively. The SIR of hypothyroidism increased significantly in both cohorts after implementing mandatory IF, with peak values of 150% in 2014–16 for the moderate ID cohort and 130% in 2004–05 for the mild ID cohort. Significant increases in SIR were seen among the young and middle aged of both cohorts, whereas no changes were seen among the elderly (60+ y). These data suggest the cautious initiation of the salt iodization program in Denmark caused an increase in hypothyroidism incidence among subjects residing in areas of moderate and mild iodine deficiency, but only among the young and middle aged.

Petersen M, et al. J Clin Endocrinol Metab. 2018 Dec 14. [Epub ahead of print]

Women remain at risk of iodine deficiency during pregnancy: the importance of iodine supplementation before conception and throughout gestation

In Australia, pregnant women are advised to take an iodine supplement (I-supp) (150 μg/day). To examine the impact of this recommendation on iodine status, and to identify factors that contribute to adequacy during gestation, supplement use and urinary iodine concentration (UIC) was measured in 255 pregnant women (gestation age 6 to 41 weeks) in Tasmania. The median UIC of 133 μg/L (IQR 82–233) was indicative of iodine deficiency. Women taking an I-supp had a significantly higher MUIC (155 μg/L) (n = 171) compared to the combined MUIC (112.5 μg/L) (n = 84) of those who had never (120 μg/L) (n = 61) or were no longer taking an I-supp (90 μg/L) (n = 23) (p = 0.017). In addition, commencing an I-supp prior to conception led to significantly higher MUIC than starting supplementation after pregnancy confirmation: 196 (98–315) μg/L (n = 45) versus 137.5 (82.5–233.5) μg/L (n = 124), p = 0.032. Timely advice regarding the importance of adequate iodine nutrition, including supplementation is needed to reduce the risk of irreversible in utero neurocognitive damage to the fetus in Tasmanian women.

Hynes KL et al. Nutrients. 2019 Jan 15;11(1). pii: E172. doi: 10.3390/nu11010172.

Serum iodine concentration in pregnant women and its association with urinary iodine concentration and thyroid function

This study aimed to evaluate the association of serum iodine concentration (SIC) with urinary iodine concentration (UIC) and thyroid function in pregnant women, and to provide a SIC reference range in pregnant women in an iodine sufficient area. Pregnant women (n = 1099) were enrolled in Tianjin in 2016–2017 and provided fasting venous blood and spot urine samples. The median UIC was 156 μg/L. The median SIC was 108 μg/L (95% reference interval, 65.6–164.7 μg/L). SIC was positively correlated with UIC (r=0.12, P<0.001), FT3 (r=0.23, P<0.001), and FT4 (r=0.50, P<0.001) and was inversely correlated with TSH (r=-0.14, P<0.001). Pregnant women with a SIC <79.9 μg/L had a higher risk of hypothyroxinemia (OR=2.44, 95% CI: 1.31-4.75). Those having SIC >138.5 μg/L were more likely to have thyrotoxicosis (OR=13.52, 95% CI: 4.21–43.36).

Pan Z et al. Clin Endocrinol (Oxf). 2019 Feb 6. doi: 10.1111/cen.13945. [Epub ahead of print]

Design: www.imholzdesign.ch Print: Spälti Druck AG CH–8750 Glarus

THE IDD NEWSLETTER is published quarterly by the Iodine Global Network and distributed free of charge in bulk by international agencies and by individual mailing. The Newsletter is also distributed to email subscribers and appears on the Iodine Global Network's website (**www.ign.org**). The Newsletter welcomes comments, new information, and relevant articles on all aspects of iodine nutrition, as well as human interest stories on IDD elimination in countries.

For further details about the IDD Newsletter, please contact: Michael B. Zimmermann, M.D., the editor of the Newsletter, at the Human Nutrition Laboratory, Swiss Federal Institute of Technology Zürich, newsletter@ign.org.

The Iodine Global Network gratefully acknowledges the support of **Kiwanis Children's Fund**, Indianapolis, USA, and the Swiss Federal Institute of Technology Zürich for the IDD Newsletter.

Kiwanis CHILDREN'S FUND