Japanese children are iodine sufficient

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IODINE GLOBAL NETWORK is a nongovernmental organization dedicated to sustained optimal iodine nutrition and the elimination of iodine deficiency throughout the world.
Japan is an island country and consists of the main islands of Hokkaido, Honshu, Shikoku, Kyushu, Okinawa, and more than 6800 smaller islands of various sizes. More than 50% of the total population (126.17 million in 2019) is concentrated in the 3 major metropolitan areas: the Kanto, Chukyo (Nagoya city), and Kinki areas (Figure 1).

Japan has been regarded as a long-standing iodine-sufficient country or even an iodine-excessive country without iodine fortification because of the regular intake of iodine-rich food when compared with other countries. The issue of iodine nutrition has not been at the forefront of the public health agenda and an official nationwide iodine survey has been never performed. In addition, there is no national surveillance system to monitor iodine intakes; therefore, recent data regarding the population’s iodine status are lacking. The purpose of this study was, for the first time, to assess the current status of iodine nutrition in Japanese by a nationwide school-based survey.

This work was a part of the research project “National survey of iodine intake and its relation to thyroid disorders in Japan” conducted by the Japan Thyroid Association starting in 2013. The objective of this project is to evaluate the current national iodine status and to provide information on iodine-related thyroid diseases in Japan. From 2014 through 2019, a nationwide school-based survey was conducted across all districts in Japan. Urinary iodine concentration (UIC), creatinine (Cr) concentration, and anthropometry were assessed in healthy school-aged children (SAC) aged 6 to 12 years.

A total of 32,025 children participated. The overall median UIC was 269 μg/L, which was within the World Health Organization’s adequacy range. There was a regional difference in UIC values within 14 regions (Figures 1 and 2), and the lowest and highest median UICs were found in Tanegashima Island (209 μg/L) and Nakashibetsu, Hokkaido (1071 μg/L), respectively. The median UIC ≥ 300 μg/L was observed in 12 of 46 regions. By using estimated 24-hour urinary iodine excretion (UIE), the prevalence of SAC exceeding the upper tolerable limit of iodine for Japanese children was from 5.2% to 13.7%. The UIC values did not change with age, body surface area and body mass index percentile.

Twelve cities or towns with a median UIC ≥ 300 μg/L were distributed mainly in the Hokkaido and Hokuriku regions. The iodine intake of a population is closely related to traditional local food and lifestyle habits. The major source of iodine in Japanese is seaweed (1) served in a large variety of ways under several different names (eg, Kombu [kelp], Hijiki, and Wakame) (Photo 1). Almost all of the Kombu is produced in Hokkaido and transported mainly from the Hakodate area to various parts of Japan through the so-called “Kombu Road” since the 17th century (2). The Hokuriku region has been one of the main kelp accumulation areas and its annual consumption of Kombu is the largest in Japan as of today. In Rishiri and Rebun Island, Hokkaido, Kombu is the main product, and the custom of eating kelp has long been established. However, the reason for the high iodine intake observed in certain other areas of Japan is unknown and further investigation is needed. In addition to SAC, the authors previously conducted surveys between 2005 and 2012 on the iodine status of children ≥ 13 years, adults (3), and pregnant and lactating women (4,5) in the metropolitan areas including Kanagawa and Chiba Prefectures. The median UIC values were 242 μg/L, 213 μg/L, 219 μg/L, and 135 μg/L, respectively. These data, taking into account the results of the present study, suggest adequate iodine intake has been sustained in Japan for at least the past 2 decades.

In conclusion, the iodine intake of Japanese people is generally adequate; however, Japan’s median UIC was ranked higher among the countries with the median UIC level between 200 and 299 μg/L. In addition, there were some regions with high iodine intake ≥ 300 μg/L. The incidence and prevalence of thyroid disorders associated with iodine intake must be obtained especially in the areas where high amounts of iodine are consumed.

The first national iodine survey in Japan shows that iodine nutrition among children is adequate, but some regions show excessive intakes

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Seaweed is a major source of iodine in Japanese diets.
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Impact of the COVID-19 pandemic on the global salt and iodine industries

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Salt production
Salt, in addition to being a basic ingredient for cooking and the food industry, is also a basic raw material to produce pharmaceutical products, cleaning products derived from chlorine, and other industries that increased their demand for products during the COVID-19 pandemic. In 2020, world salt production decreased by 1.06% compared to the previous year. In 2021, production recovered and increased 3.57% (Figure 1).

International trade of salt
From 2018 to 2019, salt exports decreased by 8.44%. In 2020, during the most severe part of the Covid 19 pandemic, salt exports decreased by 3.31% compared to the previous year. In 2021, exports of salt recovered and increased by 13.48% compared to 2020 (Figure 2).

Salt imports from 2018 to 2019 increased slightly by 0.2%, but in 2020 they decreased by 10.47%, mainly due to logistical difficulties in transport and closures due to the COVID-19 pandemic. In 2021, salt imports recovered and increased by 15.87% (Figure 3).

Iodine supply and pricing
The world’s main uses of iodine and its compounds are in X-ray contrast media, pharmaceuticals, liquid crystal displays and iodophors. Other applications of iodine included animal feed, biocides, fluoride derivatives, food supplements and nylon (1). Around 3% of the world’s iodine production is used for human consumption (2). Most of the world’s supply of iodine comes from nitrate mines in the Chilean desert, oil and gas fields in Japan, and iodine-rich brine wells in the United States. Following the COVID-19 pandemic in 2020, the global demand for iodine applications increased in 2021(1). The world’s leading company in the production of iodine,
The measures adopted by the governments and public health authorities to slow down the spread of COVID-19, like social distancing, travel restrictions, closure of economic activities and lockdowns had effects on salt consumption in some countries. Specifically, the confinements caused changes in diet and eating habits in some groups of population. Different surveys were carried out between February and May 2020 in population groups from Belgium, France, Italy, Poland, Spain, UK, USA, which confirmed changes in diet and eating habits during confinement. In these countries, daily consumption of salt increased by eating more snacks, salty foods, canned foods, frozen foods. Even sales of salt increased, as was the case in Italy. There was an increase of the average consumption of salt in France. In Spain, during the most severe period of confinement and due to less demand, the consumption of more perishable foods such as fish and shellfish decreased. However, the purchase of non-perishable prepared meals also decreased. In fact, more fresh vegetables were purchased, probably because people had more time to cook a healthier diet at home.

Selected impacts on the world salt industry

- On March 2020, the health restrictions due to the pandemic affected the salt industry in India. The transportation of solar salt by truck was stopped until mid-April 2020, affecting shipments of approximately 75 thousand tons. India’s largest salt production is in Gujarat and is exported by sea mainly to China.
- Winsford Salt Mine, the UK’s largest rock salt mine in Winsford, Cheshire, was temporarily closed in March 2020, due to mild winter weather and UK government COVID-19 preventative measures.
- In 2020, consumer and industrial salt sales of Compass Minerals decreased 12% due to lower sales of de-icing products due to mild weather in 2019 and lower salt sales volumes primarily due to COVID-19.
- Tata Chemicals in India reported in 2019-2020 that, being a food ingredient, salt did not experience demand challenges, even as COVID-19 affected demand from most sectors. Salt sales volumes were stable throughout the year.
- Tata Chemicals reported that its salt sales volumes were better than those of fiscal 2020-21 amid rising energy costs and price increases in the market. Edible salt had no demand problems in India, even during the pandemic. However, in the UK market, demand for edible and non-edible salt was affected by the decline in the leisure and hospitality sectors.
- In the first half of 2020, the Mexican Association of the Salt Industry conducted a survey among some salt producers in Mexico. There was a 5% decrease in sales of salt in some companies; that is, salt for the food industry and non-edible salt. Some companies increased sales of table salt and non-edible salt. There was an adequate supply of iodine. In 2021, there was an increase in sales of edible salt to national clients, as well as in exports for domestic consumption and food industry.
- Quimpac reported a 6% decrease in the value of domestic salt sales in Peru and a 32% reduction in the value of its salt exports in 2021.

Salt consumption and dietary patterns

Sociedad Química y Minera de Chile (SQM), reported that in 2021 the world demand for iodine had a significant recovery compared to 2020, exceeding the demand levels of 2019. This increase was mainly due to demand for X-ray contrast media, with an increase in demand of between 14% and 15% compared to 2020. This was due to the global increase in spending by the health industry during the year and the greater accessibility of these treatments in emerging economies. They estimate a growth in demand in 2022 close to 1%.

Average iodine prices during 2021 increased each quarter, reaching US$39.00 per kilogram during the fourth quarter of 2021. Sales volumes in 2022 are forecast to be similar to 2021, but average prices could continue to increase. In addition to supply chain disruptions from COVID-19, there were also shortages of potassium iodate. During a recent visit by IGN’s Regional Coordinator for Western and Central Europe to SQM in Chile, he was told that the current global iodine shortage was due to increased demand, likely due to medical needs during the pandemic. An additional factor that exacerbated the demand was production of iodine tablets in Europe to protect against thyroid cancer risk in the event of a nuclear accident.
COVID-19 impacted the world salt industry

Perspectives
It is projected that the production and supply of salt worldwide in the coming years will continue to be stable and without setbacks. However, in the medium term, climate change may alter production cycles of salt by solar evaporation. In addition, in the short term, the increase of energy prices caused by the COVID-19 pandemic and the Russia-Ukraine conflict will continue to impact the costs of production and transportation of salt and iodine in the world.

References
Persistent iodine deficiency in Israel

There appears to be an urgent need for mandatory salt fortification in Israel

The issue of iodine deficiency and the necessity of salt fortification in Israel was first raised in 2004 (1,2). The first Israeli National Iodine Survey was conducted in 2016 in children and pregnant women. Median urine iodine concentrations (UIC)s of school-aged children and pregnant women indicated that these populations were iodine-deficient (3). Additional studies in recent years in Israel showed low iodine intake and low prevalence of iodized salt intake in pregnant women (4). Previous research has shown that while Israeli milk and dairy products are iodine rich, consumption patterns of milk, dairy, as well as dairy-based foods, among Israeli adults do not ensure adequate iodine intake (5).

In early 2017, the MOH published recommendations for the general public encouraging voluntary use of iodized salt (6), advanced a social media campaign, and disseminated guidelines for prenatal iodine supplement use to Ministry of Health committees and professional associations. The Israeli standard on food grade salt was updated establishing requirements for voluntary fortified salt (30 ppm iodine) and is pending final approval.

Industry has also taken steps to produce cheaper iodized salt products (1 kg version) and more recently a cardboard box version; however, these are still between 2–3 times more expensive than the government price-controlled standard non-iodized salt. Recently, the Ministry of Health proposed a mandatory requirement for food fortification, including iodized salt, as part of an effort to increase public health resilience (7). Even if salt intake is reduced in the general population including children, according to current Ministry of Health recommendations (8), mandatory salt iodization would be sufficient to improve population iodine status.

The National Biomonitoring Program in Israel, established in 2020, aims to provide data on exposure of the general population to environmental chemicals and on nutritional status. In the program, spot urine samples and questionnaire data were collected from 166 healthy children aged 4–12 years in 2020–2021. The questionnaire included detailed questions on drinking water source (bottled, unfiltered tap, filtered tap), diet, consumption of iodized salt, exposure to environmental contaminants and socioeconomic status.
In the study, 86 boys and 80 girls from over 20 cities and small communities were recruited; 44 (26.5%) of the children lived in rural areas and 122 lived in urban areas. The response rate in children was lower than planned due to the COVID-19 pandemic, mostly among Arabs. Therefore, only 14% of the participants (23 children) were Arab children, and not 20% (the Arab proportion in the Israeli population), as planned.

The overall median (interquartile range [IQR]) UIC was 80.1 μg/L (44.7–130.8 μg/L) indicating that the population’s iodine status has not improved in the five years that have passed since inadequacy was first identified. There were no statistically significant differences in median UIC in children consuming non-filtered tap, filtered or bottled drinking water or in children consuming iodized salt. Only 14 of 166 (5.3%) children consumed iodized salt. In children with medium or high frequency milk consumption (at least one milk serving on a daily basis), median UIC levels were higher than those with low frequency consumption.

Studies have also raised concerns regarding the potential impact of desalinated water on thyroid health in Israel and elsewhere (9). Israel’s water supply contains over 50% desalinated water, with some areas reaching over 80%. Of note, the process of desalination not only removes salts from seawater, but also several essential minerals, most notably, calcium, magnesium, fluoride and iodine. The authors also performed an international comparison of mUIC taking into consideration the levels of desalinated water per capita, and fortification policies. When comparing 13 countries with population size above 150,000, whose desalinated water per capita was at least 1 m³, Israel and Lebanon were the only countries with median UIC below the WHO adequacy range. Additionally, there appeared to be low positive correlation between the amount of desalinated water per capita in each country and their median UIC levels (r² = 0.132).

The current study demonstrates that policy implemented in recent years by the Ministry of Health has not led to measurable improvement in the iodine status in SAC in Israel. These results demonstrate the urgent need for mandatory table salt fortification in Israel and the clear need for increased public awareness on the importance of consuming iodized salt.

References
Progress against IDD in West and Central Africa: Part 2

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The May 2022 IDD Newsletter focused on the progress of the prevention of iodine deficiency in West and Central Africa. This regional review highlighted the tremendous efforts that the region has made.

However, after 30 years of programming, the interest in USI has waned, resulting in stagnation in the proportion of households with access to iodized salt. The reliance on large and costly surveys has resulted in a lack of updated, disaggregated and actionable data on iodine status. This has hampered effective monitoring of USI programs in the region, particularly as more and more iodine stems from sources other than household salt, namely processed foods.

The May IDD Newsletter showcased examples from Togo and Chad in which optimal iodine status is possible; however, sustaining high coverage of iodized salt remains challenging. Both salt-importing countries are at the “mercy” of salt-producing countries. However, as seen in the trade analysis in the same edition, the salt-producing countries depend on the demand for iodized salt from importing countries such as Togo and Chad.

Senegal remains the largest producer of salt in the region, followed by Ghana. However, with its large deposit of easily accessible rock salt, Mauritania is fast increasing its share in the trade of salt in the region and may become an important player in the availability of iodized salt. Meanwhile, Nigeria, the largest importer of salt in the region, continues to import non-iodized salt (refined and iodised in-country) from outside the region.

There is a risk that the gains achieved to date may be reversed if a conscious effort on USI is not made considering the changes in the current situation and learnings from past experiences. There is a need to adopt a more food systems approach to USI programming. An approach which looks along the supply chain and across borders. An approach that addresses today’s gaps and can adjust to tomorrow’s challenges through strengthening national positioning, improved programme management, assuring a stable supply and demand for adequately iodized salt, and focusing on regional networks and stronger regional guidance and coordination.

In this edition of the IDD Newsletter, we return to West and Central Africa to look at how WFP reaches the most vulnerable with iodised salt, the difficulties faced by the small-scale producers in Ghana, the success and remaining challenges in Benin and finally, a plea from Mali for better regional coordination of salt iodization programs in the region.
USI in Benin: successes and challenges

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Background of the salt iodization program in Benin
In 1994 a study showed a median urinary iodine concentration of 40 μg/L in women of childbearing age in Benin, reflecting moderate iodine deficiency at the national level and paving the way for the country’s universal salt iodization (USI) programming (1). This resulted in household coverage of iodized salt increasing from 86% in 2001 to 90% in 2018. This benefited the iodine status of population. The median urinary concentration among school children as revealed in two studies was 408 μg/L in 2000/2001 and 318 μg/L in 2011, showing a population status above the normal range (2).

The factors behind Benin’s USI program success
The factors for success of the program lay in the strong ownership by the Government which has ensured legislation, communication, and coordination. Benin made the production, import and marketing of iodized salt in the country mandatory for human and animal consumption in 1994. Based on the recommendations of a West African consultation workshop on USI held in 2004, regulation of iodized salt content was strengthened in 2009. It was updated again in 2013 to harmonize standards with other West African Economic and Monetary Union member states (3). USI has been well integrated in the different policies on health, nutrition and agriculture. Moreover, Benin adopted an integrated communication plan in 1995, targeting salt importers, local producers, as well as consumers on the importance and benefits of iodized salt. The “National Day of Mobilization for the fight against IDD” has been celebrated every October 27 since 1995. The celebrations draw attention to the harmful effects of iodine deficiency and its negative impacts on child growth and the socio-economic development of the country, through radio and television broadcasts on the national channel and community radios.

The Benin Food Fortification Commission is responsible for the intersectoral coordination of the fight against IDD. It is responsible for the official control activities of the fortification program, including the USI program, and reports on program activities from the communal to the national level. If provision of testing and iodization equipment has in the past been funded by UNICEF, it has now been taken over by the Government. Surveillance activities at borders have largely been supported by the Government. However, the porosity of borders proves challenging in preventing noniodized salt from entering the country.

Challenges remain
In 2020, Benin officially imported 72 thousand tons of salt; 38 thousand tons from Ghana and 30 thousand tons from Senegal. While the majority of household salt is imported, local production accounts for an estimated 14% of consumption (4). Traditionally, local producers are situated on the narrow coastal line in the South of the country, in Ouidah, Abomey-Calavi, Kpomassé, Comè and Grand-Popo. Most of this salt is not iodized, despite efforts in this direction (installation of fixed and mobile iodization units, training, and awareness) (5). This mitigated success is due to lack of collaboration between producers and iodization units, as well as the relatively high cost of locally produced salt, as its production process is tedious. In this context, iodization is seen as a waste of time and as adding further production constraints.
In Sémé Podji a new technique for salt collection is currently being used by a group of women, which is less restrictive and more environmentally friendly (see Photo). The production takes place in the dry season, with a capacity of 800 to 1300 KG/year. The women’s group is open and willing to iodize their salt to comply with regulations, opening a new chapter in local salt production. Arrangements are underway to train them, provide them with a mobile iodization unit and strengthen their production capacity. The promising technology is being disseminated in the sub region, with people from the Ivory Coast having been trained.

On top of locally-produced noniodized salt, other challenges pertain to the lack of resources and data. Further resources would be needed to ensure continuous sensitization of consumers, coordination, to carry out national surveys that include all parameters, and other functions of the USI program. A reliable data collection system is needed that includes the quantities of locally produced salt, the exact amount of iodized salt imported into the country, and the different uses of iodized salt, and monitoring of households. Lastly, further studies are needed to better understand the excess in iodine intake seen in the 2000 and 2011 surveys.

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USI and small-scale salt producers in Ghana

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Background
Ghana first instituted a national salt iodization program in 1996 through Food and Drugs Act 523 (Amendment) which provided a framework for the fortification of salt to reduce IDD. IDDs were found in one out of every three Ghanaians, with Upper East and Upper West severely affected, during a national survey in 1994. In 2011, though the situation had improved, about half a million children were found to be at risk of permanent brain damage that are linked to IDDs during a follow up survey. This has significant consequences for Ghana and emphasizes the urgency with which authorities must ensure adequate intake of iodine among the population (1).

Further to the Food and Drugs Act 523, the Public Health Act (2012) which mandates fortification of salt with KIO3 (to achieve a minimum of 25ppm iodine at the retail level and 15ppm at the household level) for both human and animal consumption has also been enacted. There have also been three policy frameworks (USI I (2005 – 2007), USI II (2009 – 2011), and USI III (2016 – 2020)) that sought to achieve Universal Salt Iodization (USI) and improve quality of iodization among other objectives (2). Just last year, in 2021, the Government of Ghana developed a 2-year action plan to accelerate efforts in USI.

What have the interventions achieved?
Following these interventions previewed above, there has been steady increase in the use of salt with iodine. From 27.1 per cent of households in 1998, the percentage of households that reported using salt with some level of iodine increased to 55.0 per cent in 2006 and reached 100 per cent in 2011 (1). However, for many samples from which these statistics were obtained the iodine level of the salt was low. This progress has been possible due in part to a boost in financial and technical support to the pursuit of USI that has included provision of free iodine to salt producers (especially small-scale producers who are difficult to track and monitor by authorities) following the implementation of USI II.

In 2009-10, the Ghana Health Service (GHS) conducted a national survey using a quantitative salt iodine assessment framework and revealed that about 47.8 per cent of households used adequately iodized salt which means the level of iodine for the remainder was inadequate whiles 16.5 per cent of households were using salt with no added iodine at all (1). About five years later (in 2015), the GHS conducted another national survey and reported that households using adequately iodized salt had surprisingly declined by more than a third (from 47.8 per cent to 29.3 per cent). However, the survey found substantial improvement in iodine status with the national median UIC among non-pregnant WIFA reaching 201.6 μg/L and lying favorably within the range for optimal intake among school-age children of 100 and 299 μg/L.

Persistent Challenges with USI
Despite apparent progress highlighted above, recent studies have raised concerns about low iodine levels of both imported and locally produced salt raising concerns for the achievement of USI in the absence of publicly funded salt iodization program. A study that sought to investigate the presence and concentration levels of iodine in supposedly iodized salt being sold in various shops and markets in Accra, the capital city, showed that only two out of 11 most patronized brands of salt came close to the Ghana Standards Authority’s specification of 100ppm at production and 50ppm at retail (3).

The above study further revealed that raw-pellet salt (crystalized directly from sea water), popular in northern parts of the country and rural communities due largely to its affordability, did not show any traces of iodine in it contrary to long-held notions that the salt naturally contains some level of iodine. This raises serious concern about the feasibility of achieving USI especially in northern parts of the country and rural settlements where poverty rates are relatively higher and raw-pellet salt remains popular.

Another recent study conducted at Wa East District in the Upper West
Region also found that about 53.8 per cent of salts in retail shops had iodine levels below 15ppm (which is less than a third of Ghana Standards Authority’s recommendation of 25ppm at retail) (4). The study also found that 12.2 per cent of salt did not have any iodine at all. Similar findings have been made in the Volta region where only 30.9 per cent and 24.5 per cent of salt in retail shops and households, respectively, had adequate iodine (>15ppm) (5).

**Availability, access and cost of iodine remains a concern**

Interactions with state officials at the Ministry of Trade and Industry which has a salt desk that has been involved in salt iodization programs as well as some salt producers reveal that availability, access and cost of iodine has been a challenge following the phasing out of the free iodine program for salt producers. The situation has become worse over the past two years following the global covid-19 pandemic which has had substantial negative impact on global supply chains. Another issue that was raised is that prior to the pandemic, sluggish demand for iodine meant that some of the importers of iodine diversified from importation of iodine to deal in other products. Some salt producers raised concern about high cost of iodine. One of the producers indicated that even though iodine meant for salt fortification was supposed to be exempted from import duties and related taxes, his checks with some of the importers show that a small error in the law effectively disallows the item from enjoying the exemptions.

**Imported salt also a concern**

Availability, access and cost of iodine for local salt producers are only part of the problem. The level of iodine in some imported salt does not meet the required level (3), making imported salt a concern for the pursuit of USI and requiring enhanced vigilance. Over the past two decades, there has been steady increase in imported salt for human consumption that has been competing with local salt. Thus, apart from the fact that some imported salt does not meet required level of iodine, it also displaces some of the locally produced salt in the markets and put downward pressure on prices. This has consequences for local producers as some producers at Elmina, Apam and Nyanyano (all in the Central Region) complained about their consistent inability in recent times to sell stocks produced.

The implications for low revenues and related tendencies among local producers to cut costs for iodization and other safety measures are obvious. A former manager at the Ada Songor Salt Project (one of the large-scale salt producing entities), in an interview, noted that the competition with imported salt and associated low sales has led to several months of wages-in-arrears. This phenomenon has consequences for iodization even for large-scale salt producers.

**Increasing mining-induced violent resistance**

The continuing displacement and dispossession of artisanal and small-scale salt producers has been resisted, sometimes violently and leading to destruction of properties, injuries to persons on both sides of the conflict and sadly some deaths. Between 2013 and 2017, there were series of violent protests and clashes at Adina and adjoining communities at the eastern banks of Keta lagoon that led to deaths and destruction of properties that belonged to the company including heavy duty equipment (7). Throughout 2021, there have been series of clashes between indigenes and communities at the banks of the Songor lagoon on the one side and security personnel of Electrochem Ghana Limited (often with support of state security apparatus) on the other side. In both cases, the mining-induced violent resistance by the indigenous producers and communities have led to some fatalities. During these conflicts and resistance, artisanal and small-scale miners face an uphill task of planning production and making necessary arrangements to ensure that the salt they produce is adequately iodized.
Access to and cost of capital and loans for small-scale salt producers worsens

In general, access to capital and loans by the informal economy (which include most small-scale salt producers) is difficult and the cost of capital and loans (when accessed) very prohibitive. Some two decades ago during the Presidential Special Initiative on Salt (PSI-Salt), the Government of Ghana facilitated some loans (in-kind, giving out as cement to rehabilitate salt pans) for artisanal and small-scale salt producers. The recovery rate, influenced in part by the approach to granting such loans, was rather discouraging and the Bureau of National Investigations along with some national security personnel had to be involved to recover such loans. Grants to such producers are almost unheard of. Since the PSI-Salt era, there has not been any effort by the government to ease access to and cost of capital and loans for artisanal and small-scale salt producers. The situation is worsened by growing insecurity regarding access and tenure of land for artisanal and small-scale salt producers as well as general insecurity in salt producing communities and sites.

Concluding remarks

The specter of IDDs is a key health risk facing Ghana and many developing countries around the world. Though efforts over the past few decades have contributed to the reduction of the risk, there continues to be concerns for the attainment of USI. While a more robust vigilance regime is urgently needed to ensure that supposedly iodized salt on the markets (both local and imported) meet the standard, of equal importance is the design of salt specific policy (which does not exist now) to offer protection (especially regarding land access and tenure) and other support services (finance and technology) to artisanal and small-scale salt producers.

References

Better regional coordination for salt iodization Mali

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The context in Mali

Mali adopted universal salt iodization in 1995. As a result, household coverage of iodized salt improved, evolving from 9% in 1996 to 95% in 2013 (1) (2). Unfortunately, this achievement has not been sustainable, and availability of iodized salt at household level has been decreasing since 2018, falling to 65% in 2019 (3). This reduction in access to iodised salt as the only data on iodine status is from 2005, and found a median urine concentration in school aged children (6-12 years) of 69.9 µg/L, indicating already an inadequate iodine status (4).

A first decree regarding salt iodization was adopted in 1999, followed by several updates, the latest of which dates back to 2019 and ensures harmonization with the Economic Community of West African States (ECOWAS) standards (5). Imported salt must be iodized, except by special dispensation. Compliance with regional conventions is expected to promote and facilitate both border controls (as the standards are the same) and advocacy at the regional level. However, not all stakeholders are aware of the updated version.

Challenges in quality of salt

Despite regulatory progress, Mali’s USI program is not fully functional, especially in surveillance, monitoring and control. While Mali produces some salt, the great majority of salt is imported, mainly from Senegal, specifically the Kao lac region (around 82,000 tons per year) (6) (7). This salt, imported from Senegal under the ECOWAS agreements, is subject only to value-added tax, i.e., 18%. In addition a smaller, but growing amount of rock salt is imported from Mauritania which is neither controlled or processed (approximately 1200–720 tons per year, however this is likely to be more due to lack of data and illegal entry of salt) (7). Malian salt importers buy the salt through local intermediaries in Senegal. The merchandise is then handed to transporters who will deliver the salt in Mali. Not all importers have the necessary license and not all salt is officially imported, with some smaller quantities of salt illegally entering the country alongside other goods (see text box). In 2013 a salt quality control guide was developed, that provides clear instructions for controlling local salt at the production level and procedures for controlling imported salt at the border, in markets, and in warehouses.

The Senegal-Mali supply chain

The procurement

The import system from Senegal is made up of several actors who each influence the import dynamics at their level. These include the importer, the transporter, the customs declaring agent and the Senegal-based purchasing agent.

The importer is the one who initiates the import order for salt from Senegal. The particularity of the Malian importers is that they do not physically go to Senegal but operate with a Senegalese contact, known as an intermediary, who buys the salt at the production sites. Once the order is placed, the contact buys the salt in Senegal according to availability in the production basins. The salt should be iodised by producers on demand and based on the orders received.

In Senegal, these intermediaries buy salt from several producers according to the volume ordered. They never connect importers and producers and negotiate the lowest possible purchase price (8). The Malian importer therefore has no direct control over the quality of salt procured.

The transport

The role of the transporter is to transport the salt from the production site, by road and deliver it to the importer. He is not responsible for the customs clearance procedures. Once at the border, he reports his passage to the importer, who refers him to his declaring agent, who facilitates the customs clearance procedures.

The customs clearance

The carrier then gives him all the documentation transmitted by the import contact (invoice, phytosanitary certificate). No quantitative or qualitative testing of iodine in the salt is conducted.

Once through customs, the salt enters Mali and is delivered to importers according to their region of residence.
While there is a quality check at borders, the inspection certificate is issued only based on documentary control and the mention of iodized salt on the salt bags. Imported salt is sometimes packaged in bags falsely labelled "iodized salt".

As most salt from Senegal transits through only a few border checks in the region of Kayes in Mali, it should be easy to undertake a physical-chemical control of the salt, but this is not the case, due to the lack of equipment and qualified human resources. The Ministry of Health, with financial support from UNICEF, provided the Diboli station with a WYD spectrophotometer but the equipment remains non-functional due to the unavailability of additional equipment such as reagents.

The situation with Mauritanian salt is more complicated as the shared border is over 2000 KM long, opening possibilities of a parallel market in non-iodized salt. Once the salt has entered the Malian territory it is dispatched to regional capitals and Bamako, retailers often stock the salt on the floor, exposing it to humidity and depleting the iodine that can be contained. Supply in the Northern regions is challenging, hampered by the ongoing conflict and these regions rely on salt from Mauritania which is often not iodized.

Improving quality of salt within ECOWAS

The availability of iodized salt in Mali is highly dependent on the production of quality iodized salt in Senegal. Based on the data on the household coverage of iodized salt between 2005 and 2018, it can be assumed that the quality of imported Senegalese salt improved over the years, but the situation changed after this. Indeed, Malian importers report increased difficulties in obtaining enough salt from the Sine Saloum salt company in Senegal in the past three years, due to competing demand. This has resulted in a shift to salt import from the Mansour Niari and Saloum factories in Senegal, which have a higher moisture content, impeding salt quality and a lower iodine content. This could explain, at least in part, the decline in household coverage of iodized salt over the same period. To conclude, while household coverage was high in Mali, it did not translate into a sufficient iodine status of the population. It is important to have more up to date data, that disaggregates iodine status by household access to iodized salt.

Great strides need to be undertaken on the monitoring of salt but also to ensure high quality of imported salt. As Malian imports account for up to 25% of Senegalese salt export (8), advocacy, undertaken with other importing countries such as Ivory Coast, could help tackle the issue of compliance with ECOWAS requirements. Salt importers also need to be aware of the importance of salt iodization to protect the population from iodine deficiency disorders and of the penalties they could face if they do not respect the new legislations.

References

WFP provides local iodized salt in West and Central Africa

Clemence Maurin, Regional Fortification Manager, and Katrien Ghoos, Senior Regional Nutrition Advisor, World Food Program, Dakar Regional Bureau, Senegal

Reaching the most vulnerable

West and Central Africa (WCA) region has some of the poorest countries in the world and in the latest 2020 Human Development Index (HDI) Ranking six of the countries with the lowest HDI values were from the WCA region. Several factors threaten the health and nutritional status of children under five in West and Central Africa (1). Furthermore, the situation is worsening, as the number of women, men and children affected by a lack of adequate food and nutrition has quadrupled in just three years from 10.7 million in 2019 to 41 million in 2022 (2), due to persistent insecurity that continues to trigger massive population displacement, the impact of the climate crisis, disrupted food systems, limited food production, barriers to regional trade and the socioeconomic fallout from the pandemic which has devastated national economies as well as the increase in cost of agricultural products due to the ongoing conflict in Ukraine. This precarious situation has resulted in 7.2 million internally displaced persons (IDPs) and 1.5 million refugees and asylum-seekers, in addition to returnees and stateless persons, affecting a total of 11.9 million people in the WCA region, an increase of 1 million in 2021, mainly due to 800,000 new IDPs in the region (3).

The World Food Programme (WFP) with its mandate of saving lives and changing lives through the delivery of food assistance in emergencies and working with communities to improve nutrition and build resilience, works with the most vulnerable population in 19 countries in West and Central Africa (4). The provision of iodized salt is an integral part of its programs which include food assistance (unconditional and conditional), school meals and provision of specialized nutritious food for the treatment or prevention of malnutrition to refugees, IDPs, host population (5). In 2021, WFP distributed approximately 2,776 MT of iodized salt in 14 countries in West and Central Africa (based on Food Purchased Orders - WFP Internal Tools), reaching up to 14.7 million vulnerable people, targeting mainly women, infants school-age children and people living with HIV/AIDS and tuberculosis and thus protecting their iodine status on a regular basis (5).

Supporting local procurement of iodized salt

Over the years, WFP has steadily increased the share of food procurement that it carries out locally. Thus in 2021, almost 100% of the salt distributed in the region was procured from within the WCA region, the majority of which was procured from Nigeria (42%), followed by Senegal (35%) and Cameroon (20%). Interestingly, despite being the second largest producer of salt in the region, WFP has not procured salt from Ghana between 2015-2021. Senegal is a major salt producing country, Nigeria and Cameroon are salt refiners, i.e., they import raw salt and refine and iodized the salt for export/use in country. Both Nigeria and Cameroon procure their salt from outside of the region. The main recipient countries of iodized salt in ascending order were Nigeria (42%), followed by Benin (21%), Cameroon (16%) and Burkina Faso (11%) (Figure 1).
This local and regional level procurement not only injects cash into local economies (6) it stimulates the supply of quality iodized salt thereby increasing the availability of iodized salt in the salt producing/processing countries. In addition, WFP is aiming to increase pro-smallholder procurement, thereby strengthening smallholders’ livelihoods and the sustainability of the iodized salt supply chain through activities that support value chain actors such as salt producers, salt cooperatives and refiners (6). Armed with the WFP “Technical Specifications for iodized salt” (7), the procurement team from WFP, visits salt producers and refiners and provide technical guidance (and if needed financial support), on the sustainable production of quality iodized salt. Regular testing of the salt enables WFP to ensure that the salt continues to meet the required specification and step in with tailored support if needed.

**Driving local level demand for iodized salt**

Where markets are functional, WFP is moving towards more cash-based transfer programming. Cash transfers include assistance distributed as physical bank notes, e-money, mobile money, through debit cards or value vouchers which are redeemable at locally-contracted shops (8). Coupled with strong social and behaviour change communication, cash-based transfers empower people with choice to address their essential needs in local markets, while also helping to boost these markets. As part of this programming, WFP ensures that the locally contracted shops where the cash transfers are redeemable are well stocked in iodized salt and provides ongoing sensitization on the importance of using iodized salt. This approach will help to drive the local demand for quality iodized salt further reinforcing the supply chain of iodized salt. However, in many countries in WCA region, the iodized salt labelling is fraudulently used on salt packaging that is not iodized. This may lead to the beneficiaries no longer receiving iodized salt and a reduction in the protection against iodine deficiencies. Stronger government monitoring of iodized salt at the retail/wholesalers point may be necessary to ensure that the salt is indeed iodized. Thus, ensuring that the vulnerable population continue to be protected against iodine deficiency.

**References**

6. WFP. Local and regional food procurement policy. 2019.
In Memoriam: Minoru Irie, 1928-2022

Dr. Minoru Irie, Emeritus Professor at Toho University, and Honorary Advisor, Foundation for Growth Science, Tokyo, Japan passed away peacefully at the age of 94 years on June 13, 2022.

Dr. Irie was born in Tokyo, Japan, attended The University of Tokyo and graduated from its Faculty of Medicine in 1952.

He obtained an MD in 1953 and a PhD in 1958. After three years of Fulbright Scholarship as a clinical fellow at the Lahey Clinic and a research fellow in the New England Medical Center, Boston VA Hospital, Massachusetts General Hospital and Walter Reed Army Medical Center, he returned to the University of Tokyo in 1962. He became Director as well as Chairman of Internal Medicine, Sakura Hospital, Toho University School of Medicine in 1991 and retired from Toho University in 1993. Dr. Irie had research interests on basic and clinical studies of every aspect of thyroid function. He and his co-workers developed a TSH assay using dried blood spots in 1975 for the first time and established the superiority of TSH to T4 as the indicator of hypothyroidism in the neonate which is now generally accepted throughout the world. Under his leadership, systematic screening for congenital hypothyroidism was initiated in Japan from 1979.

One of his most vital and indeed most important contributions to public health science was international support for the prevention of iodine deficiency disorders. He was the only person from Japan who attended the 1986 inaugural meeting of ICCIDD in Kathmandu, Nepal. Since then, as the National Coordinator of ICCIDD and then IGN in Japan, he worked with many distinguished investigators in the world including Drs. Basil S Hetzel, John T Dunn, John B Stanbury, Lewis E Bravermann, François Delange, and Creswell J Eastman. Japan is the second largest producer of iodine, making up around 30% of the global production. In 2013 the Foundation for Growth Science and the Japan Iodine Industries Association in Chiba Prefecture

Salt Processing and Business Solutions

Adequately iodized salt is a global health challenge. But when it comes to work with micro and small-scale artisans producers, it takes quite a batch of skills to implement sustainable solutions. Therefore, in 2019, a group of complementary experts established the Salt Processing Business Solutions network (SPBS). SPBS is a group of consultants with the needed experience to handle complex projects. All members of SPBS have numerous years of experience in salt production technology, salt iodization, food fortification, ingredients procurement, supply chain, business development, finance, and professionalization of producer’s organizations, including cooperatives. To further expand their expertise into salt engineering, SPBS established a close collaboration with Shriraam Engineering India, having a vast experience in the supply of salt equipment. Other suppliers in the loop include Davey in South Africa and the standard Nimble 6 ton/hour machine, heavy duty and affordable, which remains an unbeatable piece of engineering in the iodized salt market, and REDYRON, in France, providing tailored sourcing services for ingredients used in salt production and food fortification.

SPBS is designed to work both for the private sector and the development community as the following projects show:

- **Angola.** An investment group in Angola foresaw the construction of a 20,000 ton/year salt farm in the southern Angola. The group is well established in Angola, active in the food industry and wholesale business, they import salt and have a vision of eventually setting up a salt refinery once the salt farm has been well established.

- **Dominican Republic.** Approached by a private company, SPBS supported the complete engineering and financial forecast for a 50,000 ton/year salt farm and 10 ton/hour salt refinery, a forecasted investment of over one million dollars. The project is designed around increasing higher quality raw salt and iodized salt production.

- **Madagascar.** Sponsored by UNICEF, SPBS conducted two field missions in 2017 and 2018, to set up the salt cooperative COSIM and advise UNICEF and the strategy to implement sustainable iodization mechanisms (Photos 1 and 2). In 2021, SPBS improved the salt quality of small producers in COSIM, strengthened the internal procedures and operations of iodized salt production and upgraded the accounting system to better monitor COSIM’s activities. Most importantly, to improve COSIM’s operational margin, SPBS defined a new marketing strategy based on small sachets of 100 and 500gr of iodized fine salt to be directly distributed to wholesalers.

For more information, see: www.salt-pbs.com and www.saltmachinery.com
Abstracts

Universal salt iodization potentially contributes to health equity: socio-economic status of children does not affect iodine status

Many studies have shown that socio-economic status (SES) contributes to health inequalities, with nutrition as one of the major risk factors. This study aimed to determine the influence of SES on iodine status and iodine availability from household salt in North Macedonia. Using cluster sampling, 1,200 children were recruited. Iodine status was assessed through urinary iodine concentration (UIC), and iodine availability through iodine content in household salt requested from participants. SES was assessed using standardized Family Affluence Score (FAS). No statistically significant correlation was found between FAS and iodine in salt. No statistically significant differences in UIC were found between children with high and low affluence ($\beta=-12.5; 95\% CI=[-35.5, 10.5]; p=0.287$). The authors concluded that universal salt iodization (USI) is a cost-effective measure for appropriate iodine intake in healthy children and adults, irrespective of their social status. Thus, USI contributes to reducing health inequalities related to iodine status among population of different social strata. Miličevska-Kostova N, et al. J Pediatr Endocrinol Metab. 2022 Aug 18. → https://doi.org/10.1515/jpm-2022-0166

Iodine in Foods and Dietary Supplements: A Collaborative Database Developed by NIH, FDA and USDA

Data on the iodine content of foods and dietary supplements are needed to develop general population intake estimates and identify major contributors to intake. Samples of seafood, dairy products, eggs, baked products, salts, tap water, other foods and beverages, and dietary supplements were collected. Samples were assayed for iodine content. The food data were released as the USDA, FDA, and ODS-NIH Database for the Iodine Content of Common Foods at www.ars.usda.gov/mafcl. Iodine data for dietary supplements are available in the ODS-USDA Dietary Supplement Ingredient Database and the ODS Dietary Supplement Label Database. Data from the iodine databases linked to national dietary survey data can provide needed information to monitor iodine status and develop dietary guidance for the general U.S. population and vulnerable subgroups. This iodine information is critical for dietary guidance development, especially for those at risk for iodine deficiency (i.e., women of reproductive age and young children). Pehrsson P et al. J Food Compost Anal. 2022 Jun;109: 104369. → https://doi.org/10.1016/j.jfca.2021.104369 Epub 2022 Jan 7.

Half of expectant women in Montenegro show iodine deficiency, indicating that supplementation during pregnancy is necessary

In this study, iodine level in pregnant women of Montenegro and their needs for supplementation were investigated. The urinary iodine concentration (UIC) study of 326 pregnant women between September and December 2017 in three regions of Montenegro was performed. UIC was related to creatinine (UIC/Cr ratio). The median UIC (133 ± 5 μg/L) was indicative of iodine deficiency. Iodine deficiency is present in pregnant women in Montenegro. Monitoring the UIC during routine analyses in pregnant women in Montenegro is recommended, along with iodine supplementation for those who need it. Đurović D et al. Int J Gynaecol Obstet. 2022 Jul 28. → https://doi.org/10.1002/ijgo.14370 Online ahead of print.

Improving Iodine Status in Lactating Women: What Works?

This review considers the best strategies to ensure iodine sufficiency among breastfeeding women and their infants. Fortification strategies to improve iodine intake have been adequate for school-age children (SAC); however, often, iodine deficiency remains a problem for breastfeeding women and their infants. Daily supplementation with iodine is not an ideal strategy to overcome deficiency. Countries defined as iodine-sufficient, but where pregnant and breastfeeding women have inadequate intake, should consider increasing salt iodine concentration, such that the median urinary iodine concentration of SAC can be up to 299 μg/L. This will ensure adequate intake for mothers and infants. The authors conclude that monitoring the UIC is essential to ensure that required thresholds for iodine adequacy are met. Brough L. Curr Nutr Rep. 2022 Jul 22. → https://doi.org/10.1007/s13668-022-00427-y. Online ahead of print.

The Prevalence and Risk Factors Associated with Iodine Deficiency in Canadian Adults

The authors examined iodine deficiency in adults (median age of 61 years) based on the analysis of 24 h urine samples collected from 800 participants in four clinical sites across Canada in the Prospective Urban and Rural Epidemiological (PURE) study. Overall, our Canadian adult cohort had adequate iodine status as reflected by a median UIC of 111 μg/L. Iodine adequacy was also evident with a median 24 h UIE of 226 μg/day as a more robust metric of iodine status with an estimated average requirement (EAR) of 7.1% and a tolerable upper level (UL) of 1.8% based on Canadian dietary reference intake values. Participants taking iodine supplements had greater 24 h urine volume (OR = 0.69). Self-reported intake of dairy products was most strongly associated with iodine status (r = 0.24) after excluding for iodine supplementation. Participants residing in Quebec City (OR = 2.58) and Vancouver (OR = 2.54) were more susceptible to iodine deficiency than Hamilton or Ottawa. Also, greater exposure to abundant iodine uptake inhibitors from tobacco smoking and intake of specific goitrogenic foods corresponded to elevated urinary thiocyanate and nitrate, which were found for residents from Quebec City as compared to other clinical sites. Mathiappanam S et al. Nutrients. 2022 Jun 21; 14(13):2570. → https://doi.org/10.3390/nu14132570

The Iodine Rush: Over- or Under-Iodination Risk in the Prophylactic Use of Iodine for Thyroid Blocking in the Event of a Nuclear Disaster

Radioactive iodine (RI) is a common byproduct of nuclear fusion processes. During nuclear emergencies RI may be released in a plume, or cloud, contaminating the environment. If inhaled or ingested, it may lead to internal radiation exposure and the uptake of RI mainly by the thyroid gland that absorbs stable iodine (SI) but not RI. A dose of radiation delivered to the thyroid gland is a main risk factor for the thyroid cancer development. The SI prophylaxis helps prevent childhood thyroid cancer. The thyroid gland saturation with prophylactic SI ingestion, reduces the internal exposure of the thyroid by blocking the uptake of RI and inhibiting iodide organification. However, negative impact of inadequate SI intake must be considered. The authors provide an overview on the recommended iodine intake and the impact of SI and RI on thyroid in children and adolescents, discussing the benefits and adverse effects of the prophylactic SI for thyroid blocking during a nuclear accident. The use of SI for protection against RI may be recommended in cases of radiological or nuclear emergencies. Benefits and risks should also be considered according to age. Adverse effects from iodine administration cannot be excluded. Precise indications are mandatory to use the iodine for thyroid blocking. Calcetta V et al. Front Endocrinol (Lausanne). 2022 May 26;13:901620. → https://doi.org/10.3389/fendo.2022.901620. eCollection 2022.