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China: leading the way in sustained IDD elimination

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In the early 1990s, over 700 million people in China were iodine deficient. In 1993, China adopted salt iodization as its principal control strategy. By 2000, USI had virtually eliminated IDD. This review celebrates this remarkable achievement and describes how the program is adapting to the ‘changing landscape’ of iodine nutrition, to ensure sustainability.

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Program management and implementation – past and present

Since its inception, China’s salt iodization program has been one of the most successful in the world (*Box 1*). The national standards for the production, wholesale, and inspection of salt and iodized salt have been defined in a series of regulatory documents on edible salt monopoly, iodine content, and production/wholesale quality management. Only designated salt producers may iodize salt if they are judged to meet these standards. Stringent internal and external quality assurance testing is undertaken at both the production and wholesale levels. As a result, almost all salt is iodized, except in areas with high levels of iodine in the drinking water, where policy requires that non-iodized salt be provided.

The IDD Elimination Program is supported by the Chinese Surveillance System of Iodine Deficiency Disorders (CSSIDD), a broad-based system of complementary mechanisms to evaluate and monitor (i) the quality of salt throughout production and at the wholesale and retail levels, (ii) the household coverage of adequately iodized salt at the sub-national and national levels,

Box 1:

Key factors contributing to China’s success

- High and sustained levels of political commitment and leadership, including sufficient funding and prioritization of IDD elimination on the social and economic development agenda
- Multisectoral cooperation
- National monopoly that prohibits sale of non-iodized edible salt and relevant systems for law enforcement, plus substantial investment in the salt industry, and industry commitment to iodization
- Strategic support to high-risk areas
- Frequent, well-coordinated, and high-quality surveillance and quality assurance that provides accurate information on the IDD situation and the impact of the program. Together they form the basis for policy development, guide program implementation, and enable modification
- Consolidation of achievements for sustained IDD elimination

and (iii) the population’s iodine status at the sub-national and national levels.

The health-associated aspects of salt iodization (household coverage of iodized salt and iodine status in the population) are monitored under a trial National IDD Surveillance Plan that is currently being implemented. The four components of the plan include:

- 1. National salt monitoring** – Coverage at household level is evaluated annually to identify regions that may be at high risk of lower coverage, but also to monitor the coverage of non-iodized salt in iodine excess areas (with high levels of iodine in water).
- 2. National IDD Survey** – Carried out every 2 to 5 years, it evaluates the population’s iodine status based on three indicators: children’s urinary iodine excretion, household iodized salt coverage, and thyroid volume (goiter). Pregnant women were included in the survey for the first time in 2011, and the next survey is due in 2014.



3. High-risk area monitoring – It was added to the CSSIDD in 2008. Its objective is to monitor iodine levels and IDD epidemic situations in regions where iodized salt coverage is below 80% and where cases of endemic cretinism have been recorded. If necessary, remedial actions can follow quickly, including emergency supplementation with iodized oil capsules and free distribution of iodized salt to populations at risk.

4. IDD Laboratory Quality Control Network – Implemented by the National Reference Laboratory (NRL), the network aims to standardize the operating procedures and test the proficiency of laboratory technicians to ensure that all laboratories responsible for testing urinary and salt iodine levels provide scientific and reliable data. Their certification is renewed annually.

In addition to the above, the Endemic Disease Control Center and the Institute of Nutrition and Food Safety of the Chinese Center for Disease Control and Prevention have undertaken a number of special investigations or studies of specific issues to provide supplementary information to the surveillance system:

- In 2005, an investigation of iodine excess identified 109 counties in 9 provinces as being high water iodine areas. Regions with iodine excess lie in the former flood plain of the Yellow River, and are often ‘embedded’ in areas with inadequate or deficient water levels of iodine. This investigation was later used to formulate a national strategy on IDD prevention and control in high iodine areas.
- In 2007, a survey of high-risk areas identified 40 counties as high risk, with 249 new cases of cretinism, and a prevalence of goiter >5%. In all cases, the cause of iodine deficiency was access to raw salt (from local salt lakes and salt deposits). Easy access makes law enforcement and prevention of illegal salt entering the market more difficult.
- A survey of four coastal provinces in 2009 investigated whether their populations were consuming excessive iodine through a combination of iodized salt and seafood. Contrary to expectations, iodized salt was

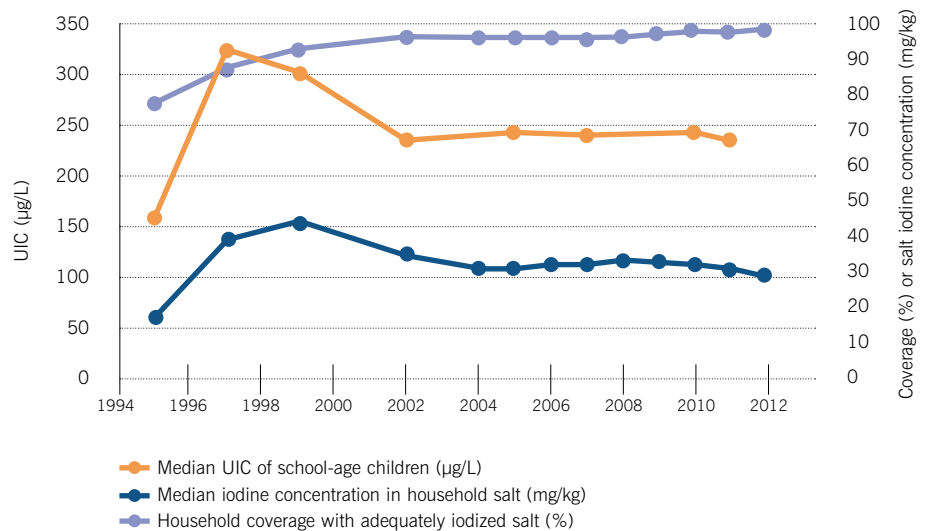
the main source of dietary iodine, and iodine nutrition was found to be adequate in general, with some women showing borderline or mild deficiency. This analysis contributed to a peer-reviewed study investigating the variability of iodine intake across China, published in 2012 (1).

Sustaining the achievements at national and sub-national level

The National Plan for the Control and Prevention of Key Endemic Diseases has foreseen several phases of IDD Elimination. Based on the global WHO/UNICEF/ICCIDD indicators (3), the target of sustained elimination of IDD has been met:

FIGURE 1 Regular monitoring and adjustment of salt iodine content ensures adequate iodine intakes in children in China.

Data: Q Ming, ICCIDD GN Regional Coordinator for China and East Asia



- From 2011 to 2012, a study project evaluated the status of interventions in high water iodine areas with the aim of making recommendations for an updated ‘prevention and control strategy’ in high water iodine areas (2).

national coverage with adequately iodized salt has been sustained above 90% since 2005, and the MUIC of school-age children is currently >100 µg/L (Figure 1). There are no provinces with a median UIC below the deficiency threshold of 100 µg/L, and the goiter rate (measured by ultrasound) has fallen steadily over the years and currently stands at 2.4%.

Despite its tremendous success at national level, the evaluation of the program in 2010 concluded that discrepancies in iodine nutrition still persist across the regions. Therefore, the objectives of the ongoing phase (2011–2015) are as follows:



- (i) sustain IDD elimination at the national level,
- (ii) achieve IDD elimination in 90% of counties in Hainan, Tibet, Qinghai, Xinjiang,
- (iii) maintain IDD elimination in 95% of counties in other provinces,
- (iv) prevent new cases of cretinism, and
- (v) maintain iodine nutrition of the general population at adequate levels (i.e., prevent both iodine deficiency and excess).

TABLE 1 Salt standards selected by each province based on a national range

National standard range and median iodine level in mg/kg	No. of provinces
14–26 ($20 \pm 30\%$)	0
18–33 ($25 \pm 30\%$)	14
21–39 ($30 \pm 30\%$)	11
18–33 for general population; 21–39 for pregnant women	7



Stones cut flat for evaporating seawater to extract salt, Yangpu Ancient Salt Field archeological site in Hainan, China

Between 2007 and now, the central government and local governments have implemented iodized salt subsidies for farmers in Qinghai, Xinjiang, and Tibet, which significantly improved the coverage of iodized salt. In 2009, five provinces with low coverage were selected as focus provinces for the GAIN-UNICEF USI Partnership Program, including Tibet, Hainan, Xinjiang, Guangdong, and Qinghai. UNICEF supported communication and demand-creation activities in all the low coverage provinces. In addition to salt iodization, interventions focused on improving the distribution systems and emergency iodine supplementation of reproductive-age, pregnant, and lactating women. GAIN has supported iodized salt supply and monitoring and evaluation activities, including the strengthening of laboratory capacity, in three of the target provinces, and research on the contribution of iodine in pre-packaged food. The Salt Monitoring Reports in 2009, 2010, and 2011 have all shown that the situation in

these provinces has improved such that the coverage of adequately iodized salt is now over 90%.

An example: new standards for salt iodization

In March 2012 China implemented new standards for salt iodization (4). The national standards have been narrowed from 20–50 mg/kg (35 ± 15 mg/kg) to 14–39 mg/kg ($20-30 \pm 30\%$ mg/kg), which both lowers the amount of iodine in the salt and reduces the range of salt allowed. In a move to transfer some autonomy and responsibility to the provinces, each province has been mandated to choose its own average iodine content within the permitted range, taking into account the actual iodine nutrition of the local population (Table 1). The decision to move from one national standard to provincial standards takes account of the differences in iodine nutrition between provinces and aims to prevent both re-emergence of iodine deficiency and iodine excess.

Two decades of annual IDD Days in China

Why does China have an IDD Day?

May 15th each year is national IDD Day in China. The aims of the IDD Day are to increase the knowledge of the population about the adverse effects of IDD and to promote population health.

When did it start?

In 1993 the State Council of China held the Virtual Elimination of IDD in China by 2000 Advocacy Meeting. In 1994 Ministry of Health and related ministries set May 5th as the national IDD Day. It was changed to May 15th in 2002 and has been running since then. This year, May 15th 2014, is the 21st IDD Day.

What happens on IDD Day?

The IDD Day each year has a specific theme; the relevant government ministries and commissions send out an announcement about the IDD Day theme. For example, the theme of the first IDD Day in 1994 was *Iodized Salt and Health*, promoting salt iodization as the national strategy. The theme for the 10th IDD Day in 2003 was *Using Iodized Salt and Protecting Children's Intelligence Development*. The theme for this year is *Providing Iodine Scientifically for Normal Intelligence*, highlighting the importance of sufficient iodine nutrition to health and brain development. On this day, there are many types of activities to promote the awareness of IDD and to celebrate the achievements.



Modern industrial salt production in China: over 80 million tons of table salt per year

The impact of the new standards has since been assessed through a pilot study, carried out between March 2012 and April 2013 in three provinces with different levels of urinary iodine concentration in children (Fujian, Shandong, and Anhui). The results showed that the MUIC in children will decrease if the iodine levels of salt decrease by >5 mg/kg.

The challenges ahead and agenda for change

China has made enormous progress towards sustained IDD elimination in the world's most populous country and set an example for the rest of the world to follow. But as China's achievements have been consolidated, there are still some issues that require additional effort. The remaining households that do not yet consume adequately iodized salt are mostly the poorest and are in remote, underdeveloped areas (mainly in Western China) and are, therefore, the hardest to reach. Reaching them may be the biggest challenge currently facing the Chinese government.

Ongoing efforts are also required to sustain IDD control at sub-national levels. There have been concerns that, despite the efforts to optimize the iodine content of salt, children in some areas may still be consuming excessive amounts of iodine, and measures may be needed to moderate their intake. On the opposite end of the spectrum there are concerns that further reductions in salt iodine levels, combined with ongoing efforts to reduce salt intake, may lead

to a greater proportion of the population, women in particular, not consuming adequate iodine. As the landscape of iodine nutrition and USI continues to change globally, these challenges will arise for many governments. With its position as a leader in IDD elimination, China is uniquely placed to develop the next set of strategies that would set the course for the global IDD elimination programs of the future.

In the course of 2014, China's National Health and Family Planning Commission (NHFPC, formerly the Ministry of Health and the National Population and Family Planning Commission) is organizing a series of workshops on IDD elimination, including an International Workshop on the IDD Prevention and Control Strategy in China. The main objective of the latter will be to discuss the latest international evidence and experience on IDD elimination, to discuss and further refine China's IDD prevention and control strategy.

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Children in northern Ethiopia are iodine deficient

Excerpted from: **Girma K et al. The status of iodine nutrition and iodine deficiency disorders among school children in Metekel Zone, Northwest Ethiopia.** *Ethiop J Health Sci.* 2014; 24 (2):109–116.

In Ethiopia, IDD has been recognized as a serious public health problem for the past six decades. Today, it still remains a major threat to national health and development. In 2011, an estimated 12 million school-age children were living with inadequate iodine, and 66 million people were at risk of iodine deficiency. Between 2005 and 2010, only 15–20% of households in Ethiopia were using adequately iodized salt, about a third of all school-age children living in endemic regions had goiter, and the national median urinary iodine concentration (MUIC) was 24.5 µg/L (1).

The USI program in Ethiopia began as early as 1989. But the Eritrean–Ethiopian war brought it to a halt, when the imports of iodized salt from the Red Sea ceased in the 2000s. In 2005, the Ethiopian government reinstated USI, with the goal of virtual IDD elimination by 2015 (2). In the subsequent years, the initiatives to maintain universal iodized salt distribution throughout the country were revitalized and relaunched. But despite some signs of progress, the country still has one of the highest rates of iodine deficiency and one of the weakest salt iodization programs (3).

To provide current data on the prevalence and severity of IDD among rural school children in Ethiopia, a study was carried out in Addis-Alem kebele (ward) in the Wombera District, Metekel Zone, between 2011 and 2012. Two hundred children aged 6–18 years were enrolled from a school of 750. All children were examined for goiter. Iodine levels were measured in salt samples from 50 households using both rapid field tests and standard titration. Urine samples from 30 children were tested for iodine concentration, and blood samples from 37 children were tested for markers of thyroid function.

The household characteristics were typical for a rural area with agriculture, and particularly crop production and animal

husbandry, as the main subsistence activity. Almost 40% of the children had goiter (girls more commonly than boys), and this rate did not change with age. A recent Ethiopian Demographic and Health Survey (EDHS 2011) reported that the highest household coverage of iodized salt (39.7%) was in the Beneshangul Gumuz region, where Addis-Alem kebele is situated. Although this study reports a similar overall coverage (40%), it also shows that only a quarter of these households (10% of all households) have salt that is iodized to adequate levels.

The median UIC among the school children was 39.9 µg/L (range, 20.54–62.2 µg/L), which shows small progress since 2005 when the national average was 24.5 µg/L. According to official guidelines, this indicates that the area is moderately iodine deficient. But with 80% of the children

tely iodized salt across the country. Careful evaluation of the impact of the USI program on the society is also necessary in order to achieve proper IDD control in the community. Reporting the results of such efforts is vital for policymakers and program managers whose goal is long-term IDD control.

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affected by moderate or borderline-severe iodine deficiency, much effort is still required to achieve sufficiency in the population.

As long as iodine deficiency remains a severe public health problem in Ethiopia, efforts are needed to further strengthen the existing systems to provide access to adequa-

Joint strategies for salt iodization and salt reduction in public health

Excerpt from a report of a joint technical meeting convened by the World Health Organization and the George Institute for Global Health in collaboration with the ICCIDD Global Network in Sydney, Australia, 25–27 March 2013.



The World Health Organization (WHO) promotes both the implementation of programs to reduce population salt intake as a strategy to reduce the burden of noncommunicable diseases (NCDs) and universal salt iodization to prevent and control IDD. This meeting brought together technical experts in IDD and dietary salt reduction, and WHO representatives from all regions of the world to discuss how to maximize the impact of salt reduction and iodine deficiency elimination programs through improved coordination.

Background

Increased blood pressure is estimated to cause 9.4 million deaths every year. In 2010, WHO recommended reducing salt intake (to <2 g sodium or <5 g salt per day) (1,2). This position has led to the adoption of the Global Monitoring Framework and Voluntary Global Targets for the Prevention and Control of NCDs, in which Member States agreed to target a 30% reduction in population intake of salt/sodium by 2025 (3). At the same time, there is concern

that IDD may re-emerge despite the fact that many countries have adopted USI in response to the resolution of the 43rd World Health Assembly that addressed the elimination of IDD.

WHO endorses USI whereby all salt for human and animal consumption is iodized (4) and reaffirms that the public health goals of reducing salt and increasing iodine intake through salt iodization are compatible given that the concentration of iodine in salt can be adjusted as salt intake changes (*Box 1*) (5).

Box 1: Salt as a vehicle for iodization

Recommendations of the WHO Expert Consultation, 21–22 March 2007, Luxembourg:

- Policies for salt iodization and reduction of salt intake to <5 g/day are both necessary and compatible
- USI is the recommended strategy to control iodine deficiency, and successful programs should continue and be sustained

- Assumption of iodization at 20–40 mg/kg is based on an average salt intake of 10 g/day at population level which may change
- The use of salt as the vehicle for new fortification initiatives other than iodine and fluoride should be discouraged
- Multinational food industries should harmonize the salt content of their products according to lowest threshold possible to avoid variations in products in different countries
- Changes in population salt intakes needs to be assessed over time via monitoring of urinary sodium excretion and levels of iodization adjusted accordingly

Implementation of salt iodization policies

Approximately a third of the world's population lives in areas with some iodine deficiency. Iodine deficiency is particularly common in the Eastern Mediterranean region, Asia, Africa, and large parts of Eastern Europe. However, the issue has not been confined to low- and middle-income countries, and there is evidence that Australia, New Zealand, and the United Kingdom are now confronted with a re-emergence of mild iodine deficiency.

Food grade salt as a vehicle for the delivery of iodine is based on many factors:

- It is one of few commodities consumed by everyone; consumption is stable throughout the year.
- Importation is often limited to a few producers.
- Iodization technology is easy to implement and is available at a reasonable cost.
- The addition of iodine to salt does not affect its color, taste or odor.
- The quality of iodized salt can be easily monitored.

Not only is salt iodization effective, it is remarkably cost-effective. The estimated annual potential cost attributable to IDD in the developing world prior to widespread salt iodization was \$35.7 billion per year versus \$0.5 billion per year after salt iodization, giving a benefit–cost ratio of 70:1 (6). The use of salt as a vehicle for food fortification in poor areas of rural subsistence farming is commonly the only choice; this is particularly true in key regions such as sub-Saharan Africa and South Asia where the health and economic burden of IDD is highest.

Synergizing salt iodization and salt reduction strategies

Previous work has demonstrated that policies for salt iodization and the reduction of salt to less than 5 g/day are compatible, cost-effective, and of great benefit to public health (Box 2).

Box 2: Commonalities of the two strategies

Excess dietary salt and lack of natural dietary iodine are of concern to public health because they affect billions of people worldwide. Consequently, both are major global public health priorities. The policies also share other commonalities in that they:

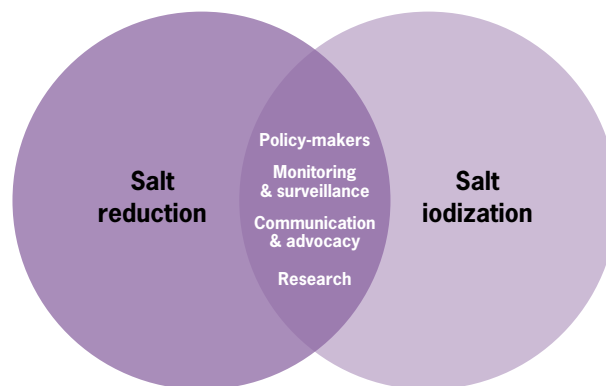
- are highly cost effective interventions to improve health;
- have similar surveillance modalities (dietary surveys and urine collection);
- require complex negotiations with the food industries;
- depend on strong political support for optimum policy implementation;
- rely on improved knowledge, attitudes and behaviors of health care professionals;
- rely on increased public knowledge, attitudes and behaviors;
- are affected by a lack of food industry action;
- rely heavily on education (e.g. “use iodized salt but less of it” particularly in low-middle-income settings where most salt is added in the home);
- require a stable non-commercial funding source to be sustained.

The report concurs that there is no evidence that adding iodine to salt increases salt consumption or impedes the implementation of salt reduction strategies. If salt intake fell to 5 g/day, salt iodization could be increased to 50 mg/kg without technical or sensory barriers to ensure intakes of 250 µg/day (7). The potential impact of salt reduction on iodine intakes will be country- and context-specific and will depend on various factors.

The policies can be coherent provided that there is (a) full implementation of USI, (b) effective implementation of salt reduction policies including regulati-

in the implementation of joint salt iodization and salt reduction policies. Governments will be encouraged to develop strategies to engage all departments in support of USI and effective regulations to reduce salt consumption. Civil society action can be leveraged to support the process. Industry will be consulted in relation to implementation but will have no role in policy-making. Developing a consistent strategy and message as well as identifying and managing perceived or real conflicts of interest will be fundamental to the successful delivery of the strategies.

FIGURE 1 Areas of integration between salt reduction and salt iodization strategies



on of salt levels in processed foods, and (c) increasing iodine levels in salt as salt intakes are decreased.

The solutions to reducing salt and preventing IDD are complex, especially in countries undergoing nutrition transition, where the amount and sources of salt in the diet are changing. Most low- and middle-income countries may not have the resources for a separate program to monitor salt reduction and iodine intake, or to negotiate with industry; integration would therefore result in improved cost efficiencies and improved health for all.

Areas for integration

A joint plan for collaborative work is to be developed to outline the common objectives. The main areas of complementarity for the two programs at global, regional and national levels are presented in Figure 1. A wide range of organizations can be involved

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Mozambique redoubles its salt iodization efforts

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Background

Mozambique, a southeast African country on the Indian Ocean, has a population of over 24 million, of which 45% are aged less than 15 years. Stunting affects almost 43% of children, and only 56% of the population is literate.

In the country's first national survey conducted in 2004, 15% of children were goitrous, and their median urinary iodine concentration (UIC) was 60 µg/L, putting Mozambique in the mildly iodine deficient bracket. The provinces of Niassa, Zambezia and Nampula were classified as moderately deficient, and rural areas had much lower urinary iodine levels (54 µg/L) than urban areas (90 µg/L). More recent data are not available. But a national iodine deficiency survey focusing on UIC in about 3,000 women of reproductive age and household availability of iodized salt was recently finalized, and a report is expected soon.

Salt industry and household coverage of iodized salt

Mozambique has more than 300 salt producers, mostly concentrated in the coastal provinces of Maputo, Nampula and Cabo Delgado. Only eight producers are large, and the vast majority are small- or medium-sized. Most salt producers, traders and retailers are licensed through the Ministry of Trade and Commerce and registered in a national database. But when it comes to small producers, many are thought to operate without a license. There are reportedly around 100 unregistered small salt producers in Zambezia alone.

In 2010, the total annual salt production in Mozambique was estimated at 145,000 metric tons, sufficient to cover human consumption (around 90,000 tons), animal consumption, industry use (including dried fish) and allow for some export. Salt imports, mainly from South Africa, and salt



in processed foods contribute only marginally to total salt consumption in Mozambique.

DHS and MICS estimates of household use of iodized salt in 2003, 2008 and 2011 were generally very low. In 2001 only 45% of families were using salt containing any iodine, ranging from 7% in Cabo Delgado to 76% in Gaza. This represents a decrease from the 58% reported in the 2008 MICS. In the same year, only 25% of households were using salt iodized at the minimum recommended level (>15 ppm). Because salt from the large producers, who monitor the quality of their iodized salt, is mostly exported, a large proportion of the locally marketed and consumed salt comes from medium and small producers. The manual spray-mixing technique used by many small producers to iodize their salt may cause a wide range of iodization levels, often below adequate. There are also reports of iodized salt being sold at double the price of non-iodized salt despite the fact that the

national iodization program is fully funded by UNICEF through the Ministry of Trade and Commerce. The price of salt may also vary greatly depending on whether it is coarse or fine, locally produced or imported.

Legislation, enforcement and monitoring

Universal salt iodization (USI) with potassium iodate for human and animal consumption was first mandated in 2000, with iodine levels set at 25–55 ppm. In 2007, the Ministry of Health and the Ministry of Trade and Commerce agreed to establish working groups to support, coordinate and oversee the implementation of a national salt iodization program. The primary role of the Ministry of Health (in collaboration with UNICEF) in the program concerns advocacy, which includes communication, education and formulating recommendations. But these activities have been slowly fading in Mozambique partly because of a lack of support, resources and financial backing.

Since 2010, iodized salt legislation is enforced by the National Inspection of Economic Activities (INAE), which is semi-autonomous under the Ministry of Industry. INAE integrates the inspections formerly implemented separately by the Ministries of Health, Industry, Finance and others. This shift in responsibilities has caused a major loss of momentum, which is being regained slowly. Funding for INAE's running costs is very low, further weakening the inspections, which currently focus on raising awareness among producers rather than on penalizing their non-compliance with the national standards.

In theory, the infrastructure for monitoring and quality assurance is available and adequate. There are about 11 national and provincial and 3 regional laboratories where salt iodine analyses can be performed. WYD iodine checkers (about 85 in total) have been distributed to the largest and medium-sized salt producers and provincial inspectors since 2007, and their recipients have been trained. The United Nations Industrial Development Organization (UNIDO) Mozambique has been involved in assessing the capacity of national and provincial laboratories.

The failure of systematic monitoring and law enforcement was one of the main weaknesses identified in a review of the iodized salt sector in 2010, and again in 2012. Mateus Matusse, National Director of Industry at the Ministry of Industry and Trade, believes that the reluctance of small producers to comply with iodized salt legislation is one of the main obstacles on the road to successful USI in Mozambique. The forecasting and distribution of potassium iodate, procured by UNICEF, presents another challenge that also contributes to the irregular fortification.

Recent developments and planned activities

Despite the established programmatic infrastructure and organization, there seems to be a clear disconnect between the political will and the execution of the salt iodization program on the ground. Pieter Jooste, the ICCIDD Global Network Regional Coordinator for Southern Africa, visited Mozambique in October 2013 to discuss current iodine-related strategies and planned activities with some of the key stakeholders in the ongoing iodization efforts. In summary:

- New legislation is currently being drafted on fortification of staple foods such as maize meal and cooking oil, which will incorporate the salt legislation. For this purpose, the existing salt regulation is being reviewed so that it can be aligned with the broader national and international requirements.

- Promotion of iodized salt is named as a key activity in the government's Multisectoral Action Plan for the Reduction of Chronic Malnutrition 2011–2015, which aims to achieve 80% use of adequately iodized salt by 2020.



- UNICEF is providing support to undertake an assessment of the salt industry to develop an understanding of the proportion of the national needs met by small, medium, and large producers, which will feed into a new national strategy for universal salt iodization.
- In close collaboration with UNICEF, UNIDO is planning a qualitative assessment of the current situation of the small salt producers in Nampula, arguably the poorest province in the country. The strategy is to formulate interventions that will empower small salt producers in Nampula and to mobilize external funding to assist them with iodization and appropriate packaging of their salt. A second priority is to create jobs for the general development of the communities.
- Two promising proposals have been made by the Ministry of Health. Since iodine nutrition already forms a small component of the school curriculum, it

was suggested to have this component expanded in primary and secondary schools as a long-term strategy to improve the knowledge of iodine nutrition across the population. Training could also be offered to community health workers and even to medical doctors.

- Secondly, it was proposed that a recommendation is formulated to ensure that iodized salt is used in all bread baked in Mozambique. Using iodized salt in bread is a key strategy in ensuring adequate iodine intake in many countries (Australia and New Zealand are the two most recent examples). But this proposal may not be simple to implement in view of the large percentage of non-iodized salt still entering the market, the weak monitoring and enforcement, and the non-compliance of salt producers.
- To tackle non-compliance among small producers, ICCIDD was asked to provide information about access to simple, practical and inexpensive field equipment to iodize salt, similar to that used in Senegal. A revolving fund has also been proposed to ensure market-driven forecasting, procurement and distribution of potassium iodate in the future.

Iodizing salt: an investment for Vietnam's economic development

Abridged from a policy brief: **"Iodizing salt and fortifying flour: the best investment for Vietnam's national economic development"** drafted jointly by UNICEF, the Flour Fortification Initiative (FFI), ICCIDD, and Alive & Thrive (A&T).

Protecting the growth and development of today's children is the key to fuelling tomorrow's economic and social development. But recent reports indicate Vietnam's next generation of young people may not achieve their full intellectual and productive potential, simply because the food they eat does not contain enough essential vitamins and minerals, including iodine.

More than half of all births are to mothers suffering iodine deficiency, preventing full brain growth in the womb and mental development as infants (1). Cognitive test scores among children born to iodine deficient mothers are lower than among their peers (2). Delayed intellectual development and poorer school achievement associated with iodine deficiency in childhood is linked to lifetime earning deficits as adults. Salt iodization is feasible and affordable for Vietnam. By adding small amounts of iodine during salt processing, the drive for salt iodization can take advantage of the salt distribution and market system to deliver safe, effective doses to protect all consumers on a daily basis.

Vietnam should rejoin the 100 countries with mandatory salt iodization

Countries with mandatory salt iodization have achieved about twice the coverage of households using adequately iodized salt compared to countries with voluntary regulations—and many have virtually eliminated iodine deficiency. Just a few years ago, Vietnam was one of those countries displaying remarkable progress.

In 1999, mandatory national regulations were issued and the salt industry responded positively. Quality iodized salt reached more than 90% of households by 2005. For consumers, iodized salt was accepted and affordable. And population surveys found the 'brain drain' of iodine deficiency had been eliminated.

However, progress was lost during the transition to the free-market.



of food fortification to provide nutrition protection. In harmony with international norms and conventions, Vietnam's Food Law of 2011 explicitly allows mandatory fortification foods to reduce the burden of micronutrient deficiencies that threaten public health.

- Article 20 of the WTO General Agreement on Tariffs

The procurement of imported potassium iodate remained centralised within the Ministry of Health, with a budget now sufficient to cover only 16% of the nation's needs. More importantly, a revised decree in 2005 on the production of iodized salt failed to uphold the mandatory iodization requirement and salt producers felt no obligation to continue iodization. Today, less than half of households consume adequately iodized salt and population surveys found 77% of pregnant women with iodine deficiency (3).

With no regulations in place to protect iodization, the 'brain drain' has returned. It is time to stem the re-emergence of iodine deficiency in Vietnam. Just as iodine deficiency was eliminated by 2005, it can be eliminated again by 2014. All that is needed is the re-establishment of mandatory legislation and enforcement systems for salt iodization and transfer of responsibility for purchasing potassium iodate to the salt industry.

Vietnam's new food law enables mandatory salt iodization

With the rapid expansion of modern food industries and consumer markets, Vietnam's Food Law of 2011 provides an up-to-date legal framework to capitalize on the poten-

and Trade states that governments may pass mandates to protect human, animal or plant life or health, provided they are transparent and do not discriminate. Mandatory fortification is not a barrier to trade.

- WHO/FAO Guidelines on Food Fortification with Micronutrients states "mandatory fortification is more suited to cases of serious public health need or risk," and "voluntary fortification is less likely than mandatory fortification to deliver a guaranteed favourable outcome."

Mandatory fortification of salt is legally enabled by the 2011 Food Law, consistent with international trade obligations and represents one of the most attainable, high-impact investments Vietnam can make in the nation's social and economic development. It is a commitment to ensuring our children achieve their full potential as students, workers, parents and citizens.

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Making salt iodization truly universal by 2020

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b. Consolidation and modernization of the salt industry

The salt industry has been entrusted with the responsibility of dovetailing iodization into the prevailing salt production and distribution system, creating a standard of adequate iodization at minimum cost and disruption. In large streamlined processing plants iodization is a relatively simple step. Over the past two decades there have been significant investments in salt refining capacity in several countries coinciding with the expansion of salt iodization coverage. In India, salt refining capacity has increased from less than 5% to nearly 60% over the past 15 years. Over the same period, China has undergone a major modernization of salt refining, iodization and packaging facilities across nearly 2,000 facilities in the country, involving an investment of over US\$200 million (2).

Iodization in medium/small operations poses more significant challenges in countries where salt manufacturing techniques and product quality vary over a wide spectrum of operations from cottage scale units producing a few hundred tons a year to very large fully automated plants producing several million tons. Thus the strategies used to achieve the first 50–60% coverage of iodized salt in several countries may not necessarily result in addressing the challenge for the remaining 40% of the population.

Background

The past two decades have seen great progress in global awareness of the problem of iodine deficiency and its alleviation through the iodization of salt. Globally, 76% of households are consuming adequately iodized salt. Yet only one fifth of countries reporting in 2014 had reached the 90 per cent target of universal salt iodization. Most had reached only 50 to 70 per cent coverage. Globally nearly 30% of school-age children are estimated to have insufficient iodine intakes and there are indications that global progress is slowing. These figures underscore the continuing need for support to national salt iodization programs.

Salt iodization probably represents the first large-scale experience in national fortification of a commodity to eliminate a public health problem. It has taught valuable lessons in collaboration between government, industry, international organizations, the community at large and other sectors. It has

also offered insights into building and sustaining an intervention politically, technically, managerially, financially and culturally.

Overview of global progress

a. Growing awareness and resources for nutrition

The past five years have seen increasing realization of the importance of nutrition as central to human development. Independent reviews such as the Copenhagen Consensus (1) have consistently ranked micronutrients as the most cost effective development intervention. The evolution of the Scaling Up Nutrition (SUN) movement to bring together the various stakeholders under a single umbrella network has focused greater attention and resources for nutrition at the global, regional and national levels. Iodine nutrition should capitalize on this positive environment in order to sustain its priority for attention and intervention.

In some countries multiple levels of iodization and packaging have posed problems in quality assurance. Raw salt producers, who often do not have the capacity to consistently produce good quality iodized salt and to monitor its quality, supply their un-iodized salt to multiple small re-packagers who assume the task of iodization and packing the salt into consumer-sized bags. The result can be salt of inconsistent quality and iodine content. One strategy has been to encourage the raw salt producers to iodize at source while another strategy has seen large processors buy up the salt produced by cottage scale producers and either iodize it in their facilities or apply it to non-food grade use (3). The stability of iodine in salt and levels of iodization and packaging are also related to issues of quality assurance. By refining and packaging salt in a good moisture barrier, such as low density polyethylene bags, iodine losses have been significantly reduced, during storage periods of over six months.

c. Monitoring and evaluation

As a key component of any public health intervention, the monitoring of progress towards the goal and the evaluation of results—in this case the elimination of iodine deficiency—is critical. Improved monitoring and surveillance can also guide program adjustments as habits and diets change over time. While quality assurance of iodized salt occurs at the factory or production level, the testing of salt samples at the household level, done by Multiple Indicator Cluster Surveys (MICS) within the Demographic Health Surveys (DHS), is useful to assess whether that iodized salt is making its way into household use or if there may be a leakage of non-iodized salt into the household, the latter being especially important to countries with mandated salt iodization (4).

There has also been innovation in field test kits to allow for field testing of iodine levels in salt thereby enabling salt producers to monitor the quality of their product at source. Starting with dropper test kits, the technology has evolved to electronic test kits that determine iodine content with reasonable accuracy. The instruments also enable the test readings to be transmitted from the field via cell phones to central servers for monitoring and collation. Work continues to refine such tools.

d. International support

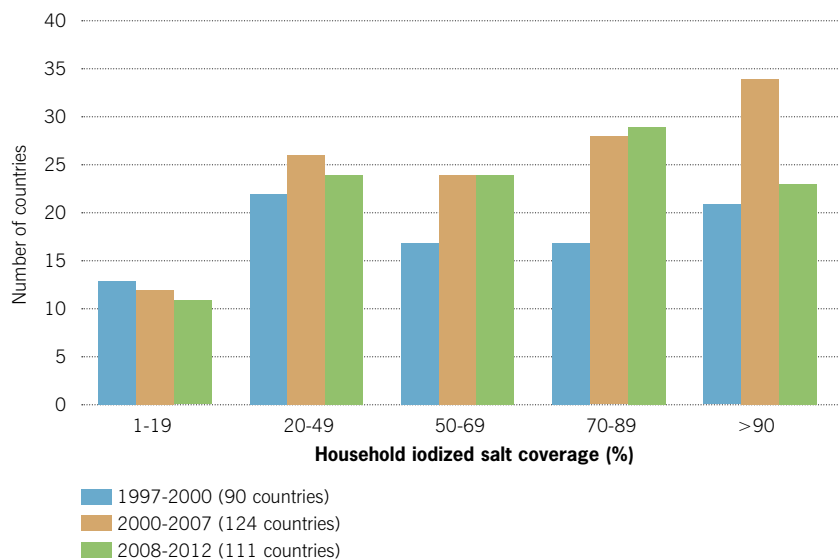
Over the past two decades several agencies have played pivotal roles at the global, regional and national levels to support the development and expansion of salt iodization programs in high burden countries—notably UNICEF (with support primarily from Kiwanis International), Micronutrient Initiative (with support from the Canadian Government) and GAIN (with support from the Bill and Melinda Gates Foundation). Global support over the last decade alone exceeds \$100 million and has been targeted to address key bottlenecks with support evolving from technical and financial assistance to building self-sustaining programs that will continue when external support is withdrawn.

to engage with other stakeholders in the global iodization and iodine deficiency elimination effort and understand the latest situation and trends in iodine nutrition and salt iodization coverage. They also need to present the salt industry viewpoint at such meetings. Once a national program is established and universal coverage of iodized salt is achieved the cost of the intervention is virtually transferred to the consumer.

b. Sustained public education and social mobilization

IDD elimination programs are threatened to be victims of their own success, yet iodine deficiency must be continuously addressed or it will re-emerge. Thus on-going communication efforts through multiple chan-

FIGURE 1 Progress in iodized salt coverage (1997–2012)



Source: UNICEF SOWC 2002: Database 1997-2000; SOWC 2009: Database 2000-2007; SOWC 2014: Database 2008-2012

Key determinants to achieve USI

a. Making salt iodization a global industry norm

The salt industry must accept and integrate iodization as part of its standard operating procedure for production of all varieties of salt for human and animal consumption. Salt Industry Associations at regional, national or sub-national levels should commit to compliance by all their members. Representatives of the salt industry also need to be active members of international networks such as the ICCIDD Global Network and Scaling Up Nutrition (SUN) meetings

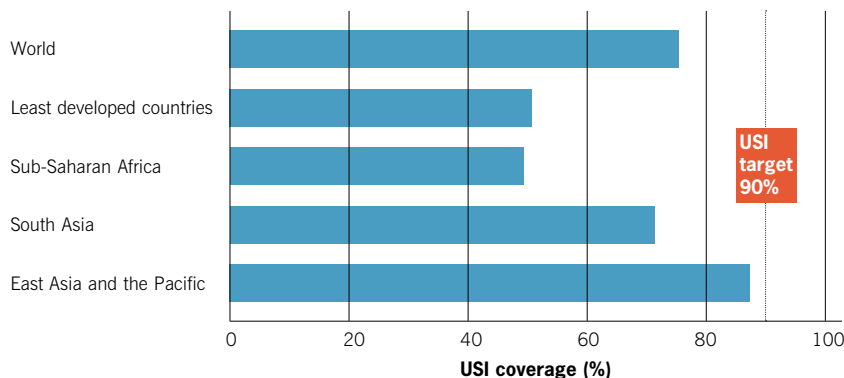
(including the media, health systems, and schools) are critical.

c. Supporting small salt producers

While large producers account for nearly 75% of all salt for edible consumption in salt producing countries, a small but significant proportion of the salt is produced by many small producers. These small salt producers are often the main salt source to the communities that are not reached by the conventional iodized salt suppliers and therefore most at risk of IDD.

Small producers need help—some would say protection—to compete and stay viable. Associations of small producers/

FIGURE 2 Percentage of households with adequately iodized salt (>15 ppm) 2007–2011



Source: UNICEF

processors are often able to improve market access and sustain sales of the product. They may also assist in improving cleaning and packing. While small-scale processors are responsible for the 'last mile' of coverage, they need sustained and secure markets.

Equally important is a sustainable and secure procurement chain for raw materials and consumables like potassium iodate (in convenient size packages and at fair prices), salt packaging material, equipment and supplies.

In recognition of the role of these small salt producers, pilot initiatives have been undertaken in several countries. In Senegal, which has more than 10,000 operating small producers, it was not the ban on non-iodized salt as much as the prospect of financial returns that motivated those involved in the pilot project to join into associations of producers with financial and technical support and training to enable them to produce a quality of iodized salt that complied with national standards while increasing their overall productivity (5).

In Rajasthan, India, where small salt producers account for 88% (1.3 million metric tons) of the state's total production for human consumption, the pilot project aimed to build the iodization capacity of small salt producers through the provision of technical inputs, teaching good business and quality assurance practices, and by establishing a revolving fund operated through their newly formed cooperatives to provide the salt producers with the financial support to upgrade their facilities, leverage other loans and expand their capacity (6).

In both cases, the support has been intensive in the initial phases with equipment and technical assistance provided, but

built into the projects is a scheme to, first, promote the economies of scale (sharing of equipment and facilities) and, second, to support the sustainability of the operation and transfer the ownership of the production of iodized salt to the small producers.

d. Engaging the processed food industry

Universal salt iodization intends that all salt for human and animal consumption is iodized. In practice, however, USI efforts do not always include salt used in processed foods. Even when legislation permits the voluntary use of iodized salt in processed foods, this does not necessarily translate into practical application. USI program guidelines often do not specify measures (such as advocacy, monitoring) directed at the use of iodized salt in processed foods.

And food processors may be reluctant to use iodized salt stating concerns about its effects on their food products and trade barriers due to legislation variations (7).

However, consumption patterns are changing, particularly in industrialized countries, resulting in a shift in the source of iodine intake. For example, in the USA approximately 70% of the total salt intake comes from processed foods, while discretionary use of table salt contributes only about 15% of salt consumed, and the remaining 15% is found naturally in foods. As a result, national programs relying upon the fortification of table salt alone may not be adequate. There are examples of successful national strategies (e.g. Netherlands, Belarus) which specifically utilize iodized salt in processed foods as a means to achieve adequate iodine nutrition in the population.

Evidence suggests that, for common food commodities, the use of iodized salt in processing does not affect organoleptic properties. However, concerns about trade barriers pose a bigger problem as legislation varies greatly from country to country. In a world of interrelated geo-politics and trade, harmonization becomes increasingly important. Efforts such as those by EURRECA Network, which works in the context of the EU to address the problem of national variations in micronutrient recommendations, may offer a way to overcome this stumbling block (8).

e. Making iodine nutrition a priority in Europe

Europe has the distinction of being the region with the highest prevalence of iodine deficiency and the lowest coverage of salt iodization in the world. This means that 52%, almost 460 million people, in Europe have insufficient iodine intake (9). This has implications not only for Europe but also influences the perspective of policy makers in the rest of the world who see an important part of the developed world not taking iodine nutrition seriously. In countries where salt iodization has not been undertaken as a public health measure, the outcomes are telling. In Russia and the Ukraine, only 35% and 18% respectively of households consume properly iodized salt, making 985,000 infants in the Russian Federation and 344,000 infants in the Ukraine unprotected from brain damage caused by IDD (10).

The clues to the underlying source of these developments lie in the challenges facing Europe. First, salt iodization is not universal in Europe. Some countries have compulsory salt iodization, such as Denmark, whereas in others it is voluntary. Some countries mandate salt iodization but do not permit the use of iodized salt in processed foods e.g. Poland. Netherlands, on the other hand, has focused on iodized salt in bread as the primary vehicle for maintaining iodine intake in her population. Second, the approaches to iodization are many, and this underlies the fact that there is no consistency in legislation across Europe. It also means that there is no consistency in the standards of iodization levels (11). Third, the necessity of awareness of iodine deficiency cannot be underestimated. With the visible signs of iodine deficiency a distant memory, the common belief is that the problem of IDD is solved. Finally, information on iodine

nutrition in the population is outdated. European public health officials need to remain vigilant in monitoring iodine nutrition and gathering data on urinary iodine excretion (12).

The way forward

Inasmuch as tremendous progress has been made in making salt iodization indeed universal and global, the fact still remains that 2 billion people worldwide are still at risk of iodine deficiency. Although universal iodization has stabilized and generally been sustained as a major public health intervention, 25% of households are not using iodized salt.

It is clear that the foundation of a USI program requires mandatory iodization and this can be achieved only when there is strong government commitment. In addition, in those countries which have existing USI programs, a reaffirmation—in the form of commitment of both human and financial resources for salt iodization programs—would not only assure sustainability but also mark the national ownership of the program and the goal. A leading advocacy effort directed at the health sector is the World Health Assembly's Resolution requiring regular reporting on iodine status. Member States last reported to the Assembly in 2013, and the next review would take place in 2016. This would be a prime opportunity for national governments to assess their monitoring capacity and take appropriate action to address gaps. It would also be an opportunity for governments to celebrate their achievements. Salt industry leaders also need to adopt salt iodization as part of their standard operating procedure in all facilities producing or processing salt for human and animal consumption.

There is no other activity that draws together the productive sector of society, the government sector, civic society and the general public such as iodine deficiency elimination does. Success with salt iodization will give the government, industry, consu-

mer groups and other stakeholders a new confidence to address other, more complex micronutrient problems using salt as well as other food carriers to deliver essential vitamins and minerals to the population.

The populations not yet reached with adequately iodized salt are often the more marginalized section of the population and in greatest need of protection. They are not reached by the mainstream of iodized salt supply but rather by the more informal sector of the small salt producers. This underlines the importance of integrating small salt producers into national USI programs. A number of working models, demonstrating initial success, exist. These models should be documented, reviewed and lessons learned shared so as to provide program guidance in areas where small salt producers have a significant role in the marketplace.

Just as the economics of the salt industry need to be understood in order to integrate salt iodization into the supply chain, active engagement of the processing food industry is necessary to include iodized salt in processed foods, especially in countries where processed foods dominate the household table.

A new strategy and advocacy are needed to bring IDD onto the European agenda. A renewed or alternative advocacy approach might be through building new awareness among the health authorities and the public in making iodized salt an informed choice.

Finally, a number of technical issues remain, both with reference to data gathering on iodine status, which is squarely in the domain of public health officials, and tools used to assess quality assurance, which holds more in the domain of the salt industry. Within the context of a changing global environment, new technological innovations, information systems, techniques, and accompanying training are needed to make the elimination of iodine deficiency a reality by 2020.

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A 'lab-on-paper' to monitor iodine in salt

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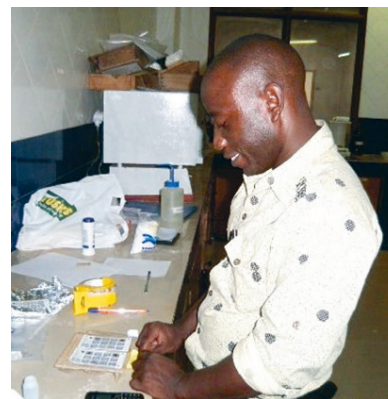
For salt iodization programs to be effective, it is important to monitor iodine content in the salt at various points along the supply chain. Iodometric titration is currently the gold standard, but it requires trained technicians and wet reagents. The rapid test kit (RTK) is the most common method to measure coverage of iodized salt in household surveys due to its affordability and feasibility, but it is not able to distinguish whether or not the salt is adequately iodized (1). As a result, other methods have been developed to make testing more precise and affordable, including the Bioanalyt iCheck IODINE® and the WYD Chinese checker (2).

With the financial support from GAIN, researchers at the University of Notre Dame (Indiana, USA) have developed the saltPAD, a paper test card that can measure how much iodate is present in a sample of iodized salt. The saltPAD combines some of the best features of RTKs (ease of use, usability in field settings) and titration (accuracy). SaltPADs can be used in

or market and household levels, where the target iodization levels are 15 or 20 ppm. SaltPADs require 1/100th of the chemicals needed for standard titration, which means they generate less waste.

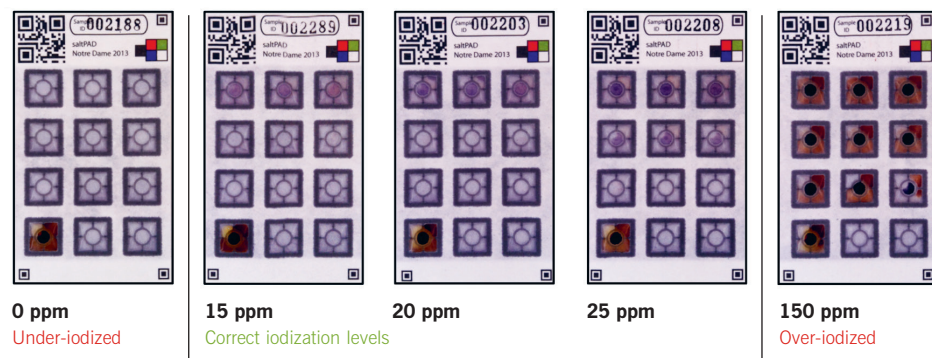
Each card contains several reaction zones, printed on the paper with waxy ink. The reagents needed to perform an iodometric titration are stored in the paper. Instead of adding portions of the titrant to the salt sample, the user mixes a solution of the salt sample with water and drops the solution onto the twelve reaction areas on the card. The reaction zones contain varying levels of the titrant, which allows different iodine thresholds to be measured. The number and intensities of the blue dots can be compared with a printed standard image to evaluate the test result (Figure 1), or the user can take a picture with a cell phone and send the image for automated image analysis. An image analysis program logs the data and the result, which may be useful for improving documentation of salt analyses, especially in household and market surveillance.

over several days. Quality control technician Richard Mbaru quickly learned how to use the saltPAD efficiently and how to interpret the results using standard images. Mr. Mbaru was able to perform the paper-based titration twice as fast as glassware titration. Another benefit of the saltPADs is that they require a much smaller quantity of deionized water, which is a major cost element of the titration method.



Richard Mbaru, a quality control technician at Kensalt, analyzes salt samples made in the production suite.

FIGURE 1 PAD response to iodate at various ppm levels of iodine. The PADs work by repurposing an iodometric titration, allowing a wide range of iodine concentrations to be analyzed.



a field setting like RTKs, but they are accurate to the part-per-million levels needed to perform quality control in a factory, to carry out regulatory monitoring, or to evaluate levels of iodization in household salt. By varying the dilution of the salt sample, the test cards can be used to evaluate production levels, which are typically 30–50 ppm,

The University carried out an internal validation test in their lab and a field test at Kensalt, a salt manufacturer in Mombasa, Kenya. The president of Kensalt, Mr. Debesh Sengupta, was interested in a technology that could allow closer monitoring of salt production, and he arranged a trial using portions of processed salt collected

GAIN is currently supporting an external validation of the saltPAD in South Africa. About 1000 PADs will be used to analyze samples in a blinded study in order to assess their accuracy and precision. If the saltPADs perform well, they may be an important step forward to improve the monitoring of iodized salt in low-resource settings.

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The success story of the seven-state IDD survey in India

Prof. Chandrakant Pandav, ICCIDD Regional Coordinator for South Asia, delivered the honorary Rajam Oration at the annual meeting of the Indian National Academy of Medical Sciences (NAMS) in Chennai on 14 October 2012. The oration was as follows:

“IDD constitutes the single largest cause of preventable brain damage worldwide. In India the entire population is prone to IDD due to deficiency of iodine in the soil and consequently the food derived from it. An estimated 350 million people are at higher risk of IDD as they consume salt with inadequate iodine. Every year, nine million pregnant women and eight million newborns are at risk of IDD in India.

On September 13, 2000, the Government of India lifted the ban at the national level on the sale of non-iodized salt (India Gazette 2000). Scientists, civil society, international agencies, and other stakeholders joined ranks to fight against this retrograde step by the government of India. The four-pronged approach to fighting the removal of the ban consisted of writing advocacy documents, meeting with stakeholders, campaigning in the media, and tracking of universal salt iodization (USI) in the states through state iodine status surveys. But effective advocacy and media campaigns were hampered by a lack of scientific data substantiating the magnitude of IDD in India. To address this gap, state level iodine status surveys were planned in seven states of India and were executed over the subsequent five years in collaboration with various national and international stakeholders.

The state level IDD surveys were carried out in seven states (Kerala, Tamil Nadu, Orissa, Rajasthan, Bihar, Goa and Jharkhand) from 2000 to 2006 by ICCIDD in collaboration with state medical colleges, Micronutrient Initiative (MI) and UNICEF. Children in the age group of 6–12 years, women in the household, retail shop keepers, and other community stakeholders constituted the study population. All three



His Excellency Governor of Tamil Nadu Mr. K. Rosaiah presenting the award of the R.V. Rajam Oration to Dr. Chandrakant S. Pandav

indicators, total goiter rate (TGR), urinary iodine concentration (UIC), and iodine content of salt (household and retail), were studied. TGR ranged from 0.9% in Jharkhand to 14.7% in Goa. The median UIC ranged from 76 µg/L in Goa to 173.2 µg/L in Jharkhand. The household consumption of adequately iodized salt (≥ 15 ppm) ranged from 18.2% in Tamil Nadu to 91.9% in Goa. These state level IDD surveys are the only sub-national level IDD surveys in India where all three indicators of iodized salt coverage were assessed concurrently.

These surveys provided valuable reliable scientific data to back up the urgent need to reinstate the ban and aided in convincing the wider scientific community and policy makers regarding the need for the same. These surveys also aided in capacity

building at state level, which will provide the necessary impetus to sustain USI. The ban on the sale of non-iodized salt was finally reinstated in May 2005.”

MEETINGS AND ANNOUNCEMENTS

2014 ICCIDD Global Network Management Council Meeting in Zanzibar

On April 2-4, 2014, the Management Council of the ICCIDD Global Network met in Zanzibar, Tanzania, to discuss global and regional strategy, as well as outline work plans and budgets for 2014. The Management Council consists of the ICCIDD GN Regional Coordinators, supported by the ICCIDD GN Executive and Senior Advisors.

The meeting was hosted by Dr. Vincent Assey (see photo), ICCIDD Global Network Regional Coordinator for East Africa. The Principal Secretary of the Zanzibar Ministry of Health, Dr. Mohamed S. Jiddawi, gave the opening address and congratulated the ICCIDD Global Network on its achievements globally and in Africa.

The meeting was attended by officials from the Tanzanian and Zanzibar IDD control programs, UNICEF and the government, including Ms Yokoberty Malisa from Prime Minister's Office; Benedict Jeje, Managing Director, Tanzania Food and Nutrition Centre; Luis Mmbando, (Tanzania NCCIDD); Juma Rajabu (Zanzibar BCIDD); Asha Hasan and Shemsa Nassoro (Nutrition Unit, Ministry of Health Zanzibar) and Malimu Hamis (Association of Zanzibar Salt Producers Organisation).

Issues in discussion included: a) coordination of salt reduction/salt iodization programs; b) the use of iodized salt in processed foods and c) integration of salt iodization programs into the larger nutrition actions, such as the Flour Fortification Initiative and Scaling Up Nutrition (SUN).



Dr. Vincent Assey (left) addressing the ICCIDD Global Network Management Council at the Zanzibar meeting.



At the Management Council meeting (left to right): Karen Codling, Regional Coordinator for Southeast Asia and the Pacific; Laurence Grummer-Strawn, Chair; and Pieter Jooste, Regional Coordinator for Southern Africa.

West African meeting identifies integration of salt reduction and salt iodization programs as a regional priority

Cardiovascular disease, associated with a high dietary salt intake, and iodine deficiency disorders (IDD) are two important causes of preventable illness and premature mortality worldwide. Therefore, optimizing both salt and iodine intakes should be a global health priority. The West African Health Organization (WAHO), the specialized health agency of the Economic Community of West African States (ECOWAS), convened a Regional Consultative Meeting of technical experts in Bobo-Dioulasso, Burkina Faso on July 17, 2013. The meeting was supported by WHO, UNICEF, and the ICCIDD Global Network.

The meeting reviewed the available data on salt consumption in West Africa and noted that, despite substantial information gaps and regional variations, it is likely that salt consumption among large parts of adult populations exceeds the recommended upper level of 5 g/day (corresponding to 2 g/day of sodium). It was also recognized that salt iodization programs have made remarkable progress in recent years, such that 90% of the region's population now have access to iodized salt. However, further efforts are needed to ensure that all salt is adequately iodized, and that all population groups attain adequate iodine status.

In line with previous expert consultations, the meeting concluded that policies for salt iodization and salt reduction are compatible, cost-effective, and of great public benefit. It recommended the establishment of a strong multisectoral working team on dietary salt reduction within the framework of each country's national coordination mechanism for noncommunicable diseases. The meeting also called for greater coordination between salt reduction and salt iodization programs to enhance public health gains and increase efficiency.

The annual meeting of the European Thyroid Association will be held in Santiago de Compostela, Spain, September 6-10, 2014. The host region of Galicia, in the North West of Spain, has a well-known relationship with iodine deficiency since endemic goiter was historically present in the area. At the meeting on September 6, the West and Central Europe Office of the ICCIDD Global Network will hold a *Satellite Symposium on IDD control efforts in the region.*



New law to ban imports of non-iodized salt in Uzbekistan

MOSCOW, March 7, 2014. RIA Novosti

Uzbekistan plans to ban imports of non-iodized salt by the end of 2014 in a drive to combat diseases caused by iodine deficiency. A deputy in the Oliy Majlis, Uzbekistan's lower house of parliament, announced that new laws would be developed by the end of the year.

The law is being developed as part of the government's 'Year of the Healthy Child' project. Lack of iodine became an issue for Uzbekistan after the collapse of the Soviet Union, when supplies of iodized salt from Russia, Kazakhstan and the Ukraine fell away. According to ICCIDD data, 92.7% of the country's population was using non-iodized salt by 1998. This figure had dropped to just under 50% by 2009.

A law on 'Protection Against Iodine Deficiency-Related Diseases' came into effect in May 2007, making all edible salt produced domestically subject to mandatory iodization. Another law adopted in 2010 requires all high-grade wheat flour and salt to be nutritionally fortified.

Egypt's EMISAL improves its salt iodization system

Source: Dr. Hassan Shehata, General Production Manager at EMISAL and www.emisalsalts.com

The Egyptian Salt and Minerals Company (EMISAL) reports developing a new automatic iodine injection system designed to improve the delivery of potassium iodate to salt, to ensure that the iodine levels meet the government standards of 30–70 ppm.

One of the factors affecting the dosing process of iodine is the unstable salt production rate, while the injection rate of iodine remains fixed and must be adjusted manually to prevent deviation from the mandated levels. The new system automatically adjusts the speed of the iodine injection pump to match the rate of salt production. An additional benefit of the system is a saving on iodine consumption, estimated by the company to be about 15% per day and equivalent to about 1.1 metric tons of KIO_3 annually (valued at around US\$64,000).

EMISAL is located in the Fayoum governorate, about 112 km south-west of Cairo. Its reported annual capacity to produce iodized salt is more than 200,000 tons. The company's main production aim is to cover the needs of the domestic market and protect the Egyptian consumers from going back to imported salt.

The International Congress of Endocrinology, together with the Endocrine Society, will host ICE/ENDO 2014, June 21–24, in Chicago, USA. The world's largest endocrinology meeting will feature a session on Saturday, June 21, entitled 'Update on Iodine Deficiency around the World', presented by leaders in the field.



Less than a third of Yemeni families consume iodized salt

February 25, 2014. By Samar Qaed, Yemen Times

Earlier this year Yemeni health officials met in Sana'a to discuss the core problems related to the salt industry in Yemen, one of which is iodine deficiency in salt.

According to a report from the Ministry of Health and Population, from 1996 until the end of 2010, the percentage of Yemeni families who consume iodized salt did not exceed 30 percent, and the percentage of families who consume salt has declined since 2010.

In 1991, both WHO and UNICEF recommended adding iodine to Yemeni salt as an effective means to ensure iodine is part of the diet. In 1996, the government regulated the iodine content in salt, mandating a minimum iodine content of 40 parts per million (ppm).

Mawfaq Al-Hitari, the nutrition officer at the Health Ministry, said: "The situation is getting further complicated because salt is often sold in bags with fake labels. Currently, salt is produced using windmills that are not adequately equipped for the production of properly iodized salt. The absence of a professional licensing and regulatory authority that would organize and develop the salt industry has exacerbated the problem."

The Consumer Protection Association said that local markets are inundated with salt labels that say iodine is contained, but the salt does not meet certain specifications and standards. In addition, Yemeni salt also sometimes contains poisonous elements—heavy metals such as arsenic, lead and cadmium—which can cause additional health problems, including kidney failure and cancer.

In late 2013, the Ministry of Public Health and Population and the Ministry of Trade and Industry established a committee of specialists to inspect salt mines and production facilities. Abdulelah Shaiban, the Deputy Minister of Industry and Trade, reported that there are many defects in the production process and that salt is ground with impurities, which may be harmful to health.

The Ministry is preparing a salt production strategy plan which will detail the standards that should be met in the production process. Different government bodies have been collaborating to develop procedures that will improve the quality of salt available on the Yemeni market. Shaiban said: "A team will make field visits to the salt facilities to coordinate and train their staff on how to grind the salt, remove impurities, and add iodine. The second step is longer-term, and will implement the plan we are preparing."

ABSTRACTS

Health knowledge and iodine intake in pregnancy

In this cross-sectional study, the authors investigated iodine supplement use and health knowledge among pregnant women in their third trimester. Two hundred pregnant women aged ≥ 18 y in Gippsland (Victoria, Australia) completed a questionnaire in 2011–2012. The authors found that 46% of women did not follow the National Health and Medical Research Council (NHMRC) recommendation to take 150 $\mu\text{g}/\text{day}$ of iodine supplements. Only 18.5% believed they needed a supplement, and only 34.5% had been made aware of the need to increase their iodine intake by their medical practitioner. The authors concluded that many pregnant women were not taking sufficient iodine supplements, and that they might be inclined to do so if they had greater knowledge of their increased iodine needs. Medical practitioners are best placed to provide this information.

Martin JC, et al. *Aust N Z J Obstet Gynaecol*. 2014 Mar 16. [Epub ahead of print]

Impact of the actions for the sustainable elimination of iodine deficiency in Cuba

In this cross-sectional study, the authors assessed the effectiveness of the Sustainable Elimination of Iodine Deficiency Program in Cuba. They measured urinary iodine concentration (UIC) and goiter prevalence in school-age children (6–11y). The median urinary iodine was 176.3 $\mu\text{g}/\text{L}$. Only 7.6% of the children showed iodine deficiency; 2.2% had severe deficiency ($< 50 \mu\text{g}/\text{L}$), and 15.3% had UIC above 300 $\mu\text{g}/\text{L}$. The prevalence of optimal iodine nutrition was 43.5% (52.5% in mountain areas). The overall goiter prevalence was 17.6% which corresponds to a mild endemic. However, in mountain areas the prevalence was 32.6% (severe endemic). The authors concluded that iodine deficiency is no longer a population health problem in urban and rural areas of Cuba, attributable to successful salt iodization. Nevertheless, high goiter rates are still observed in mountain areas.

Terry-Berro CB, et al. *Rev Peru Med Exp Salud Publica*. 2014;31(1):24-9. [Article in Spanish]

Dietary iodine absorption is not influenced by malabsorptive bariatric surgery

Bariatric surgery is accompanied by malabsorption of nutrients. The authors estimated the daily iodine intake in 35 severely obese (BMI of $51.3 \pm 8.3 \text{ kg}/\text{m}^2$) patients before and after bariatric surgery. Eleven patients underwent a Roux-en-Y gastric bypass, and 24 underwent long-limb biliopancreatic diversion. The patients did not take any iodine supplements and no iodine antiseptics were used during surgery. A transient increase in urinary iodine excretion (UIE) was observed 3 months after the operation, which returned to baseline levels at 6 months. The authors concluded that the UIE is not reduced after malabsorptive bariatric surgery: although the stomach, duodenum, and a large part of jejunum were bypassed, sufficient iodine was absorbed along the remaining gastrointestinal tract.

Michalaki M, et al. *Obes Surg*. 2014 Apr 17. [Epub ahead of print]

The iodized salt program in Bangalore, India provides adequate iodine intakes in pregnant women and more-than-adequate iodine intakes in their children

The authors compared the iodine status of healthy pregnant women (aged 18–35y) and their healthy children (aged 3–15y) from a low-income urban population in southern India. Adequately iodized salt and small amounts of iodine in food provided adequate iodine during pregnancy: median urinary iodine concentration (MUIC) in women was 172 $\mu\text{g}/\text{L}$ ($> 150 \mu\text{g}/\text{L}$ in all trimesters), and thyroid size did not change as the pregnancy progressed. MUIC in children was significantly higher (220 $\mu\text{g}/\text{L}$) and indicative of more-than-adequate iodine intake for their age. The authors concluded that iodized salt provides adequate iodine to women throughout pregnancy and more-than-adequate iodine intake to their children, which suggests that the current WHO/UNICEF/ICCIDD cut-off for UIC indicating more-than-adequate iodine intake in children may need to be reviewed.

Jaiswal N, et al. *Public Health Nutr*. 2014;24:1-11. [Epub ahead of print]

Neonatal blood TSH concentration in Wales (UK): an indicator of iodine sufficiency

Although the UK population has historically been iodine sufficient, a recent survey of UK schoolgirls has demonstrated mild iodine deficiency. Population iodine status can be assessed by the frequency of newborn thyroid-stimulating hormone (TSH) $> 5 \text{ mU}/\text{L}$. The authors assessed blood spot TSH data for 104,992 infants in Wales between 2011 and 2013. The prevalence of TSH $> 5 \text{ mU}/\text{L}$ in blood collected on days 4 and 5 of life were 1.5% and 0.9%, respectively, and no increasing trend was identified over the three years. The authors concluded that there is no evidence that the population is iodine deficient, but given the recent survey, they recommended that TSH distribution is monitored by the UK screening programs to identify emerging trends in iodine status.

Evans C, et al. *Clin Endocrinol (Oxf)*. 2014 May 6. [Epub ahead of print]

Thyroglobulin as a biomarker of iodine deficiency: a review

The authors reviewed the evidence on the usefulness of thyroglobulin (Tg) in assessing population iodine status. Only studies that clearly reported both Tg and urinary iodine concentration (UIC) in patients without thyroid disease were considered for inclusion. Median Tg $< 13 \mu\text{g}/\text{L}$ and median UIC $\geq 100 \mu\text{g}/\text{L}$ ($\geq 150 \mu\text{g}/\text{L}$ during pregnancy) were used to indicate iodine sufficiency. There were 34 eligible articles, including nine intervention studies. In adults, the results were equivocal because iodine deficient adults had median Tg values of either < 13 or $\geq 13 \mu\text{g}/\text{L}$. Only studies in school-age children showed that iodine sufficient children typically had a median Tg $< 13 \mu\text{g}/\text{L}$. The authors believe that Tg does hold promise as a biomarker of iodine deficiency, but it has limitations. A median Tg cut-off at 13 $\mu\text{g}/\text{L}$ warrants further investigation, particularly in adults or pregnant women, as there is a shortage of observational and intervention studies in these groups.

Ma ZF and Skeaff SA. *Thyroid*. 2014 Apr 24. [Epub ahead of print]

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