Ethiopia’s long road to USI
The history of Ethiopia’s Universal Salt Iodization (USI) program is closely linked to the dramatic changes in the nation’s salt industry and supply. As a signatory to the World Summit for Children in 1990, the Government of Ethiopia banned the production and sale of non-iodized salt in 1996. At the time almost all edible salt in Ethiopia was produced in large, industrial-scale plants on the Red Sea, and progress towards USI was rapid, with coverage of iodized salt reaching 80% just two years later (1). But when Eritrea seceded, the Red Sea salt supply was lost to the Ethiopian market. As imports replaced domestic supply, scarcity was common, and the price of salt rose dramatically. To ease pressure on supply, the ban on the sale of non-iodized salt was lifted, and by 2005 iodized salt coverage dropped to 4.2% (2), with dramatic consequences (Figure 1). The 2005 National Iodine Deficiency Disorders (IDD) Survey revealed that the Ethiopian population was severely iodine deficient (2). Over 6 million (40%) children aged 6–12 years and four million (36%) women aged 15–49 years were affected by goiters, and the median urinary iodine concentration in children was low at 25 μg/L. The survey revealed not only low access to iodized salt but also very low awareness of the importance of iodized salt among women (around 10%).

The long road to universal salt iodization
Over the past 10 years, the domestic salt supply has been rebuilt. UNICEF, with contributions from the Bill and Melinda Gates Foundation and USAID, along with Micronutrient Initiative (MI), the Global Alliance for Improved Nutrition (GAIN), and other partners has been supporting the Government of Ethiopia and salt producers on this journey.

Securing national supply
The discovery of Lake Afdera in the 1990’s provided a consistent supply of salt to the nation. This large saline lake in the Afar Region provides good-quality salt which is technically simple to extract by solar evaporation. It holds sufficient salt to supply the expanding national demand for at least a thousand years.

Government incentives to encourage exploitation of Lake Afdera salt led to a rush of investment by both Afari and national entrepreneurs. As is often the case with natural resource bubbles, this ‘Salt Rush’ led to significant over-capacity, with around 400 producers providing about twice as much edible salt as the country needed (3). With over-capacity, boom turned to bust: competition was fierce, the prices plummeted, and the supply of salt became inconsistent. In response, the Afdera producers formed the Afar Salt Producers Mutual Support Association (ASPMSA) to better coordinate production and supply. To stabilize this new industry, ASPMSA enforced production quota and fixed the price of iodized salt to control the market. As a result, many of the efficiencies of free market competition vanished: there was little incentive for producers to expand their market share through investment in greater efficiency, variety, and improved product quality or value (such as iodization).

Establishing national and regional structures
As domestic salt production capacity was re-built, the Government prepared to re-establish USI, forming the National USI/IDD Control Technical Steering Committee in 2003. Although it was not officially launched until 2010, the committee has made significant breakthroughs. It developed national plans for resource mobilization, training salt producers to build capacity, and ensuring a supply of potassium iodate (KIO3). It also organized forums such as the National IDD day to better advocate to government, development partners, and the private sector.

Ratifying salt legislation
After many years of promotion and advocacy, the most significant step along this journey was the passing of a comprehensive salt regulation in February 2011. It mandated that all salt for human consumption in Ethiopia should be iodized. A government agency was assigned the responsibility of enforcing the legislation and of putting robust inspection and enforcement measures in place, while UNICEF, GAIN, and MI supported it with training, reagents and equipment.
Defining and refining the National Salt Iodization Strategy

The original strategy was to build up on the iodization capacity at the larger packing and distribution facilities, mainly operated by members of the Ethiopian Salt Producers Association (ESPA) outside Afar. However, ESPA members were not Afaris, and the mostly Afari salt producers and land-owners around Lake Afdera opposed this move, perceiving it as biased towards large business interests from outside their region. Consequently, this project was abandoned.

After further assessment, the USI/IDDC committee opted for a decentralized national strategy, which provided multiple producers with medium-scale iodization units at strategic locations. This strategy was supported by the partners, who proceeded to donate iodization mixers, procure and distribute KIO3, and train the salt producers at 22 iodization units. However, the ownership of these units was unclear and their access unequal among salt producers. As a result, the units were underutilized, poorly maintained, and fell into disrepair. Subsequently, an even more decentralized approach was adopted, with salt producers shifting towards manual spraying with knapsacks and manual mixing of the iodine additive.

Setting price incentives

Following lobbying by ASPMSA, the Ministry of Trade officially fixed the price of iodized salt at the point of production at 150 Ethiopian Birr (US$7.5) per 100 kg, and the price of un-iodized salt (for industry use) was set at 32% less. The wholesalers would collect the salt and pay ASPMSA, which would then distribute the funds to the salt producers (according to their quota) after deducting the cost of potassium iodate. Effectively, this removed the incentive for the producers to reduce their costs by not adding iodine.

Communicating and advocating

To help re-establish Ethiopia’s USI program, UNICEF supported the Federal MoH in a range of communication and advocacy activities targeting the government, producers, and consumers. A communication strategy using multiple media was developed to raise public awareness of iodized salt and the importance of its consumption. To support the launch of the mandatory regulations, the activities also focused on the supply-side audiences, including the government regulatory agency, salt producers, and traders.

Establishing a sustainable supply of KIO3

Initially, KIO3 was procured and donated by UNICEF, MI, and GAIN. But when the sustainability of this approach was called into question, a consensus was reached in 2012 to support the purchase of a one-year seed stock of KIO3 while working to establish a cost recovery mechanism. The scheme has been successful: the ministry is procuring and distributing KIO3 to salt producers with no additional funds from partners or donors. Additionally, the ASPMSA system of deducting the cost of the KIO3 from the payment to producers supports the rolling funds for KIO3 and ensures that the additive reaches the producers.

Despite these efforts, less than half the salt is adequately iodized

These incentives have undoubtedly increased the awareness and strengthened the commitment to iodization among the salt producers. A national survey conducted in 2014 by Ethiopia’s Public Health Institute (EPHI) found that an impressive 95% of households were using iodized salt. However, only 43% of the salt contained more than 15 ppm of iodine (4). Such low coverage may be due to the traditional salt production process and manual iodization. Spraying KIO3 onto salt piles with knapsack sprayers may cause uneven iodine levels, and manual mixing does not achieve the required uniformity of iodine throughout the salt pile. In addition, raw salt with high levels of impurities, high moisture, or large crystal agglomerates may not be able to maintain the quantity and homogeneity of iodine. But these were not the only barriers to success. The developing salt production at Lake Afdera had to grapple with harsh climate, little infrastructure, inadequate access to water, power, and labour, as well as risks associated with being in the politi-
cally and ethnically sensitive triangle of Ethiopia, Eritrea, and Djibouti.

These difficulties notwithstanding, the Afar Salt Producers Share Company, a para-statal company in Aïdéra, was able to establish a large-scale facility to properly iodize coarse salt with a capacity of 6,000 tons per month, currently limited to 2,500 tons by the quota system.

The future: Central Iodization Facility

In recent years, in collaboration with development partners, Ethiopia has launched an ambitious project: a Central Iodization Facility (CIF). The CIF’s goal will be to offer a mechanized industrial process while establishing the scale of production and a business model necessary to address the full mix of technology, labor, legal, and other salt quality requirements. Placed between the many raw salt suppliers and the relatively few wholesalers in the value chain, the CIF’s activities will include purchasing raw salt, transporting it from producers to a centralized site, quality improvement of the salt, iodization and packaging of the salt, and engagement in downstream marketing with the distribution system.

A larger scale of production, along with a more comprehensive business model, will enable the CIF to achieve more cost-efficient integration of iodization technologies, more rigorous quality assurance, and other efficiencies of scale including a reasonable profit margin. The CIF will address each of the identified barriers to achieving USI in Ethiopia:

- **Product quality, impurities, and associated iodine retention in the distribution chain** (by introducing basic product improvements like washing, high-quality drying, and screening salt particles by size, to achieve the full Ethiopian National Standard);
- **Quality issues of the manual iodization process** (by introducing large-scale dosifiers and blenders along with better quality assurance procedures to achieve optimal iodization levels and homogeneity);
- **Unequal access to technology** (the CIF will be responsible for purchasing raw salt at a set price at the point of production at any location);
- **Labor issues** (by enabling on-site management and supervision along with hiring fewer but more highly qualified employees, who can be trained and retainned for longer); and
- **Legal environment** (by creating a legal and registered business, which can be easily inspected for full compliance with regulations).

The details of this project remain to be negotiated with all stakeholders to reach a consensus on the implementation, ownership structure (including exploring the possibility of public-private ownership), financing of the CIF, its locality and design. Partners will continue to advocate for this solution. It is feasible for Ethiopia to reach universal salt iodization. However, further political commitment at the regional and federal levels, as well as closer collaboration between the public and private sector, is essential.

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2. EHNRI, FMoH and UNICEF. Iodine deficiency Disorder (IDD) National Survey in Ethiopia. 2005
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Ethiopian brochure on the benefits of iodized salt produced by Population Service International in collaboration with UNICEF
Only half of U.S. household salt is iodized


Iodization of salt is a global public health strategy for addressing iodine deficiency. Iodine is particularly important during pregnancy, when severe deficiency can cause cretinism, congenital abnormalities, and increased neonatal and infant mortality. Recent observational studies suggest that even mild to moderate iodine deficiency during pregnancy can lead to reduced IQ and educational achievement among offspring. While iodine status is sufficient for most Americans, certain subsets of the population, including pregnant women, may be at risk for mild to moderate iodine deficiency. Yet, limited data exist on the proportion of salt that is iodized in the United States. This study used Nielsen (NielsenScanTrack) sales data from 2009 to identify salt products sold in the U.S. and determine the proportion of iodized and non-iodized salt at the retail level. Nielsen collects information from a stratified probability sample of scanner-equipped chain and large independent grocery stores with estimated total annual sales ≥2 million USD. This is the first study to report on the proportion of iodized and non-iodized salt sold at the retail level in the United States.

The authors identified 1117 salt products (Table 1). Salt blends (701 of 1117 products), such as garlic salt or similar, comprised 16% of the total sales volume. Of the remaining 416 salt products, 57 were iodized, according to the information on the label. When weighted by sales volume (in ounces or by each unit sold), only 53% of table salt sold (excluding salt blends) was iodized. Of the 47% of non-iodized salt, about 68% was regular salt, 19% kosher salt, and 12% sea salt.

Historically, iodized table salt has been an important source of dietary iodine for Americans. However, fortification of salt with iodine in the United States is voluntary, and it is estimated that now only 11–12% of sodium in the American diet comes from salt added at the table or during home cooking. The vast majority of salt comes from processed, pre-packaged, or restaurant foods.

This study may provide a baseline for future monitoring of sales of iodized salt in major food retailers in the United States. Tracking the sales of iodized salt over time will help describe potential shifts in the U.S. market share in response to ongoing efforts to reduce salt intake and ensure iodine sufficiency. To help improve iodine intakes among pregnant and reproductive-age women in the U.S., the authors suggest that increasing the proportion of regular salt that is iodized may be the way forward. However, public health interventions that aim to ensure iodine sufficiency among pregnant and reproductive-age women must also be aware of the potential for excess intake of iodine in other populations.
Papua New Guinea’s commitment to USI pays off

Victor J. Temple Coordinator, Micronutrient Research Laboratory, School of Medicine and Health Sciences, University of Papua New Guinea & IGN National Coordinator, and Karen Codling IGN Regional Coordinator for Southeast Asia and the Pacific

Severe consequences of iodine deficiency, including endemic cretinism, were identified in Papua New Guinea (PNG) as early as in the 1950s. The situation was so serious that ethical clearance was given for the first ever trials using iodized oil injections for the management of IDD to be conducted in the country in 1957 (1). The trials resulted in a drastic decline in the goiter rate, however a national program to provide iodized oil injections to the population was not initiated. Surveys in the 1980s and 1990s showed widespread iodine deficiency, with goiter rates in women and school-age children ranging from 0.5 to 54.2% across different regions.

Mandating USI
The Government of Papua New Guinea made a commitment to eliminate iodine deficiency as a public health problem by signing the World Summit for Children declaration in 1990. The country adopted universal salt iodization (USI) as the main strategy for the elimination of IDD. The Pure Food Standards of the PNG Pure Food Act of 1970 (with later amendments) mandates the addition of potassium iodate to table salt so that it provides no less than 40 mg/kg of iodine, and to all other edible salt to provide no less than 30 mg/kg of iodine. These iodization standards are higher than the global recommendation (>20–40 mg/kg at the point of production), recognizing that salt consumption is relatively low in PNG (variously estimated at 1.9–9.6 g per capita per day) (2).

Embedding iodine in the family and child health agenda
Political commitment to USI was consolidated in several major policy documents including consecutive National Health Plans (NHPs) for 1996–2000, 2001–2010, and 2011–2020. USI also features in the PNG Vision 2050 document, launched in 2009, whose objective is for PNG to become “a Smart, Wise, Fair, Healthy and Happy Society by 2050” (3). The current NHP (2011–2020) focuses on improved service delivery and primary health care to achieve eight Key Result Areas (KRAs) and reach the goal of “a healthy and prosperous nation for all, both now and for future generations” (4). The elimination of IDD as a public health problem is embedded in three of the eight KRAs.

Implementation and monitoring of the USI strategy is also fully integrated into the new National Nutrition Policy (NNP 2014–2023). Combating micronutrient deficiencies, including iodine deficiency, is one of the plan’s seven objectives. The plan also stresses the need for adequate nutrition and support during the first 1000-day ‘window of opportunity’ and the extended period that includes adolescence. It highlights the consequences of inadequate nutrition during the first 1000 days of a child’s life (from conception to second birthday), which may include brain damage, stunted stature, impairment or delays in meeting cognitive developmental milestones, poor mental capacity, diminished learning ability, and poorer educational performance. The NNP calls for political commitment at the highest level to reduce the short- and long-term impact of hidden hunger and malnutrition, two major obstacles to reaching the goals of Vision 2050 and achieving the KRAs outlined in the current National Health Plan.

Elimination of IDD is the responsibility of a multi-sectoral national committee established under the Food Sanitation Council and coordinated by a senior execu-

<table>
<thead>
<tr>
<th>Demographic characteristics</th>
<th>Household coverage (% HH)</th>
<th>Percent of households with adequate levels of iodine in salt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mini-surveys (2012 – 2014)</td>
<td>≥30 ppm</td>
<td>≥15 ppm</td>
</tr>
<tr>
<td>Gouno Lufa district, 2012</td>
<td>100.0</td>
<td>2.4</td>
</tr>
<tr>
<td>Kabalia district, 2013</td>
<td>89.5</td>
<td>17.6</td>
</tr>
<tr>
<td>Lorengau district, 2014</td>
<td>100.0</td>
<td>25.0</td>
</tr>
</tbody>
</table>

TABLE 1 Availability of salt in households (%HH) in small surveys conducted between 2012 and 2014.
reported that all salt found in households contained some iodine (≥0 ppm), and 92.5% was iodized adequately according to the global standard (≥15 ppm), and 81.6% according to the national standard (≥30 ppm). High household use of iodized salt was also reported at the regional level (except in the Southern Region, where 76.1% of salt was iodized at ≥15 ppm, and 50.3% at ≥30 ppm) and in both urban and rural areas. A total of 8 brands of salt were available nationally, of which 6 were imported brands.

Importantly, a considerable proportion of households in that survey (38.1% overall) did not have any salt at the time of data collection; this proportion was higher in the Southern Region (49.6%), and in rural areas (41.5%). It is not clear whether some households never buy salt and miss out on the benefits of iodization, or whether they buy salt day-to-day and had run out on the day of the survey.

Several mini-surveys conducted across several districts between 2012 and 2014 reported that almost all households had access to salt with at least some iodine (6–8). Although about 60% of the salt was iodized at 15 ppm or more, a significantly lower proportion met the national standard of ≥30 ppm (Table 1).

**Iodine levels in salt at the point of sale**

Iodine content in salt collected from retail outlets was measured in the 2005 NNS, and more recently in the mini-surveys between 2010 and 2014 (5–8). The recent surveys show that the variety of salt brands available in the National Capital District (the capital city of PNG) has increased. About half to two-thirds of the salt was iodized at ≥15 ppm, but only about a third was iodized at ≥30 ppm, the level expected at the point of production.

**Urinary iodine**

In 2005, the median urinary iodine concentration (MUIC) in women of reproductive age in Papua New Guinea was 170.0 μg/L, with 71.1% of UICs above 100 μg/L (6). At the regional level, the median UIC ranged from 129.5 to 290.0 μg/L, suggesting that iodine nutrition was adequate in all regions. However, the median UIC was significantly lower in the households without any salt than where salt was present (111.4 vs. 203.5 μg/L). In 8 out of 97 of the sampling clusters, none of the households had salt on the day of the survey. In these households, the median UIC was only 79.5 μg/L, indicating mild iodine deficiency. By comparison, women from the clusters with salt in the household had a median of 182.55 μg/L.

But mini-surveys conducted in recent years in various subpopulations (pregnant women, lactating mothers, infants, and school-age children) appear to reflect consistently adequate iodine intakes among all groups with the exception of school-age children in one of the districts (Table 2) (5–10).
Recommendations and next steps
The latest surveys showing that, by and large, Papua New Guinea has reached optimal iodine nutrition reflect the tremendous progress made since the implementation of USI. Yet, a significant proportion of salt (even in the NCD) remains inadequately iodized. In addition, the relatively high proportion of households with no salt suggests that there may be pockets of the population that are not reaping the benefits of USI and are, therefore, still at risk of IDD. While the overall findings are optimistic, they also highlight the need for ongoing monitoring and assessment of the implementation of USI and iodine status to ensure that the achievements made in the last decade are being sustained. In particular, more systematic monitoring at a sub-national level may be necessary to identify the pockets unreached by USI. However, routine and systematic monitoring requires adequate funding. The situation is complicated by the fact that systematic monitoring of imported salt at the points of entry is lacking, which could explain why some of the salt on the market is not iodized to the national standard (≥30 ppm).

Although national policies and strategies recognize the importance of salt iodization as a strategy to eliminate IDD, more efforts are needed from all national stakeholders to actively implement it. The current status of the salt iodization program in PNG can, therefore, be characterized as “existent but needing strengthening.” Sustaining progress requires greater political commitment to USI, regular and routine reviews of the program, more systematic monitoring, and active enforcement of national legislation to ensure that salt iodization becomes truly universal.

**TABLE 2** Urinary iodine concentration (UIC) in different population groups measured in small surveys between 2005 and 2014 in Papua New Guinea

<table>
<thead>
<tr>
<th>Location</th>
<th>Subjects</th>
<th>N</th>
<th>Median UIC (µg/L)</th>
<th>Adequate iodine status criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCD, 2005</td>
<td>Non-pregnant women</td>
<td>86</td>
<td>170</td>
<td>≥100 µg/L</td>
</tr>
<tr>
<td></td>
<td>Pregnant women</td>
<td>212</td>
<td>180</td>
<td>≥150 µg/L</td>
</tr>
<tr>
<td>NCD, 2007</td>
<td>Infants</td>
<td>100</td>
<td>254</td>
<td>≥100 µg/L</td>
</tr>
<tr>
<td></td>
<td>Lactating mothers</td>
<td>100</td>
<td>125</td>
<td></td>
</tr>
<tr>
<td>Aseki-Menyamya district, 2011</td>
<td>Children 6-12 yrs</td>
<td>207</td>
<td>150</td>
<td>≥100 µg/L</td>
</tr>
<tr>
<td>Gouno Lufa district, 2012</td>
<td></td>
<td>132</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Kubalia district, 2013</td>
<td></td>
<td>192</td>
<td>172</td>
<td></td>
</tr>
<tr>
<td>Lorengau district, 2014</td>
<td></td>
<td>233</td>
<td>215</td>
<td></td>
</tr>
</tbody>
</table>

**References**
In the recently published Global Iodine Scorecard, Papua New Guinea joined the growing number of countries that achieved optimal iodine nutrition at the national level. As we are nearing the target of virtual IDD elimination, PNG’s achievement seems particularly poignant. It was 50 years ago in the highland villages of Papua New Guinea that a team of researchers, which included Dr. Basil Hetzel, found evidence that endemic cretinism (a condition of severe mental impairment) could be prevented by correcting iodine deficiency before pregnancy. Hetzel recalls: “Papua New Guinea had the mountains and high rainfall, which provided a suitable environment for severe iodine deficiency from the soil. Our work had proved the brain involvement in iodine deficiency”. Previous research had found links between iodine deficiency and goiter, but as Hetzel explains, “cretinism was not fully understood until the trial in Papua New Guinea.”

With subsequent research, and through Hetzel’s tireless efforts, a sufficient evidence base was established to develop a global program to prevent what was now recognized as a broad spectrum of effects of iodine deficiency in a population, jointly termed iodine deficiency disorders (IDD).

In 2012, more than 40 years since Hetzel’s work in Papua New Guinea, successive Global Iodine Scorecards have shown remarkable and steady progress at the global level (Figure 1). From 54 iodine deficient countries in 2003, the number has more than halved in the past decade. Through securing political commitment, involving the private sector and persistent advocacy, we’ve expanded USI over the past two decades.

When asked whether he ever imagined we would get so close to virtual elimination of IDD in his lifetime, Hetzel says he has been hopeful, and it is very gratifying to see the evidence of progress around the world. But even though the recent success of Papua New Guinea may seem symbolic, Hetzel agrees that it’s too early to rest on our laurels. In many countries, the last-mile efforts are the hardest. “It’s important to maintain the momentum” he says.
Steadfast efforts to sustain the elimination of IDD in Bhutan

The IGN South Asia Team

The dragon kingdom of Bhutan is a landlocked, mountainous country in the Himalayas with a total land area of 38,394 km² and a population of 750,000. Within this small area, the elevation varies dramatically from 97 m in the south to 7570 m in the north. Bhutan is an IDD endemic country. A survey in 1983 reported a total goiter rate of 65%, which gave rise to a multisectoral IDD Control Program (IDDCP) established in 1984 (Table 1). Bhutan was one of the first countries globally to undertake periodic monitoring of IDD, successfully implemented from 1996 to 2001. As a result, it achieved IDD elimination in 2003 and was certified as iodine sufficient.

In 2010, the Department of Public Health, MoH, carried out a nationally representative survey to assess whether the country has been successful at sustaining iodine sufficiency. The survey reported that the median urinary iodine concentration, measured in 780 schoolchildren aged 6–11 years from the three Regions: Western, Central, and Eastern, was 183 μg/L, clearly indicating adequate iodine nutrition. The median in each of the Regions was also in the adequate range, with the lowest median (138 μg/L) reported in the East. Only two of Bhutan’s 20 administrative districts (Trashigang and Samdrup Jongkhar) had medians below 100 μg/L, in the mild iodine deficiency range. Overall, only 8.7% of the population had urinary iodine concentrations below 50 μg/L.

Household salt samples collected from the children enrolled in the study were analyzed for iodine content by iodometric titration. At the national level, 91% of households were consuming adequately iodized salt, with similar coverage across all three regions. In only one district the coverage was below 80%. Each of the three Regions has one major trade gateway with India: the Eastern Region through Samdrupjongkhar, the Central Region through Gelephu, and the Western Region through Phuntsholing. Although the Royal Government of Bhutan operates a salt iodization plant in the town of Phuntsholing, the majority of branded salt sold in Bhutan comes from India.

This survey has confirmed that Bhutan has sustained the elimination of IDD since 2003. To ensure continued success, the following steps should be ensured:

- Monitoring of salt iodine content especially at the major trade gateways with India at Phuntsholing, Samdrup Jongkhar, Gelephu, Sarpang, and Samtse.
- Strengthening information, education, and communication activities related to IDD.
- Intensive activities focusing on districts with insufficient iodine intake (Trashigang and Samdrup Jongkhar).
- Regular evaluation of the IDDCP program at district and national levels.
- Assessing iodine nutrition status of pregnant mothers, especially in low-performing districts.
- Training and capacity building of health workers and laboratory personnel to support the IDD program.
- Enhancing the capacity of Bhutan Salt Enterprise and strengthening the regulation of branded salt imports from neighboring countries, especially India.

### Table 1: History of the IDD Control Program of Bhutan

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1983</td>
<td>First National IDD survey</td>
</tr>
<tr>
<td>1983</td>
<td>Production and distribution of iodized salt to control IDD in Bhutan</td>
</tr>
<tr>
<td>1984</td>
<td>National Policy, Strategy and Plan of Action to control IDD in Bhutan</td>
</tr>
<tr>
<td>1986</td>
<td>IDD Control Program (IDDCP) in Bhutan</td>
</tr>
<tr>
<td>1986</td>
<td>Situation analysis of salt iodization program in Bhutan</td>
</tr>
<tr>
<td>1992</td>
<td>Evaluation of the IDDCP, Bhutan</td>
</tr>
<tr>
<td>1996</td>
<td>National IDD Survey</td>
</tr>
<tr>
<td>1996</td>
<td>Statement endorsing IDD elimination and USI signed by His Holiness Je Khenpo (Chief Abbot)</td>
</tr>
<tr>
<td>1998</td>
<td>Annual monitoring of IDD</td>
</tr>
<tr>
<td>2003</td>
<td>Declaration of sustainable elimination of IDD</td>
</tr>
<tr>
<td>2010</td>
<td>National IDD Survey</td>
</tr>
</tbody>
</table>
Spurring the salt industry to achieve the last mile of USI in India

Kuchibhotla Srinivas CEO, Frontier Growth Advisors, and Arijit Chakrabarty Associate, Global Alliance for Improved Nutrition (GAIN)

Introduction
Melinda Gates in one of her TED talks (“What non-profits can learn from Coca-Cola,” filmed in September 2010) makes a provocative case for non-profits taking cue from corporations such as Coca-Cola, whose plugged-in, global network of marketers and distributors ensures that every remote village wants—and can get—a Coke. Besides sanitation, condoms, and vaccinations that she makes a case for, one wonders why shouldn’t this approach work for iodized salt in order to reach the unreached? What would make the markets (for edible salt) work for the poor?

The Iodine Deficiency Disorders Control Program in India is one of the most successful public health programs. There has been remarkable progress over the past few decades, and according to the latest available data (CES 2009), 71% of the Indian households use salt with the mandated levels of iodine, while only 9% use salt that has no iodine in it. There are, however, significant rural–urban differences, and differences across the wealth quintiles. These ‘last mile’ issues need to be addressed if we are going to achieve successful universal salt iodization (USI) and sustain optimal iodine nutrition. In her talk, Ms. Gates mentions three things that Coke does to penetrate the remotest rural markets, namely:

1. Take real-time data and immediately feed it back into the product.
2. Tap into local entrepreneurial talent.
3. Do incredible marketing.

In the last few years, the Global Alliance for Improved Nutrition (GAIN) has made strategic investments in India using examples from the private sector to strengthen supplies and improve the regulatory monitoring. They have done this working closely with industry, government, and other agencies including UNICEF, End Poverty, and Frontier Growth Advisors. Their approach has encompassed three key elements to catalyze: (1) Modernization, (2) Mechanization, and (3) Consolidation. These elements enable the small-to-medium (SME) industry players to move up the curve thanks to improved operational efficiency and capacity, thus enabling them to bring high-quality, adequately iodized salt to the market. Some of the investments have included:

• Developing a web-based salt management information system, which delivers real-time data on salt production, dispatch, management, and quality control;
• Piloting a Technology Upgrade Fund Scheme to provide impetus to investment by small-to-medium salt industry players in technology upgrades, and to consolidate their operations;
• Piloting the India Salt Services Cooperative Federation (ISSCF);
• Convening stakeholders at high-level events such as the India Salt Summit.

Three of these investments are described here in more detail.

Piloting the Technology Upgrade Fund Scheme (TDFS) for the salt industry
Limited use of advanced production and processing technologies in the Indian salt industry can be put down to a lack of financial strength and investment capacity of the SMEs. But the downside of low mechanization and older technologies is higher production costs. Further, due to fierce market competition, the SMEs resort to cost-cutting measures, like cutting the cost of iodization. As a result, their salt may be of lower quality and inadequately iodized (or non-iodized). Therefore, upgrading the production and processing technology of the SMEs is a stated need to achieve the last mile of USI in India.
The Technology Upgrade Fund Scheme (TUFS) would provide impetus to investment by the SMEs in technology upgrades. TUFS policy, if implemented by the Government, would improve operational efficiency by way of capital incentivization on a shared basis by the Government and the SMEs to modernize and mechanize their facilities. The key impact of the fund would be in providing financial support to new units to adopt advanced technology, and to old units to upgrade and replace old technology. The estimated fund allocation by the Central or State Governments to cover these upgrades during the next five-year plan are estimated at around 1.5–2 million USD. If successful, the scheme will bring about a shift in the needle of USI in India by at least 5–10%.

The draft scheme has received overwhelming support from all stakeholders, and there are efforts to continue the dialogue with the Central and State Governments to adopt the TUFS policy. The next step will be to establish a multisectoral committee to continue the dialogue with the GOI and see the scheme through to implementation.

**Piloting the India Salt Services Cooperative Federation (ISSCF)**

A unique national-level salt marketing cooperative, ISSCF, was launched on January 5th this year at the India Salt Summit in Ahmedabad. This body will comprise salt manufacturers, wholesalers, retailers, and other industry sectors. Through its work, the federation aims to consolidate the operations of the salt industry SMEs by providing access to consumers, technology transfer, capacity building, salt community, and policy interface.

To date, the ISSCF has been joined by two major marketing cooperatives (Urza Cooperative Salt Services Society and Sanibhar Cooperative Salt Services Society) from two salt-producing states, Gujarat and Rajasthan, and at least 100 SMEs. This number is expected to rise quickly to around 2000, with a goal to expand operations throughout the country. The main objective of the federation is to promote sustainable production and distribution of high-quality iodized salt to the low-to-middle income segments of the society through public distribution systems, Government programs (e.g., the Midday Meal Scheme supported by the Integrated Child Development Services), and private distribution channels.

The federation is set to build state-of-the-art common processing facilities and promote the SME salt brands, with the goal of producing 0.1 million MT of adequately iodized salt within two years, to reach the 276 million people currently believed to live below the poverty line, and improve the USI coverage by 5%.

**India Salt Summit (ISS)**

The India Salt Summit was first proposed as a concept for an independent platform to discuss the strategies for addressing the three key issues (modernization, mechanization, consolidation) that need catalyzing in order to advance India’s USI program. Endorsed by the Indian salt industry, the ISS has become a successful neutral platform to involve all stakeholders.

Held at three locations (Ahmedabad, Chennai, and New Delhi) between January and April, 2015, the ISS has mobilized nearly 450 industry stakeholders (producers, processors, marketers, government policy makers, researchers/scientists, consumers, and various international agencies) to come together and discuss the various technology, infrastructure, and policy solutions that are needed to achieve truly universal access to iodized salt.

The round table discussions focused on the following agenda:

- Input from all stakeholders on the draft “Technology Upgrade Fund Scheme – TUFS”;
- Views from stakeholders on the strategies for developing a road map for the “Cooperative Federation – Providing Market Access to Producers & Processors”;
- Views on the proposed “Comprehensive Policy for the Salt Industry”;
- Launch of the “Make In India” theme, and a discussion on the structural challenges and strategies to capture the emerging opportunities.

In the future, the ISS could play a role as a mouthpiece for the salt industry, while it continues to be used as a platform to enable dialogue between policymakers and other stakeholders, bridge the innovation and technology gap, and enable a structural change within the industry, so that iodized salt becomes accessible to all.
Four Gulf States move toward IDD elimination

KUWAIT
MEDIAN UIC: 131.6 µg/L (National survey in 2013)
IODINE STATUS: Adequate

Already in 1997, a nationally-representative survey reported optimal iodine nutrition among school-age children (SAC) in Kuwait: the median urinary iodine concentration (UIC) was 147 µg/L, with 9.7% of the UIC values below 50 µg/L. In 2013, a survey was conducted to assess whether the adequate iodine status of the population had been sustained. Urinary iodine levels were measured in a representative sample (n=2,100) of 6–12 year-old SAC from all six Governorates in Kuwait. In addition, salt samples from the children’s households were analyzed for iodine content. The median UIC was 131.6 µg/L, and the proportion of UICs below 50 µg/L was 9.3%, both of which suggest that iodine deficiency is not a public health problem in Kuwait.

In terms of access to iodized salt, 15.9% of the household salt was inadequately iodized (<15 ppm), 43.2% was iodized within the mandated range of 15–40 ppm, and 40.85% contained in excess of 40 ppm of iodine. This distribution varied across the regions. There was no correlation between the concentration of iodine in urine and its concentration in salt. Most of the students (55.21%) were not aware of the benefits of iodine in the salt prior to the survey.

OMAN
POPULATION: 3,926,492 (2014)
MEDIAN UIC: 194 µg/L (National survey in 2014)
IODINE STATUS: Adequate

In response to a 1993 national survey, which suggested that school-age children may not be consuming enough iodine, the Government of Oman introduced salt iodization to bring iodine deficiency under control. According to a new national iodine survey, conducted in 2014 by the Ministry of Health (MoH), Oman has no cases of iodine deficiency. Dr Samia al Ghannami, Director General of Nutrition, MoH, presented the survey results during the opening session of the Iodine Global Network's annual meeting held on 1 April this year in Muscat, Oman. The survey was carried out on a sample of 2,560 SAC aged 6–12 years, and it found a median UIC of 194 µg/L, with only 3.5% of the UIC values below 50 µg/L.

Commending the MoH on its success, Professor Michael Zimmermann, Chair of the Iodine Global Network, said that the next goal should be to increase the intake of iodine among pregnant women, a population group particularly vulnerable to the effects of iodine deficiency. Another task will be to reduce salt intake in the population to prevent non-communicable diseases such as hypertension and cardiovascular diseases. Dr Samia added that, “The food and nutrition department is now working at different levels with health authorities to find gaps in the dietary habits of people and plug them. “For example, we have reduced the salt used in breads made locally by ten per cent and plan to cut it down by 30% in three years.”
For many years IDD was a public health problem in Qatar, even after the introduction of universal salt iodization. But the situation was not monitored, and the extent of IDD was unknown. According to the Supreme Council of Health (SCH), a study in 1997 reported a total goitre prevalence of 30%. In response to the WHA resolutions, pledging to eliminate IDD as a public health problem and calling on governments to report on their iodine nutrition every three years, Qatar has taken several steps to assess the IDD/USI situation in the country. A workshop on sustainable elimination of IDD was held in Doha on 8–9 December 2010 in partnership with the IGN and WHO-EMRO to promote IDD elimination and salt iodization in Qatar.

A national survey of IDD in 2014 revealed a median UIC of 334 μg/L in a representative sample of 6–12 year-old SAC (n=980). A repeat urine sample was collected on the second day in a subsample from the same cohort (n=288) to adjust the distribution, which showed that the habitual iodine intake, although somewhat high, is generally within the recommended intake range: none (0%) of the children had low habitual iodine intakes (below the Estimated Average Requirement of 73 μg/day) and none (0%) had excessive habitual iodine intake (above the Upper Limit of 600 μg/day).

In the same study, salt collected from households was tested for iodine content using both rapid testing (qualitative) and titration (quantitative) methods. Almost 90% of the salt was adequately iodized, around 13% was iodized below 15 ppm, and in 12.4% of samples iodization levels were excessive. In addition, the survey found that the awareness of the importance of consuming iodine and reducing salt intake should be improved, preferably through a targeted educational program.

In conclusion, the iodine intakes among schoolchildren in Qatar should be slightly reduced to bring their median UIC below the 300 μg/L cut-off indicating excessive intake. This could be achieved by reducing the iodine content in salt from 25 to 20 ppm.

In July 2014, the Ministry of Health of Bahrain announced that the country had been declared free of iodine deficiency disorders. In 2012, the Bahraini MoH in collaboration with the ICCIDD and the Ministry of Education initiated a national study to assess urinary iodine levels in SAC aged 6–12 years (n=900) from the five Governorates of Bahrain. The survey reported a median UIC of 247 μg/L (in the adequate range) and a very low goiter prevalence of 2.1%. In addition, only 1.75% of the children had urinary iodine levels <100 μg/L compared to 16.5% of children aged 8–12 years in a study conducted in 2000. But at the same time, 17.7% of the UICs were in the excessive range (≥300 μg/L). The survey also reported that 36.9% of household salt had adequate levels of iodine (15–40 ppm), and that there was a link between improved urinary iodine concentrations and higher consumption of iodized foods. Bahrain’s Minister of Health praised this achievement, which could not have been accomplished without the significant efforts of the MoH, with technical support from WHO and the IGN.
Madagascar is an island off the south-east coast of Africa with a population of 21 million and an annual growth rate of 2.7%. The number of infants born each year is about 840,000. Almost all salt consumed in the country is produced locally with about two-thirds produced by medium-to-large salt producers. The remainder is produced by multiple small-scale producers in the southern regions of Atsimo Andrefana and Androy. A survey conducted in 1992 reported a goiter prevalence of 45%, suggesting that the problem of iodine deficiency may be severe. Following a feasibility study in 1993, the Malagasy Government made iodization of salt mandatory in 1995. Since then, goiter prevalence has declined to only 6% in 2001.

However, the salt iodization program has suffered a few setbacks. A political crisis in 2009–2013 with the associated sanctions and budget cuts has weakened the coordination, monitoring, and communication aspects of the program. In addition, false information linking the consumption of iodized salt with a risk of hypertension emerged from the medical community in early 2012, leading to an increased demand for non-iodized salt, especially in urban communities and among the educated segments of the population. The 2008–09 Demographic and Health Survey (DHS) reported that only 50% of households had access to iodized salt, with considerable regional variation (Figure 1). The lowest coverage (<20%) was in the south, dropping to well below 10% in the regions of Anosy and Androy.

To repair the damage caused by misinformation and re-launch communication activities for the promotion of iodized salt, the MoH in collaboration with the National Nutrition Office and UNICEF held a workshop in November 2013. Its objective was to reach a policy consensus that would balance the need to promote iodized salt consumption (to prevent IDD) and the need to limit sodium intake (to prevent the rise of hypertension), and reduce the high cost of these diseases for families, communities, and the country.

1. To strengthen the activities of the multisectoral National Committee in charge of the fight against health disorders caused by iodine deficiency; to develop and implement policies and strategies on salt iodization and reduction of daily salt intake.
2. To set up an information system to facilitate monitoring of the universal salt iodization and salt reduction programs.
3. To sensitize the people on the benefits of iodized salt consumption as well as the reduction daily salt intake in schools, at workplaces, and in the communities.
4. To collaborate with salt producers for adequate iodization and with food processing industries for a reduction of the salt content in their products (through reformulation) so that they provide information to consumers about the nutritional value of their products using a three-colored labeling of their food products and to enable them to adopt ethics friendly marketing strategies.
5. To strengthen the surveillance and control of iodized salt during production, sale, and consumption.
6. To provide funding for activities related to salt iodization and daily salt consumption program in the budget of relevant ministries and entities.
7. To provide financial and technical support for the development and implementation of policies and strategies on salt iodization and daily salt consumption reduction.
8. To build the capacity of stakeholders (clinicians, public health experts, salt producers, consumers, policymakers, as well as external partners, ICCIDD, UNICEF, and WHO), the workshop concluded in a consensus statement co-signed by several ministries, external partners, and the National Nutrition Office. The statement signals a significant surge in political will in Madagascar to overcome the public health threats of iodine deficiency and cardiovascular disease at the same time. Here are its key recommendations:

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Consensus on salt iodization and sodium reduction in Madagascar

Simeon Nanama UNICEF Madagascar
An 88-year-old Chinese woman was brought to the emergency department by her family, who reported that she had been lethargic and unable to walk or swallow for 3 days. She had been eating an estimated 1.0 to 1.5 kg of raw bok choy daily for several months in the belief that it would help control her diabetes. She had no previous history of thyroid disease.

On examination the patient was lethargic. Her body temperature was 36.1°C, her pulse was 58 beats per minute, her blood pressure 181/89 mm Hg, and the respiratory rate 22 breaths per minute. A pulse oximetry reading was 92%. She had swelling around the eyes, an enlarged tongue, and her thyroid was not palpable. She also had a pitting edema in her lower legs, dry skin, and coarse hair. Laboratory testing was significant for serum levels of sodium (118 mmol/L), thyrotropin (74.4 mIU/L, an increase from 0.65 mIU/L 4 months earlier; normal range, 0.4–4.0 mIU/L), free thyroxine (undetectable; normal range: 0.7–2.2 ng/dL), and thyroid peroxidase antibodies (13 IU/mL; normal range, <20 IU/mL). The patient had to be intubated due to a hypoxemic and hypercarbic respiratory failure and admitted to the intensive care unit with a diagnosis of severe hypothyroidism with myxedema coma. She was treated with intravenous methylprednisolone and levothyroxine and was eventually discharged to a skilled nursing facility.

Brassica rapa chinensis, otherwise known as bok choy or Chinese white cabbage, contains glucosinolates, a group of compounds that occur widely in this genus. Some of the breakdown products of glucosinolates, such as thiocyanates, nitriles, and oxazolidines, have been implicated for their inhibitory effects on the thyroid. Studies in the 1920s were the first to note the development of hypertrophic goiters in rabbits that were mainly fed a diet of cabbage (1). Interest in the possible goitrogenic properties of foodstuffs led to the discovery of 1,5-vinyl-2-thiooxazolidone in brassica seeds and in yellow turnips. The compound was termed a goitrin because it inhibited the uptake of iodine by the thyroid gland (2). In our patient, the problem was her consumption of considerable amounts of raw bok choy. When eaten raw, brassica vegetables release the enzyme myrosinase, which accelerates the hydrolysis of glucosinolates; the cooking process largely deactivates the myrosinase in these vegetables (3). This case demonstrates the potential for nutritional factors to have a profound effect on health.

By 2000, only 26% of households across the CEE/CIS region had access to adequately iodized salt. As political turmoil and military conflicts receded, USI strategies gained momentum, and national coalitions were activated country after country. By the end of 2009, 55% of the region’s population had access to adequately iodized salt. At the same time, several countries had already officially achieved optimal iodine nutrition, others were approaching this target and, importantly, the effective national ability to pursue USI had been established in almost all CEE/CIS countries. These significant improvements resulted directly from a dramatic increase in public–private partnerships and commitment from key stakeholders.

Despite the impressive progress, the context in which USI programs are embedded continues to change. In more and more CEE/CIS countries, processed foods are becoming an important source of dietary iodine. In addition, the emphasis is gradually shifting towards reaching the most vulnerable groups (pregnant and lactating women, and infants) with iodine supplements and/or functional foods containing iodine, sometimes at the expense of promoting universal access to iodized salt. In parallel, to combat the rising threat of hypertension and cardiovascular disease, national strategies for reducing salt intakes are gaining momentum. To avoid counter-productive policy practices, there is need to ensure synergy by promoting adjustments of iodization levels as salt intakes decrease. This approach requires new forms of collaboration in policy development, research, monitoring and evaluation, and advocacy and communication. The current situation, therefore, presents not only opportunities but also new challenges as program priorities are shifting, and sustainability efforts are becoming established.

UNICEF and GAIN, with support from USAID, are organizing two consultative workshops for the countries in the Region: the first one for the Russian-speaking countries of the CIS, to be held in Almaty (Kazakhstan) in July 2015, and the second for the Balkan/Southeastern European countries in October 2015. These meetings will focus on experience sharing and lessons learned from countries with successful USI programs, integrating the strategies of USI and salt intake reduction, updating USI stakeholders on new developments in IDD prevention and program management, as well as fostering collaboration and coordination at the regional and national levels. In preparation for the workshops, the IGN and UNICEF will update the IDD/USI profiles for all countries in the Region and review the current trends to supplement the previous detailed review with new data and add information on current salt intake reduction strategies.

The workshops will primarily target national IDD/USI committees and will invite multi-sectoral participation of nutrition program officials within the Ministries of Health, IGN national representatives, senior salt industry employees, as well as laboratory experts and civic activists from NGO/consumer protection organizations. This cross-societal participation is hoped to stimulate discussion on a wide range of issues, enable the attendees to compare experiences, and share lessons learned from their colleagues in order to determine the most feasible and effective approaches to strengthening and sustaining national USI achievements.

The workshops will assist countries in developing their 3–4 year “road maps” to guide the development of an enabling environment and to provide directions to sustained USI and optimal iodine nutrition. Each road map will provide a country-specific analysis of bottlenecks and opportunities for enhanced USI strategies that are in line with global guidelines and practices. They will aim to identify the best approaches to address key barriers in lagging countries. The workshops will also offer the first opportunity to outline the steps for integrating national salt iodization and salt intake reduction strategies.
IGN and UNICEF lead a successful IDD prevention workshop in the Middle East

The first of two workshops on sustainable prevention of iodine deficiency disorders and achievement of optimal iodine nutrition and salt reduction, organized by the IGN in partnership with UNICEF MENA, was held in Dubai on 10–13 March 2015. The workshop was hosted by the Ministry of Health, under the patronage of Dr Husain Al Rand, the MoH Undersecretary for Hospitals and Clinics. Dr Izzeldin Hussein, the IGN Regional Coordinator for MENA/EMRO (see photo) provided technical and organizational support in collaboration with UNICEF-MENA and other partners.

The workshop was attended by 48 participants from all over the MENA region, including from the UAE, Oman, Egypt, Sudan, Bahrain, Iran, Iraq, Jordan, Kuwait, Lebanon, Palestine, Qatar, Saudi Arabia, and Syria. The countries shared their experiences in USI surveillance and integration of salt iodization and salt reduction programs. For all, it was an opportunity to learn how to address IDD through a successful multisectoral collaboration, and how to sustain progress in emergency settings. For their achievements in sustainable IDD elimination, the Gulf States received a collective award.

The goal of the workshop was to identify opportunities to leverage government and industry commitment and the commitment of regional bodies, such as the Gulf State Cooperation and the existing surveillance systems. The workshop identified several gaps that need to be addressed, including:

- Guidance on recognizing the sources of dietary iodine
- Continued joint efforts in salt reduction and salt iodization in the Region
- Technical support in countries where the paradigm of USI doesn’t apply
- Strengthening of internal and external monitoring of iodized salt
- Access to a reference lab in the region
- Ensuring that small-scale producers iodize salt
- Emerging excess iodine intake
- Evidence-base on how iodine interacts with other nutrients.

All countries provided their Plans of Action for 2015–2020, which will facilitate further tracking of country progress. By building on the existing USI successes across the region, the aim is to make the 4 million newborns and 148 million people who are currently partially unprotected from iodine deficiency a thing of the past in the Middle East and North Africa.

MaxMind generously supports the IGN

We are grateful to MaxMind Inc. (www.maxmind.com) for a generous donation of 250,000 USD to support our efforts to eliminate IDD around the world through salt iodization.

Founded in 2002, the Massachusetts-based provider of IP solutions donates over 50% of its profits to charities, with emphasis on high-impact, evidence-based projects.

The donation was received via GiveWell (www.givewell.org), a charity evaluator and supporter of evidence-based philanthropy, which recommended the IGN as a standout charity in December 2014. Their independent research confirmed that salt iodization is a proven, cost-effective and scalable intervention to raise child IQ.

The gift will make a major contribution to prevention of iodine deficiency in the developing world, and help disadvantaged children reach their full development potential.
Annual IGN meeting brings together partners in the fight against IDD

On April 1-3, the Iodine Global Network held a three-day Management Council meeting in Muscat, Oman. The meeting was organized by Dr. Izzeldin Hussein, the IGN’s Regional Coordinator for Middle East and North Africa (MENA), under the auspices of Oman’s Ministry of Health (MoH). The meeting was opened by H.E. Dr. Mohammed bin Saif Al-Hosni, Under-Secretary for Health Affairs, and the inaugural session was attended by senior representatives of WHO, UNICEF, FAO, and UNFP.

During her opening speech, Dr Samia Al Ghanim, Director-General of Nutrition, reported the results of a recent national survey showing that Oman has successfully eliminated iodine deficiency, thus confirming its commitment to global public health initiatives. Prof. Michael Zimmermann (the new Chair of the IGN) followed with an update on the recent global progress against IDD, reporting that at present only 25 WHO countries remain iodine deficient at the national level. Dr Jonathan Gorstein (the new Executive Director of the IGN) presented an overview of the IDD situation in the MENA region and summarized the outcomes of a recent regional workshop held in the UAE. Dr Hussein finished the session by outlining the role that the IGN will play in the integration of salt iodization and salt reduction programs in the region and globally.

The purpose of this three-day meeting was to bring together the IGN’s Regional Coordinators from North and Latin America, Europe, Africa, Asia, and the Middle East, to reflect on the recent regional and national progress against IDD, to formulate new strategic work plans for the regions, and to define the pathway to achieving global IDD elimination by 2020.

Japan donates potassium iodate to Sri Lanka

The Foundation for Growth Science in Japan was established in 1977 to advance the research, diagnosis, and treatment of diseases that impair growth. Although its interest initially focused on the human growth hormone, the Foundation included iodine deficiency disorders in 1999 when Dr. Minoru Irie became the Foundation’s president. Dr. Irie’s interest in IDD started in 1975 when he initiated neonatal hypothyroid screening in Japan. He has been an active member of the ICCIDD (now IGN) since its beginning in 1986, and he still serves as National Coordinator for Japan.

Japan is the second largest producer of iodine, making up about 30% of the global production. Japan Iodine Industries Association (JIIA), an organization for iodine producers, has been engaged in iodine aid projects and has a long history of supplying iodine to other Asian countries struggling with iodine deficiency, such as Mongolia and Cambodia.

Two years ago, the Foundation for Growth Science and JIIA launched a project to donate 850 kg of potassium iodate to a country in need. After careful consideration, Sri Lanka was named as the recipient of this generous donation.

The donation ceremony was held on Tuesday, March 17, 2015 at the Chiba Prefectural Government Offices. The occasion was attended by Mr. D.D. Premaratne from the Embassy of Sri Lanka in Japan, Mr. Y. Morohashi from Chiba Prefecture, Dr. T. Tanaka from the Foundation for Growth Science, Dr. M. Irie from the Iodine Global Network, and Ms. T. Osuga from UNICEF Tokyo, among others.

This donation will help the Sri Lankan Government to promote the Universal Salt Iodization program and to eliminate IDD in Sri Lanka.
Subclinical hypothyroidism and elevated thyroglobulin in infants with chronic excess iodine intakes

Acute iodine excess in newborns can cause hypothyroidism, but there are limited data on the effects of iodine excess on thyroid function in older infants. The aim of this study was to measure the effects of chronic excess iodine intake on thyroid function in 6 to 24 month-old infants (n=696) in eastern Nepal. Median (25th–75th percentile) household SIC was 89 (70–149) ppm, while national legislation stipulates a fortification level of 50 ppm. Median UI was 407 (312–491) μg/L; 76% of infants had a UIIC >300 μg/L, suggesting iodine excess. Calculated mean iodine intake in 12–24 month-old infants was 220 μg/ day, exceeding the recommended safe upper limit for iodine at this age (200 μg/day). Among the infants, 15·8% had an elevated Tg; 7·4% had subclinical hypothyroidism, but less than 1% had overt hypothyroidism. These findings suggest the thyroid in late infancy is already able to adapt to high iodine intakes and, in most cases, maintain euthyroidism.

Nepal AK et al. Thyroid. 2015 May 7. [Epub ahead of print]

Urinary iodine level and its determinants in pregnant women of Shanghai, China

A total of 916 pregnant women were selected from the Maternal and Child Care Service Centre of Minhang District in Shanghai. The median levels of UI in pregnant women were 156.3, 176.9 and 175.1 μg/g creatinine in the first, second, and third trimesters of pregnancy, respectively. Factors that significantly influenced the UI levels include the following: iodine content of household salt; age; occupation; multivitamin/min supplement with iodine; seaweed intakes. Furthermore, UI and iodine content of salt were moderately correlated (r=0.406, P<0.001). Both iodine content of household salt and multivitamin supplements are the main determinants of UI levels in Shanghai.


Iodine nutrition status in lactating mothers residing in countries with mandatory and voluntary iodine fortification programs: An updated systematic review

This review assessed available data on iodine nutrition status of lactating mothers residing in countries with mandatory and voluntary iodine fortification programs and/or iodine supplementation. Forty-two studies met the inclusion criteria. Among these, 21 studies assessed lactating mothers in countries with mandatory iodine fortification, 17 from countries with either voluntary and/or without iodine fortification programs, and 4 in lactating mothers undergoing iodine supplementation. In countries with mandatory fortification, the range of salt iodization in lactating mothers with UIIC <100 μg/L was 8–40 ppm, and 15–60 ppm in those with UIIC >100 μg/L. Median UIIC <100 μg/L were observed among lactating women in India. Denmark, Mali, New Zealand, Australia, Slovakia, Sudan, and Turkey. Conversely, in Chile, Iran, Mongolia, New Guinea, and Nigeria, the median or mean of UIIC was >100 μg/L. Median or mean UIIC was <100 μg/L in nearly all lactating mothers residing in countries with voluntary universal salt iodization (including Switzerland, Australia, New Zealand, Ireland, and Germany) except USA, Spain, and Japan, which had a mean or median UIIC >100 μg/L. Although universal salt iodization is the most cost-effective approach for iodine deficiency control in pregnant and lactating mothers, the median UIICs in countries with voluntary or mandatory iodine fortification is still within the iodine deficiency range, indicating that iodine supplementation of lactating mothers in daily prenatal vitamins/mineral supplements may be warranted.

Nazeri P et al. Thyroid. 2015 Mar 26. [Epub ahead of print]

Iodine deficiency in pregnant women in Austria.

In Austria, iodine deficiency is thought to be eliminated owing to table salt fortification with iodine, but whether this also applies to pregnant women is unclear. This was a cross-sectional investigation of urinary iodine excretion in 246 pregnant women (first trimester n=2, second trimester n=53, third trimester n=191). Pregnant women in the Vienna area had a median urinary iodine concentration (UIIC) of 87 μg/L. A total of 137 women of foreign origin had a significantly higher iodine excretion compared with Austrian-born women. Maternal or gestational age had no influence on UIIC. Although 79 women taking iodine supplements had a significantly higher UIIC than women without iodine supplementation (97.3 vs 80.1 μg/L, P=0.006), their UIIC was below the recommended range, indicating that doses of 100–150 μg per day are not sufficient to normalize iodine excretion. Sodium and iodine concentrations in the urine were closely correlated (R=0.539, P<0.001), suggesting that low intake of iodized salt might contribute to insufficient iodine supply.


Effect of maternal iodine supplementation on thyroid function and birth outcomes in Pakistan

The study was undertaken to examine the clinical and endocrine parameters of thyroid in 460 pregnant women from non-goiter areas (group 1; n=156) and endemic areas without (group 2; n=154) and with iodine supplementation (group 3; n=150), and their respective newborns. Women of group 3 with visible goiter were administered two capsules of iodized oil orally, each with 200 mg of iodine, in weeks 6–8 of pregnancy. In group 2, serum T4 concentrations were low while T3 and TSH levels were high which showed hypothyroisd. Goiter size decreased in most of the subjects who received a single dose of iodized oil and resulted in increased serum concentrations of thyroid hormones, whereas TSH levels decreased. Iodine supplementation also resulted in raised T4 and low TSH levels in the cord blood of neonates. Oral administration of a single dose of iodized oil is capable of correcting iodine deficiency both clinically and endocrinologically in mothers and neonates. Iodine supplementation has the potential to positively impact the birth weight of newborns.


Optimal and safe upper limits of iodine intake for early pregnancy in iodine-sufficient regions: a cross-sectional study of 7190 pregnant women in China

The authors investigated optimal and safe ranges of iodine intake during early pregnancy in an iodine-sufficient region of China, in 7190 pregnant women at 4–8 weeks gestation. The prevalence of overt hypothyroisd was lowest in the group with UIIC 150–249 μg/L, which corresponded to the lowest serum Tg concentration (10.18 μg/L). Prevalences of subclinical hypothyroisd (2.4%) and isolated hypothyroxinemia (1.7%) were lower in the group with UIIC 150–249 μg/L. More-than-adequate (UIIC 250–499 μg/L) and excessive (UIIC ≥500 μg/L) iodine intakes were associated with a 1.72-fold and a 2.17-fold increased risk of subclinical hypothyroisd, respectively. Meanwhile, excessive iodine intake was associated with a 2.85-fold increased risk of isolated hypothyroxinemia. The upper limit of iodine intake during early pregnancy in an iodine-sufficient region should not exceed UIIC 250 μg/L, because this is associated with mild thyroid disorders.