

ACHIEVING UNIVERSAL SALT IODIZATION: Lessons Learned and Emerging Issues

M.G.Venkatesh Mannar & Lucie Bohac

The Micronutrient Initiative, Ottawa, Canada

The Network for Sustained Elimination of Iodine Deficiency, Ottawa, Canada

Main presenter's details:

180 Elgin Street, Suite 1000, Ottawa, Canada, K2P 2K3; Tel. +1 613- 782-6814, Fax. +1 613 782-6838; email: vmannar@micronutrient.org

Key Words: iodine, iodine deficiency disorders, salt, universal salt iodization

Summary: This paper presents an overview of the progress in IDD Elimination through salt iodization by reviewing some lessons learned from key programmatic indicators and discusses emerging issues such as IDD prevalence in Europe, role of small salt producers, salt in processed foods and monitoring and data issues.

I. Background

Iodine is an essential nutrient for humans and animals. A deficiency of this mineral has a wide range of negative consequences such as still births, congenital abnormalities and decreased cognitive capacity.

Universal Salt Iodization (USI), which intends that all salt for human and animal consumption be iodized thus ensuring adequate iodine nutrition, was identified as the global strategy for the elimination of iodine deficiency. Salt is an excellent carrier for iodine and other nutrients as it is safe, consumed at relatively constant, well-definable levels by all people within a society, independently of economic status. (UNICEF, WHO, 27 January, 1994) WHO provides guidelines as to the recommended prescribed levels of iodization as well as the recommended urinary iodine excretion levels for specific population groups.

In 1990, seventy Heads of State gathered at the World Summit for Children in New York and pledged to eliminate Iodine Deficiency Disorders (IDD) as one of the health and social development goals. The 43rd World Health Assembly, a gathering of ministers of health, accepted the elimination of IDD as a major public health goal for all countries. (UNICEF, May 2008)

In May 2000, at the World Salt Symposium ("Salt 2000") in The Hague, executives of the salt industry met with leaders of governments, NGOs and international organizations to discuss how to better collaborate on eliminating iodine deficiency disorders (IDD) forever. An agreement was reached to form a global coalition of public, private,

international and civic organizations whose goal would be the sustained elimination of iodine deficiency disorders through universal salt iodization. This agreement culminated two years later in the high-profile launch at an UN General Assembly side event (A Smart Start for Children) of the *Network for Sustained Elimination of Iodine Deficiency* or the *Iodine Network*.

II. Objective

The objective of this paper is to provide a global overview of progress in eliminating iodine deficiency through universal salt iodization, identifying some of the lessons learned over the past decade and discuss the emerging issues impacting the achievement of the global goal.

III. Methodology

This paper comprises of a review of existing knowledge and data on the progress towards and lessons learned from programs aimed at eliminating iodine deficiency through universal salt iodization.

IV. Taking Universal Salt Iodization to Scale

Since the early 1990s, global efforts to introduce universal salt iodization world wide have resulted in impressive progress. This progress has relied on effective multi-sectoral partnerships: Governments working with the salt industry, supported by international agencies and in functioning in coordination with the civic sector and expert groups. Each of these partners have gained experience from the past two decades, the lessons learned have been, in turn, incorporated into the policy, programming and implementation frameworks that sustain USI.

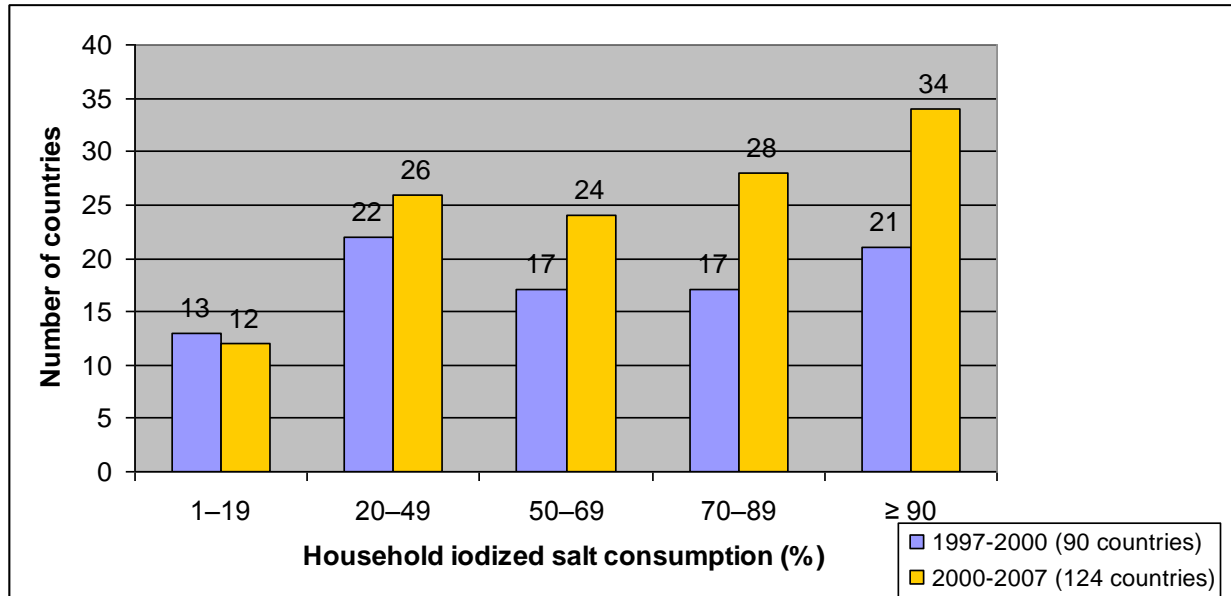
Overview of Global Progress

(UNICEF, May 2008)

- Globally, 70% of households are consuming adequately iodized salt.
- 34 countries have achieved USI and another 28 are close to the goal.
- More than 120 countries are implementing USI programmes.
- 84 million infants are protected annually from the risk of IDD.
- The number of countries where IDD remains a problem has dropped to 47.

Progress in Iodized Salt Coverage Over the Past Decade

(UNICEF, 2002) (UNICEF, 2009)



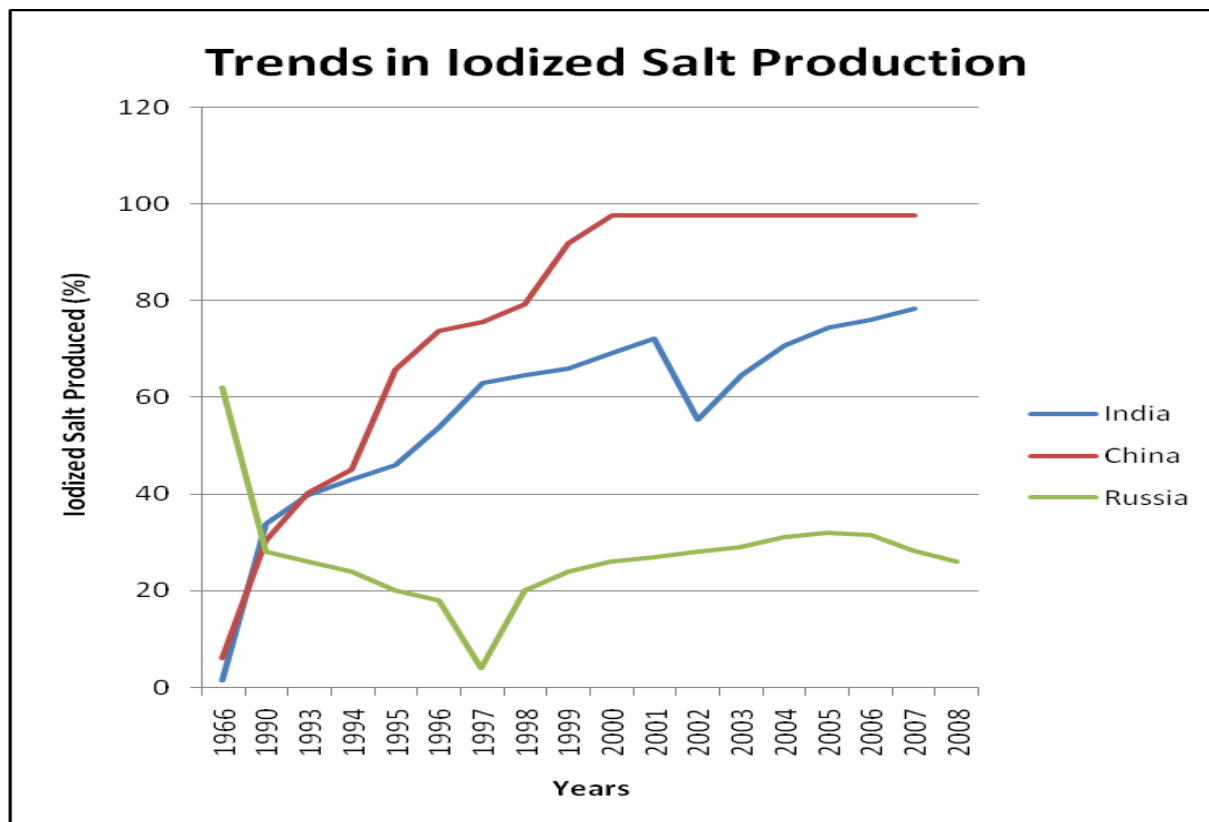
SOWC 2002: Database 1997-2000 and SOWC 2009: Database 2000-2007

Lessons Learned from National Commitment

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. Strengthening salt iodization and expanding it to cover all edible salt in the country is the key requirement to eliminate iodine deficiency in the country.

It is well established that the commitment to IDD elimination by a national government is essential to firmly root a USI program. Evidence of political commitment to USI and elimination of IDD usually comes in the form of legislation that mandates that all salt for human and animal consumption be iodized; a national coalition or oversight body responsible for the programme that reports to the Minister of Health; and the appointment of a responsible executive officer for the IDD elimination programme. (WHO, UNICEF, ICCIDD, 2007, Third ed.)

Experience has shown that legislation is a corner-stone to sustaining a USI programme. India, Russia and China demonstrate the effect of government support upon USI.



Trends lines extrapolated from available data.

Salt has a significant place in India’s political history, notably Gandhi’s salt march to Dandi in protest of taxation on salt in 1930. But it was in 1962, that the Government of India (GOI) introduced iodization of edible salt under the National Goitre Control Programme, in effect from 1963 to 1982, however, salt iodization was *permitted* only in the domain of the public sector. In 1983, iodized salt production was opened to the private sector, thus marking the beginnings of a strategy towards universal salt iodization in India. (Sundaresan, 2008)

In 1998 India instituted legislation which banned the sale of non-iodized salt. This legislation was revoked in 2000 amidst political turmoil, and subsequently resulted in a drop of adequately iodized salt production from 70.3% on 1997 to 29.6% in the period 2000- 2004. (Vir, 2009) In 2006, Government of India reinstated the ban on the sale of non-iodized salt for human consumption. Thus, India’s production of iodized salt went from 4.1 million tons in 1999 to 1.69 million during the course of the interruption in legislation and then increased to 5.1 million tons in 2007. (Sundaresan, 2008) (Vir, 2009)

In the former USSR, salt iodization was well established in an effort to eradicate endemic goiter which began in the 1950s under the Ordinance of the Ministry of Health “On Improvement of Measures to Fight Endemic Goitre”. By the 1970s, goiter was

declared virtually eradicated and with the problem “solved” prevalence not consistently tracked. By the late 1980s, the change of focus was reflected in the move by the Ministry of Health to reorganize its health facilities to treat other medical conditions.

With the dissolution of the USSR in 1991, the salt iodization program also became fragmented as government infrastructures underwent major reorganization. In addition, during this period of decline, there was no investment into the salt production infrastructure further hampering the capacity to produce adequately iodized salt. Consequently, the USSR went from an era of iodized salt production of almost 1 million tons in the 1960- 70s, of which Russia produced 318,000 tons and imported the remainder of their domestic demand from the Ukraine, through a period of decline such that by 1997 Russia, as a country, produced less than 25,000 tons. Meanwhile, with the lack of iodized salt available, iodine deficiency reemerged. (Gerasimov, 2002)

In 1997, the Head State Sanitary Physician of the Russian Federation issued a resolution on “The Prevention of Iodine Deficiency Conditions” which provided for the mandatory iodization of salt but for judicial reasons, was never enacted into legislation. Numerous subsequent attempts to get legislation passed have failed. Nevertheless, the production of iodized salt has improved somewhat as a result of collaboration between the Russian Association of Salt Producers, the Russian government and the Ministry of Health, supported by UNICEF and other international agencies. Consequently, the capacity for iodized salt production improved considerably but iodized salt production remains low (at approximately 130,000 tons in 2008, compared to an estimated domestic demand of 500,000 tons) and the household consumption of iodized salt is approximately 29%. (Gerasimov, Barriers to USI in Russia, 2009)

In both examples, national coalitions, or equivalent national bodies comprised of government, salt industry, health and civic organizations responsible for the IDD elimination oversight, have been either non- active/functioning or not established at all.

China, in contrast, is a study of dedicated government commitment at the highest level. Iodine Deficiency was noted in ancient Chinese medical script as early as 3,000 BC. Actual epidemiological evidence of the magnitude of IDD in China came to light in the 1960s which investigated the origins of endemic goiter and cretinism and showed that iodized salt was an effective intervention to address the problem. (Yip, Chen, & Ling, 2004) At that time an estimated 700 million people were at risk from iodine deficiency. In the 1970s, there were 35 million people with visible goiters and 25 million people with intellectual impairment due to iodine deficiency across the country. (Qian, 2009) Earlier efforts to deal with this public health problem were focused on highly endemic areas but were not entirely effective due to low government commitment, uneven salt iodization and, likewise, monitoring. (Yip, Chen, & Ling, 2004)

Spurred on by the UN Summit for Children in 1990, where the Premier signed the declaration which had the elimination of IDD as one of its goals, China launched into an era of dedicated strategy to eliminate IDD. Thus in 1991, that the Chinese government

made a formal commitment to eliminate IDD by the year of 2000. The defining moment, however, was a high-level advocacy meeting in September 1993 held in the Great Hall of the People involving national and state stakeholders as well as international agencies. The meeting resulted in a State Council Leading Group on IDD Elimination which reaffirmed the commitment to eliminate IDD by 2000; the establishment of a National IDD Control Program; a roll out of USI, regulation on iodized salt – including the creation of a salt monopoly to ensure iodized salt production, and the establishment of a multi-sectoral mechanism for social mobilization and advocacy. These key developments have sustained China's efforts. Universal salt iodization as the main strategy was adopted in the whole country in 1995. (Yip, Chen, & Ling, 2004) The result was an increase in iodized salt production from less than 3.3 million tons in 1993 to 8 million in 2005. Today nearly 96% of Chinese consume effectively iodized salt on a sustained basis.

Lessons Learned from Establishing Salt Iodization as a Universal Norm

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. Iodization in medium/ small operations poses more significant challenges in countries where salt manufacturing techniques and product quality vary over a wide range from cottage scale units producing a few hundred tons a year to very large fully automated plants producing several million tons. Some countries depend entirely on mining of underground rock salt deposits. Others on the extraction of salt from sea water or saline lake/underground brine by solar drying. Even where the extraction of the raw salt is done on a large scale its distribution and processing is often transferred to small processing plants at the consumer level.

The strategies used to achieve the first 50-60% coverage of iodised salt in several countries may not necessarily result in addressing the challenge for the remaining 40% of the population. New strategies will need to systematically identify the bottlenecks or constraints that impede universal iodization and address them through a combination of advocacy, technical support, monitoring and enforcement.

The key indicators of effectiveness and sustainability of salt iodization (and its integration into the provision of salt for human and animal consumption) in a country include: (WHO, UNICEF, ICCIDD, 2007, Third ed.)

- Quality assurance of iodized salt production,
- On-going gathering and analysis of data relating to salt importation, production and iodization process, distribution, major companies involved, the role small scale producers/salt farmers, association of salt producers, prices of products and the market situation,
- Working relationships and practices between regulatory authorities and salt producers.

With a requirement for quality assurance of the product, the salt industry has been instrumental in addressing a number of technical issues. For example, in some countries multiple levels of iodization and packaging have posed problems in quality assurance. In these situations 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 take on the task of iodization and packing the salt into consumer-sized bags. The result can be salt of uncertain 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. (Akunyili, 2007)

The stability of iodine in salt and levels of iodization and packaging are also related to issues of quality assurance. Conditions of high humidity result in rapid loss of iodine from iodized salt, with iodine loss ranging anywhere from 30 to 98% of the original iodine content. (Diosady, Alberti, Mannar, & FitzGerald, 1998) By refining and packaging salt in a good moisture barrier, such as low density polyethylene bags, iodine losses can be significantly reduced, during storage periods of over six months.

The salt industry has also been at the vanguard of innovation in testing equipment to allow for field testing of iodine levels in salt thereby enabling salt producers to monitor the quality of their product at source. These include the WYD checker developed by the Salt Research Institute of the China National Salt Industry Corporation and the test kits made by MBI Kits International. Work continues to refine such tools.

Over the past decade there have been significant investments in salt refining capacity in several countries. In India, refining capacity has increased from less than 5% to nearly 50% 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 (Proceedings of the International Workshop on IDD Elimination in China, 1998)

Nigeria provides a good example of building a strong working relationship between its regulatory bodies and salt industry. Salt iodization laws are enforced through two key regulatory agencies: The Standards Organization of Nigeria (which sets the standards) and the National Agency for Food & Drug Administration and Control (which enforces the standards). In turn, the salt manufacturers have established an umbrella association for effective self-regulation and to ensure distribution of adequately iodized salt. (Akunyili, 2007) (Untoro, 2006)

Lessons Learned from 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. In this regard, among the key programmatic indicators (WHO, UNICEF, ICCIDD, 2007, Third ed.) identified are:

- Commitment to assessment and reassessment of progress towards elimination with access to laboratories able to provide accurate data on salt and urinary iodine,
- Regular laboratory data on UIE in school age children with appropriate sampling for higher risk areas ,
- A database for recording of results of regular monitoring procedures particularly for salt iodine, UIE and if available neonatal TSH monitoring with mandatory public reporting.

To monitor the iodine content in salt and also the iodine status in the population effectively, it was recognized that laboratories needed to address a number of issues that could affect their accuracy. These include the variation in methods for determining iodine content in salt or urinary excretion, the differing capacities of laboratory facilities world- wide, the need for external quality assurance, and the uneven technical support available for laboratories. In response, the International resource Laboratories for Iodine (IRLI) Network was formed in 2001. Since its inception, numerous workshops have been held regionally to strengthen the laboratory capacity in different regions of the world. (CDC, 2006)

The role of the IRLI Network is to:

- Analyze samples.
- Train personnel and facilitate technology transfer to national laboratories.
- Form regional iodine laboratory networks.
- Share information with other regional networks and seek any resources needed to sustain the operation of regional networks.
- Develop technical standards and external quality assurance programs.
- Collaborate with the salt industry and other sectors (such as governments) where appropriate.

While quality assurance of iodized salt occurs at the factory or production level, the testing of salt samples at the household level, done by UNICEF Multiple Indicator Cluster Surveys (MICS) in the Demographic Health Surveys (DHS), are 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. (Sullivan, Suchdev, & Grummer-Strawn, 2007 no. 35)

Traditionally, testing for iodine deficiency within the population relied on an assessment of goiter prevalence. However, a number of issues relating to the measurement of thyroid size (goiter) as well as the responsiveness to changes in iodine nutrition status have resulted in a move towards using urinary iodine excretion as the standard mechanism of measurement. (Sullivan, Suchdev, & Grummer-Strawn, 2007 no. 35)

Lessons from Public Education and Social Mobilization

Goiter and cretinism provided the visual picture of iodine deficiency that gave it easily identifiable reference. As IDD elimination progressed, these physical manifestations became far and fewer between, giving the impression that IDD had been solved. Yet iodine deficiency persists, in its more common form – brain damage, to which the unborn foetus is especially vulnerable. In effect, IDD elimination programs are threatened to be victims of their own success yet a deficiency must be continuously addressed or it will re-emerge. Thus on-going communication efforts are necessary.

Although there has been no exhaustive study undertaken on effective communication and public education strategies on IDD that would provide defined indicators of achievement, a number of practices have been noted for their effectiveness:

- Relating IDD to brain damage, thereby creating an understanding of the functional outcomes –beyond goiter and cretinism - that result from iodine deficiency. These include mental impairment, the loss of IQ points, the impact on educational achievement and ultimately productivity. This was the critical information that influenced the Chinese Vice-Premier to commit to IDD elimination. (Yip, Chen, & Ling, 2004)
- Tailoring messages to the audience with a specific call of action they can take. The audience to be influenced ranges from top levels of government to the public health community to salt industry to community to the household. (Ling, 2007)
- Understanding the “common wisdoms” that exist in a community and correcting misinformation. Religious leaders and community leaders have been engaged to address culturally entrenched practices (ie. washing of salt before use) which are obstacles to USI. (Ling, 2007)
- Using multi-media to get IDD messages into popular culture. (Akunyili, 2007)
- Integrating up-dated information about IDD into technical and educational materials of food inspection and control bodies, health care training and academic curriculums. (Sharmanov, et al., 2008)

Ultimately, public education serves to solidify support for IDD elimination at all levels of society and thereby creates a demand for iodized salt, a necessary component for the success of a USI strategy.

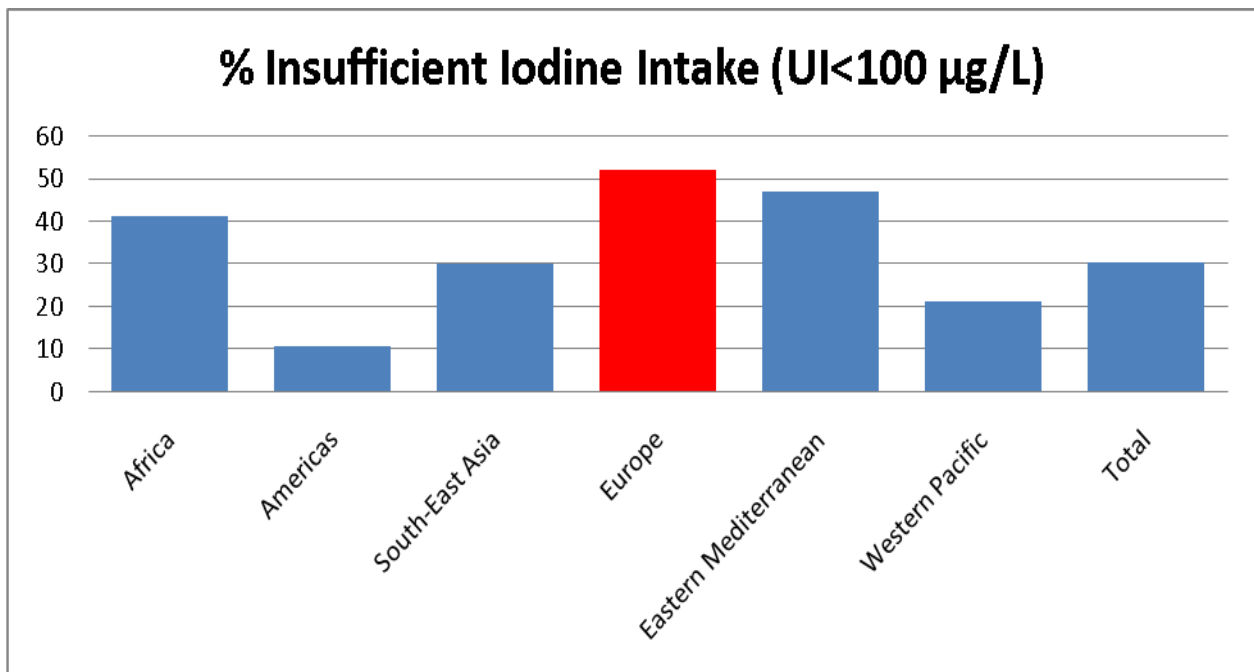
V. Emerging issues in a changing environment

Emerging Issues # 1: Prevalence in Europe and re-emergence

Europe has a historic link to iodine deficiency, which has been long documented in literature and art. It was French Chemist Boussingault who introduced salt iodization and which Switzerland first implemented on a national scale demonstrating its success. Although goiter is less frequent and cretinism a thing of Europe's past, iodine deficiency exists and persists in its more silent but devastating way. 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. (de Benoist, McLean, Anderssen, & Rogers, 2008)

Prevalence of Iodine Deficiency by Region

(WHO, UNICEF, 2007)



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. (Global Scorecard 2009) In Ireland, only about 3-4% of the table salt sold is iodized and since 2004, there has been a marked drop in urinary iodine, especially among young women, fluctuating seasonally but dipping particularly in the summer months. (Smith, Burns, Nawoor, Higgins, O'Herlihy, & Smyth, 2006) Similarly it has been reported that based on studies on iodine levels in salt in northeast England, Wales and Scotland, up to 50% of pregnant women could be significantly iodine deficient during gestation. (Lazarus & Smyth, Sept. 2008)

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 where in others it is voluntary. Some countries mandate salt iodization but do not permit the use of iodized salt in processed foods, ie. Poland. Netherlands, on the other hand, has focused on iodized salt in bread as 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. (de Jong, 2007 - publication pending) 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 out dated. European public health officials need to remain vigilant in the monitoring iodine nutrition and gathering data on urinary iodine excretion. (WHO, UNICEF, 2007)

Emerging Issue #2: Role of 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, often along coastlines or lake shores as a semi-agricultural operation. The smaller units often operate with a minimum of organization and little or no quality control. Being geographically scattered, the small units do not lend themselves to regulation by the government. Very often precise figures regarding even their location, extent of holdings and production statistics are not available. The producers have limited financial means and lack access to technical or financial assistance to institute quality iodization processes and to monitor quality. Additionally they have poor packaging practices or do not package the salt at all. As a result, the salt produced in these units is often of poor quality. Nevertheless, 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.

In recognition of the role of these small salt producers, two pilot initiatives, one in Senegal and one in India, have been undertaken to integrate them into the overall USI strategy of their respective 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. These associations were provided with iodization machines, internal quality assurance, production tools and training to enable them to produce a quality of iodized salt that complied with national standards while increasing their overall productivity. (Ndao, Ndiaye, Miloff, Toure, & A., 2009)

In Rajasthan, India, where small salt producers account for 88% (1.32 metric tons) of the state's total production for human consumption, the pilot project aimed not only to build the iodization capacity of small salt producers through the provision of technical inputs such as machinery and equipment but to sustain that capacity by creating awareness and demand for iodized salt in the community, teaching good business as well as 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. (Gulati & Jain, 2009)

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.

Time will tell if this approach is ultimately successful and sustainable but the fact remains that small producers hold a share of the salt market and as long as they remain providers of non-iodized salt for human consumption, they will be an obstacle to establishing a solid USI program.

Emerging Issue #3: Impact of increased Processed Foods & Context for Industrialized countries

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. There are a number of possible explanations for this. First, often times national legislation mandating salt iodization tends to focus on table salt only. Even when legislation permits the voluntary use of iodized salt in processed foods, this does not necessarily translate into practical application. Second, USI program guidelines often do not specify measures (such as advocacy, monitoring) directed at the use of iodized salt in processed foods. Third, food processors are reluctant to use iodized salt stating concerns about its effects on their food products and trade barriers due to legislation variations. (Bohac, de Jong, Timmer, & Sullivan, 2009)

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. (Bohac, de Jong, Timmer, & Sullivan, 2009) As a result, National programs relying upon on the fortification of table salt alone may not adequate. There are examples of successful national strategies (e.g. Netherlands) which specifically utilize iodized salt in processed foods as a means to achieve adequate iodine nutrition in the population. As other countries take on such a strategy (eg. New Zealand) and while other countries (eg. UK) take on a strategy of sodium intake reduction, the iodine nutrition should be carefully monitored so that the impact of such strategies upon population iodine status can be assessed and guidance can be developed.

With respect to the concerns of food processors, evidence suggests that for common food commodities, the use of iodized salt in processing does not affect organoleptic properties. (Bohac, de Jong, Timmer, & Sullivan, 2009) However, concerns about trade barriers pose a bigger problem as legislation varies greatly from country to country. Some countries mandate that iodized salt be used in processed foods, while others make its use voluntary. In some countries iodized salt in processed foods is forbidden.

In a world of interrelated geo-politics and trade, harmonization becomes increasingly important. As such, 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. (EURRECA, 2009)

Finally, not only are consumption patterns changing but so are the sources of iodine in the diet. In a number of European countries as well as the USA, iodophors were used by the dairy industry, thereby delivering iodine to the population through milk. This practice has decreased or been eliminated and, in addition, the consumption of milk has also declined in some countries and/ or among certain population groups. These trends need to be monitored and impact assessed through the analysis of the population iodine status. Recommendations have been made, with reference to countries that have documented iodine deficiency, to have iodine added to complementary foods. (Zimmermann, Jooste, & Pandav, August, 2008)

Emerging Issue # 4: Monitoring, gathering data & analysis of outcomes

As noted earlier in this paper, the use of alternative methods to titration to assess iodine content in salt has been increasingly used, particularly in field applications. These include the “rapid test kits” which have been used in household surveys to test iodine in the domestic salt supply. Recent studies have shown that the sensitivity and specificity of these test kits are variable, thus they are more useful in determining the presence of

iodine rather than the accuracy of the level of iodine. (Sullivan, Suchdev, & Grummer-Strawn, 2007 no. 35) Therefore it is recommended that sub-sampling should be undertaken for quantitative verification.

Although analysis of UIE samples of school aged children is the common form of measurement, there is gathering evidence that urinary iodine excretion levels in school aged children is not reflective of the iodine nutrition status of pregnant and lactating women, the target group to be reached to ensure that the developing foetus has adequate iodine nutrition. (Sullivan, Suchdev, & Grummer-Strawn, 2007) Once consensus is established on the appropriate target groups for assessing iodine nutrition, consideration must be given to make the testing of that group feasible. The methodological issues represented by targeting pregnant, lactating women and children under 2 years of age are considerable as they are not as easily accessible as children attending school.

In a context of monitoring the iodine status on a global level, WHO's data for prevalence uses the median urinary iodine as the population indicator. This indicator, however, implies an extrapolation from the population to identify the number of individuals affected yet, such an interpretation may be misleading as it would not capture segments of the population that may be under or over the median value. (Zimmermann, Jooste, & Pandav, August, 2008) Consensus is needed on how to address this issue.

Solid monitoring of iodine status reveals not only an insufficiency of iodine intake but also an excess. WHO data shows that 34 countries have more than adequate or excessive iodine intake. Investigations of these instances have resulted in identifying numerous factors including cases of salt being iodized at high levels (such as in Kenya and Uganda, which imports salt from Kenya); cases of iodine supplementation overlapping with the introduction of iodized salt (such as occurred in some regions of China) as well as iodine induced hyperthyroidism occurring in the introduction of salt iodization.

Although there is consensus that the risks involved in iodine intake excess was smaller to those of iodine deficiency, they underline the importance of good monitoring of the population iodine status. (Zimmermann, Jooste, & Pandav, August, 2008)

In May 2007, Resolution # WHA60.21 was passed at the World Health Assembly. This resolution requires that Member States report on the status of iodine nutrition every three years. It recognizes that efforts to eliminate IDD require continuous monitoring and oversight and implicitly asks those Member States who have not already done so, to establish the mechanisms for monitoring iodine nutrition and report on their progress. (World Health Organization, 2007)

VI. Conclusions

In as much as tremendous progress has been made in making salt iodization indeed universal and global, the fact still remains that 2 billion people world-wide are still at risk of iodine deficiency.

Although universal iodization has stabilized and generally been sustained as a major public health intervention, 30% 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. Recent reports by the Copenhagen Consensus, which rate salt iodization as one of the top investments with a benefit cost ratio of \$30:\$1, provide a strong argument to be directed at national policy makers in countries where national commitment has not been made. (Horton, Alderman, & Rivera, 2008) 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 new strategy and advocacy are needed to bring IDD onto the European agenda. National governments must face up to the fact that the iodine intake in their populations may be insufficient, contrary to the impression that the IDD problem has been “solved”; that iodine may not be readily available to their populations through other food sources such as milk when the use of iodophors is discontinued; and that salt iodization is not in conflict with sodium intake reduction strategies (WHO, 2007) A renewed or alternative advocacy approach might be through building new awareness among the health authorities and the public. As European countries tend to have a strong regional orientation, this may offer the possibility of building a regional network on IDD elimination comprised of health departments’ representatives, both from countries which have undertaken salt iodization and those which have not, to share expertise, experience and support each others’ efforts. Meanwhile, in societies where “consumer choice” is a strong value, engaging the public in making iodized salt an *informed* choice would go a long way to build support from the ground up.

This advocacy approach would also address the need to embed IDD knowledge within the infrastructure of the health sector and build IDD awareness among the public.

A leading advocacy effort directed at the health sector, is the World Health Assembly’s Resolution requiring regular reporting on iodine status. The next term for reporting is in 2010. 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.

Just as the economics of the salt industry need to be understood in order to integrate salt iodization into the supply chain, so too there needs to be an understanding of

processing food industry. Active engagement of the processing food industry in the cause of eliminating IDD through USI, combined with closer monitoring of a population's changing dietary habits would pave the way to restore the scope of salt iodization to include the salt in processed foods, as it was conceived, and improve the iodine status in countries where processed foods dominate the household table.

If we accept the notion that a significant part of the population without access to adequately iodized salt is not reached by the mainstream of iodized salt supply but rather by the more informal sector of the small salt producers, it 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.

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 within the next decade.

Bibliography

- Akunyili, D. N. (2007, #35). Achieving and Sustaining Universal Iodization: Doing it Well Through Regulation and Enforcement. Lessons Learned from USI in Nigeria . *SCN News* , pp. 43-47.
- Bohac, L., de Jong, J., Timmer, A., & Sullivan, K. (2009). Use of Iodized Salt in Processed Foods: Implication on USI Strategies. *Micronutrient Forum - Abstracts & Posters* . Beijing: Micronutrient Forum.
- CDC. (2006, August). *International Resource Laboratories for Iodine Network (IRLI) - Bi-annual Update*. Retrieved from Centers for Disease Control and Prevention: www.cdc.gov
- de Benoist, B., McLean, E., Anderssen, M., & Rogers, L. (2008, Vol. 29, no. 3). Iodine Deficiency in 2007: Global Progress since 2003. *Food and Nutrition Bulletin* , pp. 195-202.
- de Jong, J. (2007 - publication pending). *A Review of the Use of Iodized Salt in Processed Foods*. Ottawa: Network for Sustained Elimination of Iodine Deficiency.
- Diosady, L., Alberti, J., Mannar, M., & FitzGerald, S. (1998, vol. 19 no. 3). Stability of iodine in iodized salt used for correction of iodine-deficiency disorders. *Food and Nutrition Bulletin* , pp. 240-250.
- EURRECA. (2009). *European Micronutrient Recommendations Aligned*. Retrieved from www.eurreca.org
- Gerasimov, G. (2009, May 11). Barriers to USI in Russia. *Presentation at the Satellite Session on IDD at the Micronutrient Forum* . Beijing, China.
- Gerasimov, G. (2002). *Iodine Deficiency Disorders in the Russian Federation: A Review of Policies Towards IDD Prevention and Control and Trends in IDD Epidemiology (1950 - 2002)*. Moscow: web publication UNICEF.
- Global Scorecard 2009*. (2009). Retrieved from Network for Sustained Elimination of Iodine Deficiency: www.iodinenetwork.net
- Gulati, D., & Jain, P. (2009). Promoting Salt Iodization Among Small Salt Producers in Rajasthan, India. *submitted to World Salt Symposium 2009*. Beijing.
- Horton, S., Alderman, H., & Rivera, J. (2008). *Challenge Paper 2008: Hunger and Malnutrition*. Fredericksberg: Copenhagen Consensus.
- Lazarus, J., & Smyth, P. (Sept. 2008). Iodine Deficiency in the UK and Ireland. *The Lancet - Correspondence* .
- Ling, J. (2007, Vol 35 ISSN 1564-3743). Achieving and Sustaining USI: Getting the Message Across to Change Policy, Attitudes and Behaviour. *SCN News* , pp. 37-42.
- Ndao, I., Ndiaye, B., Miloff, A., Toure, N., & A., N. (2009). Tools to Improve Monitoring, Compliance and Profitability of Small Salt Producers in Senegal. *Micronutrient Forum - Abstracts & Posters*. Beijing: Micronutrient Forum.
- Proceedings of the International Workshop on IDD Elimination in China. (1998). Beijing: Ministry of Health & ACAD.
- Qian, M. (2009, May 11). Universal Salt Iodization and Sustained Elimination of IDD in China . *presentation at Satellite Session on IDD at the Micronutrient Forum* . Beijing, China.
- Sharmanov, T., Tsoy, I., Tazhibajev, S., Kulmurzayeva, L., Ospanova, F., Karsybekova, N., et al. (2008, February vol 27, no. 1). IDD Elimination Through Universal Salt Iodization in Kazakhstan. *IDD Newsletter* .

Smith, D., Burns, R., Nawoor, Z., Higgins, M., O'Herlihy, C., & Smyth, P. (2006). Iodine Status in Ireland. *Evidence Based Nutrition Policy: UNICEF's Experience in Eliminating Iodine Deficiency*. Warsaw.

Sullivan, K., Suchdev, P., & Grummer-Strawn, L. (2007 no. 35). Achieving and Sustaining USI: Doing It Well Through Quality Assurance, Monitoring and Impact Evaluation. *SCN News* , 48-53.

Sundaresan, S. (2008, June 23). Sustained Elimination of Iodine Deficiency: Progress, Sattus, Challenges and Way Ahead. *presentation at the Meeting of the Board of the Network For Sustained Elimination of Iodine Deficiency* . Ottawa, ON, Canada: Network for Sustained Elimination of Iodine Deficiency.

UNICEF. (2002). *State of the World's Children 2002*. New York: UNICEF.

UNICEF. (2009). *State of the World's Children 2009*. New York: UNICEF.

UNICEF. (May 2008). *Sustainable Elimination of Iodine Deficiency*. New York: UNICEF.

UNICEF, WHO. (27 January, 1994). *World Summit for Children: Mid-decade goal - Iodine deficiency disorders, report from UNICEF and WHO Joint Committee on Health Policy Special Session*. Geneva: UNICEF, WHO.

UNICEF, WHO. (1994). *World Summit for Children: Mid-decade goal- Iodine deficiency disorders, report from UNICEF and WHO Joint Commiteee on Health Policy Special Session*. Geneva: UNICEF, WHO.

Untoro, J. (2006, March). *Country Assessments*. Retrieved from Network for Sustained Elimination of Iodine Deficiency: www.iodinenetwork.net

Vir, S. (2009). Advocacy and Demand Creation for Adequately Iodized Salt - Lessons Learnt and Ways Forward. *Review of Salt Iodization in India*. New Delhi: Network for Sustained Elimination of Iodine Deficiency.

WHO. (2007). *Salt as a Vehicle for Fortification: Report of a WHO Expert Consultation*. Geneva: WHO.

World Health Organization. (2007). *WHA60.21. sustaining the elimination of iodine deficiency disorders. In Sixtieth World Health Assembly*. Geneva: WHO.

WHO, UNICEF. (2007). *Iodine Deficiency in Europe: A continuing public health problem*. Geneva: WHO.

WHO, UNICEF, ICCIDD. (2007, Third ed.). *Assessment of iodine deficiency disorders and monitoring their elimination: A guide for programme managers*. Geneva: WHO.

Yip, R., Chen, Z., & Ling, J. (2004). People's Republic of China. In B. S. Hetzel, *Towards the Global Elimination of Brain Damage Due to Iodine Deficiency* (pp. 364-395). New Delhi: Oxford University Press.

Zimmermann, M., Jooste, P., & Pandav, C. (August, 2008). Iodine-Deficiency Disorders. *The Lancet* .