



# IDD NEWSLETTER

VOLUME 40 NUMBER 2 MAY 2012

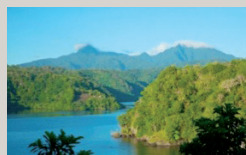
IN THIS ISSUE:



Senegal  
Unicef SOWC 1  
5



Iodized salt in processed foods 7  
Indian salt monitoring 9



Classic IDD paper 14  
USA 15



Philippines 17

Thailand 18  
Meetings and Announcements 19  
Abstracts 20

## Senegal struggles to control iodine deficiency

Iodine status is borderline in rural women and children and just half of households have access to iodized salt

**Roland Kupka, Banda Ndiaye, Mamadou Guelaye Sall, Boubacar Camara** The United Nations Children's Fund Regional Office for West and Central Africa, Dakar, Senegal, Micronutrient Initiative Regional Office for Africa, Dakar, Senegal; and the University Cheikh anta Diop, Dakar, Senegal.



Personal digital assistants (PDAs) streamlined data collection in the Senegal iodine survey

### Background

With an estimated annual salt production of 450,000 tons, Senegal is West Africa's largest salt producer. The country easily meets its domestic salt needs estimated at 45,000 tons and exports the remainder to Europe and other African countries. Of the domestic production, one large and one medium size producers account for an estimated 280,000 tons, primarily for export, while thousands of artisanal salt harvesters produce the remaining 170,000 tons. An estimated 80,000 tons

produced by artisanal salt harvesters is iodized, primarily in the context of small cooperatives called economic interest groups (EIGs) that are supported by the government through training and equipment [1]. The iodization status of the remaining 90,000 tons is uncertain.

Senegal mandated in 1995 the iodization of culinary salt and then in 2000 the iodization of all salt produced in and entering the country. The Senegalese government in 2006 has created a National Committee for Salt Iodization that brings together the Ministry of Industry, Ministry of Trade, Ministry of Health, Crafts Ministry, Consumer Associations, as well as technical and financial partners including the World Food Programme, World Health Organization, Micronutrient Initiative, the Global Alliance for Improved Nutrition, and United Nations Children's Fund. The National Committee's major goal is to support EIGs in the production of quality and adequately iodized salt. In this regard, it is committed to cover the remaining 90,000 tons of production with the current EIG model.

The 2005 Demographic and Health Survey (DHS) [2] served as the baseline for the recent salt iodization efforts in Senegal. Using the rapid test kit, the survey demonstrated that 64% of household salt was iodized. In 2007, a survey conducted in two Southern regions with previously poor iodization coverage and low iodine status showed substantial improvements in these indicators [3]. In order to be able to evaluate the impact of the salt iodization program on iodized salt coverage and iodine status on a national scale, the National Committee decided in 2010 to implement the first country-wide survey on iodine deficiency disorders (IDD) [4]. The survey was made possible through financial and technical support from the Micronutrient Initiative.



### Survey methods

The country (see map) was divided into two strata: One for regions with traditionally poor iodine status (Tambacounda, Kédougou, Kolda and Sédhiou; the 'endemic zone') and one for the rest of the country (the 'control zone'). The Ziguinchor region was not surveyed because of poor security. The survey population was women of reproductive age, defined as ages 15–49 years, including those who reported to be pregnant during the interviews, and children of primary school

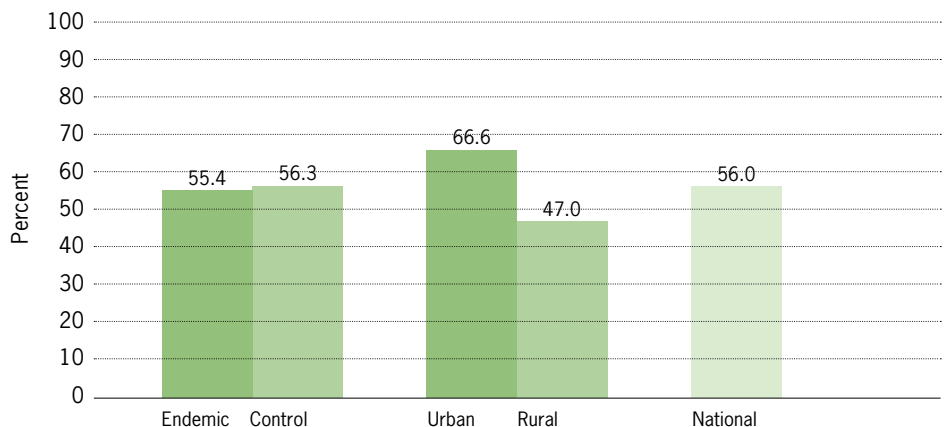
age (ages 6–12 years). Statistical power calculations showed that a sample of 1500 households in the endemic and 2000 in the control zones was needed to determine household salt iodization coverage (using the rapid test kit) and other endpoints with adequate precision. In a subsample of 700 households, salt samples were collected to determine salt iodine concentrations, and samples were collected among women and children to determine urinary iodine concentrations (UIC). The subsampling was performed with the use of personal digital assistants (PDA) as a function of the number of family members present in the household. PDAs were also used to administer two questionnaires and collect responses as well as the location

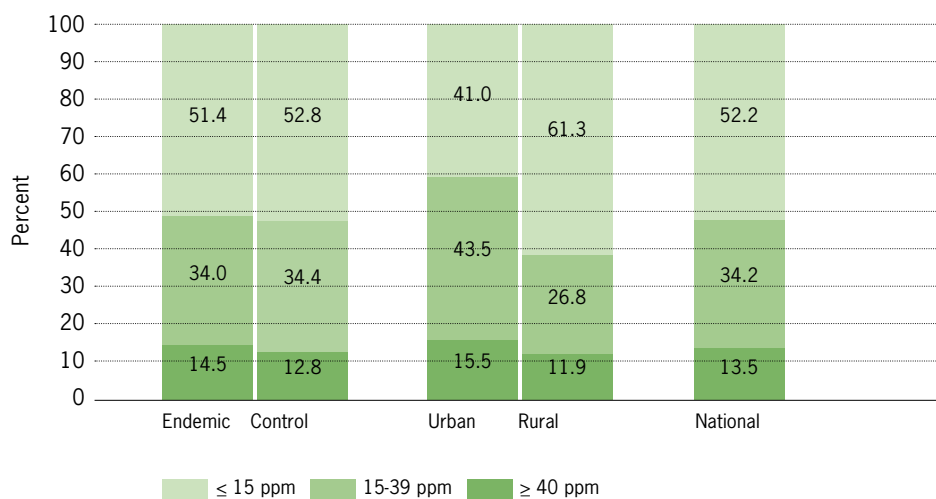
of the household using global positioning systems [5]. UIC and salt titration analyses were performed at the Université Cheikh Anta Diop, Dakar, Senegal.

### Results: salt iodization

Data were collected between 15 October and 6 November, 2009. Of the 3768 households surveyed, 1506 (40%) were in the endemic zone and 2262 (60%) in the control zone, while 1729 (46%) households were in urban and the remaining 2039 (54%) in rural areas.

**Figure 1: Household availability of iodized salt in Senegal by area of residence**



**Figure 2: Salt iodine concentrations in Senegal by area of residence**

The households surveyed were inhabited by 31,397 persons, including 6309 children aged 6–12 years (20%) and 7980 women of reproductive age (25%); of the latter, 302 women were pregnant at the time of the survey. In the subsample, data was available for 695 households; of those, 310 (45%) were in the urban and 282 (41%) in the endemic areas. Salt was available in 97.2% of households surveyed. Nearly 80% of salt was packaged in bulk; this proportion was higher in endemic (92.0%) than control (69.8%) and in rural (85.3%) than urban (70.8%) areas.

Rapid test kit results indicated that 56.0% of Senegalese households have iodized salt (Figure 1). The availability was similar in endemic and control areas, and higher in urban than rural areas. The titration analyses from the subsample revealed that the median national iodine concentration was 15 ppm and varied significantly between urban (19 ppm) and rural (12 ppm), but not between endemic (15 ppm) and control (14 ppm) areas (data not shown). The analyses also showed that 34.2% of salt was iodized between 15–39 ppm, and 13.5% at  $\geq 40$  ppm, yielding a proportion of salt iodized at  $\geq 15$  ppm of 47.7% (Figure 2).

### Results: urinary iodine concentrations

Among children aged 6–12 years, the national median urinary iodine concentration (UIC) was 104  $\mu\text{g}/\text{l}$  (Table 1). In all,

47.8% of children had UIC  $< 100$   $\mu\text{g}/\text{l}$  and 19.4% had UIC  $< 50$   $\mu\text{g}/\text{l}$ . In urban and control areas, the median UIC was  $\geq 100$   $\mu\text{g}/\text{l}$ , whereas it was  $< 100$   $\mu\text{g}/\text{l}$  in rural and endemic areas. Among non-pregnant women aged 15–49 years, the national median UIC was 92  $\mu\text{g}/\text{l}$  (Table 2). Overall, 54% of women had UIC  $< 100$   $\mu\text{g}/\text{l}$  and 24.1 had UIC  $< 50$   $\mu\text{g}/\text{l}$ . Similar to the children, the median UIC was  $\geq 100$   $\mu\text{g}/\text{l}$  in the urban and control areas.

### Discussion and Policy Implications

This survey was conducted out of the strong commitment of the National Committee for Salt Iodization to ensuring that  $>90\%$  of the salt used in Senegalese households is iodized. Even though important progress has been made towards this goal since the implementation of the legislation on iodized in 1995, it appears that household iodized salt coverage has in fact decreased slightly in recent years from 64% (as shown in the 2005 DHS) to 56% in the current survey [2].

The urinary iodine data indicates that non-pregnant women of reproductive age are mildly iodine deficient. There is a strong rationale for ensuring that women of reproductive age have adequate iodine status. This is because iodine deficiency during pregnancy, especially in its severe form, impairs maternal thyroid hormone metabolism and may thus impair fetal brain development [6], and increase risks of fetal

and perinatal mortality [7, 8]. The survey showed that the iodine status of school-aged children is of borderline sufficiency on the national level and that those living in rural and the Southern endemic zones are mildly iodine deficient. Such deficiencies status may impair cognition and school performance [9, 10] and ensuring an equitable coverage of adequately iodized salt, the most feasible and sustainable measure to prevent such deficiencies, should thus be of priority.

On the basis of this survey, program managers must continue to seek improvements of the national salt iodization program, as the country is still far from the goal of Universal Salt Iodization, defined as  $>90\%$  availability of household iodized salt. Promising strategies include finding more effective ways to support EIGs, such as by developing viable business models and sustainable systems for vital supplies such as potassium iodate. Furthermore, increasing the coverage of the current EIG system to cover the estimated 90,000 tons of salt with uncertain iodization levels is crucial.

Even though the household coverage of iodized salt (56.0%) was similar to the proportion of adequately iodized salt (47.7%), which may indicate that iodization, once performed, generally equals or exceeds the 15 ppm level, optimizing iodization practices to prevent deficiency or excessive levels should remain a programmatic goal. To complement these efforts, the enforcement of national legislation on mandatory salt iodization needs to be strengthened to limit the commercialization of non-iodized salt. Operational assessments are needed to learn where current efforts are falling short of expectations.

The opinions and statements in this article are those of the authors, and may not reflect official policies of UNICEF or the Micronutrient Initiative. Correspondence to: Banda Ndiaye, [bndiaye@micronutrient.org](mailto:bndiaye@micronutrient.org)



**Table 1: Urinary iodine concentrations of children aged 6-12 years in Senegal**

	Area of residence		Area of residence		National
	Endemic	Control	Urban	Rural	
Median ( $\mu\text{g/l}$ )	92	114	141	83	104
% < 20 $\mu\text{g/l}$	4.2	3.8	1.7	5.9	4.0
% 20-49 $\mu\text{g/l}$	18.9	13.1	8.7	21.1	15.4
% 50-99 $\mu\text{g/l}$	31.7	26.2	20.7	34.9	28.4
% 100-199 $\mu\text{g/l}$	27.2	33.8	39.7	23.9	31.1
% 200-299 $\mu\text{g/l}$	12.8	13.8	17.7	9.9	13.4
% $\geq$ 300 $\mu\text{g/l}$	5.3	9.2	11.7	4.2	7.6

**Table 2: Urinary iodine concentrations of non-pregnant women aged 15-49 years in Senegal**

	Area of residence		Area of residence		National
	Endemic	Control	Urban	Rural	
Median ( $\mu\text{g/l}$ )	79	100	115	73	92
% < 20 $\mu\text{g/l}$	5.5	4.0	2.1	6.7	4.6
% 20-49 $\mu\text{g/l}$	26.2	15.4	12.3	25.8	19.6
% 50-99 $\mu\text{g/l}$	27.4	30.6	27.1	31.3	29.4
% 100-199 $\mu\text{g/l}$	24.1	33.0	34.2	25.5	29.5
% 200-299 $\mu\text{g/l}$	13.9	11.4	17.6	7.9	12.4
% $\geq$ 300 $\mu\text{g/l}$	3.0	5.6	6.7	2.7	4.6

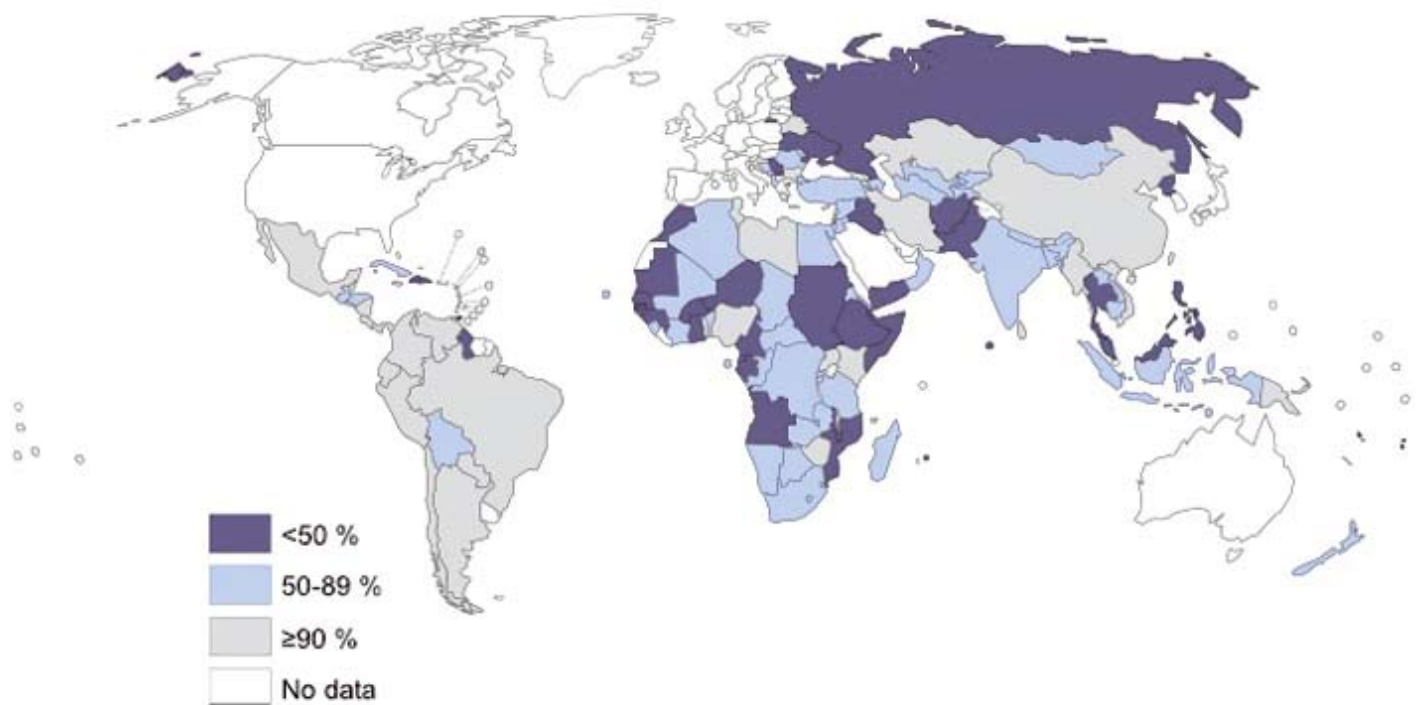
**Senegalese women and children benefit from iodized salt**

## References

1. Ndiaye, B., et al., Sustainable salt iodization using cost recovery scheme for small salt producers in Senegal, in Micronutrient Forum 2009: Beijing, China.
2. Ndiaye, S., et Mohamed Ayad. 2006. Enquête Démographique et de Santé au Sénégal 2005. Calverton, and U.C.d.R.p.l. D.H.S.e.O.M. Maryland.
3. Université Cheikh Anta Diop and D.e.S.d.l.R. Institut de Formation et de Recherche en Population, Evaluation de l'impact de l'iodation du sel sur la prevalence des TDCI et l'impact du déparasitage sur la prévalence de l'anémie dans les régions de Tambacounda et de Kolda, Sénégal, 2007.
4. Ministère de la santé et de la prévention médicale, Université Cheikh Anta Diop, and Micronutrient Initiative, Etude sur les troubles dus à la carence en iode au Sénégal. , 2010.
5. Teta, I.N., et al., Direct digital entry of national iodine survey data in Senegal. IDD Newsletter 2011. 39(1): p. 12-14.
6. Morreale de Escobar, G., M.J. Obregon, and F. Escobar del Rey, Role of thyroid hormone during early brain development. European journal of endocrinology / European Federation of Endocrine Societies, 2004. 151 Suppl 3: p. U25-37.
7. Cao, X.Y., et al., Timing of vulnerability of the brain to iodine deficiency in endemic cretinism. The New England journal of medicine, 1994. 331(26): p. 1739-44.
8. Connolly, K.J., P.O. Pharoah, and B.S. Hetzel, Fetal iodine deficiency and motor performance during childhood. Lancet, 1979. 2(8153): p. 1149-51.
9. Gordon, R.C., et al., Iodine supplementation improves cognition in mildly iodine-deficient children. The American journal of clinical nutrition, 2009. 90(5): p. 1264-71.
10. Zimmermann, M.B., et al., Iodine supplementation improves cognition in iodine-deficient schoolchildren in Albania: a randomized, controlled, double-blind study. The American journal of clinical nutrition, 2006. 83(1): p. 108-14.

# UNICEF's The State of the World's Children 2012: Children in an Urban World

The latest global data from UNICEF show 71% of households surveyed are using adequately iodized salt, but coverage is only 61% in the least developed countries



**“Hundreds of millions of children today live in urban slums, many without access to basic services. We must do more to reach all children in need, wherever they are excluded and left behind. Some might ask whether we can afford to do this, especially at a time of austerity. But if we overcome the barriers that have kept these children from the services that they need and that are theirs by right, then millions more will grow up healthy, attend school and live more productive lives. Can we afford not to do this?”**

*Anthony Lake, Executive Director, UNICEF SOWC 2012*



In many countries, children living in urban poverty fare as badly as, or worse than, children living in rural poverty, when it comes to undernutrition and under-five mortality. Hunger and undernutrition wear an increasingly urban face. The number of the poor and undernourished is increasing

**Table 1: Percentage of households consuming iodized salt (2006-2010)\***

Africa	55
Sub-Saharan Africa	53
Eastern and Southern Africa	65
West and Central Africa	—
Middle East and North Africa	48
Asia	74
East Asia and Pacific	88
South Asia	55
Latin America and Caribbean	—
CCE/CIS	—
Industrialized countries	—
Developing countries	71
Least developed countries	61
<b>World</b>	<b>71</b>

\* Iodized salt consumption is defined as the percentage of households consuming adequately iodized salt (15 parts per million or more). Main data sources: DHS, MICS, other national household surveys and UNICEF.

faster in urban than in rural areas. Even the apparently well fed – those who receive sufficient calories to fuel their daily activities – can suffer the ‘hidden hunger’ of micronutrient malnutrition. Without these micronutrients, children are at increased risk of death, blindness, stunting and lower

IQ. Poor nutrition contributes to more than a third of under-five deaths globally. Effective interventions to reduce child undernutrition may include provision of micronutrients through micronutrient supplementation and food fortification.



# Iodized salt in processed foods: how important is it?

The Institute of Food Technologists (IFT) recently published a major global review, contracted by The Micronutrient Initiative (MI), assessing the extent to which iodized salt is used in processed foods, as well as food processors' level of knowledge on iodine nutrition. This article is a summary of that review. The full report can be found at: Ohlhorst SD, et al. **Use of Iodized Salt in Processed Foods in Select Countries Around the World and the Role of Food Processors.** *Comprehensive Reviews in Food Science and Food Safety*. Volume 11, Issue 2, pages 233–284, March 2012

Universal salt iodization (USI) is a safe, cost-effective, and sustainable strategy to ensure sufficient intake of iodine by all individuals. However, USI has in practice tended to focus only on table salt and not all salt destined for human consumption. Recent trends, particularly in industrialized countries, show that individuals are consuming the majority of their salt through processed foods, in which iodized salt is generally not used, rather than through iodized table salt. Additionally, recent initiatives to encourage reduced sodium consumption have prompted many consumers to reduce their intake of iodized table salt. While these trends in sodium consumption are more frequently observed in industrialized countries, they are expanding into many developing countries where iodine deficiency is also a concern. Thus countries, which focus on iodization of table salt alone, may not achieve optimal iodine nutrition of their population.

There were 2 Phases of this project. In Phase I, IFT conducted a desk review to determine the types and level of processed food consumption in the 39 countries of interest selected by MI (Table 1), as well as to identify suppliers of the major processed foods consumed and the use of salt as an ingredient in those products. Phase II was to conduct an electronic survey of food processors and detailed telephone interviews with a small sample of select company representatives from 16 countries (Table 2). IFT sent an electronic survey to over

800 individuals; outreach included over 15 multinational food companies. The survey responses IFT received were limited; however, IFT made a substantial effort to obtain useful information for each country. IFT also used survey responses and personal e-mail communications to locate 10 food company representatives to participate in telephone interviews to gain more detailed information.

Many of the 39 countries reviewed struggle with food insecurity, thus it was generally difficult to find food consumption data for these impoverished nations, particularly data on processed food consumption. Nationwide food consumption data were helpful to better understand processed food consumption for those countries that collected it; however, developing countries often lack the resources for such a large undertaking. Smaller, published academic studies were most useful in identifying types of foods that may be available in the different locales within a country, at times including minimally processed foods.

IFT found that residents in many of the developing countries typically consume minimally processed foods such as bread and cheese, but that they do not frequently consume what are considered processed foods in “Western” society (packaged, prepared foods). Although processed foods may be available, consumption often differs based on income and region in the country. The more affluent and urban areas of

countries appear more able to purchase processed foods, and therefore more likely to have a higher consumption rate.

A pattern of processed food consumption or lack thereof did not present itself for the various country categories assigned to the 39 countries evaluated. Whether the country has a heavy or high IDD burden or an opportunity to progress did not correlate with the consumption of processed foods in that country. IDD is present in both developed and developing countries, and countries from each of these categories may or may not have processed foods available. Some countries with the heaviest burden for IDD may also have many processed foods available such as China, while another country with high IDD does not appear to have even minimally processed foods readily available. However, the majority of the European countries and Latin American countries identified on the list do have processed foods more readily available than some other countries identified, although not all are prepared with iodized salt.

Many of the developing nations reviewed have the highest prevalence for IDD, often due to the high level of food insecurity. IDD is more closely linked to food insecure populations, which are also often low-income and rural populations, who lack access to food, including food that may have been prepared with iodized salt. Some of the developing countries have



enacted legislation to combat high rates of IDD and require iodization of all salt to be consumed; however, they also often lack regulatory infrastructure and therefore lack effective methods to monitor and enforce salt iodization. For this reason, it appears that even when legislation and other efforts have been enacted, they are not comprehensively implemented.

Future research on iodine use in processed foods should include the need for nationwide food consumption data and additional food science research. Salt suppliers also face challenges when iodizing salt in developing countries, as they may not have the technical capabilities, equipment, or resources to do so.

**Survey and telephone respondents reported potential challenges when using iodized salt in food products, including:**

- trade barriers
- increased costs
- lack of resources and technical capability
- lack of enforcement
- instability of iodine
- potential equipment and process overhauls
- competing priorities
- consumer misconceptions



The survey and telephone respondents indicate that food companies are willing to use iodized salt in food products; however, the use of iodized salt in food products may need to be mandated by law and effectively monitored as an incentive for a company to invest, and to create a level playing field in the industry. Although USI intends for all salt for human and animal consumption to be iodized (whether used in food products or not), in practice, that is not always the case. Iodized salt appears to primarily be used in food products only when required by legislation, and companies do not appear to use iodized salt in product categories that do not require it (such as beyond bread products in Australia) or for products

sold in countries that do not require it. Suggested approaches to get food companies to voluntarily use iodized salt in food products include outreach and education to company nutrition departments, who would then recommend policy changes to top levels of management. Additionally, a strong educational campaign for consumers on how to address IDD through the use of iodized salt in food processing could provide an incentive for companies to meet consumer demand.

In general, although most companies are open to discussing iodine nutrition in more detail, iodine nutrition is currently discussed infrequently at food companies. Most respondents appear to have a fair level of knowledge about iodine nutrition and the use of salt as a vehicle for iodine, although individuals working for different departments in a food company have differing levels of understanding. Companies did indicate that they would be open to localized educational efforts to inform select company representatives about iodine nutrition.

**Table 2: Countries in Phase II of the iodized salt in process foods project.**

Australia	Kenya
Bangladesh	Mexico
Bolivia	Nigeria
China	Pakistan
Egypt	Russia
Ghana	Senegal
India	South Africa
Indonesia	United Kingdom

**Table 1: Countries in Phase I of the iodized salt in processed foods project.**

Countries with heavy burden of IDD	Countries with high burden of IDD	Countries with opportunity to progress	Latin American countries	European countries
India	Russia	Senegal	Chile	United Kingdom
Pakistan	Afghanistan	Ghana	Argentina	Ireland
Ethiopia	United Republic of Tanzania	Ukraine	Mexico	Finland
China	Democratic Republic of Congo	Kenya	Bolivia	Netherlands
Sudan	Iraq	Mozambique	Uruguay	Australia
Indonesia	Bangladesh	Niger		New Zealand
Philippines	Yemen	Egypt		
	Angola	Haiti		
	Turkey	South Africa		
		Brazil		
		Nigeria		
		Nepal		



# India launches state-of-the-art system for monitoring salt iodization

Global Alliance for Improved Nutrition (GAIN) Geneva, Switzerland

**“This investment will help future generations in India access adequately iodized salt and avoid irreversible mental and physical setbacks.”**

*Greg S. Garrett, GAIN*

India was one of the first countries in Asia to implement salt iodization, with policies dating back to the early 1960s. While the country has made huge strides in increasing iodized salt production in recent years, progress has not always been steady. A lift on the ban of sale of non-iodized edible salt between 2000 and 2005 left iodized salt use suspended at 51 percent of households as per the National Family Health Survey 3 (1). The ban's 2005 reinstatement -- combined with heightened consumer awareness, effective monitoring, and improvements in iodization practices and packaging -- helped to boost the use of iodized salt from 51 percent of households in 2005, to 71 percent by 2009 as per the UNICEF Coverage Evaluation Survey that year (2).

Amidst this impressive increase in coverage, equitable distribution remains a challenge: consumption of iodized salt is much higher in urban areas (83 percent) than in rural areas (66 percent) leaving the most vulnerable population at a greater risk (3). A recent study sponsored by MI in rural districts of eight high-burden states reveals that nearly 65 percent of households in the richest wealth quintile have access to ade-

quately iodized salt, compared with only 36 percent in the lowest wealth quintile (4). Other challenges include improving QA/QC monitoring and prioritizing USI on the government agenda. The GAIN-UNICEF USI Partnership is working closely together with the Government of India, salt industry, and grassroots partners to address each of these areas through national and state level activities (See ICCIDD Newsletter, August 2011).



Most recently, GAIN, along with UNICEF and MI, has supported the development of a web-based Management Information System (MIS) to provide real time information on quality and quantity of iodized salt to the Salt Commissioner's office. The Salt Department of India formally launched the MIS in February

2012 after two years of development. The system will provide information related to the production, quality, and distribution of iodized salt throughout the country in real-time. Through improving accuracy, extensiveness, and speed of information provided, the MIS will allow the Salt Commissioner's office and partners to better identify and address gaps in the program and ensure that adequately iodized salt becomes available to all Indian consumers.



### Monitoring Challenges

India is unique in that it has a designated Salt Commissioner and rail subsidy for iodized salt. The country's salt industry consists of nearly 13,000 primary salt producers, the majority of which are small scale, and over 800 registered iodized salt manufacturers. The Salt Department regulates the industry and monitors production, distribution, and quality and iodine content of salt through a network of 32



static and mobile laboratories throughout the country. Additionally rail transport clearance offers a built-in check for pre-shipment monitoring of quality and iodine content. About 55 percent of edible salt is transported by rail.

Samples from production areas as well as pre-shipment samples are collected by Salt Department officials and sent to one of the department's 32 laboratories for analysis. In 2010, the GAIN-UNICEF Universal Salt Iodization Partnership collaborated with ICCIDD to assist the Salt Department to strengthen QA/QC in these laboratories through establishing a universal protocol and filling existing equipment and training gaps. After the training was completed, 76% of 79,722 samples tested by iodometric titration were found to be conforming to the mandated standards – improving the quality of iodized salt being produced.

In order to track production and movement of iodized salt, the Salt Department manually collects information related to production, distribution, and quality, which is then communicated up a chain of reporting channels to the Salt Commissioner. This is critical information to monitor plant performance and measure progress of USI. This labor-intensive and costly process of reporting would regularly result in data duplication, redundancy, and gaps.

Real-time access to reliable information through an online system would allow the Salt Department to integrate data collection countrywide, and ultimately improve monitoring of production and movement of adequately iodized salt. In 2009, GAIN took the lead along with the Salt Department, UNICEF, MI and development support from VBISOFT (India) Limited, to develop a Management Information System (MIS) designed to address these issues and improve the effectiveness of the Salt Department in monitoring India's USI program.

### MIS Development

GAIN initiated the project by conducting a comprehensive study on the feasibility of installing an MIS. The study recommended installing web-based enterprise software to provide real-time data to the Salt Department. The feasibility report was presented in a Partners Meeting in June

2009. The Salt Commissioner agreed with all partners that the MIS would strengthen the ability of the Salt Department to improve the availability and equitable distribution of adequately iodized salt in the country. The Salt Department, UNICEF and MI came forward to jointly invest in the development of the MIS together with GAIN.

After acceptance of the feasibility study, the next step was to develop the software. GAIN commissioned VBISOFT (India) Limited to undertake the software development. Cost for the hardware was shared by the Salt Department, UNICEF, and MI. During the development phase (February to December 2011), system designers overcame several hurdles such as customizing the software as per user requirement and ensuring sign off of the modules by authorized officials.

In February 2012, the Salt Department formally launched the new system at its headquarters in Jaipur. The system connects all of the department offices to the salt production plants to enable real-time information flow. Information is organized and displayed clearly through a simple user interface including dashboards depicting quality, production, and distribution, along with custom search functions. The online platform can be accessed through any web browser, thus eliminating the previous effort and time required to manually compile and transfer information; and drastically increasing efficiency in decision-making and reporting.

**“With the introduction of the system, the efficiency of the Department will increase many folds which will go a long way in professionally managing Salt Department processes.”**

*Mr. M. A. Ansari,  
Salt Commissioner of India*

**Project timeline**

2008	2009	2010	2011	2012
<ul style="list-style-type: none"> <li>• Feasibility study to develop a Management Information System took place</li> </ul>	<ul style="list-style-type: none"> <li>• Feasibility report presented at partners meeting with GAIN, UNICEF, MI, and Salt Commissioner</li> <li>• Decision to develop MIS</li> </ul>	<ul style="list-style-type: none"> <li>• Project plan completed</li> <li>• Software Requirement Study started</li> </ul>	<ul style="list-style-type: none"> <li>• System design &amp; development</li> <li>• Prototype approval</li> <li>• Pilot implementation and user testing</li> <li>• User training</li> </ul>	<ul style="list-style-type: none"> <li>• Official launch of system</li> <li>• Training and transition process</li> </ul>



*Better salt monitoring means better iodine nutrition for India's future*



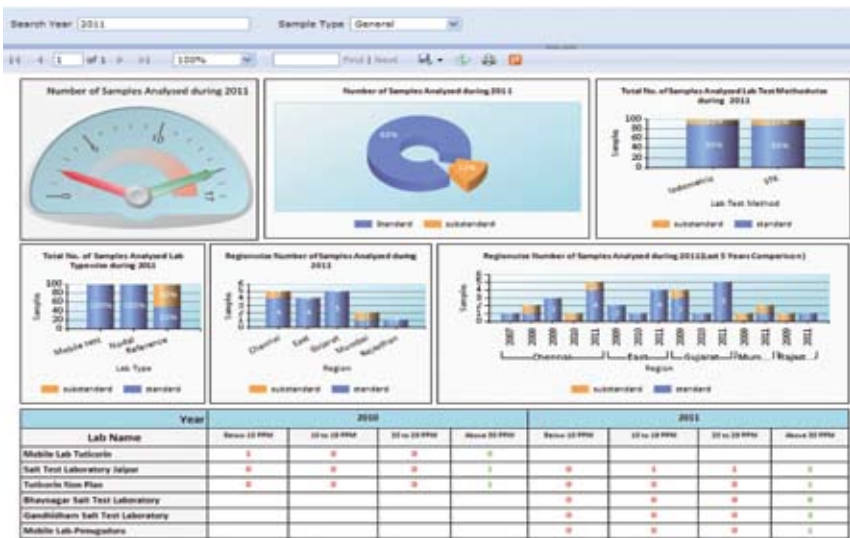
*India Salt Commissioner's offices in Jaipur*



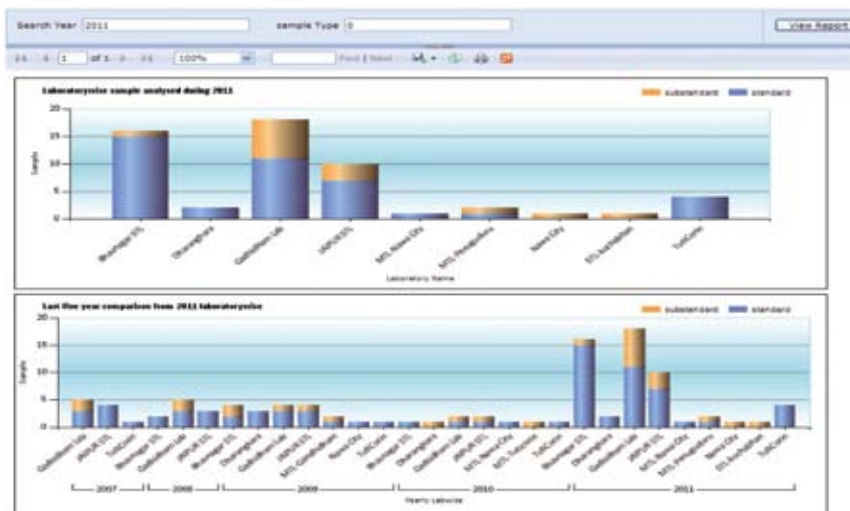
### Dashboard from the Indian MIS-Production



### Dashboard from the Indian MIS-Quality Assurance



### Dashboard from the Indian MIS-Quality Assurance







**Indian Salt Department team shows the management information system to track quality and production of iodized salt across the country.**

Photo credit: Greg Garrett/GAIN

### Impact and Implications

The MIS system offers game-changing potential for the Indian USI Program, which has gained substantial momentum in recent years. Through access to real-time information, the Salt Commissioner's office will be able to improve supply management of one of the largest salt industries and delivery networks in the world. The Salt Commissioner has estimated it will take approximately one year to transition from manual data reporting processes to full utilization of the system. Since the system is web-based it will be possible to integrate and deliver data on iodized salt to various government departments as well as development organizations located across the globe. In addition, because the India system has been designed to be easily customizable for any country

or fortification project, it can be adapted for implementation in other countries.

### References

1. International Institute for Population Sciences (IIPS) and Macro International 2007. National Family Health Survey (NFHS-3), 2005–06: India: Volume II. Mumbai: IIPS.
2. UNICEF 2010. Coverage Evaluation Survey 2009 (CES-2009). New Delhi
3. UNICEF 2010. Coverage Evaluation Survey 2009 (CES-2009). New Delhi.
4. Micronutrient Initiative 2010. Summary Report: Iodized Salt Coverage Study 2010. New Delhi.

**“This collaboration reiterates that the whole is greater than sum of its parts. I am sure that this web based enterprise software solution would be able to remove bottlenecks... to monitor and control equitable supply of salt in the country and ensure iodine compliance under the NIDDCP program”**

*Dr Rajan Sankar,  
Country Manager, India, GAIN*

## History of iodine research

# Basil Hetzel's groundbreaking iodine study in Papua New Guinea in the 1960s now a 'classic'

The following article contains excerpts from the commentary paper: "Epidemiology, iodine deficiency and the power of multidisciplinary sufficiency" by Anthony McMichael in the *International Journal of Epidemiology* (published online on May 13, 2012). It celebrated the recognition of the paper: "Neurological damage to the fetus resulting from severe iodine deficiency during pregnancy" published in the *Lancet* in 1971, as a 'classic' paper.

It is pleasing to see this article (1) being accorded 'classic' status. Around 1970, Basil Hetzel, Foundation Professor of Social and Preventive Medicine at Monash University, Melbourne, Australia—and supervisor of my (unrelated) PhD—saw clearly the need and opportunity to pursue a program of research for which this classic article is the prime foundation. The program sought, via epidemiological research and then animal experimental studies, a fuller understanding of the developmental and health consequences of lifelong iodine deficiency.



Basil Hetzel was Professor of Medicine during my undergraduate clinical years (1964–66) at the University of Adelaide. I knew nothing, then, of his nascent interest in the problem of iodine deficiency and goiter in the Papua New Guinea (PNG) highlands. In describing the source of his interest, he has noted in his autobiographical book, *Chance and Commitment: Memoirs of a Medical Scientist* (2005), the role of serendipity in one's research life—in this case, his being asked to review a journal paper, in 1963, on an exploratory study of goiter prevention in PNG.

During my first years in the Department of Social and Preventive Medicine at Monash

University, there were occasional frissons of excitement relating to the ongoing randomized controlled trial of cretinism prevention in newborns in a sample of villages in the PNG highlands. The intervention, in 1966, entailed intramuscular injection of reproductive-aged, alternate, women with iodized oil or saline. Follow-up of pregnancy outcome occurred over the next 3 years, via copious boot-leather epidemiology in the mountainous PNG highlands. This classically experimental study was a relatively novel epidemiological research design in the late 1960s—and especially so for non-communicable disease outcomes. Hetzel was fortunate to have able and energetic field-working colleagues, well-attuned to tramping around the PNG highlands—Drs. Ian Buttfeld and, especially, Peter Pharoah. The support from the PNG Department of Public Health was also invaluable.



Meanwhile, back in Australia, the other side of the 'iodine coin' was causing public health concern. Tasmania, with its long-standing problem of iodine deficiency and adult goiter, had introduced iodine-supplemented bread in 1966. At that same time, coincidentally, iodine-based sterilizers (iodophors) were introduced into the dairy industry to ensure a safe milk supply. This

became a second, unintended, source of iodine supplementation in the diet. A subsequent rise in thyrotoxicosis occurred due to over-exposure to supplementary iodine and, hence, overactive thyroid glands. Hetzel was called in as an advisor. Here was further confirmation of a central role for dietary iodine imbalance as a source of various human health disorders.

Few in the epidemiology research arena have the chance to test and elaborate their ideas in the realm of animal experimental research. In 1975, Basil Hetzel took the opportunity to take over as head of a revamped branch of the Australian Government's CSIRO (Commonwealth Scientific and Industrial Research Organization). This now became the Division of Human Nutrition, based in Adelaide, South Australia. A sequence of experimental studies of iodine deficiency in pre-pregnant animals was carried out first in sheep and then in marmoset monkeys. This stage of the research story made clear that the iodine deficiency caused abnormal development of the fetal cortex and cerebellum, growth retardation and stillbirths and abortion.

Following Hetzel's clarification of the syndrome of IDD in the early 1980s, IDD prevention became part of modern, global, public health architecture. This 'translational' step is where the really hard work often begins. How to actually prevent disorders and diseases for which there is now clear empirical evidence of major risk factors? Hetzel and colleagues saw that, in the long haul, it was going to be necessary to esta-

blish an authoritative body to deal with international agencies and national governments. In 1985, they established an international NGO, the International Council for the Control of Iodine Deficiency Disorders (ICCIDD).

In the wake of successful lobbying and negotiation at the international level, with the WHO and UNICEF in particular, the ICCIDD was then able to assist in the development of a global program of elimination of IDD. Basil Hetzel was executive director during 1985–95, and then chairman during 1995–2001. Today, the

ICCIDD comprises a global network of >800 professionals. This network includes epidemiologists, endocrinologists, salt chemists, media experts and others.

The ongoing program of iodine supplementation, led by WHO, has not been a straightforward path to continuing prevention. Cultures and governmental capacities differ, and population diets and environmental conditions change over time. In 2007, WHO therefore took action to require countries to monitor and report on their IDD control programs. Even so, iodine deficiency has been reappearing in

various parts of the world in recent years, including in some locations in Australia. As ever with environmental health, there is need for continuing vigilance – especially as expanding populations farm on increasingly marginal land and deplete iodine from the soil.

#### Reference

1. Pharoah POD, Buttfield IH, Hetzel BS. Neurological damage to the fetus resulting from severe iodine deficiency during pregnancy. *Lancet* 1971;297:308-10.

## Iodine intakes in young U.S. women are borderline and pregnant women may be mildly deficient

A new report provides nationally representative data and trends of iodine intake in the U.S. population

The National Report on Biochemical Indicators of Diet and Nutrition in the U.S. Population is a series of publications that provide ongoing assessment of the U.S. population's nutritional status by measuring blood or urine concentrations of diet-and-nutrition biochemical indicators. The Centers for Disease Control and Prevention's (CDC) Division of Laboratory Sciences at the National Center for Environmental Health (NCEH/DLS) conducted the laboratory analyses for the 2012 report.

CDC measured these indicators in specimens from a representative sample of the U.S. population during all or part of the four-year period from 2003 through 2006. CDC's National Health and Nutrition Examination Survey (NHANES), conducted by the National Center for Health Statistics (NCHS), collected the specimens for this report. NHANES is a series of surveys designed to collect data on the health and nutritional status of the U.S. population. The report can be accessed online: <http://www.cdc.gov/nutritionreport>. This excerpt is from that report.

#### Dietary sources of iodine in the U.S.

In the United States, where the addition of iodine to salt is not mandatory, most people get their iodine from dairy products and grains (bread) (1). In the United States, salt is iodized with potassium iodide at 100 parts per million (76 milligram [mg] of iodine per kilogram [kg] of salt). Iodized salt is chosen by about 50–60% of the U.S. population (2). Still, most ingested salt comes from processed food (approximately 70%), which is typically not iodized in either the United States or in Canada (3).

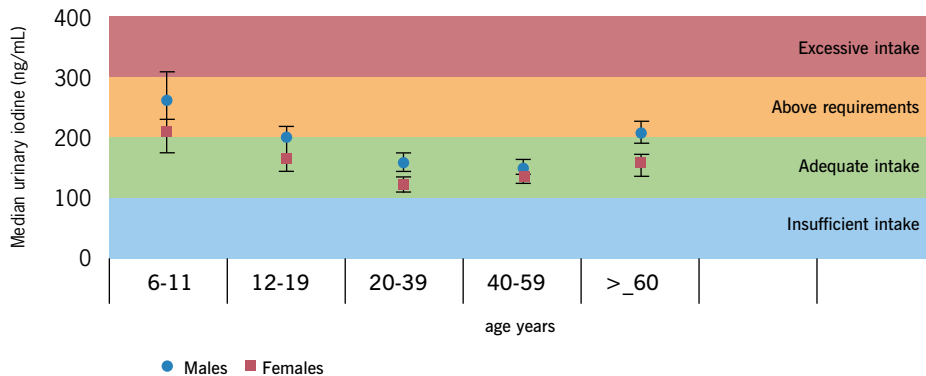
Dairy products have been identified as another important contributor to iodine status among reproductive-age women in the United States (4). A current survey of prenatal multivitamins marketed in the United States showed that 49% did not contain iodine. Furthermore, the majority of women of childbearing age (> 80%) are not consuming supplements containing iodine (5).

#### Urinary iodine concentrations (UICs) in NHANES

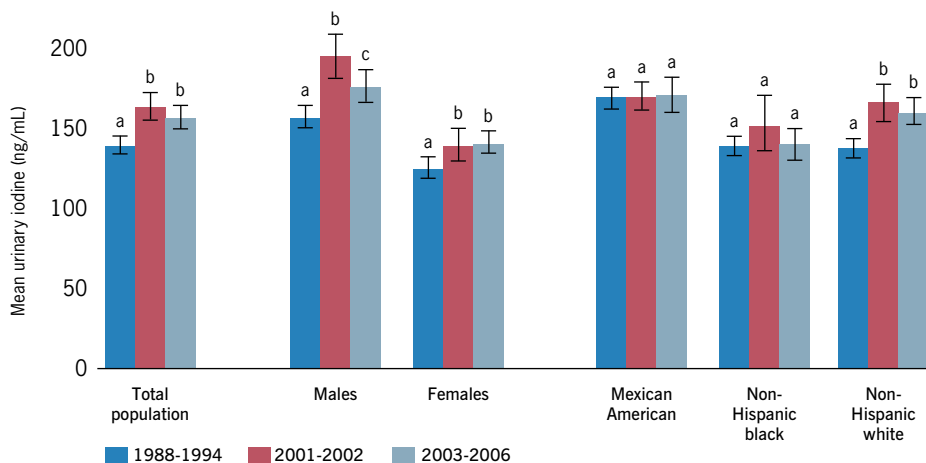
NHANES has measured urinary iodine since 1971. The NHANES III survey (1988–1994) showed a sizable decrease in urinary iodine concentrations compared to concentrations measured during NHANES I (1971–1974) (6). This decline may have been due to the dairy industry's effort in the mid-1980s to reduce the iodine residue in milk from feed supplements and iodophor sanitizing agents (7). Decreased concentrations of iodine in fruit-flavored breakfast cereals resulted from a ban on erythrosine (an iodine-containing food dye) and could also have contributed to the decline in UIC.

Since 2000, UI has been measured in the continuous NHANES survey. When CDC laboratory scientists measured UIC in four NHANES surveys from 2001 through 2008, they found that the US median UIC has stabilized since the initial drop that had occurred from NHANES I to NHANES III and that it represented adequate iodine intake for the overall population 6 years and older.

**Figure 1: Median UICs in the U.S. population by age and gender associated with estimated iodine intake. NHANES 2001-2006. Error bars are 95% CIs.**



**Figure 2: Age-adjusted geometric mean UICs in the U.S. population by gender or race/ethnicity. NHANES 1988-2006. Error bars show the 95% CIs. With a group, bars not sharing a common letter differ (p<0.05).**



**Highlights of iodine findings:**

UICs in the US population showed the following demographic patterns and characteristics:

- The iodine intake of the US population appeared to be adequate on the basis of the median UIC. There was no significant overall change in urinary iodine concentrations between 2001 and 2006.
- However, women aged 20-39 years had the lowest iodine intake, just slightly above sufficient intake (Figure 1). Young women merit special attention to ensure the best possible brain development of the fetus during pregnancy. Females had lower urinary iodine concentrations than males.

- While no group had a median UIC that represented excessive intake, boys 6-11 years of age had the highest intake, and the upper confidence limit of the median was just slightly within the range of excessive intake (Figure 1). Urinary iodine concentrations followed a U-shaped age pattern, with the lowest concentrations seen in young and middleaged adults.
- UICs have been relatively stable over almost two decades between 1988-2006 (Figure 2). They increased slightly (<20%) between 1988-1994 and 2001-2002 in the total population, in males, in females, and in non-Hispanic whites. However, they remained unchanged in non-Hispanic blacks and Mexican Americans. Non-Hispanic blacks had lower urinary iodine

concentrations than either non-Hispanic whites or Mexican Americans.

- The median (95% CI) UIC for pregnant women, (125(86-198) µg/L), was below the cut-off value of 150 µg/L indicating iodine deficiency, however, the sample size was small (n=184) (8).

**Continued monitoring of the population for iodine sufficiency is warranted because of groups at risk of IDD.**

**References**

1. Murray CW, Egan SK, Kim H, Beru N, Bolger PM. US Food and Drug Administration’s Total Diet Study: Dietary intake of perchlorate and iodine. *J Exposure Sci Environ Epidemiol.* 2008;18:571-580.
2. Institute of Medicine, Food and Nutrition Board. *Dietary Reference Intakes: vitamin A, vitamin K, arsenic, boron, chromium, copper, iodine, iron, manganese, molybdenum, nickel, silicon, vanadium, and zinc.* Washington, D.C.: National Academy Press; 2001.
3. Becker DV, Braverman LE, Delange F, Dunn JT, Franklyn JA, Hollowell JG, et al. Iodine supplementation for pregnancy and lactation—United States and Canada: recommendations of the American Thyroid Association. *Thyroid.* 2006;16:949-951.
4. Perrine CG, Herrick K, Serdula MK, Sullivan KM. Some subgroups of reproductive age women in the United States may be at risk for iodine deficiency. *J Nutr.* 2010;140:1489-1494.
5. Gregory CO, Serdula MK, Sullivan KM. Use of supplements with and without iodine in women of childbearing age in the United States. *Thyroid.* 2009;19:1019-1020.
6. Hollowell JG, Staehling NW, Hannon WH, Flanders DW, Gunter EW, Maberly GF, et al. Iodine nutrition in the United States. Trends and public health implications: iodine excretion data from National Health and Nutrition Examination Surveys I and III (1971-1974 and 1988-1994). *J Clin Endocrinol Metab.* 1998;83:3401-3408.
7. Pennington JAT, Schoen SA. Total Diet Study: estimated dietary intakes of nutritional elements, 1982-1991. *Int J Vit Nutr Res.* 1996;66:350-362.
8. Caldwell KL, Makhmudov A, Ely E, Jones RL, Wang R. Iodine status of the U.S. population, National Health and Nutrition Examination Survey, 2005-2006 and 2007-2008. *Thyroid.* 2011;21:419-427.



# A Philippine salt producer embraces iodized salt as its corporate social responsibility

**Theresa S. Samaniego** Philippine Daily Inquirer, May 18th, 2012

The Philippine government since the 1990s has pushed iodized salt as the simplest yet most potent solution to iodine deficiency, to the point of enacting a law mandating that all salt produced and sold in the market should be iodized.

A Philippine salt producer, Salinas Corp., according to its business development manager Glenn John Khonghun, was among those companies that participated in the salt iodization program in 1993, during which the advocacy was conducted on a national scale.

At that time, the Department of Health, with the support of Salinas Corp. and several other concerned groups and stakeholders, was able to inform and educate mothers in hospitals, health centers and clinics on the benefits of using iodized salt. Salinas then took upon itself the cause of finding ways to better implement the iodized salt program as part of its corporate social responsibility activities.

In a recent interview, Khonghun remembered: “The challenge then was how to institutionalize a social change, a basic in any social marketing effort... Through the government leadership, local government units who embraced the advocacy to use iodized salt were given incentives and recognition, which eventually helped propel the adoption of the campaign.”

The hype of the '90s for iodized salt may have since died down. But the fact remains that it continues to be a good source of iodine, an essential micronutrient needed by the body for the thyroid gland to properly function and produce enough hormones.



*This vintage postcard from Salinas, The Philippines, shows the snow-white mountainside salt terraces.*

It also remains a fact that iodine deficiency continues to be alarmingly more prevalent in pregnant and lactating women. According to Khonghun: “Children who were born of mothers with iodine deficiency are most affected. In cases where iodine was absent early in life, the disorder can be irreversible.”

IDD is the single most common cause of preventable mental retardation and brain damage in the world. This is why Salinas Corp. has continued its partnership with the DOH – a relationship that will mark the 20th year by 2013.

“We renewed our commitment to the health programs of the DOH in 2005, upon the declaration of PP 958 [Decade of Healthy Lifestyle], which serves as an expansion of the health campaign for iodized salt,” Khonghun said. “This is our way of augmenting the government’s resources, by doing our part and giving back to society”.

# Cross-sector collaboration in Thailand pushes for USI

**Mark Thomas** chief communication section, UNICEF Thailand; guardian.co.uk, Monday 12 March 2012

In May 2010, UNICEF was approached by Sansiri Plc., one of Thailand's largest real estate developers, about making a donation. When Sansiri's president, Srettha Thavisin, was told during the initial meeting that instead of funding, UNICEF would rather have Sansiri's support in promoting key policy changes for children, he was intrigued. And when Thavisin learned about the threat posed by iodine deficiency disorders (IDD) to the well being of children in Thailand, and the impact this would have on the country's future social and economic development, he committed himself and Sansiri to help address this issue.

IDD is the most common cause of preventable intellectual disability and brain damage in the world. Even a mild iodine deficiency in the general population can result in significant loss of learning ability and a decline in individual IQ. In Thailand, where only about half of households use iodized salt and most other common food seasonings are not iodized, iodine deficiency had been a major threat to children's development for over 50 years. To address this and to protect children, there has been a push for regulations mandating the iodization of all salt for human consumption. Progress towards that goal, however, had been slow.

In July 2010, with extensive support from Sansiri, a major public campaign branded with an „Iodine Please“ logo was launched to encourage support for mandatory salt iodization. Sansiri tapped into its extensive corporate resources to help develop and distribute numerous messages highlighting

the benefits of iodized salt, and through its business and political contacts helped UNICEF reach key decision makers at the highest levels of government.

This campaign, combined with the ongoing, long-term efforts to promote salt iodization, resulted in a change – the Thai Ministry of Public Health adopted regulations on mandatory iodization in September 2010. These regulations took effect on 1st January 2011, with strict enforcement and heavy fines for non-compliance starting in June 2012.

support also clearly shows the added value the corporate sector can bring, far beyond simply donating money.

The level of creative resources provided by Sansiri for the campaign, as well as the number of messages designed and the speed with which they were disseminated, were beyond the reach of UNICEF or any other development organisation. In addition, Sansiri's contacts provided critical opportunities to present to decision makers at the highest levels.



**Srettha Thavisin, Sansiri President, (left) and Tomoo Hozumi, UNICEF Thailand Representative, (right) at Sansiri 2011 Children Day's Celebration during which Iodine Please campaign was the main theme.**

In supporting the campaign, Sansiri clearly recognized the important role of the private sector in the development of Thailand and in addressing critical development issues for children. The impact of this

## Meetings and Announcements

### New Chinese standards lower salt iodine

Liu Dong Global Times, China, March 16, 2012

Different regions nationwide are expected to adopt varying iodine content levels in their salt after the new national standards for iodized salt were officially put into effect Thursday. According to the new standards published by the Ministry of Health, the iodine content of iodized salt will be decreased from the previous uniform national standard of 35 mg per kg to three varying levels of 20, 25 and 30 mg per kg.

The new regulations allow different areas in the country to pick new standards based on the needs of local people. In the 1970s, iodine deficiencies were extremely common in China, with 35 million people suffering from thyroid diseases. Disfiguring goiters often marred the lives of rural residents. The country officially started adding iodine to salt in 1994, with a 60 mg per kg standard for iodized salt which in 2000 was decreased to 35 mg. In 2010, Mao Qun'an, a spokesperson for the Ministry of Health, said that iodized salt would not cause excessive intake of iodine

and the risks of iodine deficiencies were bigger than those from the excessive intake of iodine.

But an official announcement released by the Ministry of Health Thursday stated the reason for the adjustment was due to a 2005 national survey which showed that although iodine levels in the population were still within acceptable ranges, they had exceeded levels recommended by the World Health Organization (WHO), especially in children, whose urinary iodine content exceeded 23 percent of the WHO standard.

Meanwhile, officials said that with sources of iodine becoming more diverse in daily life and given that the manufacturing of iodized salt had improved over time, it was time to make some changes to the old standards. The Beijing government announced Friday they had chosen 25 mg as the new standard for iodized salt after joint research by several government departments.

A senior staff member at the Shanghai Salt Company, a State-owned monopolistic salt producer, said they have not yet received order to manufacture new types of salt there. "We were already ready for the new standards. But we haven't started to adjust yet, and for now we are still selling the old products," said Liu Shuguo, the head of marketing for the company.

Liu noted that Shanghai residents could purchase non-iodized salt at some 1,400 designated stores and hospitals. By the end of Friday, provinces including Hunan and Guangdong had all applied the new standards and decreased the level of iodine in salt. Luo Yunbo, dean of the Food College at China Agriculture University, told the Global Times that the promotion of iodized salt had been an efficient and benevolent program, and that it had prevented many iodine deficiency diseases. "The adjustment shows the authorities have realized that living conditions today have greatly changed. Therefore flexibility is necessary," Luo said.

### A Wee Bit More Iodine For Much Better Health in Tasmania

Michelle O'Byrne MP, Minister for Health, Tasmanian Government Media Releases, 19 April 2012. <http://www.media.tas.gov.au/release>

Tasmanians are for the first time getting the ideal amount of iodine in their diets, thanks to an Australian first initiative. The Minister for Health, Michelle O'Byrne, said even mild iodine deficiency is well recognized as having negative effects on growth and intellectual development in babies and children. Ms. O'Byrne said although iodine makes up just a tiny fraction of a recommended diet, Tasmanians simply weren't getting enough through the food they ate. "So in 2001 we asked the baking industry to voluntarily use iodized salt in bread," she said.

"As a result we saw childhood iodine levels marginally improve, partly because not all bread-making mix was

made in Tasmania. Our experience from this trial, together with the recognition that other states shared an iodine deficiency problem, influenced a decision to make the use of iodized salt in bread mandatory across the country in 2009. This additional iodine in our food from the mandatory national program has now been shown to have resulted in optimal iodine levels in Tasmanian children."

The Department of Health and Human Services has routinely surveyed iodine intake since 1998, tracking improvement through urinary iodine surveys of school children. More than 320 children from 35 schools were involved in the 2011 survey, conducted

from April to November last year. Ms. O'Byrne said the results confirm the government's commitment to preventive health programs.

"These kinds of outcomes may take time but persistence pays off," Ms O'Byrne said. "The results show the importance of routinely monitoring key health indicators, and especially the benefits that regulation can have on improving our health. Surveys like this rely on the cooperation of schools and parents and I would especially like to thank the children who made a valuable contribution to the health of all Tasmanians."

### EUSalt General Assembly 2012: Raising awareness of the benefits of iodized salt

EUSalt, the European salt producers' association, held its annual General Assembly in Sevilla, Spain from 23rd -25th May 2012. The association provides a platform for sharing expertise on salt and its many applications for industry experts and stakeholders involved. Being a responsible stakeholder, EUSalt has contributed to raising the issue of iodine deficiency disorders (IDD) and the possibility of erasing IDD.

For this, EUSalt supports the UNICEF/WHO/ICCIDD actions to highlight IDD and to provide a tool of improved iodine nutrition through iodized salt.

The issue of IDD prevalence in Europe still is a concern as some regions continue to be iodine deficient. This topic was raised at the General Assembly to define projects to communicate the concern of ade-

quate dietary iodine intake. Arnold Timmer of UNICEF and Michael Zimmermann of ICCIDD provided statements on the importance of IDD elimination through iodized salt, which can be viewed on the following video link: <http://dl.dropbox.com/u/46218653/Iodine%20HR.wmv>

### First national iodine survey in Guam

Ken Quintanilla Kuam News, Guam, May 15, 2012

During a briefing at the Governor's Office, the Department of Public Health announced it is conducting an Iodine Deficiency Survey until the end of the month in order to determine if Guam's children and pregnant woman have low iodine intakes.

According to Public Health director Jim Gillan, iodine is needed to make thyroid hormones, which are important for growth, development and brain function. He explained: "This is the first time that this has been done on Guam and we're hoping that all of the results will be negative but if they're positive, the fix is fairly easy."

The survey, being done by the WHO, follows on surveys in Fiji and Vanuatu that found low iodine levels. Public Health will be conducting the survey in over 700 randomly selected school children from 3rd to 6th grades in Department of Education schools and close to 300 pregnant women.



## Abstracts

### Iodine deficiency in pregnant women in the apparently iodine-sufficient capital city of Turkey.

This study assessed the iodine nutritional status of pregnant women living in Ankara, an area that has appeared to be iodine sufficient in earlier studies with a hospital-based, non-interventional, prospective, cross-sectional design. A total of 162 pregnant women in their second trimester were examined regarding iodized salt use, UIC, presence or absence of goiter and thyroid function. Goiter status was determined by palpation. While the proportion of iodized salt use was 80.2%, UIC was below 150 µg/l in 72.8% of the women. The median UIC was 80.5 (8.9–340.3) µg/L, indicating insufficient iodine intake. Total goiter rate was 15.4%. Preferential T3 secretion reflected by elevated molar ratios of FT3/FT4 was present in 89.5% of the women. 12.4% had subclinical hypothyroidism or isolated hypothyroxinaemia based on serum TSH and FT4 levels. The authors concluded that iodine deficiency is a serious problem among pregnant women in Ankara and proposed that nationwide surveillance studies be performed to directly assess and monitor the iodine status of pregnant women. They also suggested that pregnant women in Turkey should likely be supplemented by iodine-containing preparations in addition to iodized salt.

*Kutlu AO, et al. Clin Endocrinol (Oxf). 2012 May 15. [Epub ahead of print]*

### A comprehensive assessment of urinary iodine concentration and thyroid hormones in New Zealand schoolchildren: a cross sectional study.

This study aimed to carry out an assessment of the iodine status of New Zealand schoolchildren using a range of biochemical indices suitable for populations (i.e. UIC) and individuals (i.e. thyroid hormones). Data was from the New Zealand National Children's Nutrition Survey, a cross-sectional survey of a representative sample of schoolchildren aged 5–14 years. The median UIC was 68 µg/L (n=1153), indicating mild iodine deficiency. The median Tg concentration was 12.9 µg/L, which also suggests mild iodine deficiency. The Tg concentration of children with an UIC <100 µg/L was 13.9 µg/L, higher than the 10.3 µg/L in children with an UIC >100 µg/L (P= 0.001). The mean TSH (1.7 mU/L), fT4 (14.9 pmol/L), and fT3 (6.0 pmol/L) concentrations for these mildly iodine deficient New Zealand children fell within normal reference ranges. The UIC and Tg concentration indicate that New Zealand schoolchildren were mildly iodine deficient, and both are suitable indices to assess iodine status in populations or groups.

*Skeaff SA, et al. Nutr J. 2012 May 8;11(1):31.*

### Summary of an NIH Workshop to Identify Research Needs to Improve the Monitoring of Iodine Status in the United States and to Inform the DRI.

The Office of Dietary Supplements (ODS) at the U.S. NIH sponsored a workshop on May 12–13, 2011, to

bring together representatives from various NIH institutes and centers as a first step in developing an NIH iodine research initiative. The workshop also provided an opportunity to identify research needs that would inform the dietary reference intakes for iodine, which were last revised in 2001. The CDC monitors iodine status of the U.S. population on a regular basis, but the status of the most vulnerable populations remains uncertain. The NIH funds very little investigator-initiated research relevant to iodine and human nutrition, but the ODS has worked for several years with a number of other U.S. government agencies to develop resources needed to conduct iodine research of high quality (e.g., validated analytical methods and reference materials for multiple types of samples). The meeting identified iodine research needs appropriate to the NIH mission.

*Swanson CA, et al. J Nutr. 2012 Jun;142(6):1175s–85s.*

### Iodine status and fish intake of Sudanese schoolchildren living in the Red Sea and White Nile regions

To investigate iodine status and fish consumption of schoolchildren living in the Red Sea and White Nile regions of Sudan, a cross-sectional study was done to determine UIC, visible goiter rate, iodine content of salt and fish consumption in Port Sudan (Red Sea) and Jabal Awliya (White Nile), Sudan. Two hundred eighty (n=280) children aged 6–12 years were studied. The median UIC in children from Port Sudan and Jabal Awliya was 553 and 160 µg/L, respectively. Goiter was detected in 17.1% of children from Port Sudan but only in 1.4% from Jabal Awliya. The salt samples from Port Sudan contained 150–360 mg iodine/kg salt, whereas those from Jabal Awliya had levels below the detection limit. Despite consuming salt devoid of iodine, children from Jabal Awliya had optimal iodine status. It is plausible that consumption of Nile fish from Jabal Awliya Reservoir might have provided sufficient iodine. In contrast, children from Port Sudan were at higher risk of iodine-induced hyperthyroidism resulting from consumption of excessively iodised salt. The authors concluded that (i) Sudan still has a problem with iodine nutrition and quality control and monitoring of salt iodisation and (ii) including fish in the diet may provide a sufficient amount of iodine for schoolchildren.

*Hussein IS, et al. Public Health Nutr. 2012 Apr 4:1–7. [Epub ahead of print]*

### Pregnant French women living in the Lyon area are iodine deficient and have elevated serum thyroglobulin concentrations.

The aim of the study was to assess iodine status and thyroid function in healthy pregnant women in the Lyon metropolitan area. In a cross-sectional study, healthy pregnant women (n=228) with no history of thyroid disease were consecutively recruited from an obstetric clinic during all trimesters. Thyroid functions and UICs were measured. Thyroid functions were compared with those in a control group of nonpregnant adults. The

median (range) UIC was 81 (8–832) µg/L, and 77% of pregnant women had a UIC <150 µg/L, indicating inadequate iodine intake. Overall, 11% of women had abnormal TSH or anti-TPO. The median FT4 (pmol/L) was 14.9, 12.6, and 11.5 in the first, second, and third trimesters, respectively. The median Tg in pregnant women was 16.2 µg/L, did not differ across trimesters, and was significantly higher than in the control group of nonpregnant adults (11.7 µg/L) (p=0.02). The authors concluded that pregnant women in the Lyon area are iodine deficient and have increased serum Tg concentrations compared with nonpregnant controls, likely due to physiological thyroid hyperstimulation during gestation exacerbated by ID.

*Raverot V, et al. Thyroid. 2012 May;22(5):522–8.*

### Prenatal iodine deficiency results in structurally and functionally immature lungs in neonatal rats.

Maternal hypothyroidism may adversely affect postnatal lung structure, and there is a high prevalence of hypothyroxinemia (low T4, normal T3) in iodine-deficient pregnant women. Half of a group of female rats were given an iodine-deficient diet; ID for 3 mo, and the rest were given an iodine-sufficient diet. Pups born to ID mothers were compared with age-matched pups from IS mothers at postnatal days 8 (P8) and 16 (P16) (n = 6–8/group). ID pups had normal circulating T3 but significantly low T4 levels (P < 0.05) and concomitantly approximately sixfold higher thyroid hormone receptor-β mRNA in alveolar epithelium. Lung histology revealed larger and irregularly shaped alveoli in ID pups relative to controls. Reduced tidal volume, peak inspiratory and expiratory flow, and dynamic lung compliance were found in ID pups compared with IS pups. Significant lowering of surfactant protein (SP)-B and SP-C mRNA and protein were found in ID pups at P16. The authors conclude that maternal hypothyroxinemia due to ID may result in the development of immature lungs that, through respiratory distress, could contribute to the observed high infant mortality in ID neonates.

*Godbole MM, et al. Am J Physiol Lung Cell Mol Physiol. 2012 May;302(10):L1037–43.*

### Urinary iodine and sodium status of urban Korean subjects: A pilot study.

The authors estimated iodine status in urban Koreans: 540 urine samples from apparently healthy subjects (young and old) were collected, and UIC was determined. The median UIC was 267.6 µg/L, and the median UIC of the younger group (191.8 µg/L) was significantly decreased compared to that of the older group (383.9 µg/L). The authors concluded that the median UIC in the Korean urban population indicates more than adequate iodine intake.

*Choi J, et al. Clin Biochem. 2012 May;45(7–8):596–8.*

**THE IDD NEWSLETTER** is published quarterly by ICCIDD and distributed free of charge in bulk by international agencies and by individual mailing. The Newsletter is also distributed to email subscribers and appears on ICCIDD's website ([www.iccidd.org](http://www.iccidd.org)). The Newsletter welcomes comments, new information, and relevant manuscripts on all aspects of iodine nutrition, as well as human interest stories on IDD elimination in countries.

For further details about the IDD Newsletter, please contact:

Michael B. Zimmermann, M.D., the editor of the Newsletter, at the Human Nutrition Laboratory, Swiss Federal Institute of Technology Zürich, ETH Zentrum, Schmelzbergstrasse 7, LFW E19, CH-8092 Zürich, Switzerland, phone: +41 44 632 8657, fax: +41 44 632 1470, [iccidd.newsletter@hest.ethz.ch](mailto:iccidd.newsletter@hest.ethz.ch).

ICCIDD gratefully acknowledges the support of the Swiss Federal Institute of Technology Zürich for the IDD Newsletter.