INTERNATIONAL COUNCIL FOR CONTROL
OF IODINE DEFICIENCY DISORDERS

ICCIDD IDD NEWSLETTER

VOLUME 39 **NUMBER 3 AUGUST 2011**

IN THIS ISSUE:













# Iodine deficiency uncovered in the UK

## A national study finds more than 2/3rds of schoolgirls have low iodine intakes

THE INTERNATIONAL COUNCIL FOR CONTROL OF IODINE DEFICIENCY DISORDERS (ICCIDD) is a nonprofit, nongovernmental organization dedicated to sustained optimal iodine nutrition and the elimination of iodine deficiency throughout the world. Its activities have been supported by the international aid programs of Australia, Canada, Netherlands, USA, and also by funds from UNICEF, the World Bank and others.

**Michael Zimmermann** ICCIDD Executive Director, Zurich, Switzerland

The United Kingdom (UK) currently has no national program of food or salt iodization, and there has been no national survey of iodine nutrition in the country in over 60 years. Vanderpump and colleagues from the British Thyroid Association recently assessed iodine status of the UK population. As reported in The Lancet (2011;377:2007-12), they performed a cross-sectional survey in 2009 in girls aged 14-15 years attending secondary school in nine UK centers (Aberdeen, Belfast, Birmingham, Cardiff, Dundee, Exeter, Glasgow, London and Newcastle-upon-Tyne), with three different sampling clusters in each center. Urinary iodine (UI) concentrations were measured in 737 girls. Although the WHO and ICCIDD recommend sampling 6-12 year-old children in iodine surveys, older girls were chosen for this survey because they might proceed to pregnancy in the short-to-medium term.

Median UI excretion was 80.1 μg/L (IQR 56.9-109.0). The WHO/ICCIDD cut-off for the median UI that indicates iodine deficiency is <100 μg/L. UIs indicative of mild iodine deficiency were present in 51% (n=379) of participants, moderate deficiency in 16% (n=120), and severe deficiency in 1% (n=8). Prevalence of iodine deficiency was highest in Belfast (85%, n=135). Tap water iodine concentrations were low or undetectable and were not positively associated with UIs. Low UIs were predicted by sampling in summer, geographical location and low intakes of milk (the main source of iodine in the UK).

Thus, the study findings suggest the UK is currently iodine deficient and the authors of the paper conclude there is "...an urgent need for a comprehensive investigation of UK iodine status and implementation of evidence-based recommendations for iodine supplementation." The UK is now in the top 10 iodine-deficient countries (based on national median UIC <100 μg/L in children) with the greatest numbers of school-age children with insufficient iodine intake (UIC < 100 μg/L ) (see Figure 1).

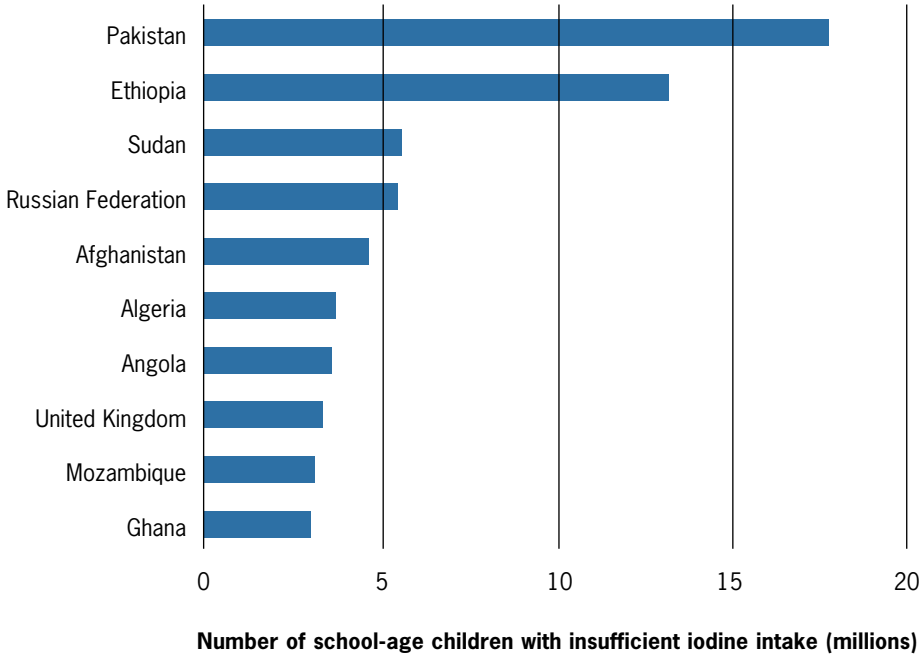
Health authorities in the UK and those in many other industrialized countries have been slow to grasp that iodine deficiency is not confined to developing countries. In Australia, the UK and the US, three countries previously iodine sufficient, iodine intakes are falling. Australia and the UK are now mildly iodine deficient, and in the US, iodine intakes are about 50% lower than intakes 30 years ago (1). Subgroups of reproductive age women in the US are now at risk for iodine deficiency (see following article in this issue of the IDD NL).

There are several reasons why iodine intakes in these industrialized countries are falling. The major dietary sources of iodine in typical 'Western' diets are bread (containing iodized salt) and dairy products. But some of the iodine in bread (from iodized dough conditioners) and nearly all of the iodine in dairy products is adventitious: dietary iodine supplements given to cows and residues of disinfectant iodophors used for cleaning teats and milk storage containers end up in milk and can sharply increase its low native iodine content. A recent study in Canada found iodine concentrations in milk often exceeds 450 μg/L if lactating cows are given high-dose iodine supplements (2). Over the past few decades, adequate dietary intakes in many industrialized countries have depended on these 'accidental' and unregulated iodine sources. But intake from these sources may be falling, for commercial and legislative reasons. For example, in Australia in 1975, the mean iodine concentration in cows' milk was nearly 600 μg/L. Concerned about potential toxicity, the government specified a milk iodine limit of 500 μg/L in 1982. This led to the replacement of many iodophors by chlorine-containing sanitizers.

**Vanderpump and colleagues concluded:**

"There is an urgent need for a comprehensive investigation of UK iodine status and implementation of evidence-based recommendations for iodine supplementation."

**Figure 1** **The UK is now number 8 on the list of the top 10 iodine-deficient countries (based on national median UIC <100 µg/L in children) with the greatest numbers of school-age children with insufficient iodine intake (UIC < 100 µg/L ) in 2011.**




By 2001, median iodine content of milk samples in Sydney had fallen to 140 µg/L. In 2004, a national survey found children in southeastern Australia were iodine deficient (3) and 9% of girls had goiter by thyroid ultrasound, leading to the introduction of a national program in 2009 to iodize all salt used in bread making.

In the U.K., historically a 'goiter belt' extended through much of north-central England and Wales. In these areas in the 1940s and 50s, goiter was present in up to 50% of older girls and young women, but in the 1960s, endemic goiter disappeared. Phillips suggested this "accidental public health triumph" resulted from increasing use of iodophors in dairying and higher milk intake (4); iodine-containing bread conditioners may also have contributed. Mainly due to these adventitious sources, dietary iodine intakes in the U.K. increased between 1952 and 1982 from 80 µg to 255 µg/day. However, since then milk intakes have fallen while less than 5% of household salt in the UK is iodized.

What can be done to prevent iodine deficiency in industrialized countries? In most industrialized countries, because greater than 80% of salt consumption is from purchased processed foods, if only household salt is iodized, it will not supply adequate iodine. Thus, to successfully control ID in industrialized countries, it is critical to convince the food industry to use iodized salt in their products (see article later in this issue of the IDD NL). Fortunately, iodine at ppm levels in foods does not cause any sensory changes, and, in most countries, the price difference between iodized and noniodized salt is negligible, so there are no major barriers to its use in foods. In Denmark and the Netherlands, nearly all salt used by the baking industry is iodized, and this controls ID. Switzerland's long-running iodized salt program has been successful because ca. 60% of salt used by the food industry is iodized on a voluntary basis. The current global push to reduce salt consumption to prevent chronic diseases and the policy of salt iodization to control ID do not conflict: iodization methods can fortify salt to provide adequate iodine even if per capita salt intakes are reduced to <5 g/day, as long as all salt consumed is iodized.

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# U.S. dietary iodine status remains sufficient overall, but pregnant women may be mildly iodine-deficient

**Caldwell KL** et al. Iodine status of the U.S. population, National Health and Nutrition Examination Survey, 2005–2006 and 2007–2008. Thyroid 2011;21:419-27.

The iodine nutritional status of the U.S. population has been assessed periodically since 1971 by the National Health and Nutritional Examination Survey (NHANES). Major sources of iodine in the U.S. diet include iodized salt, dairy foods, and some grain products. The World Health Organization has determined that a median urinary iodine (UI) level of 100 to 199 µg/L reflects optimal iodine nutrition for populations of nonpregnant adults. During pregnancy, because dietary iodine requirements and renal iodine excretion are both increased, a median UI of 150 to 249 µg/L is considered optimal.

Spot urinary iodine measurements were obtained in about one third of the 5000 participants in the 2005–2006 NHANES and in all of the 5000 participants 6 years of age or older in the 2007–2008 NHANES. Sampling was designed to be nationally representative. Pregnant women were identified on the basis of urine testing.

Overall, population median UIs were 164 µg/L (95% CI, 154 to 174) in 2005–2006 and 164 µg/L (95% CI, 154 to 173) in 2007–2008. These values have not changed substantially in NHANES surveys since 2000. Children had higher UIs than adults; the median UI for children 6 to 11 years of age was 239 µg/L (95% CI, 193 to 279) in 2005–2006 and 215 µg/L (95% CI, 194 to 240) in 2007–2008. Non-Hispanic black individuals had lower UI (2007–2008 median UI, 137 µg/L; 95% CI, 123 to 155) than non-Hispanic white individuals (2007–2008 median UI, 168 µg/L; 95% CI,154 to 180) and Mexican Americans (2007–2008 median UI; 174 µg/L; 95% CI, 162 to 190).

In the combined dataset from 2005–2006 and 2007–2008 there were a total of 184 pregnant women. Their median UI was 125 µg/L (95% CI, 86 to 198). The combined dataset also included 1578 non-pregnant women of child-bearing age (15 to 44 years); the median UI for this group was 130 µg/L (95% CI, 116 to 139).

The authors concluded that iodine nutrition in the United States remains adequate overall, and U.S. dietary iodine intake has remained stable since 2000. However, although the sample size of pregnant women is too small to draw firm conclusions, it appears pregnant U.S. women are mildly iodine-deficient.

Commenting on this article in the July 2011 issue of 'Clinical Thyroidology', Dr. Elizabeth N. Pearce of Boston University Medical Center and ICCIDD Board Member wrote:
„The 2007–2008 NHANES survey is the first in which UI values were measured in all participants, and it represents the largest dietary iodine assessment in the United States to date.

In light of the 50% drop in urinary iodine values between NHANES I (1971–1974) and NHANES III (1988–1994) (1), it is reassuring that U.S. urinary iodine values have since stabilized and that overall U.S. iodine intake is adequate. However, the fact that pregnant women in the samples from 2005–2006 and 2007–2008 were mildly iodine-deficient is quite worrisome.

Because thyroid hormone is essential for normal neurodevelopment in utero and in early life, the groups most vulnerable to the effects of iodine deficiency are pregnant and lactating women and their offspring. Decreases in maternal and fetal free T4 associated with even mild iodine deficiency in pregnancy may have adverse effects on cognitive function in children (2,3). While larger than in previous NHANES datasets, the sample size of 184 is far too small to be truly representative of all pregnant U.S. women. More information is needed about risk factors for low dietary iodine intake among pregnant U.S. women. Data about regional and racial/ethnic variations in urinary iodine concentrations would be useful in this regard. To achieve a sample size adequate to allow for more subgroup analyses, oversampling of pregnant women should be carried out during the next NHANES survey. Until we are better able to identify particular U.S. women at risk for iodine deficiency, all pregnant and lactating women in the United States are best advised to take a prenatal multivitamin containing 150 μg of iodine daily (4).

In all of the NHANES surveys to date, children have had higher median urinary iodine concentrations than adults. This is most likely explained by children's higher dairy intakes. Whether the marginally excessive iodine intake among U.S. children will predispose them to higher rates of thyroid autoimmunity and/or thyroid dysfunction later in life is unknown. More studies are needed to better understand the effects of different levels of iodine ingestion throughout the life cycle."

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# Ten repeat collections for urinary iodine from spot samples or 24-h samples are needed to reliably estimate individual iodine status in women

**Maria Andersson** ICCIDD, ETH Zurich, Switzerland

Although the median urinary iodine concentration (UIC) is a good indicator of iodine status in populations, there is no established biomarker for individual iodine status. If the UIC were to be used to assess individuals, it is unclear how many repeat urine collections would be needed and if the collections should be spot samples or 24-h samples.

In a prospective, longitudinal, 15 mo study, healthy Swiss women (n=22) aged 52 – 77 y collected repeated 24-h urine samples (total n=341) and corresponding fasting second-void morning spot urine samples (n=177). From the UIC in spot samples, 24-h urinary iodine excretion (UIE) was extrapolated based on the age/gender-corrected iodine/creatinine ratio. Measured UIE in 24-h samples, estimated 24-h UIE, and UIC in spot samples were (geometric mean ± SD) 103 ± 28 μg/24 h, 86 ± 33 μg/24 h, and 68 ± 28 μg/L, respectively, with no seasonal differences. Intra-individual variation (mean CV) was comparable for measured UIE (32%) and estimated UIE (33%). The CV tended to be higher for the spot UIC (38%) than for the estimated 24-h UIE (33%) (P=0.12). Comparable intra-day variations in urinary iodine excretion have been previously reported in Danish adults.

The findings demonstrate that, in this population, ten spot urine samples or 24-h urine samples were needed to assess individual iodine status with 20% precision. Spot samples would likely be preferable because of their ease of collection. However, the large number of repeated urine samples needed to estimate individual iodine status is a major limitation and emphasizes the need for further investigation of more practical biomarkers of individual iodine status.

For more details, please see the full publication of this study, currently in press at The Journal of Nutrition: Konig F, et al. Ten repeat collections for urinary iodine from spot samples or 24-h samples are needed to reliably estimate individual iodine status in women. *J Nutr 2011 Sep 14 [Epub ahead of print].*

# Kazakhstan triumphs over iodine deficiency

## Official recognition of IDD elimination at the opening of the Workshop of Iodine Labs of the CEE/CIS Region in Almaty, Kazakhstan

On 15 June 2011 the Ministry of Health of Kazakhstan in association with UNICEF Kazakhstan and Kazakh Academy of Nutrition held a joint conference to recognize Kazakhstan's certification as a country that has eliminated iodine deficiency through Universal Salt Iodization (USI), and at the same time, inaugurate the Regional Network of Resource Laboratories for Iodine.

The event was attended by officials of the Kazakhstan Government, representatives of International Organizations (CDC, UNICEF) and the Kazakh Academy of Nutrition, as well as personnel from Laboratories for Iodine located in 15 countries of the CEE/ CIS region who are Members of the Regional Laboratory Network headed by Kazakhstan. For more information, please see: *www.unicef.kz*.

The President of the Kazakh Academy of Nutrition, Professor Sharmanov, addressed the audience in his welcome speech at the conference, „Over recent years the Republic of Kazakhstan has attained sizable progress owing to efficient cooperation among the Government, salt producers, NGOs and International Organizations. The Government of Kazakhstan has established best conditions for salt producers with a view to develop and implement regulatory legal framework making for mandatory dietary and fodder salt iodization in the country. The International Organizations rendered their assistance to salt producers in setting the production up and monitoring the iodization."

### Background

Kazakhstan is located in central Eurasia. The size of its territory makes it the 9th largest country in the world. Its population is >15 million, and almost one quarter of the population is <15 years of age; and the number of newborns each year is around 200,000.

*Award ceremony on June 15 in Almaty featuring Vilma Tyler of UNICEF Regional Office (right), Prof. T. Sharmanov (middle), President of Kazakh Academy of Nutrition and Dr. Kenes Ospanov, Chairman of the Committee of Sanitary Epidemiologic Surveillance of the Ministry of Health and Deputy-Minister of Health (left).*

The Republic of Kazakhstan has achieved the goal of Universal Salt Iodization (USI) thanks to a series of joint collaborative steps pursued by national organizations with the devoted support of international agencies. Evidence from salt tests during a national, population-representative survey in early 2006 showed that 92 percent of the households are using adequately iodized salt. This is a quantum leap as compared to the situation in 1999 when less than one-third of the households in Kazakhstan were using iodized salt. Also, the median urinary iodine concentration in women of reproductive age, found in the National Micronutrient Survey 3 months later in 2006, was 250µg/L as compared to 95µg/L in 1999.

Further in-depth data analysis of the National Micronutrient Survey revealed that the use of adequately iodized salt (≥15mg iodine/kg) in the households across Oblasts (Provinces) is closely correlated with the share of urinary iodine concentrations ≥100µg/L in the women living in these households, thus offering an affirmation that the USI strategy practiced in Kazakhstan is the underlying factor that drives the alleviation of iodine deficiency in the population.

## Keys to success

The Law "On Prevention of Iodine Deficiency Disorders" enacted on 14 November 2003 bans the sale or trade of non-iodized consumption salt in Kazakhstan, thus making iodization compulsory of all the food-grade and fodder salt accessible by the population, the food manufacturing industry and the cattle breeders. The principal law also specifies the exclusive use of potassium iodate (KIO3) as fortificant and lays down the requirements for packaging, labeling and storage of iodized salt. The normative iodine level in salt at production, import and trade, is 40±15mg iodine per kg. The national legislation on IDD prevention is anchored in a comprehensive set of Decrees and Declarations by the President and the Government of the Republic of Kazakhstan, aimed to promote a healthy population as the basis for national development.

Salt producers conduct internal quality assurance of iodized salt production by overseeing the usage of potassium iodate and its addition into food grade salt during processing, combined with regular conduct of qualitative spot tests or quantitative measurements in production-based laboratories. The salt producers and traders are united in a National Association of Salt Producers, which represents their interests and reports on the national production statistics. Salt inspections in wholesale and retail markets as well as residential catering institutions are carried out by the Sanitary-Epidemiological Supervision (SES) authority, and the results are linked to obligatory quarterly reporting to the Chief Health Inspector of the Ministry of Health.

*Participants at the Almaty Workshop for Iodine Labs in the CEE/CIS Region*

High-level political oversight to ensure progressive execution of fortification policies is vested in an Interdepartmental Coordination Council on Food Fortification, headed by the Minister of Health and with members from the two Chambers of Parliament, relevant Government Departments, supportive international agencies, the NGO and scientific communities, and the salt and food industry sector. Data on the production and supplies of iodized salt are included in the official State Statistical reporting by the Ministry of Health and the Agency on Statistics of the Republic of Kazakhstan.

A wide range of information about the dangers of IDD and the benefits of using iodized salt has been assimilated by the training and awareness systems of the Republic. Technical and methodical learning has been inserted in the basic and ongoing curriculums of primary health staff, institutions of academic learning and secondary schools. A comprehensive communications effort has been done using a multitude of media materials and channels, resulting in the achievement of an uncommonly high awareness and acceptance level that IDD is a significant threat to the intellectual performance of children and that the regular use of iodized salt is an effective remedy for its prevention. The systematic inclusion of civic society in the delivery of the communications drive at the "doorstep" of the population, the keen attention to ensuring that salt industry and its sales agents remain well-informed, the inclusion of food inspection and control bodies of SES and Customs in relevant training workshops, as well as the planned targeting of key politicians with specific information and advocacy were important factors for the success of the communications efforts.

Practically all necessary financing of costs associated with USI and IDD elimination have become incorporated in the ongoing expenditures of the private and public organizations involved. The salt producers and traders have assimilated the costs of iodization, reflecting it in the price of the product to their customers. The costs for inspections by SES and Customs authorities are carried in the State budgets of the respective agencies, as is the official reporting on statistics.

Starting in 2005, the Committee of State Sanitary-Epidemiological Surveillance under the Ministry of Health has been building a national database to consolidate and track key performance indicators of USI and IDD elimination. The obligatory quarterly reports by the Republican SES of the salt iodine inspections, in combination with reports of the Customs Committee on iodized salt imports and the Committee on Technical Regulation and Metrology on the Certificates of Conformity are entered to reflect the iodized salt supply situation.

The elimination of iodine deficiency through USI is a major public health triumph for Kazakhstan. The letter from The Network for Sustained Elimination of Iodine Deficiency certifying the elimination of IDD in Kazakhstan is shown on the following page.

*USI ensures adequate iodine for Kazakh women*

iodine NETWORK

The Centers for Disease Control and Prevention (CDC)
China National Salt Industry Corporation
EuSalt
Salt Institute
Emory University
Global Alliance for Improved Nutrition
The International Council for Control of Iodine Deficiency Disorders (ICCIDD)
Kiwanis International
The Micronutrient Initiative
Tata Chemicals
UNICEF
The World Food Programme
World Health Organization

www.iodinenetwork.net

**May 2010**

HE Mr. Massimov Karim, Prime Minister of the Republic of Kazakhstan
HE Mr. Tokayev Kassym-Zhomart , Speaker of the Parliament of the Republic of Kazakhstan
HE Mr. Dosskaliev Zhaksylyk, Minister of Health
Mr. A. Sagymbayev, President of Salt Producer Association of Kazakhstan
Mr. Sharmanov Toregeldy, President of Kazakh Academy of Nutrition

Honorable Sirs:

The Network for Sustained Elimination of Iodine Deficiency hereby acknowledges the request of the Ministry of Health of Kazakhstan for external evaluation of Kazakhstan's Universal Salt Iodization (USI) and Iodine Deficiency Disorders (IDD) elimination programmes.

In response to this request, we have the privilege herewith to recognize the achievement of the elimination of iodine deficiency through universal salt iodization in Kazakhstan. This achievement is clearly described in the document entitled "Dossier on USI Achievement in Kazakhstan" (Astana, September 2007), and we endorse the conclusions and the recommendations made in this report.

We are confident that the Government of Kazakhstan will make all efforts to sustain the elimination of iodine deficiencies. As noted in the report, this remarkable achievement can be enhanced by strengthening the relevant legislation and monitoring systems to include the use of iodized salt in processed foods and the further development of an integrated national USI / IDD monitoring system.

We recognize the important role of the Committee of State Sanitary – Epidemiological Surveillance of the Ministry of Health as well as those of the salt industry and other non-governmental society organizations in the country. We believe that this collaboration is key to the continued success of the USI and IDD elimination programmes.

We wish to congratulate the Government of Kazakhstan for its success in achieving universal salt iodization and the elimination of iodine deficiency disorders as a public health problem. In achieving and sustaining the elimination of iodine deficiencies, the Government is protecting the health and well-being of children and the entire population of Kazakhstan for generations to come.

**Nicholas Alipui**
*Chair*

*Network for Sustained Elimination of Iodine Deficiency*

# Scaling up investment in iodized salt and other nutrition interventions to improve child health and the economy in Kyrgyzstan

*Kyrgyzstan children will benefit from better access to iodized salt*

UNICEF, Bishkek, Kyrgyzstan, 30 June 2011. Despite improvements in the past decade, 22 per cent of all deaths among children under-five in the Kyrgyz Republic are still caused by undernutrition, according to a report launched today. Besides the loss of lives, the burden of undernutrition in the Kyrgyz Republic is also substantial in economic terms, and is estimated to be US$32 million annually. Scaling up nutrition interventions, including iodized salt coverage is therefore crucial to prevent loss of children`s lives and is a strategic economic investment with high returns, according to the Situational Analysis - Improving Economic Outcomes by Expanding Nutrition Programming in the Kyrgyz Republic. The report was released at a meeting jointly organized by the Ministry of Health, UNICEF and the World Bank.

"Undernutrition is a critical public health challenge, although it remains a hidden problem," said Sabyrbek Djumabekov, Minister of Health of the Kyrgyz Republic. "The Government has already taken steps to reduce its direct causes. However, it is obvious that we need to initiate multi-sectoral programs and from this perspective we are looking forward the recommendations made by this important report."

"These children learn less, and they will earn less – deepening the cycle of poverty," said Anthony Lake, UNICEF's Executive Director. "Investing in good nutrition is the smart, cost effective thing to do, helping to save more children's lives and accelerate progress towards reaching the Millennium Development Goals with equity," he added.

In Kyrgyzstan, three-quarters of the country's salt is iodized and ten percent of wheat is fortified. But further effort is needed:

- Iodizing all salt sold will reduce iodine deficiency resulting in a US$500,000 annual benefit due to increased worker productivity.
- Fortifying all of the country's flour with iron, folic acid, and other B vitamins will improve the quality of the diet. The government's efforts to fortify wheat flour as a public health intervention needs to be further supported.

"At least US$6.2 million of the country's economic losses from undernutrition can be prevented by scaling up existing nutrition programs in the Kyrgyz Republic," said Tamer Rabie, a World Bank Senior Health Specialist. „Development partners need to capitalize on the successes achieved by the Government and assist it in its scaling up of programs such as salt iodization and flour fortification," he added.

For the full report, please see:
*http://www.unicef.org/media/media_59045.html*
For further information, please contact:
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# The food industry can play an important role in correcting iodine deficiency

**Lucie Bohac** Coordinator, Network for Sustained Elimination of Iodine Deficiency, Ottawa, Canada

The role of the food industry in preventing iodine deficiency disorders (IDD) was the focus of a scientific symposium at the Institute of Food Technologists Annual Meeting in New Orleans, Louisiana, June 11-14, 2011. There were four speakers in the symposium, and their presentations are summarized below.

## Lucie Bohac, Network for the Sustained Elimination of Iodine Deficiency: "Importance of Food Industry Salt for Improving Dietary Iodine Supplies"

Ms. Bohac began the session by setting the context: 2 billion people around the world are at risk of iodine deficiency and an estimated 38 million infants are born each year unprotected from potential brain damage. Universal salt iodization (USI) intends that all salt for human and animal consumption is iodized. Yet in practice, legislation tends to apply only to table salt. The WHO's recommended level of iodization is >15ppm iodine and <40ppm, at household level. The iodine content in the salt supply is regulated by a country's legislation that permits salt iodization and sets the standard for iodine content at production. Analysis of legislation of countries worldwide shows great variation. For example, in the US, salt iodization is voluntary. In Canada, iodization of table salt is mandatory but not permitted in processed foods except for baby formulations. In France using iodized salt in processed foods is not permitted. In China use of iodized salt is mandatory with the exception of pickles and also certain regions of the country where there is a naturally high iodine level in the ground water. Countries that do use a combination of table salt and use iodized salt in a particular food product modify the iodization levels to ensure that the optimal amount of iodine reaches the population.

Trends in consumption are changing. In industrialized countries, approximately only 15% of daily salt intake comes from table salt, while in many developing countries or more remote regions salt is added at household level, thus making it the source of sodium in the diet.

*Salt is the ideal vehicle for iodine fortification in most countries, but high sodium intakes have been linked to hypertension*

However, the trend towards greater consumption of meals prepared outside the home is becoming more prominent. Evidence suggests that increased consumption of processed foods goes hand in hand with increased urbanization, rising incomes and women's employment.

As salt reduction programs are spreading across the industrialized world, there has been some evidence that this could impact the use of iodized salt. For example, recent National Health and Nutrition Examination Survey (NHANES) data in the US revealed that 56% of the female respondents indicated they rarely use table salt. In addition, there are studies that show that a salt restricted diet may leave certain targets groups, such as women, with below optimal iodine nutrition. In Western countries, 70% - 75% of the total sodium intake comes from processed foods. This suggests that countries relying only upon the iodization of table salt will need to review consumption patterns and consider adopting a more comprehensive approach to supplying adequate iodine.

Concerns about using iodized salt in processed foods fall into the following categories: concerns about changes in the taste, smell or changes to food product, trade barriers and health. In 2007, the Iodine Network commissioned a review of the use of iodized salt in processed foods. This review of 35 studies looking at organoleptic properties and iodine stability showed no effects attributed to the iodine in the salt. The studies focused on food quality, iodine retention and effects of cooking and heating as well as nutritional and technological aspects of iodine.

Trade barriers are created when there are different regulations and standards relating to the use of iodized salt in processed foods. For example, in highly interconnected trade regions such as Europe, cheese made with iodized salt cannot be imported to France where legislation does not permit the use of iodized salt in processed foods. Recently there have been questions raised about how to manage the intersections of salt intake reduction programs and salt iodization programs. There is overall agreement that these two programs are compatible as iodization levels can be adjusted when salt consumption (or consumption of food products that use iodized salt) patterns change. However, it is important to monitor the iodine status of the population as well as maintain good oversight over production to ensure that correct iodization levels of salt. Ms. Bohac concluded by indicating that the food processing industry can contribute to iodine nutrition by using iodized salt, by using food science to address organoleptic concerns and by ensuring product quality assurance.

## Sarah Ohlhorst, American Society for Nutrition:

# "Current Role of Food Processors in Iodine Fortification of Food Products"

*Iodized salt does not change the color or taste of processed foods*

This presentation gave the highlights of the results of an IFT study (funded by The Micronutrient Initiative) to determine the use of iodized salt in processed foods worldwide and food processors' knowledge of iodine nutrition. Phase 1 of the project looked into the consumption of processed foods in 39 countries around the world and gathered information on the types of processed foods consumed, including their sodium content, and also the levels of consumption by different socio-economic groups. As well, major food processors and salt suppliers were identified and information was gathered about the approaches to influence sodium intake and iodine fortification. Finally the study looked at the enforcement of these approaches.

The results indicated that there were considerable consumption information gaps, especially pertaining to processed foods consumption. Meanwhile, in many of the 39 countries reviewed, food insecurity was often linked to iodine deficiency. Consumption patterns for processed foods were not present particularly in developing countries as many lacked nationwide food consumption data and published academic studies tended to focus on smaller population subsets. Although processed food consumption is influenced by income and region of the country, the level of IDD burden did not correlate with processed food consumption.

However, processed food is more often consumed in industrialized countries, whereas food is minimally processed in developing countries. Iodine legislation may exist in a country; however, it is not always effective because there are difficulties with monitoring compliance and enforcement of the legislation.

Phase 2 of the study consisted of an electronic survey of food processors followed by detailed telephone interviews with a small sample group of select company representatives from 16 countries to determine their use of iodized salt and sources, their awareness of iodine nutrition and salt as a fortification vehicle. The results showed that most respondents have some iodine nutrition understanding, although IDD is not often discussed in food companies. Food processors do use iodized salt when

required by legislation, both in products that require it and/or for products sold in countries that require iodized salt use. Legislation is viewed as important in providing company incentive to iodize and also by creating a level playing field within the market. Salt suppliers in developing countries did state difficulties in undertaking iodization, including lack of technical capacity and resources. Survey and telephone respondents noted numerous challenges including operational, political and market challenges.

Ms. Ohlhorst concluded by outlining future research needs; first, nationwide food consumption data is needed to determine the need for legislation, including setting the standard for iodization, and ensuring adequate iodine consumption, while avoiding overconsumption. Second, food science research can assist in determining the amount of iodine after food processing and ensuring iodization does not impact taste or other qualities of food.

## Branka Legetic, Pan American Health Organization:

# "Getting a double win for public health: Food processors opportunity to support the optimization of iodine nutrition and sodium intake"

This presentation focused on the importance of collaboration between iodine fortification and dietary salt reduction programs. A 2007 report of a WHO expert consultation, "Salt as a Vehicle for Fortification", confirmed the compatibility of these two policies. In 2009, the Iodine Network called for data on projected trends of salt consumption to inform national iodization programs in order to enable on-going efforts to calibrate iodine fortification levels to ensure appropriate population iodine intakes. Also, the 2009 Policy Statement for the Americas, "Preventing Cardiovascular Disease in the Americas by Reducing Dietary Salt Intake Population –wide" reaffirms that salt intake should be reduced without compromising micronutrient fortification efforts and that national governments are to review national salt fortification policies and recommendations to be in concordance with the recommended salt intake.

In early 2011, PAHO convened a meeting of experts and stakeholders to discuss the potential for collaboration between these programs in the Americas and discuss how this could be taken forward (see photo). With the goal of securing optimal salt and iodine intake in the Americas, the intent was to bring together the state of public health knowledge and experience in iodine fortification and salt reduction in order to draft an outline of a framework for collaborative action. The proposed Framework for Collaborative Action comprised of five areas: common and coordinated messaging, common advocacy platforms, concurrent surveillance, strategic joint research and shared forums with relevant sectors of the food industry. Common and coordinated messaging would take place at global, regional and national levels to ensure that there is consistency in messages across all stakeholders from decision makers to industry to health professionals and consumers. Common advocacy platforms would be directed at national governments to:

*Participants in the meeting "Improving public health through the optimal intake of iodine and sodium" at Pan American Health Organization (PAHO) in Washington D.C., March 31 to April 1, 2011*

- implement and monitor IDD programs,
- coordinate iodine fortification and dietary salt reduction programs including the adjustment of iodine fortification based on salt consumption and on population requirements,
- emphasize the importance of optimal iodine intake,
- Indicate the health benefits and cost savings to health care systems of dietary salt intake reduction.

Collaboration in the surveillance of both salt and iodine intake would include:

- looking at methods that optimally assess and monitor salt and iodine intake,

- undertaking food surveys to distinguish the main sources of salt and iodine in the diet (including potassium where a public health concern),
- methods that account for vulnerable and diverse populations,
- establishing, promoting and supporting laboratory proficiency for iodine, salt analysis,
- knowledge, attitudes and behavior surveys on salt consumption, and
- monitoring developments in the food industry such as nutrition labeling and iodine content.

Strategic joint research would be intended to fill knowledge gaps relevant to both salt iodization and reduction of dietary salt including pilot and case studies of countries of differing economic and cultural make-up. The final component of the framework, shared forums with the relevant sectors of the food industry, would include the promotion of universal salt iodization, improved capacity and technology of the salt industry, particularly with respect to the sector of small –sized salt producers and would promote the calibration of iodization levels based on different salt intakes.

The next steps identified were to bring the framework to the main stakeholders in iodine nutrition and salt reduction programs in the Americas to review and accept the framework and to approach countries in Central and South America to undertake a pilot of the coordination of the two public health policies. Ms. Legetic concluded her presentation by noting that sodium reduction is a "hot" topic in the food industry, universal salt iodization is necessary in order to prevent iodine deficiency disorders, and there is a need to adjust iodization standards based on salt consumption. The food processing industry should be using iodized salt in their products while at the same time reducing the salt content.

## Inka Beck, Nestlé S.A.:
# "Investing in iodized salt makes sense"

This presentation gave the food processing industry perspective on the subject and used Nestle's Maggi brand as a case study. Julius Maggi was an entrepreneur who invented a liquid sauce with a meat-like taste for seasoning food. Since the use of condiments like Maggi flavoring cubes in food is widespread and Nestle has world-wide penetration with many of its products, the company seized on the opportunity to use its products to deliver essential micronutrients such as iodine. In fact, 90% of Maggi products are fortified with iodine, primarily through the use of iodized salt. Maggi products are not fortified mainly in countries that do not permit the use of iodized salt in processed foods.

The use of iodized salt in culinary products has the advantage of increasing the overall coverage of iodized salt, even in the face of salt intake reduction. Furthermore, changes in salt consumption imply the need for iodization beyond simply table salt. Studies have shown that discretionary salt (table and household cooking) use has decreased while food salt (from processed and readymade foods) has increased, particularly in industrialized countries. In addition, by iodizing popularly positioned products, consumers with low income and those in rural areas can have improved access to iodine sources. For example, in Central West Africa, where the percentage of households using iodized salt ranges from as low as 1% in Guinnea- Bisseau to over 95% in Nigeria, good penetration of Maggi cubes reaches people where iodized salt is less available.

There are advantages to using iodized salt in culinary products. As a food processing company Maggi ensures quality assurance of their products such that culinary products are delivered in functional packaging that prevents nutrient loss due to moisture and light. In addition, the company undertakes audits of the salt suppliers and monitors quality of the iodized salt. Finally, from the perspective of a food manufacturer, being able to procure iodized salt is not only logistically easier but also less costly than undertaking to iodize the salt itself.

*In most countries, the Maggi seasoning cube contains iodized salt*

There are challenges to using iodized salt, however, the main one being the variations of regulations in trade regions. For example, in Europe, which has the highest prevalence of IDD according to WHO, some countries permit the use of iodized salt, others do not, or they permit different fortificants (iodide or iodate). There are also different standards of iodization. These factors make it very difficult for food processors to reformulate as per country specifics rather than be able to use a harmonized approach across a trade region.

# Small scale salt producers unite to strengthen local production of iodized salt in the southern Philippines

**Karie Atkinson** GAIN, Geneva, Switzerland. Photos by Arnold Duque, Chairman, TAMACO, the Philippines.

"The effort of the Global Alliance for Improved Nutrition (GAIN) to build the capacity of local salt producers like me to collectively produce and distribute salt fortified with iodine is empowering," says 37-year-old Rose Beatriz Guballa, a member and Board Director of Tamaraw Salt Producers Cooperative (TAMACO) in the Philippines.

Insufficient iodine in diets causes irreversible mental and physical impairment, among other disabilities. TAMACO is iodizing salt in Occidental Mindoro, a major salt-producing province in the southern Philippines with about 3,500 salt farmers. Salt has a long history in Ms. Guballa's family. She runs her family's 30 year old salt farm with 280 employees in the small village of Magsaysay.

"GAIN has helped TAMACO solidify the fragmented salt production industry in Mindoro," she asserts enthusiastically. "We are now moving as one voice representing our industry and have started strategizing as a community and even receiving support from the Provincial Government of Occidental Mindoro," she says.

*Rose Beatriz Guballa, a member and Board Director of Tamaraw Salt Producers Cooperative (TAMACO) in the Philippines*

Since salt producers started working together, Ms. Guballa reports they have been looking into how they can improve their iodized salt production, both quality and quantity-wise and be more competitive through economies of scale. After just eight months of operations, TAMACO reports some significant milestones. The salt cooperative has successfully facilitated the engagement of local salt producers with global experts in salt iodization and cooperative development and purchased more than 50,000 bags of iodized salt (about 2,500 metric tons) to potentially reach 600,000 people. It has also begun working with the Food and Drug Administration and the National Nutrition Council of the Philippines on promotion of iodized salt use.

TAMACO's effort to stimulate demand for local salt has increased salt prices by 0.20 Philippine pesos (PhP) per kilo. As a result, the salt farmers and their families have seen an overall increase in their income by about 1,800,000 PhP per month (US$ 41,000). The participative model is both contributing to local poverty reduction and decreases in iodine deficiencies.

*Salt farmer in Mindoro, the Philippines*

## Next Steps

TAMACO has identified a warehouse where members will be able to iodize, brand and package their salt in one place. It will soon begin iodizing the salt at this location and will then package it in small, affordable packets for consumers. Through support from GAIN and the Department of Sciences and Technology of the Philippines, members will be trained in how to set up quality control systems that accurately measure iodine levels in salt.

"We will also need to train our sales force on the importance of iodized salt for health so that they can convey the message to our clients," emphasizes Ms. Gubala.

## Challenges

The cooperative's principal challenge will be finding markets for its product, especially since the market is dominated by large-scale importers and traders. It plans to target food industries that use iodized salt in food manufacturing plants in order to reach a broader portion of the population.

"We are determined to find regular markets for our iodized salt," says Ms. Guballa. She says TAMACO plans to give commissions and better price terms to traders who sell to their markets. The cooperative also lacks the proper salt processing equipment to serve the whole industry, relying primarily on the iodizing machines of its members.

Compliance is another challenge. Despite legislation, national data shows that only about 25 percent of household salt is iodized to government standards. TAMACO is supporting the implementation of the Philippines' Act for Salt Iodization Nationwide (ASIN) as a member of the law's Technical Working Group organized by the National Nutrition Council of the Philippines. The partnership between GAIN, the Government of the Philippines, ICCIDD and UNICEF aims to increase this coverage to 90 percent.

# Iodized salt in India: strengthening quality control along the supply chain

**The Global Alliance for Improved Nutrition (GAIN)** Geneva, Switzerland

## State level wholesalers and traders of edible salt to increase supply of adequately iodized salt for Indian consumers

According to the 2005/2006 National Family Health Survey 3, nearly half of households in India do not have access to adequately iodized salt. Strengthening quality control at production centers along with regulatory monitoring is key in India to accelerate universal salt iodization. From the production centers to the consumers, the wholesalers and traders within a state are an important link along the supply chain of edible salt. Besides other factors, the quality of iodization at the production centers is also dependent on the indications from these wholesalers and traders of salt.

GAIN (Global Alliance for Improved Nutrition) in close consultation with the Salt Department of the Government of India, conducted a series of interactive consultations in 2011 with these wholesalers and traders of edible salt in order to strengthen the quality control along the salt trade chain. As a first step, 12 trading centers were identified encompassing the eight states that have household access to adequately iodized salt below the national average of 51% as per the National Family Health Survey 3 (2005/2006). These trading centers are located in small towns and cities accessed by the main wholesalers and traders of edible salt.

The series of these interactive meetings were led by the Salt Department, Government of India. Participation by the local district administration was ensured. Other partner agencies with GAIN working in the field of Universal Salt Iodization, such as UNICEF, Micronutrient Initiative and Indian ICCIDD also participated in these meetings that highlighted:

- Sensitization of the wholesalers and traders to ensure supply of adequately iodized salt
- Encourage use of salt testing kits by wholesalers and traders to strengthen quality control along the supply chain
- Advocacy with the district administration to increase vigilance in order to strengthen the regulatory monitoring
- Assurance by the salt department to strengthen quality control in the production centers
- Advocate with the health department to strengthen the Iodine Deficiency Disorders control program and with partners advocate to increase demand for adequately iodized salt


*The Indian deputy salt commissioner, Mr. M.A. Ansari (center), along with district officials interact with participants during GAIN-organized consultations.*

## Meetings and Announcements

# Prof. Michael Zimmermann elected new Executive Director of ICCIDD

At the 2011 ICCIDD Board Meeting on June 2-3 in Boston, USA, Prof. Michael Zimmermann, M.D., from the Institute of Food, Nutrition and Health of the Swiss Federal Institute of Technology (ETH), Zurich, Switzerland, was elected as the new Executive Director of ICCIDD, succeeding Mr. David Haxton. Prof. Zimmermann received his medical degree from Vanderbilt University in the USA, and did his postgraduate training at the University of California at San Francisco and the University of California at Berkeley. He lives in Zurich, Switzerland, and holds dual citizenship, in both the US and Switzerland. He was formerly the ICCIDD Deputy Regional Coordinator for Western and Central Europe, and he is also the Editor of the IDD Newsletter.

*Participants at the 2011 Board Meeting of the International Council for the Control of Iodine Deficiency Disorders, that was held on June 2-3 in Boston, USA. The meeting was hosted by Prof. Elizabeth Pearce of Boston University Medical Center.*

## Abstracts

### Are pregnant women in New Zealand iodine deficient? A cross-sectional survey.

This study assessed iodine status of 170 women living throughout New Zealand. The median urinary iodine concentration (UIC) of the women was 38 μg/L, well below the 150 μg/L cut-off value that indicates adequate iodine status; 7% of women had goiter. Not surprisingly, iodine intake was also low at 48 μg/day. The majority of women had TSH and FT4 concentrations within pregnancy reference ranges, suggesting that despite the low UIC observed in these women, thyroid hormone production appeared unaffected.
*Pettigrew-Porter A, et al. Aust N Z J Obstet Gynaecol. 2011 Aug 22. [Epub ahead of print]*

### Feed iodine concentrations on farms with contrasting levels of iodine in milk.

Farms in Canada with contrasting levels of milk iodine were selected: 30 farms with the lowest levels of iodine in milk (low group) and the 30 farms with the highest levels (high group). The dietary concentration of iodine offered daily was 33% lower for the low group compared with the high group; that is, 1.20±0.099 versus 1.81±0.195mg/kg of dry matter (DM), respectively. Milk iodine concentrations averaged 146±13.9μg/kg for the low group and 487±44.6μg/kg for the high group. More than 85% of the farms tested were feeding iodine levels higher than the dietary iodine recommendations (0.5mg of iodine/kg of DM). Iodine supplements should be used with caution in lactating cow diets.
*Borucki Castro SI, et al. J Dairy Sci. 2011;94(9):4684-9.*

## Iodine concentration of organic and conventional milk: implications for iodine intake.

In view of the increasing popularity of organic milk in the UK, the authors aimed to compare the iodine concentration of retail organic and conventional milk and to evaluate regional influences in iodine levels. Samples of organic milk (n=92) and conventional milk (n=80), purchased from retail outlets in sixteen areas of the UK. Organic milk was 42.1 % lower in iodine content than conventional milk (median iodine concentration 144·5 v. 249.5 ng/g; $P < 0{\cdot}001$). The lower iodine concentration of organic milk has public-health implications, particularly in view of emerging evidence of iodine deficiency in UK population sub-groups.

*Bath SC, et al. Br J Nutr. 2011 Jul 5:1-6. [Epub ahead of print]*

## Does a small difference in iodine status among children in two regions of Belgium translate into a different prevalence of thyroid nodular diseases in adults?

The aim of this study was to explore whether there are regional differences in iodine status and in prevalence of thyroid diseases in the two main regions of Belgium. In Flanders, median urinary iodine concentration (UIC) was higher than in Wallonia, 84 µg/L (n = 1,316) and 78 µg/L (n = 1,268), respectively ($p < 0.001$). There were no differences in goiter prevalence and thyroid volume between the regions among children. The number of thyroidectomies, carried out for MNG or solitary nodules, and the use of anti-thyroid medication were significantly higher in Wallonia than in Flanders. Thus, there was a higher incidence of thyroidectomies and more extensive use of anti-thyroid medications in the adult population in the region with the lowest iodine excretion.

*Vandevijvere S, et al. Eur J Nutr. 2011 Aug 7. [Epub ahead of print]*

## Minimal impact of excess iodate intake on thyroid hormones and selenium status in older New Zealanders.

In a randomized, controlled trial in older people (n=143), two groups received >50 mg iodine as iodate/day for 8 weeks because of supplement formulation error, either with 100 µg selenium (Se+highI), or without (highI). Thyroid hormones, selenium status and urinary iodine concentration (MUIC) were compared at weeks 0, 8, and 4 weeks post-supplementation. MUIC increased nine and six fold in Se+highI and highI groups, falling to baseline by week 12. Ten of 43 participants exposed to excess iodate showed elevated TSH (hypothyroidism) at week 8. In all but two, TSH had returned to normal by week 12. In three participants TSH fell to <0.10 mIU/l (hyperthyroidism) at week 8, remaining low at week 12. The authors concluded that excess iodate induced hypothyroidism in some participants and hyperthyroidism in others. But most abnormalities disappeared after 4 weeks.

*Thomson CD et al. Eur J Endocrinol. 2011 Aug 30. [Epub ahead of print]*

## Doubling in the use of thyroid hormone replacement therapy in Denmark: association to iodization of salt?

In Denmark, iodization of salt was initiated in 1998 because of mild-to-moderate iodine deficiency. The aim of this study was to evaluate the effect of the raised iodine intake on the nationwide incident use of thyroid hormone replacement therapy (levothyroxine) to treat hypothyroidism. The incidence rate increased 75% in the moderately iodine deficient region (72.2 incident users/100,000 person-years in 1997 to 126.6 in 2008) and 87% in the mildly deficient region (86.9-162.9). The largest relative increase was seen among women in the youngest age-group, where more than a doubling was seen. The authors suggested the mechanisms behind the increase may be a result of iodine-induced hypothyroidism, although higher case finding may play a role.

*Cerqueira C, et al. Eur J Epidemiol. 2011 Jun 10. [Epub ahead of print]*

## Hypothyroidism caused by iodine deficiency and iodine levels in enteral formulas.

A 4-year-old female patient on enteral nutrition was diagnosed with hypothyroidism caused by iodine deficiency. The iodine concentration in the enteral formula was 1.6 µg/100 kcal, and the patient's iodine intake while receiving the enteral formula was calculated to be 16 µg/day, which is much lower than the recommended dietary reference intake of 80 µg for children aged 3-5 years. Iodine concentrations in 20 enteral nutritional formulas available in Japan were then measured: iodine concentrations were less than 5 µg/100 kcal and less than 10 µg/100 kcal in 13 and 18 enteral nutritional formulas, respectively. The authors concluded that iodine deficiency is a likely outcome in patients who receive these formulas for a prolonged period.

*Shiga K, et al. Pediatr Int. 2011 Aug;53(4):501-4.*

Design: www.imholzdesign.ch Print: Spälti Druck AG CH-8750 Glarus

**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)**. 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.

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