# IDD NEWSLETTER

**ICCIDD** IODINE NETWORK

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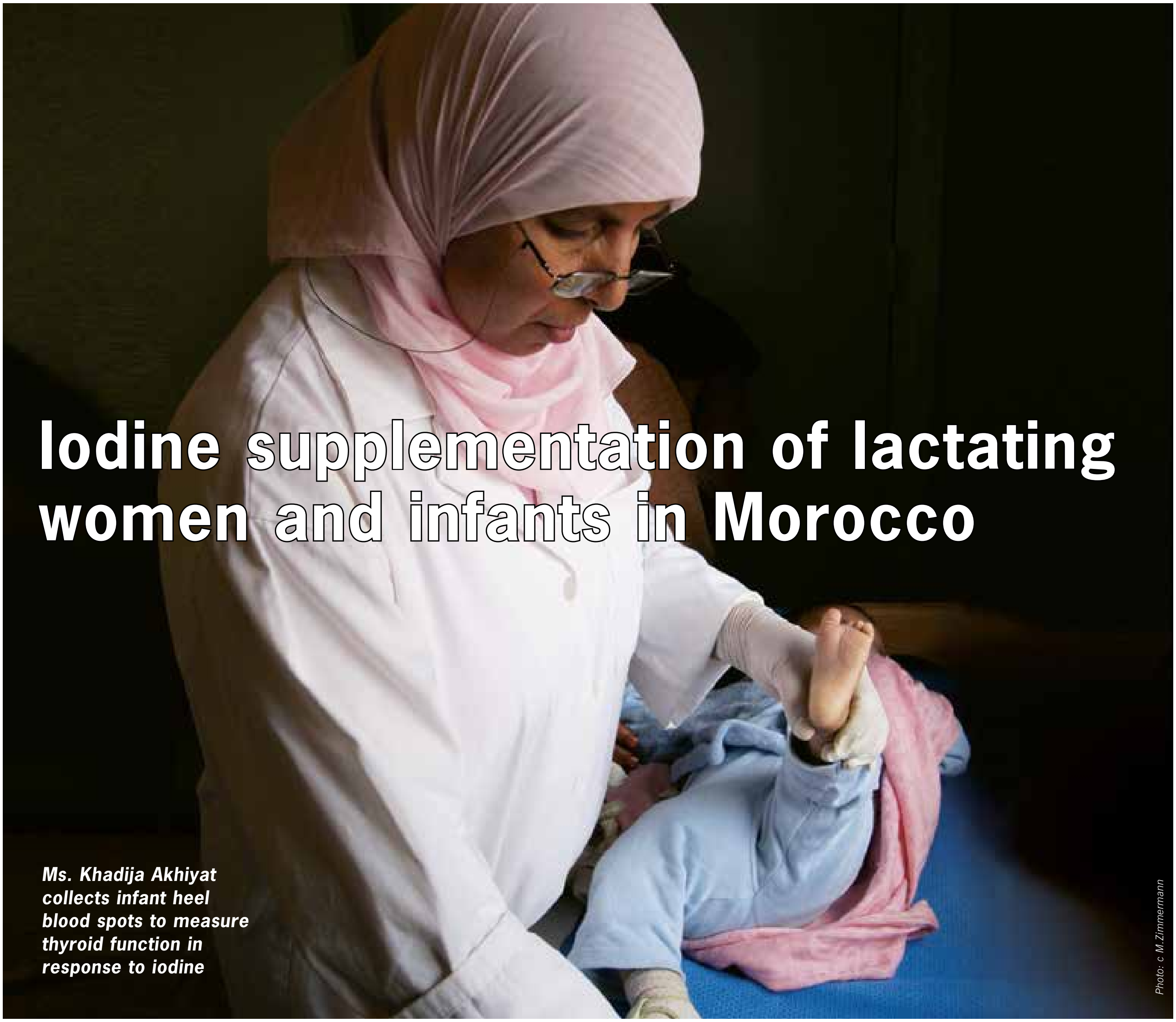


# Iodine supplementation of lactating women and infants in Morocco

***Ms. Khadija Akhiyat collects infant heel blood spots to measure thyroid function in response to iodine***

*Photo: c M.Zimmermann*



**THE INTERNATIONAL COUNCIL FOR CONTROL OF IODINE DEFICIENCY DISORDERS (ICCIDD) IODINE NETWORK** is a nongovernmental organization dedicated to sustained optimal iodine nutrition and the elimination of iodine deficiency throughout the world.

# A new Moroccan study shows that a single capsule of iodized oil given to lactating mothers in the first month postpartum is passed on through breast milk and covers infant iodine needs during the first year

Excerpted from: **Bouhouch R et al. Direct iodine supplementation of infants versus supplementation of their breastfeeding mothers: a double-blind, randomised, placebo-controlled trial. Lancet Diabetes & Endocrinology; online publication, 22 November 2013.**

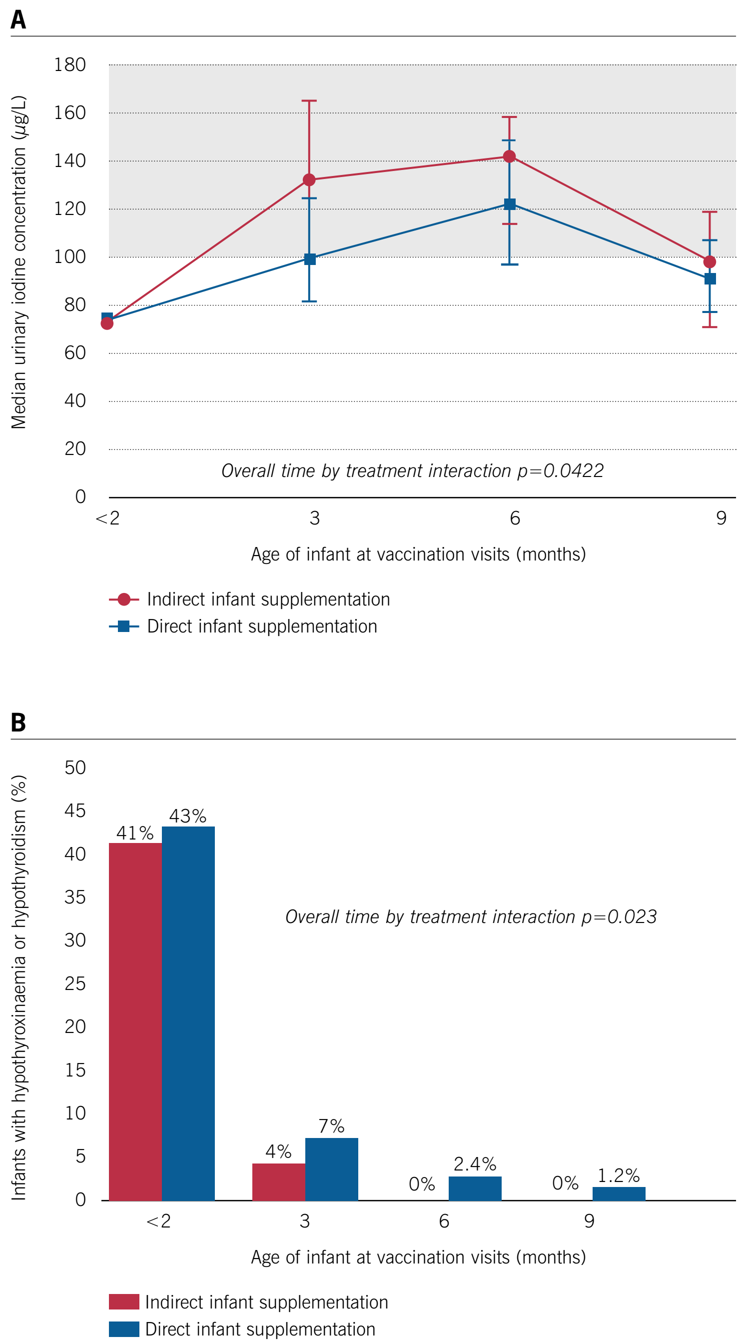
Iodine deficiency during infancy may impair brain development and increase infant mortality (1,2). Infants are at high risk for iodine deficiency because their requirements per kilogram body weight for iodine are higher than at any other time in the life cycle. Even in countries where most other age groups are iodine sufficient, infants may have insufficient intakes (3). Therefore, programs to control iodine deficiency in populations should emphasize this critical period.

Salt iodization remains the key strategy to control iodine deficiency (4). But in regions where iodized salt is not available or available only to a negligible extent, lactating women and infants should be supplemented with iodine. Supplementation with iodized oil may be preferable to daily supplementation in remote populations where channels of distribution are limited and where compliance with a single dose regimen is likely to be higher.

For lactating women, WHO recommends a single annual 'depot' dose of 400 mg of iodine as oral iodized oil and exclusive breastfeeding for at least six months, on the assumption that breast milk will then provide adequate iodine to the infant (4). If infants are not able to be breastfed or are not being provided iodine-fortified complementary foods, the recommended strategy is a single dose of 200 mg as iodized oil, given directly to the infant (5).

But the recommendations for iodized oil supplementation have surprisingly little evidence base. There have been no published studies providing oral iodized oil to lactating women to determine if this supplies adequate iodine to the breastfeeding infant.

**FIGURE 1** **(A) Urinary iodine concentrations (µg/L) and (B) prevalence of hypothyroidism after supplementation with iodine. The grey area shows WHO criteria for adequate iodine status based on the median UIC.**



The aim of a recent study in southern Morocco was to evaluate the efficacy and safety of the current WHO recommendations for iodized oil supplementation in lactation and infancy, comparing direct supplementation of the infant to indirect supplementation through breast milk. Morocco has enacted national legislation mandating compulsory salt iodization, but because of poor compliance by the salt industry and a lack of enforcement many regions remain iodine deficient, and the national median UIC in children is only 69 µg/L (6).

A team from the Swiss Federal Institute of Technology (ETH) Zurich and the University in Marrakech conducted the study. In a double-blind, randomised, placebo-controlled intervention trial, breastfeeding mothers and their new-borns (n=482) received either: a) a single dose of 400 mg iodine to the mother and placebo to the infant (Group 1); or b) a single dose of 100 mg iodine to the infant and placebo to the mother (Group 2). Growth, thyroid function, urinary iodine concentrations (UIC) and breast milk iodine concentrations (BMIC) were measured at baseline, 3, 6, and 9 months, and mental and psychomotor development at 12 months.

At baseline, the median UIC in infants was 73 µg/L indicating iodine deficiency and 42% of the infants had low thyroid function. During the study, maternal UIC, BMIC and infant UIC were higher in Group 1 compared to Group 2, and the number of infants with thyroid hypofunction was lower in Group 1 compared to Group 2 *(Figure 1)*. At 3 and 6 months, the median infant UIC in Group 1 was sufficient (>100 µg/L). At 12 months the groups did not differ from each other in development measures.

In summary, this study provides the first direct evidence that, in areas of moderate-to-severe iodine deficiency without effective salt iodization, supplementation of the lactating mother with a single dose of iodized oil soon after delivery provides adequate iodine to the infant for up to six months during breastfeeding. Because infant immunization rates are high in nearly all countries, providing iodized oil to lactating mothers at the first vaccination visit is a strategy that could be easily implemented within existing health delivery systems. This approach appears to be safe and rapidly normalizes thyroid function in the infant, and may protect against potential damage from iodine deficiency until iodine-fortified complementary foods, such as micronutrient powders, are introduced.

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**Many iodine-deficient women around the world struggle to provide both adequate iodine to their breastfeeding infants and meet their own iodine needs. Here, a woman in Laos with a large goiter caused by iodine deficiency breastfeeds her baby**

*(Photo: ©UNICEF, with permission)*

# Reinvigorating Madagascar's USI program

**Pieter Jooste** ICCIDD Global Network Regional Coordinator for Southern Africa, Cape Town, South Africa

***Antananarivo, the capital of Madagascar***

## Background

Madagascar, an island nation off the coast of southeast Africa, has population of ca. 22 million, of which 41% are aged less than 15 years. 92% of the population lives on less than US$2 per day and stunting affects more than 40% of children. In addition, the country is frequently hit by natural hazards such as cyclones and floods. The island is also historically iodine deficient. The total goiter rate among 6-12 year old children decreased after the launch of the IDD control project in Madagascar in 1995, falling from 45% in 1992 to 6% in 2001 (sentinel sites) and 3.4% in 2004 (DHS). Older regional studies reported that the median urinary iodine concentration (UIC) was 70 µg/l in 1995 and 157 µg/l in 1998. Unfortunately, monitoring of the iodine status of the population faltered, and no major iodine survey has been done for the last 16 years.

## Household coverage with iodized salt

The use of iodized salt in Madagascar varies regionally with more than 90% of households using iodized salt in the northern region, 80-90% of households using iodized salt in the northwest and mid-east regions, 20-80% in the central region and less than 20% in the southern regions. The 2008/09 DHS used rapid test kits for testing household level salt samples. The data showed that 75% of households use

iodized salt and 50% use adequately iodized salt that has levels of iodine above the minimum required level of 15ppm. These data need to be interpreted with caution because of the limited sensitivity of test kits. The use of iodized salt is more common in urban (72%) than rural (49%) areas with wide variations between regions. Only 32% of poor households have access to iodized salt while 73% of the rich households have access. The presence of iodized salt is particularly low in the central highlands and southern regions, where small-scale salt producers are operating.

## National committee and legislation

The National Nutrition Unit of the Ministry of Health manages the IDD program. A control strategy on USI was launched in 1995. The following decrees were issued from 1994 -1996 to make the iodization of salt a legal obligation:

- Décret No 95-587 du 05 Septembre 1995 adopting a national strategy on combating IDD; requires all salt to be iodized; including salt for animals; for sacks of 25kg to 60 kg, iodine should be at 50 ppm and for salt packaging of 250 grams, the rate of iodine should be at 30-50 ppm before leaving the factory.
- Arrêté Interministériel No 0499/96 du 06 Février 1996 describes enforcement mechanisms for the above-mentioned decree;
- Arrêté Interministériel No 2413/94 du 02 Juin 1994 defining the national norms for salt iodisation.

A national coalition had been established in the 1990's including the relevant ministries (Health, Commerce, Agriculture, Scientific Research, Interior and Justice), multilateral partners (UNICEF, WHO, USAID, the World Bank) and salt producers, under the leadership of the Ministry of Health.

But because of political unrest over the past decade, no formal institutional coordinating body was active until July 2013 when the committee for the elimination of iodine deficiencies was re-activated under the coordination of the National Nutrition Office.

## Salt industry

In Madagascar, local production of salt is sufficient for nationwide consumption. La Compagnie Salinière de Madagascar (Madagascar Salt Company) located in the northern region produces about 40-50% of total local salt. In 2006, the Compagnie Salinière produced at its full capacity of 70,000 tonnes/year, using industrial iodization processes. A large proportion of this salt is exported to neighbouring countries. Some 30-35% of salt in Madagascar is supplied by four medium-size enterprises located in the mid-western region, who may no longer be adequately iodizing salt. Multiple small producers, about 30 in total, in the south provide the remaining 20-25% of salt, that is usually not iodized. About 5% of salt production takes place, also on a small and informal scale, in the southern lakes region. Daily per capita salt consumption is 8.2 g calculated from supply estimates.

Salt in Madagascar is not only iodized but also fortified with fluoride. A common salt iodization and fluoridisation logo is used by all industrial companies. The packaging of industrial salt does feature the fortification (using the national logo), but does not emphasize the health benefits of consuming only iodized salt. Only the packaging of CoReSEL, a factory with salt iodization and fluoridation capacity created with UNICEF and World Bank's support in 2005, features the health benefits of iodized and fluoridated salt.

Despite existing national legislation, the present political instability in Madagascar has significantly hampered enforcement of legislation, therefore there is no functioning system of licensing for salt producers. In the southern part of the country, where salt production is mainly informal and not institutionalized, quality control is rare and difficult to perform.

Seven governmental sentinel salt laboratories and one central Department of Health laboratory in Antananarivo were previously operating. The regional laboratories have ceased operation because of a lack of funding and the central laboratory continues to analyse salt collected from markets mainly in the northern region where the coverage of iodized salt appears to be good. UIC surveillance efforts have ceased early in the 2000's.

***Growth and development of Malagasy children will benefit from strengthened USI***

## 2013 workshops on iodized salt and salt reduction alignment and planning a national survey

Pieter Jooste, the ICCIDD Global Network Regional Coordinator for Southern Africa, recently visited Madagascar and met with Dr Simeon Nanama and Amal Tucker Brown of UNICEF Madagascar and Juliawati Untoro of UNICEF ESARO. An additional threat to the national IDD control program is misperceptions among health professionals on iodine: a recent rapid evaluation conducted by UNICEF Madagascar found 37% of health professionals attributed the iodine in iodised salt to hypertension. During the visit, the Department of Health and UNICEF organized two workshops related to USI. In the first workshop a national UIC survey was planned and in the second workshop for health professionals, the issue of iodized salt, reduction of salt intake and hypertension was debated. In the first workshop, after debating the objectives, limitations in funding, laboratory capacity and logistics available in Madagascar, it was agreed that a national survey should be undertaken in 2014 to measure the iodine content of household salt and of drinking water, and the UIC in school-aged children and in pregnant women.

In the second workshop, several local speakers covered the main topics in this field and an endocrinologist made the point that iodine has no effect on hypertension. A clinical psychologist used data from local studies showing the effect of iodine deficiency on mental function and physical growth. On the second day four working groups debated the important points of a national salt iodization program and adopted a consensus statement of the compatibility of the policy on salt iodization and the policy on reduction of salt intake. This document was then sent to all relevant governmental departments and to other role players for further comments and finalization.

## Plan of action

High priority steps need to be taken to revitalize the USI program. These are:

1. The National Nutrition Office need to adopt a consensus that the salt iodization program is of utmost importance for the development of the future generation. High level advocacy and communication will be instrumental to refocusing attention and resources on this program.
2. The Department of Health and UNICEF Madagascar should be given all the support necessary for planning and executing the national iodine survey in 2014. A specific strategy should therefore be considered to reach those with low household coverage of iodized salt, particularly in the South.
3. The central and regional sentinel salt laboratories need to be upgraded to routinely analyze iodine in salt from producers and markets.
4. A register of salt producers needs to be established to promote bidirectional communication with the health authorities. Salt producers should be acknowledged as one of the primary players in the salt iodization program in order to strengthen their commitment towards salt iodization.

# Iodized salt in bread improves iodine nutrition in Australia

**Mu Li, Creswell J. Eastman** and **Gary Ma** ICCIDD Global Network, University of Sydney and University of Western Sydney, Australia

## Background

There has not been any regular, national surveillance program of iodine nutrition in Australia, but some States, such as Tasmania, have regularly surveyed schoolchildren by testing urinary iodine levels. It has generally been believed that the Australian population was iodine replete, with data showing average urinary iodine levels in excess of 200 µg/L in the early 1990s (1). Since then, we have reported the re-emergence of iodine deficiency in Australia (2). A similar situation pertains in New Zealand where iodine deficiency has also been reported in schoolchildren, infants, toddlers and pregnant women.

In 2003-2004 we conducted the Australia National Iodine Nutrition Study (NINS), examining 2,000 schoolchildren across five mainland States and found that Australian children were mildly iodine deficient, with a weighted national median urinary iodine concentration (UIC) of 96 µg/L. The levels were lowest in the two most populated States on the eastern seaboard, Victoria and New South Wales (3). The UIE in schoolchildren is a proxy indicator of iodine nutrition status of the general population.

The NINS results became the major driver for the development of new public policy on food fortification to correct iodine deficiency in Australia and New Zealand. In October 2008, the Australia Commonwealth Government gazetted a new mandatory iodine fortification policy, stating "iodised salt must be used for making bread where otherwise salt would be used" (4). This mandatory food fortification policy was fully implemented in October 2009.

However, it was essential that the national program be monitored for its effectiveness.

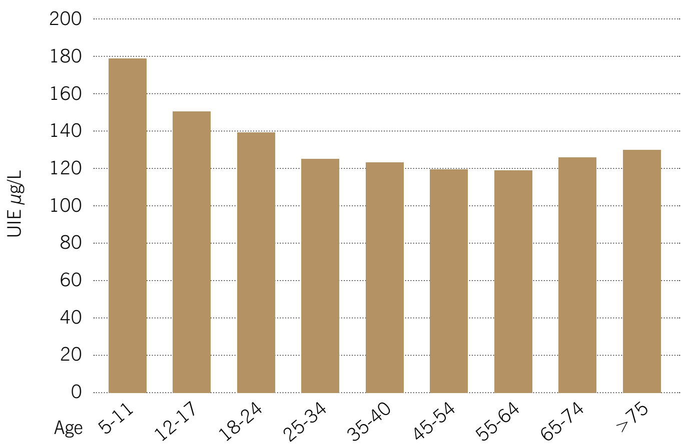
## The National Health Measures Survey

The 2011–13 Australian Health Survey is the largest and the most comprehensive health survey ever conducted in Australia. It consists of the existing National Health Survey (NHS) and two new components, the National Nutrition and Physical Activity Survey (NNPAS) and the National Health Measures Survey (NHMS), aimed to gather information on a broad range of health related issues. People aged ≥ 5 years of age who participated in either the NHS or the NNPAS were invited to participate in the voluntary NHMS between March 2011 and September 2012. Blood and urine samples were collected from over 11,000 participants across Australia. The sample collection started about 18 months after the mandatory iodine fortification commenced. The results from this survey provide a timely snapshot of the current status of iodine intake in the Australian population and the effectiveness of the policy of food fortification with iodized salt.

## The iodine nutrition status of Australian population

The NHMS results for iodine showed that Australians now have an adequate iodine intake with the adult population median UIC being 124 µg/L *(Figure 1)* (5). While there were some variations across different age groups, all were within the optimal UIC range of 100-200 µg/L. In children, particularly the younger group of 5 – 11 year olds, the median UIC level was relatively higher compared with adults. Compared with the Australian National Iodine Nutrition Study data *(Table 1)*, the median UIC of 8-10 year old children in the NHMS has increased significantly as

**FIGURE 1** **Median urinary iodine excretion (UIE) by age (years) in Australia**




*Source:* Australian Bureau of Statistics, Australian Health Survey: Biomedical Results for Nutrients, 2011-12 cat. no. 4364.0.55.006

**TABLE 1** **UIE (in µg/L) in 8-10 year old Australian schoolchildren in 2003-04 and 2011-12.**

| State | 2003-04 Median UIE | 2011-12 Median UIE |
|---|---|---|
| Queensland | 136.5 | 165.9 |
| New South Wales | 89.0 | 177.0 |
| Victoria | 73.5 | 162.6 |
| South Australia | 101.0 | 149.9 |
| Western Australia | 142.5 | 261.3 |

a result of the mandatory food fortification policy. The NHMS included 2,187 samples of women of childbearing age (16-44 years), weighted to represent the population estimate of 4,671,000 women in this age group. The median UIC for women aged 16-44 years was 121 µg/L, which is in the iodine sufficient range. There was no significant difference between the median UIC for women living in urban or rural areas.

The relatively higher UIC in children, compared with adults, suggests a greater intake of iodine from other food sources such as milk and dairy products. In Australia, despite the reduction of the residual iodine content in milk, it remains an important source of dietary iodine (6). This is similar to what has been found in the US National Health and Nutrition Examination Surveys (7). Therefore, residual milk iodine combined with fortification of bread with iodine has been effective in correcting iodine nutrition of schoolchildren. Iodine nutrition in New Zealand schoolchildren has also reportedly improved as the result of the iodine fortification of bread (8).

As pregnant and breastfeeding women were not specifically targeted in the NHMS, there was a small sample size of pregnant women, and information on women's breastfeeding status was not collected. These exemplify a missed opportunity to monitor iodine nutrition in these two most vulnerable groups. The mandatory fortification of bread with iodine, however, was not designed to provide the extra iodine needs of pregnant and breastfeeding women. The Australia National Health and Medical Research Council recommends a daily iodine supplement of 150 µg for pregnant and breastfeeding women to complement the mandatory iodine fortification policy (9). A recent study reported only pregnant women taking supplements containing iodine had median UIC indicative of iodine sufficiency (10). However, most pregnant women have poor knowledge about the possible adverse effects of inadequate iodine nutrition on their unborn children. While universal salt iodization is not currently an option in Australia, it is the medical practitioners' responsibility to educate women to reach optimal iodine nutrition during pregnancy and lactation to prevent the development of neurocognitive disorders in their babies. The iodine nutrition status in these groups should be monitored as a matter of priority.

## Acknowledgement
We would like to thank Juanita Pettit, Director of Health Surveys, Health and Disability Branch, Australian Bureau of Statistics, Australia for reviewing the article.

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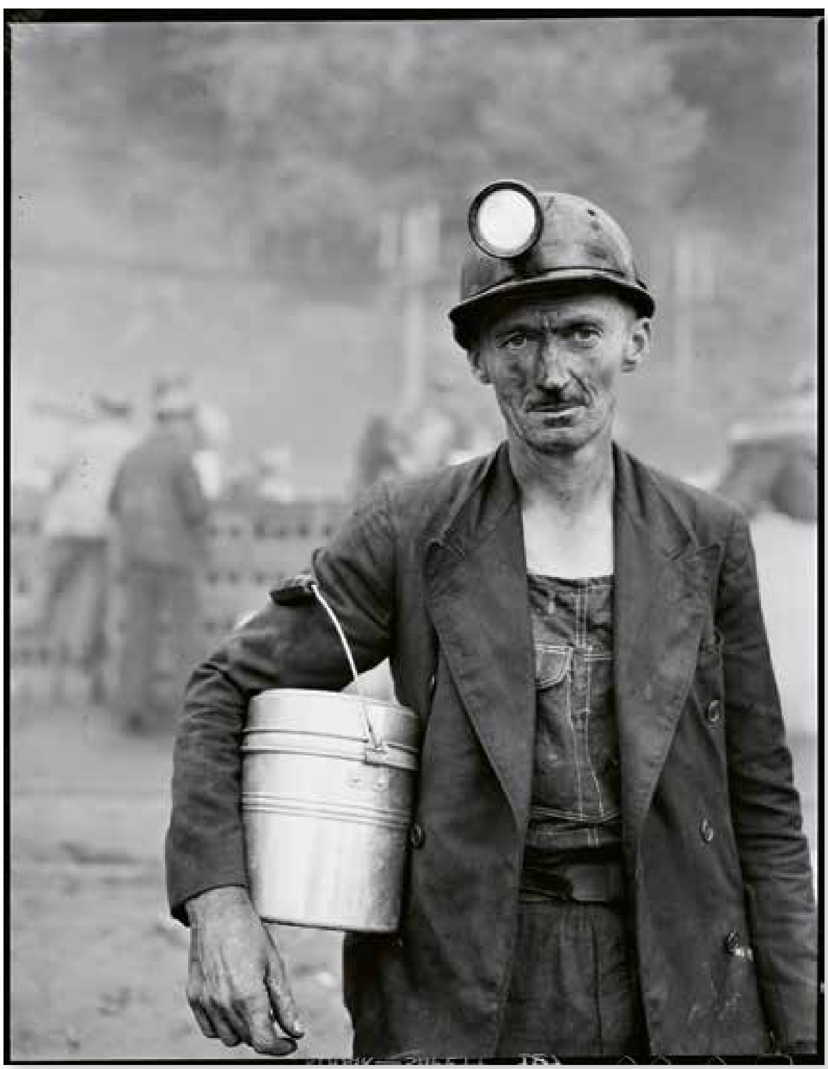
# Introduction of iodized salt in the 1920s boosted the US economy

Excerpted from: **Nisen M, Business Insider, November 2013, commenting on: Adhvaryu A et al. Salt Iodization and the Enfranchisement of the American Worker, September 2013**



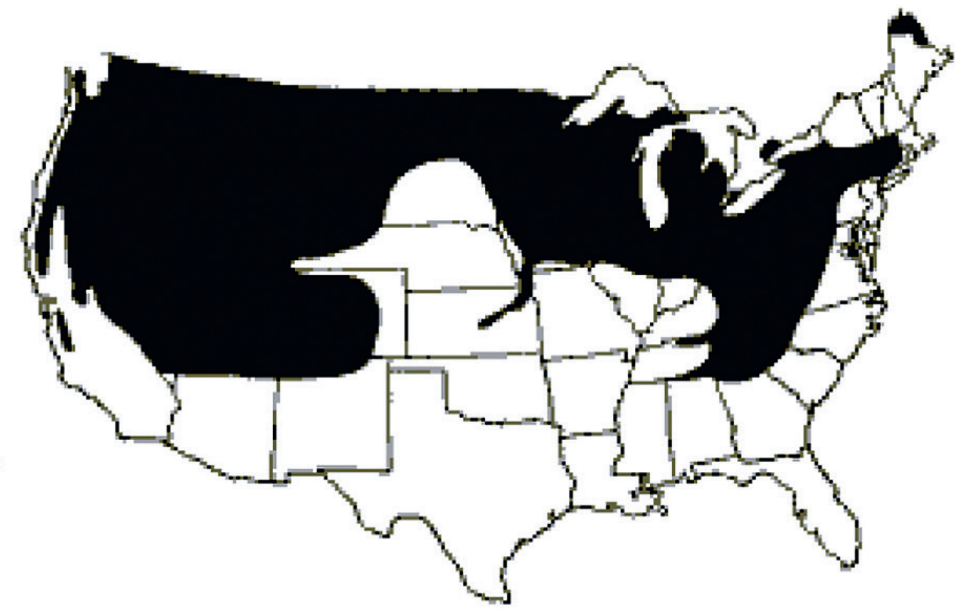
It is estimated that the widespread addition of iodine to salt beginning in 1924 increased IQ in America by as much as 15 points. But along with improved health outcomes, adding iodine to salt also helped boost the U.S. economy. For the generation that followed those born pre-iodization, labor force participation increased by 1% and high school completion rates jumped by 2%, according to a new paper from U.S. researchers at the University of Michigan.

The boost was higher in areas that had particularly high levels of iodine deficiency, and even helped spur the surge in female labor participation in the mid 20th century, as the effects were concentrated among women, according to the paper.

Other factors, of course, from growing societal acceptance of women working outside the home to a booming post-war economy played a part as well, but particularly in areas where iodine deficiency and related disorders were common, the effect was substantial.

The numbers may seem small at first glance, but they're significant. And it's fascinating that something as simple as fortifying a common food ingredient could change people's lives inside of a decade. Incredibly, this is one of the few major public health interventions that was carried out entirely by the private sector. In fact, it was basically one company, the Morton Salt Company, that did the heavy lifting. Iodization was never legally mandated, and it cost the taxpayer almost nothing.

**FIGURE 1** Goiter among drafted men in the US in World War I



*Black areas:* **High goiter incidence, i.e. 6 and more goiter cases per 1,000 drafted men.**
*White areas:* **Low goiter incidence, i.e. 5 and less goiter cases per 1,000 drafted men.**
*Source: McClendon (1939)*

The IQ boost, and the likely source of most of the economic gain, come from the fact that children born to iodine-deficient mothers can have significant and irreversible cognitive impairment. Iodine deficiency remains the largest preventable cause of mental retardation in the world. Women are more sensitive to iodine deficiency, and their babies gain significant cognitive benefits from its consumption, according to the paper.

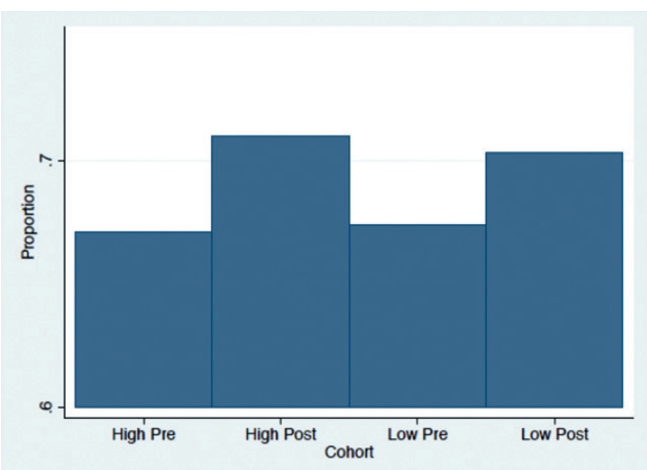
Iodization was powerful for two reasons. First, iodine deficiency is highly localized in the U.S., as shown in *Figure 1*. The black areas on the map show areas of high goiter occurrence. Second, iodization happened rapidly, and only a small amount is required to prevent deficiency. After Morton introduced iodized salt nationwide in 1924, the U.S. went from near-zero to wide availability in just half a decade. Iodine deficiency rates plummeted dramatically and rapidly in areas where it had been high.

That made the effect on "positive wage earning," defined as earning more than one received in government assistance, and labor force participation particularly dramatic in high-deficiency areas. *Figure 2A* shows labor force participation in high goiter areas (indicating iodine deficiency) before and after iodized salt's introduction compared to low goiter areas. *Figure 2B* does the same for positive earnings.

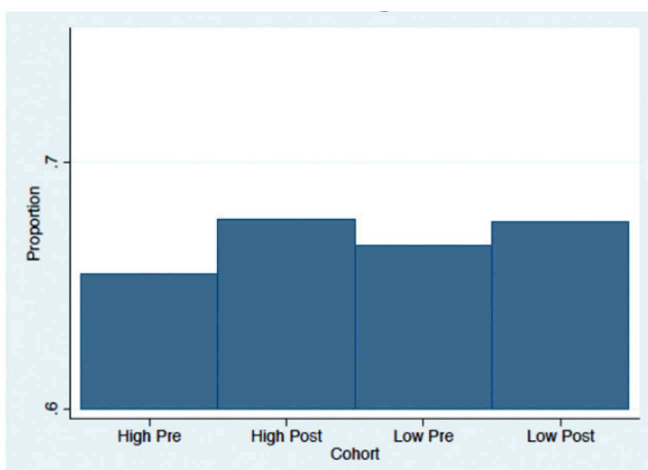
The study results inform the ongoing push for salt iodization in many low-income countries. Blanket iodized salt distribution in fact had a very targeted impact, benefiting the worker on the margin of employment and females, and generating sizeable economic returns at low cost. As big and rapid an effect as iodization had in the U.S., nearly a quarter of the world still doesn't have sufficient access to iodine. There's still a great deal of work to be done.

**FIGURE 2** Proportion of labor force participants and positive wage earners in high goiter and low goiter areas, before and after salt iodization.

PANEL A: Labor force participation




PANEL B: Positive wage earners




***Read the full report at:***

*http://www.arec.umd.edu/sites/default/files/_docs/events/Achyuta%20Adhvaryu-Salt%20Iodization%20and%20the%20Enfranchisement%20of%20the%20American%C2%A0Worker-9-25-13.pdf*

# Where do we get the iodine to iodize salt? The ‚white gold' of the Atacama Desert

Excerpted from: **Becky Oskin, Live Science** ***http://www.livescience.com/43154-chile-atacama-nitrates-formation-explained.html***

Most of the iodine used to iodize salt worldwide originates in the driest, highest desert on Earth, Chile's Atacama Desert. It holds the world's richest iodine and nitrate deposits. However, the source of the massive mineral drifts has long remained a mystery.

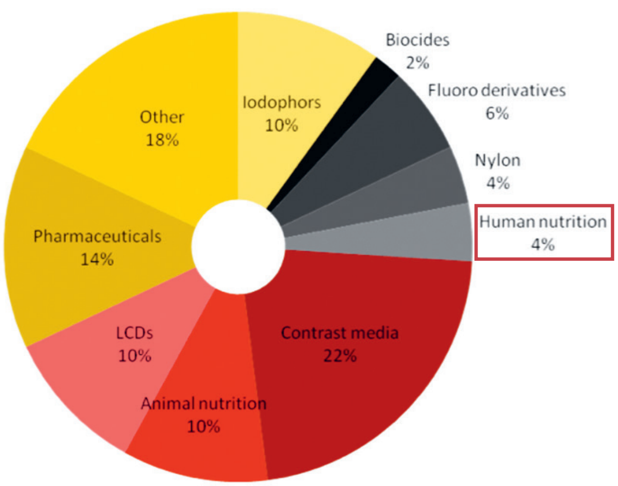
Glowing white as they bake on the desert surface, the Atacama mineral belt is 700 kilometers long and 20 km wide. The iodine is either in crunchy surface deposits called caliche — crusts formed by evaporation — or found in veins in bedrock.

„These are weird deposits that, from a geological perspective, shouldn't be there," said Martin Reich, a geochemist at the Universidad de Chile in Santiago. Now, Reich and an international group of collaborators think they've finally solved the mystery. Their findings were published in the January 2014 issue of the journal Geology.

For decades, the simple explanation was that millions of years of evaporation concentrated the iodine near the desert surface. The minerals were brought in as sea spray carried on fog, or as rain during short-lived climate shifts to wetter periods. But Reich and his colleagues discovered a more complicated story.

It turns out that the iodine comes from an unusual source — deep, old groundwater. „Our results show the iodine does not come from the atmosphere, such as ocean fog or sea spray, but is very old in age and has been leached and transported from marine sedimentary rocks," Reich said.

The first step started more than 20 millions years ago, when rain and snow leached iodine from marine and volcanic rocks in the High Andes. The iodine was transported westward into the future Atacama Desert basin by groundwater. But the climate shifted and rainfall in the Atacama Desert dropped precipitously. And the Coast Mountain Ranges acted as an impermeable barrier, forcing groundwater to rise and evaporate, leaving behind the iodine and other minerals. This fortunate series of events millions of years ago led to the 'white gold' iodine deposits of the Atacama, creating a major source of iodine that today supports the global effort to control iodine deficiency.




***Only a small fraction of the iodine mined from the Atacama is used for iodized salt***


***Satellite view of the Atacama desert in Chile (above) and a close up of the iodine-rich caliche deposits (bottom)***

# Ghana launches a new advocacy campaign on USI


***Welcome address was delivered by Hon. Nii Lantey Vanderpuije – Ghana Deputy Minister of Trade and Industry.***

***Keynote address was given by Hon. Baba Jamal (in dark suit) – Ghana Deputy Minister of Local Government and Rural Development.***

**Samuel Gbogbo** Nutrition Department, Ghana Health Service, Accra

A national launch of the new communication and advocacy campaign on universal salt iodization in Ghana was held in Accra on 10th October 2013. The launch was convened by the Nutrition Department/ Ghana Health Service, with funding from UNICEF, and included about 160 participants.

## Objectives

- To sensitize stakeholders on iodized salt
- To solicit for support from stakeholders for Universal Salt Iodization program
- To launch the strategy as well as the communication and advocacy campaign on universal salt iodization.

Dr. Erasmus Agongo (Director, PPME/ Ghana Health Service) delivered the opening remarks. He mentioned that iodine deficiency is a serious bottleneck to national development because it affects the core of development (i.e. human development). He also stated that although the strategy has been implemented for more than a decade and the relevant laws have been passed, the critical issues are the information gap in importance of consumption of iodized salt, as well as access, production and regulation. He concluded by stating that the launch of the new communication and advocacy strategy is a step to re-energize all stakeholders to play their key roles in eliminating IDD in Ghana.

The welcome address was delivered by the Hon. Nii Lantey Vanderpuye (Deputy Minister, Ministry of Trade and Industry). He stated that the launch of the communication strategy aims at sensitizing the public on the use of iodized salt and its health implications. He re-echoed His Excellency President John Mahama's concern on Ghana's achievement of Millennium Development Goals 4 and 5 which are to Reduce Child Mortality and Improve Maternal Health by 2015 and stated that improved nutrition, including the consumption of iodised salt, will provide the necessary backbone in achieving these MDGs.

Solidarity Messages were delivered from UNICEF, the Canadian Embassy, WHO, GAIN and the ICCIDD Global Network, represented by the National Coordinator, Professor Ebenezer Asibey-Berko.

The keynote address was delivered by Hon. Baba Jamal (Deputy Minister, Ministry of Local Government and Rural Development). He emphasized that USI involves iodization of all salt meant for human and livestock consumption, including salt used in food industries. He highlighted that iodine deficiency has serious health, economic and developmental effects.

***USI in Ghana has major benefits for mother-child health***

Based on the projected birth rates for the period 2011-2020, it is estimated that about 1.5 million children in Ghana will be affected by irreversible brain damage due to IDD if nothing is done about the current iodine deficiency situation. He stated that, considering that the mental impairment caused by iodine deficiency is permanent, in economic terms the present value of lost future wages due to iodine deficiency over this time period is about 668 million dollars.

Mr. Jamal mentioned that interventions that are being implemented include capacity building and provision of appropriate technical support to the salt industry, establishing a monitoring mechanism to ensure effective and sustainable enforcement of regulations on quality iodized salt production and distribution, and public sensitization on the use of iodized salt. He stated that, in spite of several activities aiming to reach the target of 90%, only 35% of households in Ghana currently use adequately iodised salt.

To inform the population about the importance of consuming iodized salt, the communication campaign has been designed to run for a period of one year. The campaign will target consumers, salt producers, salt traders, law enforcement officials as well as the District Assemblies who will henceforth spearhead communication activities for the attainment of USI. Mr. Jamal concluded by stating his hope that Ghana can mobilize the various sectors for coordinated and integrated action to achieve the target of 90% household consumption of iodized salt.

***Airing of audio and video productions***

Audio productions in four key Ghanaian languages (Ga, Akan, Ewe and Dagbani) as well as English and also a docudrama on iodized salt were played. These productions will be used during advocacy activities on Universal Salt Iodization.

***The 'blue' pledge session***

This session entailed representatives of various institutions pledging by steeping the palm of their hand in a blue paint and stamping their palm on a board as sign of support of the salt iodization program in Ghana.

***Closing remarks***

Dr. Erasmus Agongo (Director, PPME, GHS) in his closing remarks recommended that the launch should be replicated at regional and districts levels. Furthermore he stated that all regions and districts should hold media briefings on the strategy and provide information for local radio stations, including phone in radio discussions. He also emphasized the importance of the relevant bodies that will ensure enforcement of the regulation.

# Belarus celebrates a superb sustained USI program

**Sergei Petrenko, Tatiana Mokhort, Gregory Gerasimov** ICCIDD Global Network Belarus, and the ICCIDD Global Network Office for Eastern Europe and Central Asia.

At the initiative of the Belarus Ministry of Health, legislation passed in April 2001 "On the Prevention of Iodine Deficiency Disorders" stipulated that only iodized salt could be used in the manufacture of processed foods (except seafood) and in all education and health facilities. The sale of non-iodized salt was not prohibited, but all retail food outlets were required to have iodized salt available for consumers. The Centers of Hygiene and Epidemiology were committed to conducting the regular monitoring of the quality of iodized salt. Also in 2001, Belarus ratified an intergovernmental agreement with countries of the Commonwealth of Independent States on preventive measures to reduce IDD.

In 2011, the total national demand of 130,000 tons of salt (both iodized and non-iodized) in the food industry and the retail trade was covered by two Belarus producers (78%) and imports (22%), mainly from Ukraine. While retail trade of non-iodized salt in Belarus is not prohibited, iodized salt sales (as proportion of total sales of food salt) have increased from 35.5% in 2001 to 74.5% in 2012, and up to 76.7% in the first half of 2013 *(Figure 1)*. Quality of iodized salt has also remarkably improved. The share of non-standard samples (with iodine levels below 25 and over 55 mg/kg) decreased from 10% in 2002 to 0.02% in 2012. Improvements included introduction of new iodization technology and the use of potassium iodate instead of less stable potassium iodide.

Following the adoption of the government resolution in 2001 all food manufacturers started to use iodized salt.

**FIGURE 1 Iodized salt sales in Belarus, as a percentage of total food salt sales.**

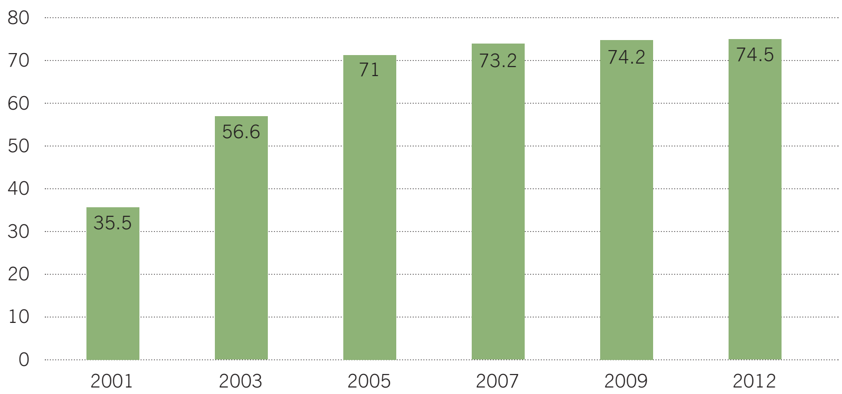



**FIGURE 2 The poster used in a social advertising campaign conducted by the Ministry of Health and UNICEF in 2006–2011**


Application of iodized salt in the manufacture of bakery products resulted in significant increase of iodine content: from 10 μg to 20-30 μg of iodine per 100 g of bread. Since bread in Belarus is consumed in relatively large amount (on average – 350 g/day), daily intake of iodine from bakery products increased by 50-70 μg or 30-50% of the daily requirement for an adult person. It was estimated that the average Belarusian obtains up to 70% of the daily iodine requirement with processed foods manufactured with iodized salt.

**FIGURE 3** **Median UIC (µg/L) based national and subnational surveys in Belarus**

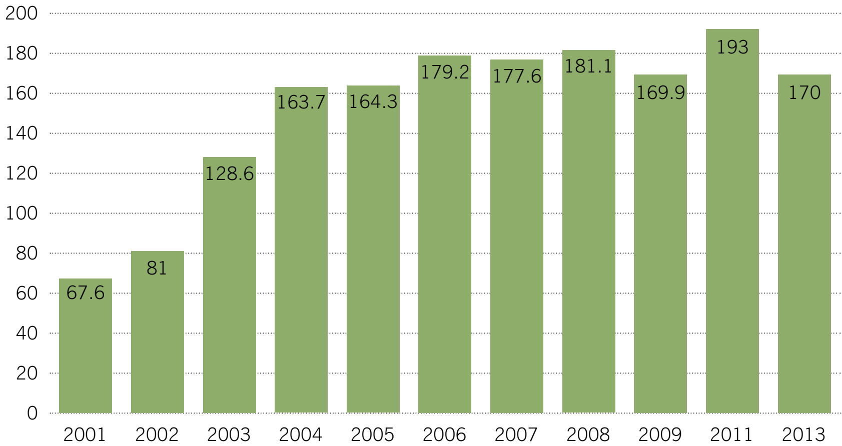



**TABLE 1** **Incidence of hyperthyroidism (per 100,000), Belarus, 1998–2012**

| Group | 1998 | 2001 | 2004 | 2009 | 2012 |
|---|---|---|---|---|---|
| Adults | 8.00 | 9.83 | 21.3 | 10.03 | 11.71 |
| Adolescents | 4.02 | 4.94 | 6.71 | 5.76 | 6.49 |

A media campaign was one of the most important steps in the implementation of the program to eliminate iodine deficiency in Belarus. A promotional campaign in 2006–2011 that was commissioned by UNICEF on Belarusian television under the slogan „A Pinch of Iodized Salt, a Step to Health" enjoyed tremendous success and enhanced public awareness of iodine deficiency and its effects, while contributing to an increase in the use of iodized salt in homes. According to the most recent household survey conducted by Belarus Statistics Agency (2012), 85% of the respondents used iodized salt on regular basis.

A national IDD survey conducted in 2006 showed that the median UIC had increased by more than 4 times and reached optimal levels in all regions of the country *(Figure 3)*. The share of households that used iodized salt increased to 93.6% in 2006. In all the schools surveyed, only iodized salt was being used in canteens. Subnational surveys conducted in 2007 to 2013 showed that median UIC remained on the level of 150 – 189 µg/l while goiter prevalence in children further decreased to 4 – 7%. In the capital city, Minsk, median UICs in pregnant women were 204.8 µg/L in 2009 and 223.6 µg/L in 2010, thereby meeting WHO recommendations.

The experience of many countries worldwide shows that the introduction of iodized salt can lead to a temporary rise in the incidence of hyperthyroidism (iodine-induced hyperthyroidism). Indeed, after the large-scale introduction of iodized salt in Belarus in 2001, the incidence of hyperthyroidism almost doubled among adults, while, among adolescents, the increase was much smaller *(Table 1)*. However, by 2009, the incidence of hyperthyroidism had practically returned to pre-supplementation levels.

To conclude, the Belarusian iodine prophylaxis model based on the extensive use of iodized salt in the food industry has had enormous impact. This approach to iodine prophylaxis is universal, available to all segments and age groups in the population, exhibits no gender differences, has a minimum cost, and may be easily implemented by other countries in the region, specifically Russia and Ukraine.

***Iodized salt in Belarus ensures children can learn well at school***

# Low iodine intakes in U.K. pregnant women

**The following are excerpts from an interview by the Nutrition Society with Dr. Sarah Bath and Prof. Margaret Rayman of the University of Surrey on their recent paper in the British Journal of Nutrition** *(Bath SC, et. Br J Nutr. 2014 Jan 7:1-10. [Epub ahead of print].*

***Why are we concerned about iodine status in pregnancy?***

Iodine, as a component of the thyroid hormones, is required for brain development, particularly in the fetus, therefore an adequate intake of iodine is very important during pregnancy. The WHO iodine requirement for pregnant women is nearly double that of non-pregnant adults (250 vs. 150 µg/day). While it is well known that severe iodine deficiency in pregnancy can lead to impaired brain development, at the extreme resulting in cretinism, even mild-to-moderate iodine deficiency in UK pregnant women has been associated with reduced cognitive scores in their children.

***Do we get enough iodine in the UK?***

Based on a national survey of schoolgirls in 2009, the UK is now classified as mildly iodine deficient by the WHO. Despite the importance of adequate iodine intake during pregnancy, there are relatively few studies of iodine status in UK pregnant women, and no data have been collected on iodine status in pregnant women living in the South East of the UK.

***What did we do in our study?***

We recruited 100 pregnant women at 12 weeks' gestation from the Royal Surrey County Hospital. Women provided a spot-urine sample for the measurement of iodine status; urinary iodine excretion is considered to be a good biomarker of iodine status and is used to estimate status in a population. We estimated 24-hr iodine excretion using urinary creatinine concentration (which takes the dilution of the urine sample into account) to explore relationships between iodine status and dietary intake; women completed a short food-frequency questionnaire that collected data on intake of iodine-rich foods.

***What did we find?***

According to WHO criteria, the women were classified as mildly-to-moderately iodine deficient; the median urinary iodine concentration, at 85.3 µg/L, is considerably below the WHO cut-off for adequacy of 150 µg/L. Furthermore, the estimated 24-hr iodine excretion value was much lower than would have been expected if women had been meeting the WHO requirement of 250 µg/day. This, together with studies showing iodine deficiency in pregnant women in other regions of the UK, raises concern for the brain development of UK babies.

Of the dietary components that we investigated, intake of milk was the strongest predictor of maternal iodine status, echoing results from other studies that show milk is the major source of iodine in the UK diet. Women who reported taking a prenatal supplement containing iodine (42%) had a significantly higher iodine status than women who did not use such a supplement. It is important to note that not all prenatal supplements in the UK contain iodine.

***Where can women of childbearing age get more information on iodine?***

Our findings suggest that women should be given advice about iodine before and during pregnancy. In association with the British Dietetic Association, we have therefore produced an iodine food fact sheet.

***What is the next step for this research?***

This research needs to be repeated in other areas of the UK; a national survey of iodine status in pregnancy is needed to establish the full magnitude and spread of iodine deficiency in UK pregnant women.

# Somalia's groundwater is surprisingly high in iodine

Excerpted from: **Kassim IAR et al. Iodine intake in Somalia is excessive and associated with the source of household drinking water.**
*Published on-line: J Nutr February 5, 2014.*

***Iodine-rich groundwater may lead to high iodine intakes in Somali women***

Somalia lies at the northeast tip of Africa and currently comprises the semiautonomous zones of the Northwest Zone (Somaliland), Northeast Zone (Puntland) and the war-ravaged South Central Zone. Since 1991, Somalia has lacked an effective central government. A high and persistent level of internal conflict and incursions by foreign governments has contributed to a series of health and nutrition crises (1).

Until recently, little was known about the iodine nutrition of the Somali population. It was generally assumed that iodine deficiency was a public health problem in Somalia due to the limited access to iodized salt. To address this a national survey of micronutrient status was carried out in 2009 by the FAO and the University College London, in collaboration with UNICEF, the World Food Program and WHO.

A national 2-stage, stratified household cluster survey was conducted in 2009 in the Northwest, Northeast, and South Central Zones of Somalia. Urinary iodine concentration (UIC) was determined in samples from women (aged 15–45 y) and children (aged 6–11 y), and examination for visible goiter was performed in the Northwest and South Central Zones. A 24-h household food-frequency questionnaire was conducted, and salt samples were tested for iodization.

## Results

The median UICs for nonpregnant women (n=617) and children (n=756) were 329 and 416 μg/L, respectively, indicating excessive iodine intake (>300 μg/L). The prevalence of visible goiter was <4%. To assess exposure to iodized salt, samples from >2300 households were tested by using rapid test kits. The overall coverage of salt iodization was low at 7.7%, and where it did occur a large proportion was inadequately iodized, with concentrations <15 mg/kg *(Figure 1)*. Household salt iodization was only recorded with any frequency in the South Central Zone, where 6.7% of samples were fortified at concentrations ≥15 mg/kg and 5.4% of samples were fortified at concentrations <15 mg/kg. In this zone, exposure to iodized salt was associated with a significantly increased median UIC in women (770 vs. 281 μg/L) and in SAC (1260 vs. 366 μg/L). The 4 clusters where salt iodization exceeded 20% coverage were all located adjacent to the Kenyan border in the area of El Wak.

Because exposure to iodized salt could not explain the occurrence of the excess UICs, we next analyzed the association between iodine intake and the main source of household drinking water for sources utilized by at least 50 households. *Figure 2* shows the main household water source ordered by water source, with surface water sources followed by shallow dug wells, deeper drilled boreholes, tanker/cart, and berkad (a water storage construction widely used in Somalia). The data show the relation between the main source of household water and the UIC of household members. Consumption of water sources of unknown origin, that is, water stored in berkads or from donkey carts or tankers, was associated with an intermediate UIC. A comparison of UICs of individuals from households that used water from boreholes against those that used any other main water source revealed a higher iodine intake in children (569 vs. 385 μg/L) and in women (430 vs. 282 μg/L).

Evidence that water can be an important contributor to total iodine intake comes from studies in Denmark, South Africa, China, and refugee populations in Algeria (2-6). Although iodine intake from water sources may be important in preventing deficiency, it may also contribute to excessive intakes. Further work is required to investigate the geochemistry and safety of groundwater sources in Somalia and the impact on population health.

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**FIGURE 1** **Proportion of households in Somalia possessing iodized salt (n = 2345). NEZ, Northeast Zone; NWZ, Northwest Zone; SCZ, South Central Zone** *(From: Kassim et al. 2014).*

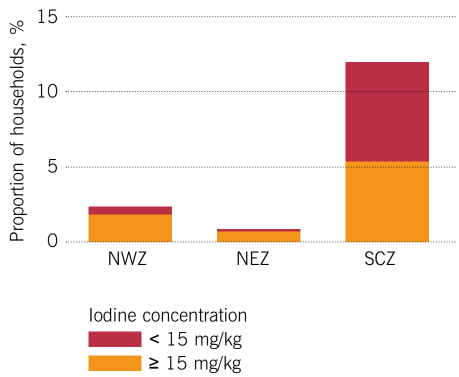
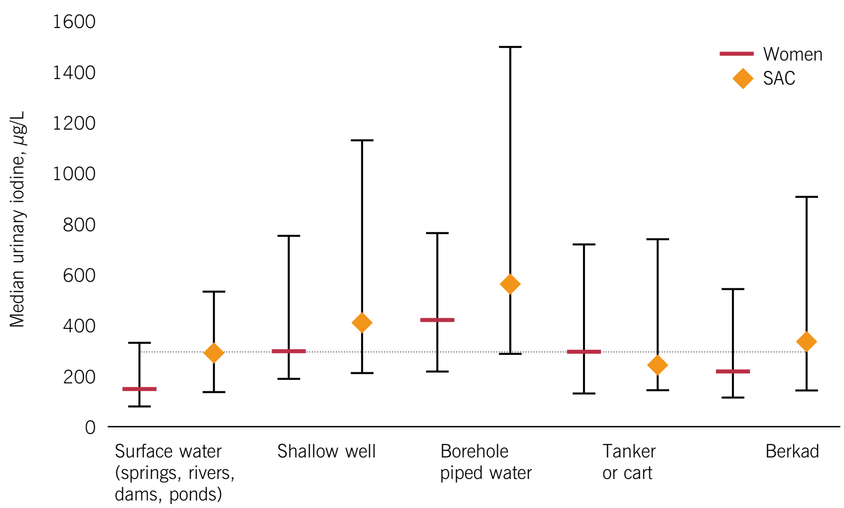



**FIGURE 2** **Median (IQR) UICs in women (n = 617) and school-age children (SAC) (n = 756) in Somalia by main household water source. The dashed reference line indicates the WHO cutoff above which median UIC is excessive** *(From: Kassim et al. 2014).*



## MEETINGS AND ANNOUNCEMENTS

### Advocacy meetings on salt iodization in Russia and Ukraine: breakthroughs on the horizon?

In November 2013, ICCIDD Global Network conducted advocacy meetings in Moscow (in collaboration with GAIN) and in Kiev (in collaboration with GAIN and UNICEF). The meeting in Moscow gathered more that 50 participants from the health sector, food industry, government and NGOs. Reports described how some progress was achieved in 1999-2003, but in the last decade (2003-2013) there were no improvements in iodine status and a „voluntary" model of salt iodization has proved to be ineffective. The government-approved Healthy Nutrition Policy (2010) and Plan for Action (2012) sets goals for fortification of staple foods. In the resolution of the meeting participants provided a recommendation to the Ministry of Health on development of new legislation/regulation that would mandate use of iodized salt in baking industry and increase sales of iodized salt through retail trade.

Over 50 participants, including representatives from many regions, attended the meeting in Kiev, Ukraine. With advocacy support of GAIN, UNICEF and ICCIDD Global Network, the Institute of Endocrinology and Academy of Medical Sciences initiated a move toward legislation that will mandate the use of iodized salt in food industry and schools. It will also require that all shops keep iodized salt for sale. The Ministry of Health and the Health Committee of Ukraine Parliament are charged with development of this legislation.

### Training session on salt iodization in Rawalpindi, Pakistan

*The International News, February 9, 2014*

The district health department in Rawalpindi is working hard to make the iodized salt program a success. Executive District Officer (Health) Dr. Zafar Iqbal Gondal addressed the 25 participants of a one-day refresher training session of District Officers Health, Deputy District Officers Health, Sanitary and Food Inspectors on salt iodization. The training session was organized by the health department in collaboration with the Micronutrient Initiative (MI).

Dr. Gondal said that according to the results of National Nutrition Survey 2011, more than 64% of school-age children in Pakistan are protected from IDD through salt iodization. However, more than five million babies born every year in Pakistan are unprotected against brain damage due to IDD. He lauded the role of the sanitation staff of the health department for their efforts in achieving adequate salt iodization targets in the district. He added that Sanitary and Food Inspectors of the health department would monitor salt factories on a weekly basis to ensure processing of adequately iodized salt only. The district health department has given a one-month deadline to the food and sanitary inspectors to ensure 100 per cent salt iodization.

### European experts approve two iodine infant health claims: thyroid and cognitive function

In January 2014, the European Food Safety Authority (EFSA) approved new health claims for iodine in children under-3 years of age. In the claim 'Iodine and thyroid function' EFSA concluded there was a clear cause and effect relationship between the dietary intake of iodine and normal infant thyroid function. The opinion can be found at: *http://www.efsa.europa.eu/en/efsajournal/doc/3516.pdf.*

In the claim 'Iodine and normal cognitive development' EFSA stated that there is a well established role of iodine in preventing retarded mental and physical development in children and adolescents, and impaired mental function and reduced cognitive capacity for people of all ages. It concluded there was a clear cause and effect relationship between the dietary intake of iodine in infancy and normal cognitive development. The opinion can be found here: *http://www.efsa.europa.eu/en/efsajournal/doc/3517.pdf*

**Prof. Madhukar G. Karmarkar**

### *Madhukar G. Karmarkar (1934-2014)*

Prof. Madhukar G. Karmarkar passed away on the 12th January 2014 in New Delhi. Prof. Karmarkar completed his Ph.D. in Biochemistry from M.S. University, in Baroda, India. After postdoctoral training in India and the U.S., he joined the faculty of AIIMS, New Delhi in January 1972 in the Department of Medicine. Later he established the Department of Laboratory Medicine and was its first Professor and Head. Prof. Karmarkar was a founding member of the International Council for Control of Iodine Deficiency Disorders (ICCIDD).

Prof. Karmarkar was a doyen in the field of IDD. Starting with his Kangra Valley Study in India in 1960s, he was pioneer in delineating the epidemiology of IDD in India. He was also part of the team that unraveled the epidemiology of neonatal hypothyroidism and the impact of IDD on cognitive development in India. He played a major role in developing methods for assessment of iodine nutrition. He was an inspiring teacher, astute researcher, erudite scholar, a motivator, tenacious optimist, and had a great sense of humor.

**Prof. Gerard N. Burrow**

### *Gerard N. Burrow (1933-2013)*

Dr. Gerard N. Burrow passed away on December 14, 2013. A memorial service was held at Yale University's Medical Historical Library on January 17, 2014. The library was overflowing with Jerry's friends and colleagues from Yale Medical School, of which he was Dean from 1992-1997, and the Sea Research Foundation in Connecticut, for which he served as President and CEO after his retirement from Yale. Jerry's contribution to society in general and in medicine and medical education in particular was widely recognized. He served as the President of the American Thyroid Association (ATA) in 1986-87 and received the ATA's Distinguished Service Award in 1993 in recognition for his many contributions as a leader in the thyroid field.

From 2000 to 2006 he was Vice Chair of ICCIDD, and continued as Chair from 2006 until 2012. During the last year of his tenure, he coordinated the merger of ICCIDD with the Iodine Network bringing all the key iodine players into a grand alliance. He worked tirelessly in the fight against IDD and his leadership, fierce intelligence and compassion will be sorely missed.

# ABSTRACTS

### Apparent insufficiency of iodine supplementation in pregnancy

In this cross-sectional study, iodine levels in urine specimens from pregnant women in New York City were measured. One hundred eighty-two women visited a clinic where free iodine supplementation was offered (150 µg of potassium iodide daily; Group A), and 183 women were seen at a practice at which no supplementation was offered (Group B). The authors found that, overall, the median urine iodine concentration for the entire group was 152.5 µg/L. The median UI level of the supplemented Group A (169.8 µg/L) was significantly greater than that of Group B (128.4 µg/L; $p<0.01$). The authors concluded that New York City pregnant women were significantly less prone to iodine deficiency when provided with iodine supplementation.

*Pessah-Pollack R, et al. J Womens Health (Larchmt). 2014;23(1):51-6.*

### Iodine fortification may influence the age-related change in thyroid volume

The authors assessed the individual thyroid volume changes after the mandatory nationwide iodine fortification program in two Danish areas with different iodine intake at baseline: Copenhagen, mild iodine deficiency (ID) and Aalborg, moderate ID.They examined 2,465 adults before (1997) and after (2008) the Danish iodine fortification of salt in 2000. Ultrasonography was performed by the same sonographers using the same equipment and participants treated for thyroid disease were excluded. The authors concluded that age-dependent differences in thyroid volume and enlargement had levelled out after the Danish iodization program. Thus, the previously observed increase in thyroid volume with age may have been caused by iodine deficiency.

*Krejbjerg A, et al. Eur J Endocrinol. 2014 Jan 7. [Epub ahead of print]*

### Comparison of population iodine estimates from 24-hr urine and timed spot urine samples

Median urine iodine concentration (UIC; µg/L) in spot urine samples is recommended for monitoring population iodine status. Other common measures are iodine:creatinine ratio (I/Cr; µg/g) and estimated 24-hr urine iodine excretion (UIE; I/Cr predicted 24-hr Cr; µg/d). Despite different units, these measures are often used interchangeably. Volunteers aged 18-39y collected all their urine samples for 24-hours (n=400); voids from morning, afternoon, evening, overnight, and a composite 24-h sample were analyzed for iodine. The authors calculated median observed 24-hr UIE and 24-hr UIC, and spot UIC, I/Cr, and 2 measures of estimated UIE calculated using predicted 24-hr Cr. They found that median 24-hr UIE was 173.6 µg/d and 24-hr UIC was 144.8 µg/L. From timed spot urine samples, estimates were UIC: 147.3-156.2 µg/L, I/Cr: 103.6-114.3 µg/g. Iodine measures did not vary consistently by timing of spot urine collection. Conclusions: Estimates of UIC, I/Cr, and estimated 24h-hr UIE from spot urine samples should not be used interchangeably. Compared with 24-hr UIC, on average, spot UIC did not differ.

*Perrine CG et al. Thyroid. 2013 Dec 5. [Epub ahead of print]*

### Long-term exposure to excessive iodine from water is associated with thyroid dysfunction in children

The objective of this study was to assess the effects of a long-term exposure to excessive iodine on thyroid dysfunction in children. Urinary iodine concentration (UIC) and thyroid function in 371 children from a high iodine (HI) area (water iodine: 150-963 µg/L) and 150 children from an adequate iodine (AI) area (water iodine: 12.8-50.9 µg/L) were measured. The median UIC of children in the HI area was 1030 µg/L, and that of children in the AI area was 123 µg/L. Children in the HI area had a higher concentration of thyroid stimulating hormone and higher positivity of both thyroid peroxidase antibodies (TPOAb) and thyroglobulin antibodies (TGAb). The prevalence of thyroid diseases was higher in the HI area children than that in AI area children, especially subclinical hypothyroidism. Increased thyroid volume was correlated with higher UIC. The authors concluded that excessive iodine intake in children in HI areas is associated with impaired thyroid function; UIC ≥ 600 µg/L and thyroid Abs were the main risk factors for subclinical hypothyroidism.

*Sang Z, et al. J Nutr. 2013;143(12):2038-43.*

### A systematic review of thyroid dysfunction in preterm neonates exposed to topical iodine

The aim of this review was to determine whether maternal exposure to iodine or neonatal exposure to topical iodine-containing solutions increases the risk of transient thyroid dysfunction in neonates born <32 weeks' gestation or <1.5 kg. 794 papers were identified during the initial search; 15 studies were fully reviewed. The incidence of (transient) hypothyroidism/hyperthyrotropinemia following exposure to topical iodine ranged from 12 to 33 per 100 infants; the incidence in non-exposed infants was 0. The authors concluded there is evidence that neonatal exposure to iodine-containing disinfectants causes thyroid dysfunction in infants born <32 weeks. It would seem prudent to restrict exposure of iodine-containing skin disinfectants in preterm infants; chlorhexidine might be a credible alternative.

*Aitken J, et al. Arch Dis Child Fetal Neonatal Ed. 2014;99(1):F21-8.*

### Impact of iodine supplementation in mild-to-moderate iodine deficiency: systematic review and meta-analysis

The authors undertook a systematic review of the impact of iodine supplementation in populations with mild-to-moderate iodine deficiency. The quality of studies was graded and eligible trials were evaluated in the meta-analysis. Nine randomized controlled trials (RCTs) and eight observational studies met the inclusion criteria. Controlled trials on infant neurodevelopment were lacking; gestational iodine supplementation reduced maternal thyroid volume and serum thyroglobulin and in some studies prevented a rise in serum thyroid-stimulating hormone. A pooled analysis of two RCTs that measured cognitive function in school-age children showed modest benefits of iodine supplementation on perceptual reasoning and global cognitive index. The authors concluded that iodine supplementation improves some maternal thyroid indices and may benefit aspects of cognitive function in school-age children, even in marginally iodine-deficient areas.

*Taylor PN, et al. Eur J Endocrinol. 2013;170(1):R1-R15.*

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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, iccidd.newsletter@hest.ethz.ch.

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