

In this Issue:

Focus on pregnancy



Serbia

2

United States

5

Bosnia

7



New Zealand

9

Italy

10

Iodized salt
and UI

11



Sustaining USI

13

Meetings and
Announcements

18

Abstracts

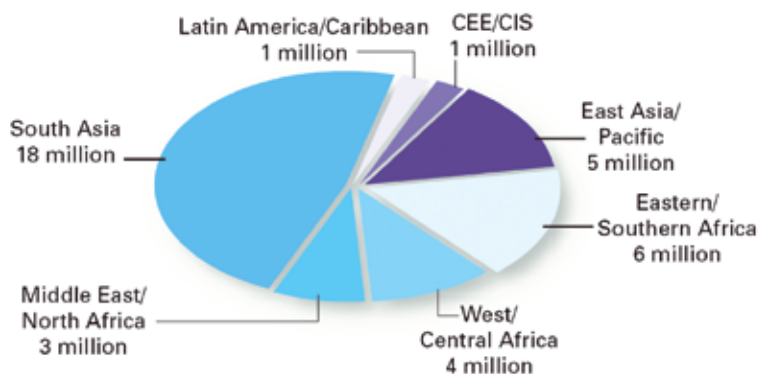
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Iodine deficiency during pregnancy

Over the past decade, there has been increasing focus on iodine deficiency during pregnancy. Iodine is critical for optimal fetal development. Yet 38 million newborns in developing countries every year remain unprotected from the lifelong consequences of brain damage associated with iodine deficiency. How can we ensure adequate iodine intake in this vulnerable group?

This issue of the IDD Newsletter highlights efforts in countries as diverse as Bosnia and Herzegovina, New Zealand, Italy, Serbia and the United States.

Distribution of infants born in developing countries annually who are unprotected against IDD, by region, 2000-2006



Both iodized salt and iodine supplements are important sources of iodine for pregnant women in Serbia

Dragana Jovic and **Tanja Knezevic** Institute of Public Health of Serbia; **Frits van der Haar** Global Public Nutrition Solutions, LLC; **Alexandra Jovic** UNICEF Belgrade

Historically, goiter and cretinism were significant public health problems in Yugoslavia. The first regulations on salt iodization were introduced in 1937 at a low level of 5mg KI/kg for household salt directed to the high goiter areas. During a Congress of Preventive Medicine in 1950, the iodization level was increased to 10mg KI/kg in 1954 and expanded to all the salt for human and animal consumption. Ten years later, epidemiological surveys found a 4-fold reduction in the goiter prevalence among school children (1). The present legislation in Serbia mandates that all edible salt should be iodized at 12–18 mg iodine per kg salt, while both KI and KIO₃ are permitted.

Since there are no natural deposits of salt, all the salt requirements in Serbia are imported. Two firms dominate the national salt supply situation, namely 'Interkomerc' a general food and household goods trading company located in Belgrade and 'So Product' a salt processing and packing company 30km outside of Belgrade. The variety of salt brands in the market shows active competition among the salt suppliers. So Product imports the basic salt mostly from Israel, Belarus, Austria and Ukraine. The firm has a number of modern iodization and packaging lines, with an internal quality assurance system based on quantitative salt iodine analysis on a regular 2-hour basis. Interkomerc imports iodized salt mostly from Solana

Tuzla (Bosnia-Herzegovina), but also from other sources in Romania, Greece and Ukraine.

Studies of school-age children during 1998–2000 by the National Institute of Public Health in Belgrade showed a median urinary iodine (UI) concentration of 158 µg/L and a decrease in goiter prevalence to 2.35% (2). Adequately

The goal of eliminating IDD is only truly successful when the USI strategy endures. During September–December 2007, the Institute of Public Health of Serbia (IPHS), with financial and technical support of UNICEF, carried out a national iodine survey of the supply and consumption of iodized salt in relation to the iodine status of the population (children and pregnant women), using



iodized salt was being used in 73% of the households in 2000 (3). These findings confirmed the massive improvement in iodine nutrition that occurred during the preceding half a century.

the standard design of 30 clusters (primary schools), selected proportionate to population size. The IPHS laboratory participates successfully in EQUIP, and internal quality control demonstrated a precision of $\pm 5\%$ for the urinary iodine assay.

No differences were found in the iodine content of the 950 salt samples obtained from school children and the 347 salt samples from pregnant women (results combined in Figure 1). Notably, all the household salt samples obtained in the survey were iodized. The median salt iodine content was 13.9mg/kg; 32% of the salt samples had ≥ 15 mg/kg, and 76% fell within the range of 12–18mg iodine/kg mandated by Serbian law.

The median UI in school children was 195 $\mu\text{g/L}$; 9% of the children had $\text{UI} < 100 \mu\text{g/L}$, the UI was 100–199 $\mu\text{g/L}$ in 42%, and the UI was $\geq 200 \mu\text{g/L}$ in 48% of the children. By ultrasound, elevated thyroid volume was found in only 3% of children (4). The UI data of the children were converted to iodine

consumption estimates with the formula of the US Institute of Medicine (5). The median iodine consumption in children was 185 $\mu\text{g/d}$. Children in urban areas (median 192 $\mu\text{g/d}$) had higher iodine intake than in rural areas (171 $\mu\text{g/d}$), and the intake was higher in boys (192 $\mu\text{g/d}$) than in girls (175 $\mu\text{g/d}$). As expected, the iodine consumption of the children increased with age (Figure 2). When compared to the recommended dietary allowance, the children in Serbia were consuming a diet that typically provided 158% of their RDA, with an increase from $\pm 125\%$ of the RDA at 6–8 y to $\pm 190\%$ of the RDA at 12–14 y of age.

The median UI in pregnant women (Figure 3) was 158 $\mu\text{g/L}$. The UI was $< 150 \mu\text{g/L}$ in 45% of the women, 32%

had a UI in the range 150–249 $\mu\text{g/L}$ and $\text{UI} \geq 500 \mu\text{g/L}$ was found in 5%. Physicians in Serbia often recommend dietary supplements to pregnant women and in this survey, 34% of women reported using an iodine supplement. The UI concentration in pregnant women who used a supplement (median 195 $\mu\text{g/L}$) was significantly higher than those who reported not using a dietary supplement (146 $\mu\text{g/L}$). Notably, the median UI in the women not supplementing was just below the range of sufficient UI concentration recommended by WHO/UNICEF/ICCIDD (Figure 4).



Figure 1: Histogram of the iodine content in household salt, Serbia, 2007

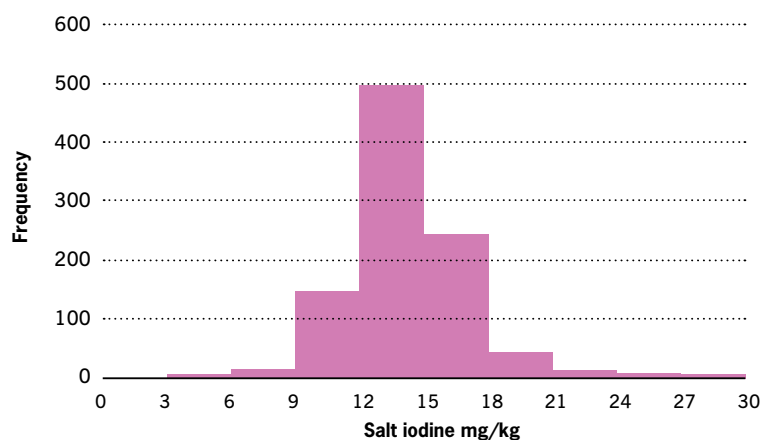
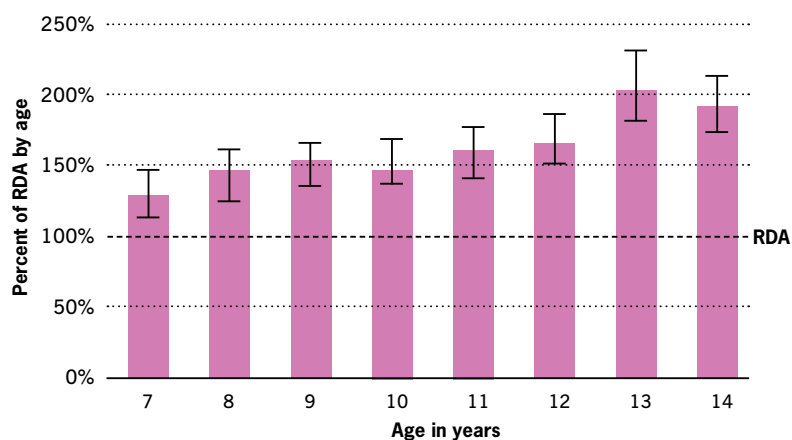


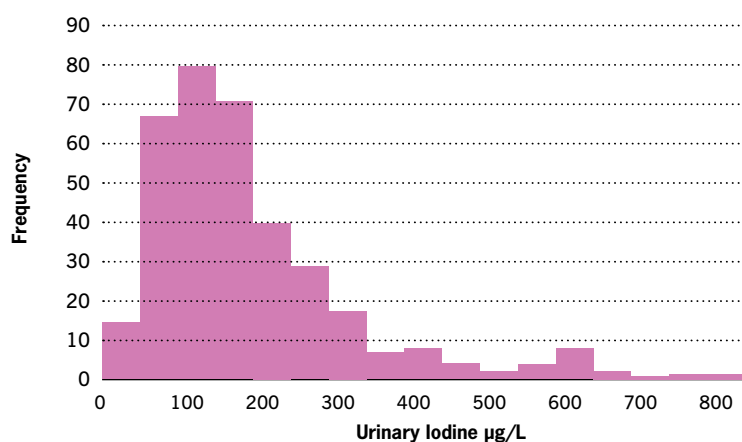
Figure 2: Relationship of iodine consumption with age, Serbia, 2007



There was no relationship between the iodine levels in household salt and the UI concentrations in either the school children or the pregnant women (non-supplement users). The UI levels in the pregnant women not using a dietary supplement (median 146 $\mu\text{g/L}$) were much lower than those in the school children (195 $\mu\text{g/L}$), even though the iodine content in the salt from their households did not differ, thus suggesting different dietary practices between these groups.

The present results suggest the population of Serbia enjoys optimum iodine nutrition, even with a low salt iodization level compared to international standards. The absence of a direct relationship between the iodine content in household salt and the iodine status of the children and the women suggests household salt contributes only a fraction of their overall dietary intakes. Thus, the use of iodized salt in the food industry would likely contribute a major share of the dietary iodine consumption in Serbia.

Figure 3: Histogram of UI concentrations in pregnant women, Serbia, 2007



Overall, the iodine nutrition status among the entire group of pregnant women was just sufficient. The pregnant women who were not using iodine supplements, however, had a borderline iodine status. This supports a recommendation for a modest upward revision of the current mandated salt iodization range and suggests only potassium iodate should be permitted as fortificant.

Inspectors of Sanitary Surveillance conduct regular salt inspections in the markets and the food industry, and they submit the samples to IPHS for analysis to ensure continued quality of the iodized salt supply. The salt iodine measurements indicate that the quality assurance of iodized salt production is functioning well. The IPHS functions de facto as the coordinating entity on behalf of the Government, but it receives no

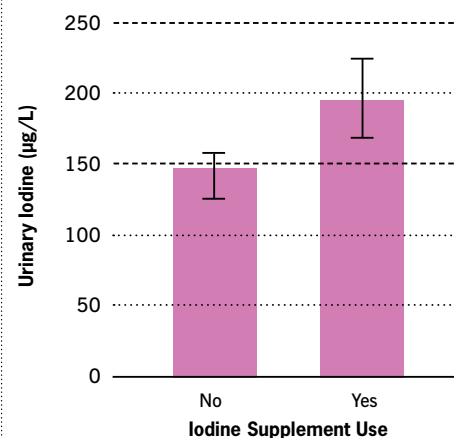
specific budget allocation for this purpose. Awareness of IDD and salt iodization is an integral part of the public history of Serbia and this technical knowledge has been included in regular educational curriculums of primary and secondary schools, as well as various professional colleges. The Ministry of Health has recently re-established a National IDD Commission, which is expected to review the latest information and give guidance on future policy.

For the past 50 years, salt iodization levels in Serbia have increased slowly and in small steps, while aiming to avoid excess thyroid disorders in vulnerable populations. Even today, the mandated levels are still low by international standards (6). There is increased realization that the iodine consumption of pregnant women provides a better gauge of the risk for poor fetal development from low iodine intake. Thus, the finding that pregnant women when not taking iodine supplements have borderline iodine nutrition has renewed impetus for considering an upward revision of the salt iodization level in Serbia.

Long-term commitments by all public, private and civil stakeholders in solving IDD as a national priority forms the basis for ensuring adequate iodine consumption from the diet. There needs to

be broad recognition and awareness of the importance of IDD, continued joint efforts to control IDD using up-to-date methods and technologies, and rapid and effective programs and legislative solutions.

Figure 4: UI concentrations in pregnant women by iodine supplement use, Serbia, 2007



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Pregnant and reproductive-age women in the United States may be at risk for iodine deficiency, particularly if they do not regularly consume dairy products

This article is excerpted from the paper “Some Subgroups of Reproductive Age Women in the United States May Be at Risk for Iodine Deficiency” by **Cria Perrine, Kirsten Herrick, Mary Serdula** and **Kevin Sullivan** from the Centers for Disease Control and Prevention and Emory University, in Atlanta, USA, that was published on-line on June 15, 2010, in the Journal of Nutrition.

Although the U.S. population has traditionally been considered iodine sufficient, median urinary iodine concentrations (UIC) have decreased 50% since the 1970s. The 2001–2006 NHANES data from urine iodine spot tests for pregnant ($n = 326$), lactating ($n = 53$), and nonpregnant, nonlactating ($n = 1437$) women of reproductive age (15–44 y) were analyzed. WHO criteria were used to define iodine sufficiency (median UIC: 150–249 $\mu\text{g/L}$ among pregnant women; $>100 \mu\text{g/L}$ among lactating women; and 100–199 $\mu\text{g/L}$ among nonpregnant, nonlactating women).

The iodine status of pregnant women was just sufficient (median UIC = 153 $\mu\text{g/L}$; 95% CI = 105–196), while lactating (115 $\mu\text{g/L}$; 95% CI = 62–162) and nonpregnant, nonlactating (130 $\mu\text{g/L}$; 95% CI = 117–140) women were iodine sufficient. Fifty-two percent of pregnant women never or rarely consumed table salt, 81% were not consuming a supplement that contained iodine, and 14% consumed no dairy products in the



previous 24 h. Among nonpregnant, nonlactating women, 56% never or rarely consumed table salt, 79% were not consuming a supplement that contained iodine, and 20% consumed no dairy products in the previous 24 h.

Dairy product consumption was an important contributor to iodine status among both pregnant and nonpregnant, nonlactating women, and those who do not consume dairy products may be at risk for iodine deficiency. Among pregnant women who had consumed no dairy products in the previous 24 h, median UIC was 100 $\mu\text{g/L}$ compared with 163 $\mu\text{g/L}$ among those who had consumed dairy products in the previous 24 h. When stratifying dairy product intake of nonpregnant, nonlactating women into quintiles, median UIC were lesser among women in the lowest 2 quintiles of consumption compared with those in the highest 2 quintiles (Figure 1). The median UIC among nonpregnant, nonlactating women with no or low dairy product consumption was just above the cutpoint of 100 $\mu\text{g/L}$ for sufficiency.

To address the iodine needs of the population, the United States began fortifying table salt in the 1920s. However, today most salt in the U.S. diet comes from processed foods rather than added table salt and most of it is not iodized. In this analysis, approximately one-half of the women reported they never or rarely added table salt to their food. Given changes in dietary habits, including greater intake of processed foods and more foods being consumed away from home, new strategies may be needed to ensure sufficient iodine intake among all women of reproductive age. The results confirm that dairy products are an important contributor to iodine status among both pregnant and nonpregnant women of

reproductive age in the United States.

The natural iodine concentration of milk is rather low; however, supplementing cattle feed with iodine and the use of iodophors as disinfectants in the milking process can increase the iodine content of dairy products (1).

Several countries have successfully used mandatory iodine fortification of cattle fodder to ensure adequate iodine nutrition of the population. The USDA has set a limit on the amount of iodine that can be supplemented in cattle feed, but the use of iodophor disinfectants is not regulated or monitored in the U.S. Thus, the levels of iodine present in dairy products in the U.S. can vary substantially and it is

unclear how much of the iodine comes from supplemented cattle feed versus the use of iodophor disinfectants. The accidental contribution of iodine to dairy products through iodophor disinfectants is an important source of dietary iodine in many countries (2).

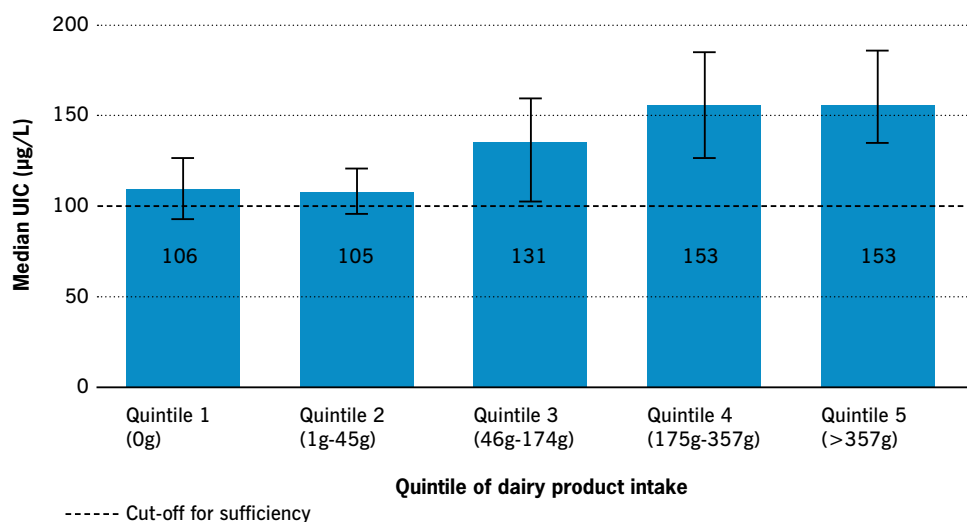
Australia is an example of a country that was iodine sufficient for decades until changes in dairy industry practices inadvertently reduced the iodine content of dairy products, contributing to iodine deficiency among the population (3).

While dairy plays such an important role in iodine nutrition, increased monitoring of iodine levels among the population, as well as increased understanding of the sources and levels of iodine in dairy, is warranted. It is concerning that an important source of iodine in the U.S. diet partially occurs by accident and is susceptible to change with little notice.

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Figure 1 UIC of nonpregnant, nonlactating women by quintiles of previous day's dairy product intake. Values are medians and 95% CI, $n = Q1, 315; Q2, 242; Q3, 278; Q4, 273; Q5, 267$. Median UIC differ by quintile of dairy product intake, $P < 0.01$.



An effective iodized salt program provides adequate iodine for pregnant women in Bosnia and Herzegovina

Selena Bajraktarevi UNICEF Bosnia and Herzegovina and **Borislav Karanfilski** Medical Faculty, Skopje

Bosnia and Herzegovina (BH) was traditionally iodine deficient with regions of endemic goiter. The first prophylaxis for iodine deficiency was introduced in 1956 and consisted of adding 7 mg of iodine per kg of salt. Subsequent surveys, conducted by the Public Health Institute of BH, in 1963–1973 showed a decrease in the occurrence of goiter. However, the results of a 1999 survey showed that goiter remained in 25% of schoolchildren. A seminar organised by UNICEF BH on iodine deficiency in the country was held in 1999. Conclusions from the seminar included the recommendations that: a) 20–30 mg/kg of iodine should be added to salt; b) the more stable potassium iodate should be used for that purpose; and c) a national committee for control of IDD should be established.

To the satisfaction of all, these recommendations were successfully implemented. IDD committees, including representatives from all the relevant stakeholders, were established in the Federation of BH and Republika Srpska. In the Federation of BH a rulebook prescribing the addition of 20–30 mg/kg of iodine to salt was adopted in 2001, and the same program was begun in Republika Srpska in 2005. The first version of the rulebook for the Federation of BH prescribed that iodate and iodide could be added to salt, whereas the rulebook for Republika Srpska only prescribed the more stable iodate. At a later stage these



two rulebooks were harmonized, and only iodate was approved for salt iodization for the entire territory of BH.

A survey in 2005–2006 across the entire territory of BH evaluated the iodine status of schoolchildren aged 8–10 y by measuring urinary iodine concentrations (UI) and thyroid size by palpation and ultrasonography. This survey showed a decrease in goiter from 25% in 1999 to 7.8% in 2005/6, while there was an increase in the median UI from 102 µg/L to 157 µg/L. These results were explained by the well-known fact that preventive measures lead to a normalization of UI values in a short period of time, but the correction of increased thyroid volume takes several years.

Overall, the survey indicated that the correction of iodine deficiency had been accomplished in BH for the first time.

Yet this study did not assess the level of iodine intake among pregnant and lactating women, whose iodine requirement, due to higher rates of thyroid hormone production, is at least twice that of schoolchildren and adults. Thus, the aim of a survey conducted in BH in 2007–2008 was to estimate the level of iodine intake among pregnant women as well as to evaluate the potential need for iodine supplementation. According to WHO, the median UI for pregnant women should range from 150 to 250 µg/L and be at least 100 µg/L for lactating women.

The results of the 2007–2008 survey found a median UI of 160 µg/L for all pregnant women in BH; 46% of all pregnant women had a UI below 150 µg/L. The median UI among lactating women was 170 µg/L, which is adequate; only 22% had UI values below 100 µg/L.

Although most pregnant and lactating women in BH have adequate iodine intakes, they should be encouraged to use an iodine supplement of 100 µg/day. In BH this should apply in particular to women who, for whatever reason, consume less salt than is recommended or are in the habit of using limited amounts of salt in their daily diet. This also applies to women that live in rural areas and who, for social or other reasons, exclusively use food produced in iodine-poor BH soil.

In the 2005/2006 survey, household salt sampling showed that only 40% of the analysed samples were properly iodized: 38% were under iodized (<20 mg/kg) and 21% were over iodized (>30 mg/kg). Most samples were iodized with potassium iodide. To use the results of the survey on pregnant and lactating women in 2007–2008 to reevaluate the quality of salt used by the population of

BH, each pregnant and lactating woman was asked to bring in a sample of the salt that they used at home. The analyses showed that the quality of salt used by the BH population was still unsatisfactory in 2008, even though it was much better when compared to 2005. In 2008, 65% of samples were properly iodized, and the number of under iodized samples decreased to 11% while the number of over iodized samples fell to 21%. The results showed that a large portion of the salt was still iodized with iodide rather than iodate, both in the Federation of BH where both were still allowed under the regulations in force at that time and in Republika Srpska where this was not permitted. These older regulations have now been revised and now stipulate that salt for human consumption, including that used by the food industry, should be iodized with 20 to 30 mg/kg using only the more stable potassium iodate.

Although efforts have resulted in significant improvements in salt iodization, activities should be continued with the same intensity in order to accomplish the best results and achieve WHO standards. Progress in the correction of iodine deficiency in BH has been achieved due to broad societal involvement

and action. Information and educational activities aimed at the population concerning the importance of using iodized salt in the household will continue in the future. Health workers, consumer organizations and other non-governmental organizations, as well as print and electronic media, can contribute towards the successful dissemination of this important message. BH has a well-established IDD program and has achieved IDD elimination, but it now faces the challenge of sustaining this progress.



New Zealand pregnant women offered new iodine supplement

On July 1, 2010, a new iodine tablet was launched targeted at pregnant and breastfeeding New Zealand women. The 150 µg iodine supplement will be subsidized, and recommended by the National Health and Medical Research Council and the New Zealand Ministry of Health for daily consumption by all women considering pregnancy, or who are currently pregnant or breastfeeding.

Pregnant and breastfeeding women in New Zealand are not currently getting enough iodine and need to top up their intakes to meet their requirements. This new supplement, along with consumption of iodine containing foods, will help pregnant and breastfeeding women in New Zealand to meet their iodine requirements.

New Zealand nutrition experts were asked for their views on this new supplement.



sistently until they stop breastfeeding. This will ensure that there is normal development of the brain and nervous system for their baby. Unfortunately damage through insufficient iodine is irreversible and reduces a person's mental capacity. Dietitians NZ is very pleased that PHARMAC has chosen to make the iodine supplement freely available to pregnant and breastfeeding women."

Carolyn Cairncross, Nutritionist at the New Zealand Nutrition Foundation, comments:

"Iodine is essential in our diet to ensure the thyroid gland functions normally... Any woman who is pregnant or breastfeeding requires more iodine to make sure they have enough for both themselves and their baby. As it is unlikely that they will receive enough iodine from diet alone, a daily supplement of 150 micrograms is recommended from when a woman is considering pregnancy, while pregnant and for the whole time she is breastfeeding.

Jan Milne, Executive Director of the professional association for dietitians, Dietitians New Zealand, comments:

"Dietitians in New Zealand are pleased that the iodine supplement will be freely available to pregnant and breastfeeding women at no charge. The soil in New Zealand has a low iodine content,

meaning that our food supply does not provide enough iodine in our diets. For most people, the recent addition of iodine to bread through fortification has brought our iodine intake up to a reasonable level. This is not the case for women who are pregnant or breastfeeding as they have even greater requirements. It is essential for women who are planning pregnancy to get started on the 150 µg tablet and keep taking it con-

Tablets containing this amount of iodine are now available in New Zealand, making it easier for these women to increase their daily iodine intake over this time."

Helen Little, Dietitian and Professional Advisor, Women's and Children's Division, Canterbury District Health Board, comments:

„New Zealand pregnant and breastfeeding women can now achieve an adequate iodine intake via a new iodine-only tablet now available in New Zealand...It is difficult to meet the

additional requirements for pregnancy and breastfeeding with diet alone as New Zealand's food supply is low in iodine. Some good dietary sources include cooked seafood, iodized salt, eggs, milk, iodized bread, and sea-meal custard. Along with good dietary sources of iodine it is recommended a daily supplement of one tablet containing 150 µg of iodine for all women planning a pregnancy, during pregnancy and this should continue for the duration of breastfeeding. For further information, I would recommend that people contact their midwife, dietitian, doctor, or pharmacist."

Further information

NHMRC Public Statement: Iodine supplementation for pregnant and breastfeeding women: http://www.nhmrc.gov.au/_files_nhmrc/file/publications/synopses/new45_statement.pdf

Information from the Ministry of Health on iodine status in New Zealand:

<http://www.moh.govt.nz/moh.nsf/index-mh/nutrition-iodine#supp>

New Zealand Nutrition Foundation facts on iodine: <http://www.nutritionfoundation.org.nz/nutrition-facts/minerals/iodine>

Italian women using iodized salt before pregnancy have better thyroid function than those who only begin iodized salt use during pregnancy

In Europe, less than 50% pregnant women receive iodine-containing supplements, and for most women in this life stage, dietary iodized salt is the major source of iodine. Moleti and colleagues, at the University Polyclinic in Messina, Italy, performed a longitudinal study in young Italian women to investigate the effects of the duration of iodized salt consumption on maternal thyroid function during pregnancy. They prospectively evaluated thyroid function in 100 consecutive thyroid antibody-negative pregnant women from a mildly iodine-deficient area. Sixty-two of these women had regularly used iodized salt for at least 2 yr prior to becoming pregnant and were classified as long-term users, and 38 had commenced iodized salt consumption upon becoming pregnant and were classified as short-term users.

They found marked differences in thyroid function between the two groups. Long-term iodized salt consumption resulted in a very low prevalence of maternal



thyroid dysfunction during pregnancy. In contrast, short-term consumption did not seem to protect against the risk of thyroid dysfunction. The prevalence of thyroid dysfunction was almost 6-fold higher in short term than in long term users: it was

36.8% in short term users vs. 6.4% in long term users; the relative risk was 5.7, with the 95% confidence interval 2.03-16.08 ($p < 0.001$).

The data suggest that long-term iodine prophylaxis using iodized salt reduced the risk of maternal thyroid dysfunction by 82.5%. The authors concluded that prolonged use of iodized salt significantly improves maternal thyroid economy and reduces the risk of maternal thyroid insufficiency during gestation. It appears long-term use of iodized salt in Italian women is necessary to ensure that intrathyroidal iodine stores have been built up and are thus adequate to meet increased iodine needs during pregnancy.

See: Moleti M, et al. Iodine prophylaxis using iodized salt and risk of maternal thyroid failure in conditions of mild iodine deficiency. *J Clin Endocrinol Metab.* 2008;93(7):2616-21.

How much does availability of iodized salt improve iodine nutrition?

Susan Horton CIGI Chair in Global Health Economics, The University of Waterloo, Canada; **Alexander Miloff**, Senior Research Associate, Harvest Plus

We would expect broader distribution of iodized salt within countries would be associated with better iodine nutrition. A recent study shows that for both developed and developing countries, wider availability of iodized salt is associated with higher median urinary iodine excretion (UI) in schoolchildren (one of the more readily available indicators of iodine status) (1).

Of course, there are other factors which also affect iodine status. For developing countries, there appears to be a modest improving time trend, perhaps reflecting better implementation and enforcement of salt iodization regulations. For developed countries, soil iodine levels also have a positive effect on iodine nutrition.

These variables are not the only predictors of iodine status. Many other variables intervene. Even if salt is iodized, the level of iodine mandated and the quality of monitoring and enforcement matter. Likewise, the availability of iodine from other sources in the diet varies (for example, use of iodine compounds in milk production, consumption of certain marine products, and importance in the diet of processed foods which contain non-iodized salt).

Data and methods

The study required the construction of two databases, each containing data on median UI for schoolchildren as a measure of iodine status. Although median UI of pregnant women would be particularly interesting, this is not available for many countries. The data on UI come from the WHO database (2).

For developing countries, the WHO UI data were matched to data on household consumption of iodized salt from the same year, available from UNICEF (3). Matching for the same year was possible for 30 countries (for five countries, matched data were available for more than one year). A variable was also created to represent whether or not the country had regions of known iodine deficiency (4).

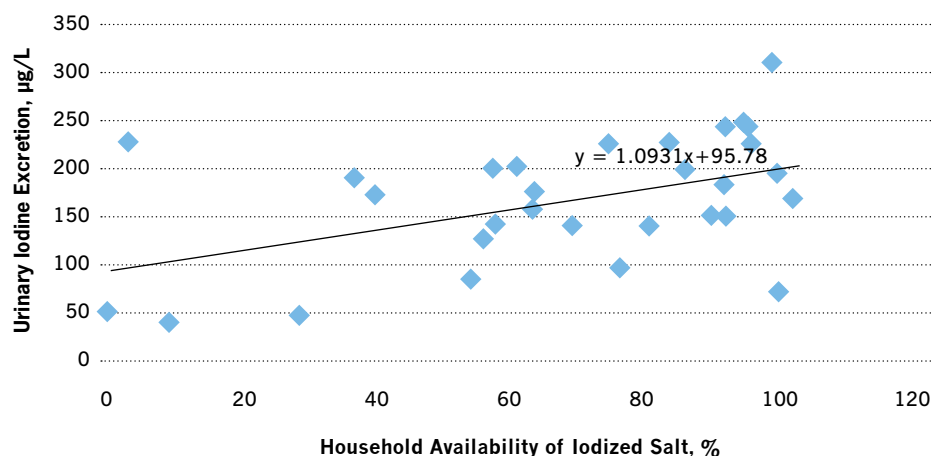
For the developed countries, data were used on salt penetration ratio (proportion of table salt marketed, which is iodized): these were also matched to UI data within a 5-year window. Data are much less readily available for developed countries; however, unlike the developing countries, there have been fewer policy changes regarding iodization. These data were also matched to median soil iodine data from the British Geological Survey (5). This yielded a database for 13 countries. Multiple regression analysis was used to analyze the effects of iodized salt on urinary iodine, how this was also mediated by soil iodine, and whether there were any time trends.

Results

Figures 1 and 2 show the relationships between UI and iodized salt availability. There is obviously considerable variance in UI due to other factors, such as other iodine sources in the diet, or presence of goitrogens in the diet. However, the figures suggest that UI responds positively to availability of iodized salt. The data suggest that an increase of 1% in availability of iodized salt (whether measured as availability to households, or as the iodized salt penetration rate), is associated with an increase in UI of between 0.73% and 0.83%.

Soil iodine also has a positive and significant effect on UI for the developed countries, and a 1% increase in soil iodine in developed countries is associated with a 0.77% increase in urinary iodine. For the developing countries, UI has also increased over the decade considered (1996 to 2005), possibly related to improved program implementation. The explanatory variables accounted for about two-thirds of the variance in UIE across countries.

Figure 1 UIE versus household availability of iodized salt, 30 developing countries



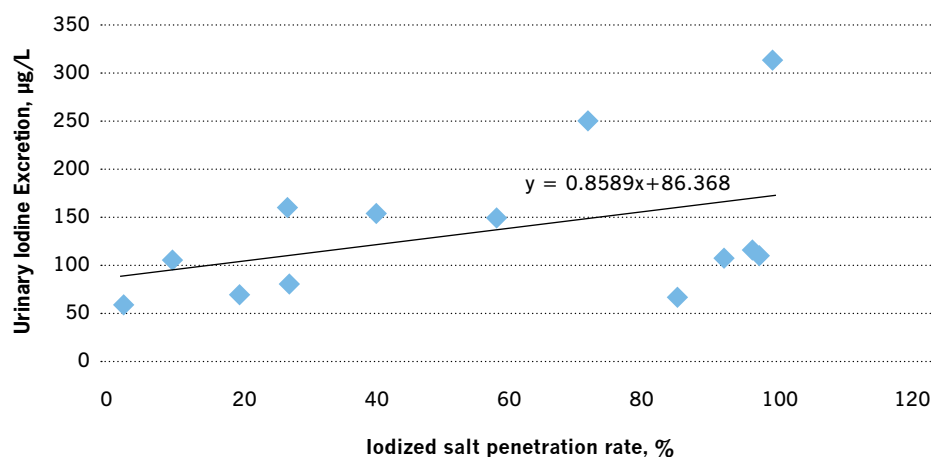
Application to policy

There has been a concerted effort to improve iodine status in the developing world, through Universal Salt Iodization. This cross country analysis supports the benefits of this initiative. It also points to the importance of similar policy options for developed countries. Salt iodization is particularly important for countries with lower soil iodine; New Zealand is one industrialized country with particularly low soil iodine, which has given this policy priority. However, even in countries with higher soil iodine such as the UK and Ireland, salt iodization can help protect groups who are vulnerable to adverse effects of deficiency, such as pregnant women.

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Figure 2 UIE versus salt penetration, 13 developed countries



Achieving and Sustaining Universal Salt Iodization: Reflection on Issues and Strategies

It is well known that 15 to 20 high burden countries account for a significant proportion of the un-iodized salt that is produced and consumed. The Micronutrient Initiative (MI) along with national governments, salt industry and international partner organizations including UNICEF, WFP and the International Council for the Control of Iodine Deficiency (ICCIDD) has been actively involved in supporting salt iodization programs in several developing countries. This article reviews 6 countries as a sample set of countries to reflect a variety of issues faced and strategies used to deal with them in 2009.

Venkatesh Mannar and **Annie Wesley** Micronutrient Initiative, Ottawa, Canada

ETHIOPIA

After almost achieving Universal Salt Iodization in the early 1990s, iodized salt consumption in Ethiopia dropped to as low as 5% after Eritrea seceded from Ethiopia and much of the country's salt was being imported. In response to this, indigenous sources for salt production, including the salt deposits at Lake Afdera in Afar Regional State established national salt production. After a prolonged debate over the strategy to be followed for re-starting and scaling up salt iodization, consensus was finally reached. Federal and regional officials and other key stakeholders agreed that iodization should start at Lake Afdera, where it would be carried out the local youth association using the existing machines. Whilst this interim measure was in place a Central Salt Iodization facility would be constructed at the Lake capable of iodizing all the salt produced outside the existing AFSPC plant. An arrangement linking the largest producer, the



Satellite picture of Lake Afdera showing location of salt fields

Afar Salt Production Share Company with the local Youth Association was initially able to produce 3,600 MT of iodized salt using mobile salt iodization machines and training. A topographic and soil survey at the site allocated to the central salt iodization plant at Lake Afdera in the Afar region was also commissioned.

Another challenge was the confusion created as a result of excessive production of salt relative to the domestic demand. The pricing of both iodized salt and non-iodized salt became a critical issue. An analysis of the costs incurred in salt production at the Lake formed the basis for the prices that the Federal government finally imposed on the producers. To help resolve some of

the many ongoing issues, an experience sharing and fact finding study visit was organized for key regional and federal staff to salt iodization plants in Senegal, and sensitization workshops for relevant regional staff on IDD and salt iodization. A detailed study of the options for iodization was proposed to have a clear direction and a basis for an informed decision by all the stakeholders. A team of consultants completed this study in May 2010 and the report is being finalized. A decision on the long term strategy for iodization is to be made as part of a Government Master Plan for the minerals industry which is being produced by the Federal Ministry of Mines and Energy.



Partnership meeting of key agency representatives with Dr. Kesetebirhan Admasu Birhane, Director-General for Health Promotion and Disease Prevention, Federal Ministry of health, Ethiopia

Concurrently, a field assessment led by FMOH was conducted in Afar to help develop a new short term plan to fast track salt iodization using existing equipment and supplies. Following this field assessment, the FMOH in consultation with the Afar Regional government and other stakeholders decided that salt iodization should be done by salt producers themselves instead of the youth association as originally planned. The Federal Ministry of Health undertook a resource mapping exercise for the implementation of this strategy and, in early 2010 requested the support of partners in supplying resources to meet the needs identified. Also in early 2010, a stakeholders meeting was held to develop a coordinated approach by the interested international organizations including MI, UNICEF, GAIN and World Bank, to support the government strategy. During this meeting

the stakeholders identified the areas in which they would be willing to provide inputs and this information was fed back to the FMOH. This support, initially for decentralized iodization of salt in the field before it is packed for sale, will be integrated with a long term approach to centralize the refining and iodization of salt as part of a Master Plan for the minerals industry.

The delays in progress with salt iodization means continued risk for Ethiopia's newborns. With a relatively large proportion of people below the UIE cut-off, the risk of mental impairment required urgent action. As a temporary measure MI and UNICEF are working to procure and distribute iodized oil capsules in the endemic regions of the country.

GHANA

Although Ghana is recognized as the second largest salt producer in the West Africa sub-region, recent estimates of proportion of households consuming adequately iodized salt is only 33%. However, during 2009, levels of iodization in Ghana have continued to increase at a slow but steady pace with processors continuing to show willingness in principle to iodize in spite of practical difficulties. An improved production season led to an overall increase in the amount of iodized salt produced from 9,807 to 13,425MT though there was also a decrease as a percentage of the total production. Information gathered during field visits suggest that the two key constraints to processors iodizing were: a) the lack of an effective enforcement system which has the effect of penalizing processors who carry the cost of iodizing their salt; b) an unreliable and difficult access system for providing iodate to processors.

In order to fully understand these constraints and to make recommendations on how to overcome them, MI in partnership with WFP, commissioned two consultants to investigate and present



Salt fields in Ghana

their findings at a stakeholder workshop held in Accra in November 2009. During the investigations and at the workshop, a third constraint was identified as the lack of a strong coordinating body for USI in Ghana, a so-called "one stop shop". The reports and the discussions from the workshop are to be presented to the key decision makers within the Government of Ghana and will form the basis of planning of future USI activities. One particular concern remains the continuing failure of the two supported cooperatives to act effectively not only to iodize but also to establish and operate the salt banks which have been strongly supported by the Government. The lack of a cooperative culture will need to be tackled in future years if USI is to be achieved in Ghana where 35% of the salt is produced by small and micro processors.

INDONESIA

The National Socio Economic Survey (CBS 2005) indicated 73% of households as consuming adequately iodized salt. Later surveys indicated a fall in this number to 62.8% (RISKESDAS 2008). However, when reliable quantitative measures (titration rather than rapid test kits) were used in 30 sampling districts/cities, the survey found only 25% of Indonesian households to be consuming adequately iodized salt, due to problems with low quality iodization. This alarming picture was corroborated by potassium iodate sales data.

One strategy involved national level partnerships of MI and UNICEF with the Central Government to develop and

implement a National USI/IDD Strategy and USI-IDD Action Plan. The other part of the strategy involved partnership with local governments to support implementation of projects within the plan framework. These focused on a) improving the quality control and quality assurance of small and medium salt processors in Java b) improving production technology and efficiency of large salt processors in East Java and c) continuing onsite iodization of raw salt and developing business models to iodize salt which is currently not iodized. In Bima and Lombok Island, ~12,200 MT of iodized salt was produced in 2009, over double last year's total, as a result of technical and material support to the salt industry. The local government capacity to monitor the quality of salt was also developed and strengthened.



Quality control at P.T. Garam, salt company, East Java, Indonesia

Strong political commitment by the local government was shown by the issuance of a decree on the prohibition of non-iodized salt distribution in Bima. In addition, the Governor of West Nusa Tenggara Province issued a decree in early 2010 to “increase the consumption of iodized salt” for the province. Approximately IDR 4 billion/year was committed by the government for imple-

mentation which includes provision of subsidies for the poor and for school children to purchase iodized salt. It is expected that consumption of iodized salt will increase significantly in this area due to these efforts. In order to accelerate USI achievement in Indonesia, equipment in five large-scale salt processors in East and Central Java will be upgraded in the next three years to improve salt production technology and efficiency. It is expected that 250,000 MT of additional iodized salt production capacity will be achieved during two years of this project's implementation. In addition, about 290 small and medium-scale salt processors in Java will be assisted for salt iodization quality control and quality assurance.

PAKISTAN

With a National Program Officer for USI-IDD placed in the Ministry of Health, the Government is well positioned to implement and strengthen IDD control and USI Program in Pakistan. During the year, the focus was consolidation, quality assurance and enhanced monitoring of the program. An additional 270,000 MT of iodized salt was produced in 2009, enough for approximately 67 million people, and a 25% increase from last year's total. The plan for 2010 is to actively strengthen the government's quality control systems through strengthening the laboratories.

Strategies adopted during implementation

Based on the lessons learnt in previous attempts for USI in Pakistan, the main focus of the program has been capacity building of the salt processors and district health managers, provision of equipment and other logistics required for salt iodization, ensuring regular and continuous supply of potassium iodate, and continuous monitoring and supervision. The following strategies were adopted:

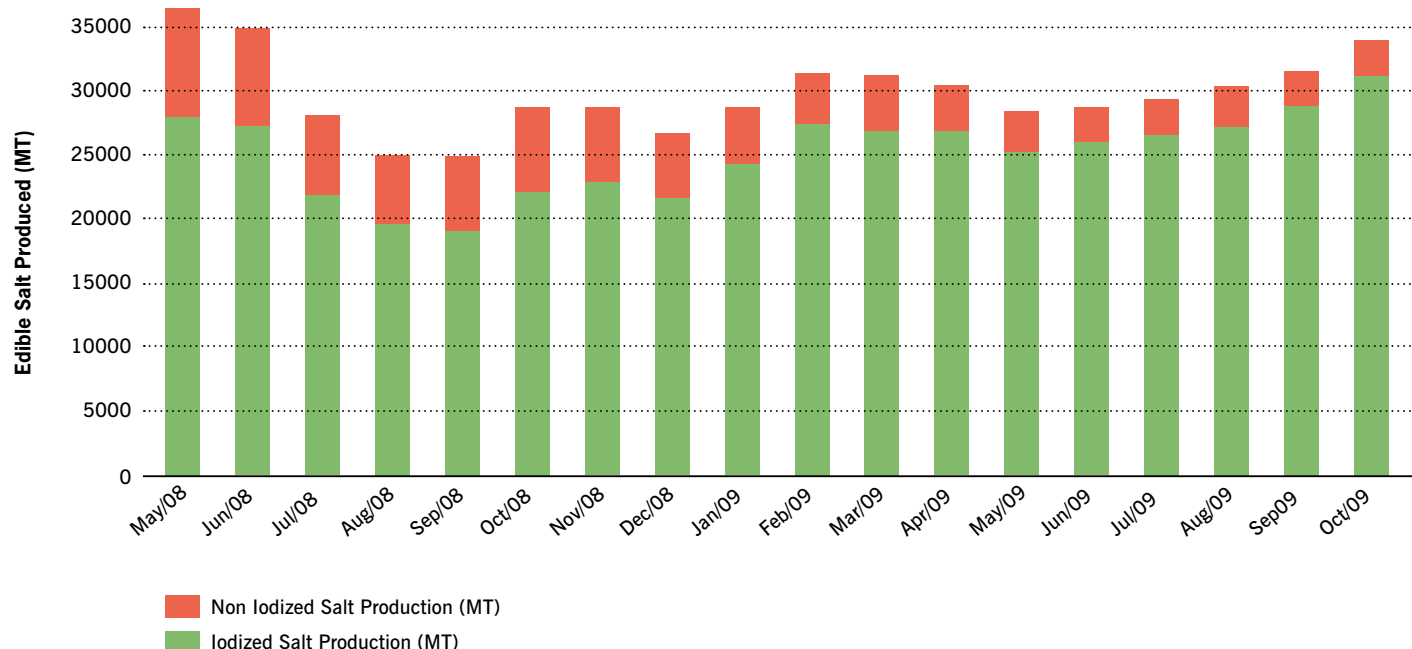
- **Support to salt processors:** including training on iodization, quality assu-

rance and internal monitoring; provision of free equipment and potassium iodate at a subsidized rate; RTKs for monitoring and financial assistance for refurbishment to small units

- **Support to Health Department:** Under this support, District Focal Persons, district health managers and other field staff were trained on techniques of iodization, monitoring, supervision, reporting and quality control. Government laboratory capacity was strengthened for using titration methods to analyze iodine content of salt
- **Support in advocacy and awareness creation:** Advocacy and dissemination seminars were arranged periodically to disseminate the achievements gained in the program and to gather support from different stakeholders. Orientation trainings of medical and paramedical staff, NGOs and community workers were carried out in a bid to increase awareness in the community to reduce misconceptions and increase the demand for iodized salt
- **Legislation:** A regulatory framework is important for the success of a program. Due to long overdue National Legislation in USI, strong efforts were made to utilize the new devolved system of governance and get district and provincial/regional legislation on USI. District level legislation on compulsory USI has been enacted in 27 out of 97 project districts of Pakistan and the state of AJ&K (up from 13 last year) which covers >65 million out of 154 million people of the target districts.

In addition to commodity and equipment support to salt processors, government laboratories were strengthened, with key staff trained on quality control and quality assurance. Monitoring reports currently suggest that over 70% of the edible salt is now being iodized, reaching a total of 154 million individuals throughout the country. However the extent to which this salt is adequately iodized is not yet well understood.

Iodized vs Non-iodized Edible Salt Production in 65 Target Districts of Pakistan (data based on Rapid Test Kit method)



To confirm the level of iodization at production level, a survey in 2010 is proposed which will sample from over 800 of the processors to determine the proportion of processors who are iodizing salt and estimate the quantity of edible salt which is being iodized overall at national level.

NIGERIA

No sooner was Nigeria accorded USI status in 2007 than the 2007 MICS report indicated that household consumption in northern zones had reduced significantly, pulling the national average below 75% from well above 90%. This was corroborated by the 2008 Nigeria Demographic Health Survey (NDHS), which put the current coverage even lower at 53%. A USI workshop under the auspices of National Planning Commission (NPC) helped bring together key stakeholders (including private sector, regulatory agencies (NAFDAC and SON), academia, NGOs, govern-

ment and development agencies), to discuss the possible causes of the problem and solutions. It was decided to commission a study to understand the supply chain from production to consumption and identify possible reasons for slippage. Other activities being undertaken include a correlation study between iodine deficiency and household consumption of iodized salt, with preliminary results available in 2010/2011. A desk review to re-establish and validate salt intake levels nationally is also being planned.

Trends in household coverage of iodized salt in Nigeria (2002-2007)

Zones	NPHCDA/MO E-2002 (1256 samples)	NDHS-2003 (1260 samples)	FMOE-2005 (1260 samples)	MICS-2007 (25485 samples)
North Central	84.4	92.7	83.3	75.7
North East	90.0	98.8	96.7	66.4
North West	95.2	98.2	97.1	67.8
South East	82.5	97.0	81.0	85.9
South South	92.9	98.0	86.2	82.2
South West	85.7	98.0	98.6	83.0
National	88.5	97.3	90.5	74.9

SENEGAL

A strong and effective Government leadership, along with inputs from international agencies, helped to increase the capacity and commitment of small-scale salt processors – leading to production of an additional >65,000 MT of iodized salt this year. MI and WFP in collaboration with UNICEF provided support, through the “Cellule de Lutte contre la Malnutrition” (CLM) to increase the quantity of adequately iodized salt through building and reinforcing the technical and organizational capacity of the small salt processors. This has

The regional purchasing units established to facilitate and sustain the procurement of potassium iodate continue to play a central role in providing ready access for small salt processors to this key input. During 2009, 2,340kg of potassium iodate were directly procured by the local organizations of small salt processors (GIEs) and used for their ongoing salt iodization activities. 2.6 MT of potassium iodate was purchased by the central purchasing units to restock. Efforts are ongoing to improve the enabling environments and the targeting of further interventions. Discussions are underway with UNICEF

and HKI to support the West African Health Organization (WAHO) to work on harmonization of salt iodization standards in the ECOWAS region. In collaboration with partners including the Government of Senegal (MoH and CLM) and Cheick Anta Diop University in Dakar, a National Iodine deficiency disorders and salt iodization survey in Senegal to estimate the USI coverage and the IDD prevalence in children and women was conducted. The survey also aimed to assess the correlation between USI and IDD as well as other risk factors of IDD in Senegal. 3768 households from the 14 regions of Senegal have participated in

the survey. The efficiency of the survey was improved through programming Personal Digital Assistant (PDA), a field friendly electronic device being used to save time and cost of large scale surveys. Field staff could be trained to collect

data. The data analysis is underway. The results will be useful to make appropriate adjustment to the national iodine deficiency disorders control and prevention program.

Conclusion

Although each country is unique in terms of issues faced and strategies used to address them, identifying common elements will help in applying the lessons for other situations. Some overarching issues and lessons include:

- Need for renewed advocacy at policy level in countries
- More evidence of functional and economic impacts of iodine deficiency and effectiveness of intervention
- Stronger involvement of salt industry in national planning and implementation of the USI program
- Inadequate incentives for salt processors to iodize
- Support to countries to establish iodization and sustained mechanisms for procurement of iodate and consumables
- Inadequate monitoring and surveillance
- Risk of slippage and mechanisms for corrective action

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USI coverage survey in Senegal

proven to be a promising strategy to help Senegal achieve universal iodization of the salt it produces for domestic consumption and for export to Mali, Burkina Faso, Guinea and Ivory Coast.

Meetings and Announcements

High Level Forum on Elimination of IDD in China

The Health News and Communication Centre, Ministry of Health (MOH), People's Republic of China and China Center of Diseases Control (CDC) organized the "High Level Forum on Elimination of IDD", supported by UNICEF, on May 15, 2010 to celebrate the 17th National IDD Day. More than 100 participants were invited to attend the one-day Forum in Beijing, including participants from ministries, NGOs, the salt industry and the public health sector.

Zupe Chen, Yuqin Yan and **Mu Li** ICCIDD, People's Republic of China



The forum was opened by Dr. Bai Huqun, Deputy Director, Department of Disease Prevention and Control, MOH. Then, Dr. Yin Yin Nwe, UNICEF Representative to China and Mr. Cris Tunon, Senior Program Manager, WHO China Representative Office, gave speeches highlighting the remarkable achievements China has made in the effort to eliminate IDD through USI as a major public health problem. They also stressed the importance of China's success in setting the example for the world.

The first session was the following invited lectures focusing on different hot issues raised recently by public media of China: a) Global trends in programming to eliminate iodine deficiency (Jonathan Gorstein, University of Washington, USA); b) The national regulation on salt iodization needs to be modified (Weipin Teng, from

China Endocrinology Association); c) The historical progress and further challenge in the elimination of iodine deficiency in China (Zupe Chen, from NIDDAC and ICCIDD); d) Iodine intake and incidence and prevalence of thyroid diseases (Rajan Sankar, from GAIN); e) The impacts of iodine on current Chinese health status and their strategy (Bingyin Shi, from China Endocrinology Association).

The second session was for reporting results from the investigation on iodine nutritional status and analysis on iodine content in daily food in the population living in coastal areas. This project, supported by MOH and UNICEF, was carried out in response to recent complains on USI. These have included potential iodine excess, the increasing incidence of thyroid diseases including papillary thyroid cancer, and the possibility of reducing salt iodine in the coastal areas

due dietary iodine from high intake of seafood. Liaoning, Shanghai, Zhejiang and Fujian Provinces were selected from 10 coastal provinces for this important study. There are four presentations. All provided valuable data for continuous need to have USI program in these areas regarding the following facts:

(1) The 2009 coastal residents' dietary iodine intake survey was carried out independently, and aimed to assess the actual dietary iodine exposure in the four coastal provinces/municipalities. The report showed:

- since China adopted USI, the population iodine intake level can meet the daily requirement;
- the iodine intake is below the WHO and European Union's Tolerable Daily Intake (TDI of 600µg/d) and the upper limit (UL) specified by WHO/UNICEF/ICCIDD (1100µg/d) and that of the Chinese Nutrition Society (1000µg/d);
- iodine from USI is the major contributor to iodine intake in people's diet, contributing 63.5% of intakes;
- the population average dietary iodine intake level is adequate and safe, not in excess.

(2) The aim of risk evaluation was to address whether under the current USI strategy, the residents in coastal areas are exposed to excessive dietary iodine intake.

The Evaluation concluded:

- a. The urinary iodine concentrations and dietary iodine intake data are consistent,

the overall iodine nutrition of the residents living in coastal areas is appropriate and safe; salt iodization did not cause excessive dietary iodine intake in residents living in coastal areas. In contrast, due to relatively low iodized salt coverage rate in both coastal urban and rural areas, iodine nutrition of the coastal residents is lower than inland rural areas in the same province. Iodine nutrition is insufficient in some pregnant women living in coastal areas who have a higher risk of iodine deficiency.

b. In areas of water iodine concentration < 150µg/L, the residents' overall iodine nutrition is appropriate and safe; the risk of iodine deficiency is greater than iodine excess, particularly if iodized salt is not con-

sumed. It is extremely necessary to continue the salt iodization strategy in order to control the risk of iodine deficiency.

c. There are different levels of iodine deficiency in different parts of China, iodine from iodized salt is the dominant source of iodine in people's diet; in light of the achievements have made in China in the prevention and control of IDD through salt iodization, it is considered the health benefit of salt iodization is far greater than the possible health risk.

Representatives from Xijiang and Tibet reported recent progresses made in these two Autonomous Regions under the leadership and support from both central and

local governments in the third session of the Forum. The Health News and Communication Centre of Ministry of Health held a press conference during the Forum. Zupei Chen, Weixin Dai (endocrinologist) Yongning Wu, Zhaoping Liu and Hongmei Shen participated in the conference and met with news journalists to introduce the major achievements, as well as the recent results of the survey in coastal provinces. China Central Television News reported the hot issues from the Forum and the Press Conference in the evening national news, and on the same day, a broadcast a special program entitled "The road to the health" with a focus on IDD and USI.

2010 Basil Hetzel Award given to Nicholas Kristof, columnist of the New York Times newspaper

2010 Basil Hetzel Award

Nicholas D. Kristof

New York Times

Dr. Basil Hetzel has been at the forefront of the global campaign to overcome iodine deficiency and its associated mental impairment, firmly establishing the causal role of iodine deficiency in brain damage to newborns. To honor his leadership, the International Council for the Control of Iodine Deficiency annually honors the person making the most significant public reportage of iodine deficiency disorders and the necessity of sustainable national programs.

Nicholas D. Kristof of the New York Times is the inaugural winner of the Basil Hetzel Award. Mr. Kristof has displayed an unerring understanding of the crucial role of micronutrients and of iodized salt in sustaining adequate iodine nutrition. Using columns in the opinion-leading New York Times, Mr. Kristof has stimulated sympathy for the cause of iodine nutrition, popularized understanding of the "hidden hunger" of micronutrient malnutrition and called the attention to the role of iodized salt in "Raising the World's I.Q."

"Without his work, the world would not know the pennies-per-year cost and compelling cost-benefit ratios of various public health interventions and that iodizing salt and fortifying other foods with micronutrients is an unrivaled public investment opportunity. Effective journalists understand the importance of putting a "human face" on news reportage. Mr. Kristof's understanding of the crucial contribution of salt iodization, happily, has been married to his compassion and communication skills. His stories from South Asia and West Africa have universal application, enormous power and compelling character. Like Dr. Basil Hetzel, Mr. Kristof has seen an important problem, taken time to understand the problem and its causes, and projected himself in leadership to make the world a better place for us all.

Reference:

"Raising the World's I.Q." December 4, 2008

"The Hidden Hunger" May 24, 2009

"The Women's Crusade" August 23, 2009

Gerard N Burrow

Gerard N. Burrow, chairman, ICCIDD
June 24, 2010

Food relief parcels of the International Committee of the Red Cross contain iodized salt

Hans Bürgi ICCIDD Switzerland

The International Committee of the Red Cross (ICRC) has recently sent out a brochure soliciting donations (ICRC Private Donations, CH-1202 Geneva, Switzerland). Among other information the brochure lists the content of various relief packages, e.g. for household items, hygienic items and food items, as currently provided for Iraq.

The food package contains the following items:

35 kg rice / 4 kg white beans /
4 kg red beans / 2 kg chick beans
4 l vegetable oil / 2 l olive oil /
2 kg tomato juice concentrate
2 kg sugar / 2 kg tea
1 kg salt (iodized)

The salt must fulfill exact specifications as to moisture and maximum content of heavy metals. The salt must contain 50 to 83 mg potassium iodate (equivalent to 30 to 50 mg of iodine) per kg. It is to be packed in newly woven polypropylene bags with an inner lining of a minimum of 50 microns. With probably hundreds of million of people relying on food parcels for survival, it is reassuring that relief organizations compose food relief packages with great care. To this purpose the ICRC and the International Federation of the Red Cross have prepared a catalogue that is already in its 3rd (2009) edition. The catalogue lists standards for 2000 commodities that may be included in relief packages [<http://procurement.ifrc.org/catalogue/>].

Abstracts

A simple indirect automatic method to determine total iodine in milk products by flame atomic absorption spectrometry

A simple, precise and accurate automatic method for the determination of total iodine in milk products by indirect atomic absorption spectrometry is proposed. Iodide in solutions resulting from alkaline ashing of samples is precipitated with silver ion in a precipitation-dissolution flow manifold, which allows performing on-line the retention of the silver iodide precipitate formed on a filter, its wash with diluted ammonia and its dissolution with a diluted thiosulfate solution. Dissolved silver is also determined on-line by flame atomic absorption, and the achieved amount of this metal is proportional to that of iodine in the sample. The proposed method is very selective, avoids interferences from anions present in the samples, which can be also precipitated with silver, because these silver compounds are dissolved with ammonia at the washing step. This method allows the determination of iodine in the range 0.011–0.35 µg/mL.

Yebra MC, et al. *Talanta*. 2010;82(2):828–833.

IDD Info: A software to manage surveillance data of Iodine Deficiency Disorders

IDD info, a new software for managing survey data of Iodine Deficiency Disorders (IDD), is presented in this paper. IDD Info aims to create IDD project databases, process, analyze various national or regional surveillance data and form final report. It has a series of measures of choosing database from existing ones, revising it, choosing indicators from pool to establish database and adding indicators to pool. It also provides simple tools to scan one database and compare two databases, to set IDD standard parameters, to analyze data by single indicator and multi-indicators, and finally to form typeset report with content customized. IDD Info was developed using Chinese national IDD surveillance data of 2005. Its validity was evaluated by comparing with survey report given

by China CDC. The IDD Info is a professional analysis tool, which succeeds in speeding IDD data analysis up to about 14.28% with respect to standard reference routines. It consequently enhances analysis performance and user compliance. IDD Info is a practical and accurate means of managing the multifarious IDD surveillance data that can be widely used by non-statisticians in national and regional IDD surveillance.

Liu P, et al. *Comput Methods Programs Biomed*. 2010 Jul 2. [Epub ahead of print]

Iodine status of adolescent girls in a population changing from high to lower fish consumption

During the last decades, fish and milk consumption has decreased considerably in Iceland, especially among adolescents. As these food items are important dietary iodine (I) sources, the aim of the study was to assess the iodine status and dietary pattern of adolescent girls in a population changing from a high to lower consumption of milk and fish. Subjects were randomly selected adolescent girls (16–20 years old, n=112). A validated Food Frequency Questionnaire (FFQ) was used to evaluate food consumption and compare it with food-based dietary guidelines for milk and dairy products (2–3 portions/day) and fish (>=2 times/week). Urine samples were collected for measuring urinary iodine (UI) and creatinine (Cr) and blood samples for measuring serum thyroid-stimulating hormone (TSH). Milk and dairy products provided 43% and fish provided 24% of the total dietary I. More than 65% of the girls consumed fish less than twice a week, and 40% consumed less than two portions of milk and dairy products per day. The median UI was 200 µg/L. High intake of milk was associated with higher UI, but fish intake was not. The authors concluded that iodine status of Icelandic adolescent girls is within the optimal range, and that it is important to monitor both iodine status and the iodine concentration of important sources of iodine, as both dietary habits and composition of food might change with time.

Gunnarsdottir I, et al. *Eur J Clin Nutr*. 2010 Jun 16. [Epub ahead of print]

Prevalence of micronutrient deficiency in popular diet plans

With more than two-thirds of the U.S. population overweight or obese, and research showing that one-third are on a diet at any given time, a need existed to determine whether current popular diet plans could protect followers from micronutrient deficiency by providing the minimum levels of 27 micronutrients, as determined by the U.S. Food and Drug Administrations (FDA) Reference Daily Intake (RDI) guidelines. Suggested daily menus from four popular diet plans (Atkins for Life diet, The South Beach Diet, the DASH diet, The Best Life Diet) were evaluated. Six micronutrients (vitamin B7, vitamin D, vitamin E, chromium, iodine and molybdenum) were identified as consistently low or nonexistent in all four diet plans.

Calton JB. *J Int Soc Sports Nutr*. 2010 Jun 10;7(1):24. [Epub ahead of print]

Prioritizing micronutrients for the purpose of reviewing their requirements: a protocol developed by EURRECA

The EURRECA (EUROpean micronutrient RECommendations Aligned) Network of Excellence is working towards the development of aligned recommendations. A protocol was required to assign resources to those micronutrients for which recommendations are most in need of alignment. Three important 'a priori' criteria were the basis for ranking micronutrients: (A) the amount of new scientific evidence, particularly from randomized controlled trials; (B) the public health relevance of micronutrients; (C) variations in current micronutrient recommendations. A total of 28 micronutrients were included in the protocol. The 10 highest ranked micronutrients were vitamin D, iron, folate, vitamin B12, zinc, calcium, vitamin C, selenium, iodine and copper.

Cavelaars AE et al. *Eur J Clin Nutr*. 2010 Jun;64 Suppl 2:S19–30.

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.

For further details about the IDD Newsletter, please contact:

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

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