COVID-19: impact on iodine programs

Iodine deficiency in Israeli pregnant women

2020 Iodine Global Scorecard

Iodized salt in Sri Lanka

IODINE GLOBAL NETWORK is a nongovernmental organization dedicated to sustained optimal iodine nutrition and the elimination of iodine deficiency throughout the world.
The COVID-19 pandemic has engulfed the world. Health care systems all over the world have been stretched to unprecedented levels, and health care workers have become the world’s heroes as they work to contain the epidemic under significant personal risk. Governments all over the world, including throughout Asia, have put into place measures to persuade citizens to stay at home in an attempt to slow the spread of the disease and reduce infections and deaths from the pandemic. Measures include closure of businesses, requirements to work and stay at home and restrictions on domestic travel. As a result, families have been separated, incomes reduced, unemployment increased, and people are having difficulty in obtaining basic necessities.

The COVID-19 pandemic has dire implications for nutrition. Even before the pandemic, Asia contained nearly half of the individuals, worldwide, suffering from the triple burden of malnutrition, characterized by the coexistence of undernutrition (stunting and wasting), micronutrient deficiencies and overweight and obesity. The determinants of this triple burden are complex and likely to be further compounded by the pandemic. Widespread poverty, unemployment and low education negatively affects household food security and limits accessibility, availability and affordability of healthy food items. These challenges may provoke a surge in malnutrition among the most vulnerable populations.

Good nutrition is critical for the functioning of the immune system and protects against diseases. The WHO guidance during the pandemic highlights that “good nutrition is crucial for health particularly in times when the immune system may need to fight back” While more data is needed on the role of nutrition in reducing the severity of COVID-19, the role of micronutrients to the optimal function of immune systems is well established.

Fortification of staple foods is a critical weapon in the fight against COVID-19

Ravi Menon, Indonesia Country Director, Global Alliance for Improved Nutrition (GAIN); Jee Hyun Rah, Chief, Nutrition, UNICEF Indonesia; Sri Kuyuniati, Indonesia Country Director, Nutrition International; Karen Codling, IGN Regional Coordinator for South East Asia; Becky Tsang, Technical Officer, Food Fortification Initiative Asia; Penjani Mkambula, Global Programme Lead, Food Fortification at GAIN; Sri (Ninik) Sukotjo, Nutrition Specialist, UNICEF Indonesia; Atmarita, Nutrition Specialist and Senior Researcher, Indonesian Nutrition Foundation for Food Fortification

Fortification of staple foods is a safe, very low-cost, effective, evidence based public health strategy to ensure that everyone, including the most vulnerable, has access to essential micronutrients. Successful examples in the Asian region include the mandatory addition of multiple micronutrients to flours and cereals, vitamins to cooking oil and iodine to salt.
Fortification can improve immunity and prevent infections and prevent nutritional deficiencies that increase mortality, constrain educational attainment and work productivity and increase the risk of birth defects. While women and children benefit in particular because they have the highest requirements for micronutrients; all members of the population benefit from fortification of staple foods. This is true especially for lower income populations who cannot afford micronutrient-rich foods and supplements and whose intake of vitamins and minerals is mainly from fortified food.

Disruptions to food systems due to COVID-19 are expected to negatively affect access to fresh and perishable foods due to farmers inability to produce or distribute, resulting in less diversity of nutrient rich foods on the market. We therefore anticipate a rise in consumption of non-perishable foods which are a poor source of micronutrients. However, consumption of fortified staple foods such as cereal flours, cooking oil and salt and use of these fortified foods in production of processed foods such as instant noodles and bread will mitigate these negative effects.

Our agencies are partners working with Governments to support and strengthen large-scale fortification programs and we are committed to doing all that we can to ensure that the production, distribution and consumption of fortified foods does not falter. The first step is to ensure production and distribution of fortificants (the micronutrient(s) added to foods during the fortification process). We have reached out to fortificant manufacturers in countries with fortificant manufacturing factories (India, China, Germany) and distribution hubs in Asia (Malaysia, Singapore, Thailand) and have confirmed that stockpiles of fortificants are adequate, though lockdowns at some ports has resulted in inevitable delays. However, difficulties in delivery of fortified foods have been encountered due to the limited operations of local haulage suppliers and increases in transport costs especially for small and medium scale producers.

Governments can help ensure the continued production and availability of fortified foods by:

1. Ensuring that fortificants for food fortification are prioritized for clearance at ports or at border sites.
2. Exempting fortificants from import duties, taxes, levies and other government-imposed chargers to counter increases in the cost of fortificant due to falls in the value of many currencies as the result of COVID-19.
3. Clarifying that logistics suppliers for the food industry are essential service providers and enabling access to information and shared economies on spare haulage capacity wherever that exists.
4. Mitigating the delays in fortificant supplies by putting in place policies for national stockholding of fortificant to ensure local availability and access by fortified foods producers.
5. Ensuring fortified staple foods and condiments are distributed in social safety net programs, to mitigate against potential rise in micronutrient deficiencies for vulnerable populations.

ASEAN populations are already going through much hardship during the pandemic. Many will rely on public distribution and social protection schemes that distribute fortified food. Enabling citizens to flatten the curve is vital from both a public health and economic perspective, and continued supply of fortified foods will ensure that a rise in micronutrient deficiencies will not add to the morbidity and mortality toll from COVID-19.
COVID-19 lockdown and two wet spells bring salt farmers misery in Andhra Pradesh, India

From S. Murali, writing in The Hindu, April 28, 2020

Over 2000 small and marginal farmers extract salt for six months in the mandals of Motumala, Biramkonda and Kothapatnam in Prakasam district till the onset of the southwest monsoon.

Fifty-year-old P. Pitchaiah, a salt farmer from Motumala village near Kothapatnam, was hoping to get decent returns during this summer. Now his hopes have been completely dashed in the wake of the COVID-19 lockdown. Workers have not turned up at his salt pan for more than a month now to scrap salt and move it to safety. "I am also unable to engage truck to move the produced salt in view of the lockdown in force," laments the salt producer doing all that he could to move the scrapped salt to a godown nearby on his own amid the threat of a downpour.

The lockdown has come at most inopportune time as it was during April and May that salt production reaches its peak, explains another salt farmer Thambi Srinivasulu. "I am not in a position to break even for salt extraction this year," he says. The wet spell twice during April has also brought misery to them. Another salt producer G. Raghava says "every time rains occur, salt production is held up for about 10 days."

Another farmer, K. Brahmananda Reddy, wants the State government to purchase salt from them and give it to people under the public distribution system, in order to get some relief as a severe labor shortage hit salt extraction. “We are also ready to supply salt fortified with iodine to get a better rate for our produce,” they say and plead for institutional credit for processing the salt widely used in tanneries and chemical industrial units.

Salt being moved from a salt pan by workers in lockdown-bound Gundamala in Prakasam district, India.
Haitian iodized salt program weathers the COVID-19 storm

Chip Wirth; David O’Brien; James Reimer, Salt Project Director of the University of Notre Dame Salt Program

Formidable challenges are not new to Father Jean Michelet Dorescar, Congregation de Sainte Croix, C.S.C., and General Manager of Bon Sel Dayiti, a Haitian fortified salt processor. After all, his country endures the ravages of frequent and devastating natural disasters, compounded by chronic economic instability and political unrest. Despite Haiti being in the grips of the COVID-19 pandemic, Fr. Michelet continues to be tireless in his efforts to provide the country with fortified salt to prevent iodine deficiency and help eradicate lymphatic filariasis, a mosquito born disease that affects more than two million Haitians.

The Bon Sel facility remains Haiti’s sole salt processing facility and plays a crucial role in fortifying both local and imported salt, as well as supplying food processors and food service operators with iodized salt. By expanding into the food industry, particularly bakeries and bouillon makers, iodized salt is reaching a wider population in which consumption patterns have shifted away from the in-house use of salt. In addition, Fr. Michelet has overseen an expansion into the industrial salt industry, providing positive margins to help offset operating expenses. The Bon Sel facility operates as a social enterprise with support from the University of Notre Dame and Cargill Salt, using commercial principles and marketplace strategies to address the pressing challenges of iodine deficiency and lymphatic filariasis more effectively.

The COVID-19 pandemic presents new and daunting challenges to healthcare, with many programs now halted or severely curtailed. The Bon Sel program is an example of a community-based health intervention that can continue to deliver benefits when many other activities must be suspended due to COVID-19. In spite of the pandemic, Fr. Michelet and his team continue to leverage the Haitian salt supply chain to cost effectively achieve healthcare objectives for preventing IDD. Bon Sel demonstrates how a commercial enterprise collaborating with like-minded government agencies and non-governmental organizations can serve as key contributors in addressing humanitarian needs.

With some packaging supplies running low and his labor force restricted, Fr. Michelet tends to the daily processing and fortification of salt. He is heartened by the ample amount of salt and is pleasantly surprised by the volume of sales and shipments to his commercial customers, particularly the bakeries and bouillon makers. While the mix of sales may shift somewhat, he accepts that the changes are merely part of the ebb and flow of supply and demand in the marketplace. Fr. Michelet is accustomed to having to adapt in the face of natural disasters, and COVID-19 is no exception—he continues to make the adjustments necessary to ensuring that the Haitian salt industry is in a position to benefit the health of his fellow Haitians. Once again, Bon Sel, Haiti’s indispensable salt program, weathers a storm.
The coronavirus outbreak is first and foremost a human tragedy, affecting millions of people. It is having a growing impact on the consumption and production of iodized salt and flow of adequately iodized salt to the community level in Middle East North Africa (MENA)/Eastern Mediterranean (EMR) member states. The immediate and socio-economic impacts of the COVID-19 pandemic are likely to disproportionately impact the quality of the diets and nutrition services as well as practices of communities, pregnant women and breastfeeding mothers in the region especially with regard to salt iodization and food fortification.

The novel COVID-19 pandemic has put the world on a standstill, affecting major operations. In MENA/EMR the iodized salt production started to be halted in many member states, particularly in countries already having difficulty in sustaining the production such as in Yemen, Syria, Iraq, Libya, Morocco, Sudan. It has also disproportionately affected production in most of the other countries in the region, with the exception of the Gulf member states, where iodized salt is imported under rigorous monitoring and observation of quality control operating systems to sustain the coverage.

A major impact on the quality of iodized salt production and distribution is expected during and post the COVID-19 pandemic due to the interruption of proper monitoring, limitations on mobility and transportation, and implementation of social distancing measures, which collectively prohibit the labor force from reporting to

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**Ekaterina Troshina, IGN national coordinator for Russia, on the frontlines against COVID-19**

Prof. Ekaterina Troshina (on the right in the photo) has been the IGN National Coordinator in Russia for 15 years. She works as Head of Department of Therapeutic Endocrinology and Deputy Director of the in Moscow. She is coordinating IDD prevention activities in the Russian Federation, and has been working for many years to establish legislation for iodized salt at the national level.

Russia has a large number of COVID cases, about half of them in Moscow. As the number of COVID-19 cases in Moscow increased, several hospital departments of the National Medical Research Center for Endocrinology are admitting COVID patients with endocrine comorbidity (diabetes, thyroid and adrenal diseases, etc.) and Prof. Troshina is in charge of treatment of more than 40 patients with pneumonia and other COVID-19 complications.

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**Iodized salt coverage and COVID-19 in MENA/EMR**

Izzeldin Hussein; IGN Regional coordinator for MENA/EMRO; Samia Al-Ghanamia, IGN national coordinator, Oman; Salima Al Mammary, Nutrition Department/Ministry of Health, Oman; Lamia Mahmoud, Public Health Specialist, WHO, Oman; Ahmed Farah Shadol, Public Health Specialist, WHO Consultant, Oman; Salwa Sorkati, Micronutrition specialist, WFP Officer, Sudan; Nawal al Hamad, IGN National Coordinator, Kuwait

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workplaces. The effects of quarantine and isolation on most businesses in the region are also impacting salt work.

To assess the current impact of COVID-19, we conducted a rapid on-line assessment in a few countries of the region to review the obstacles and appraise the magnitude of interruption in production, transportation, availability and affordability of iodized salt in the market. The exercise also assessed the obstacles in the importation of potassium iodate from the main sources, and the commitment of industry and policy makers to sustain the iodization program during and post the COVID-19 pandemic.

Our rapid assessment revealed that in many countries of the region there is a drop in manufacturing of iodized salt at industry level. Amongst 45 industry settings investigated, only 15 showed no interruption and reflected sustained commitment in producing iodized salt; these plants are mainly in Egypt, Iran, Tunisia, KSA, Kuwait, UAE and Oman. Furthermore, we investigated the reasons for sustaining or failure to sustain the production. We found that the major cause is the interruption in supply of potassium iodate and the labor force. At community level, we investigated reasons of not using iodized salt in cooking, whereby more than 40% responded that the restricted mobility and difficulty in reaching big hypermarkets were the main reasons for low consumption of iodized salt, while small groceries increased the purchase and selling of artisanal salt and coarse salt which is used in big quantities as cheap source for cooking, and sterilization purposes, including as a hand wash. Investigation regarding the availability of potassium iodate revealed that 80% of the salt industry in the region suffered from shortage of supply and an increase in price since the spread of the COVID-19 pandemic, coupled with interruption of all means of transportation. Our search also indicated that in only a few countries of the region – especially in Gulf member states – the stock of iodized salt is enough for the coming 90 days.

To explore the extent of decision-makers' commitment towards strengthening regulatory monitoring during this period of COVID-19, we approached a few policy makers in selected countries of the region and we found that the main focus now is to curb the spread of COVID-19. Hence policy makers could be using the pandemic to refrain from imposing any regulatory measures or monitoring of iodized salt production flow to the market or to ensure that the household have access to iodized salt.

We recommend the so-called ‘SALT Approach’, an acronym which signifies "Stimulate and Support", "Appreciate, Authenticity", "Listen, Learn, Link", and "Transfer, Team, Trust and Transform" towards improving USI and coverage during and post the COVID19 pandemic in MENA/EMR Member States.

Our starting point is: when people take ownership of their challenges, they will face the challenges. In addition, when a sense of ownership becomes embedded within iodized salt producers, the action they take is not affected by any external stimuli, such as the current pandemic episode. Creating such a sense of ownership could be a foundation to salt iodization sustainability in MENA-EMR region. Salt producers enthused with political will are key to sustaining the progress achieved so far. Appreciation of the industry’s role in converting from production that is only consumption-driven, towards a more comprehensive marketing system where the salt industry takes part of the responsibility of awareness and communication among the wholesaler and retailers, as well as restriction of unhindered commerce in non-iodized salt. Agencies providing emergency food aid should ensure that salt provided as part of the food basket conforms to the required level of iodization, especially in countries currently under war conflict such as in Yemen, Syria, Iraq and Libya. It is time to listen to the small-scale producers to promote their participation in salt iodization activities by providing minimal incentives to such producers and forming cooperatives for easy accessibility to items of iodization, including potassium iodate. Finally, it is vital to introduce a universal IDD day celebration to inject the sense of ownership and encourage community leaders and new generations to grant more attention to this important public health issue.

Ensuring adequate supplies of iodized salt in MENA/EMR during the COVID-19 pandemic is important for family health.
Estimating the global benefits of salt iodization to correct IDD


https://pubmed.ncbi.nlm.nih.gov/32458745/?from_term=gorstein+j+and+iodine&from_sort=date&from_pos=1

There has been tremendous progress over the past twenty-five years to control iodine deficiency disorders (IDD) through universal salt iodization (USI). In 2019, using the median urinary iodine concentration (MUIC), only 19 countries in the world are classified as iodine deficient; in contrast in 1993, using the Total Goiter Rate (TGR), 113 countries were classified as iodine deficient. However, few analyses have tried to quantify the global health and economic benefits of USI programs, and the shift from TGR to MUIC as the main indicator of IDD complicates assessment of progress.

The authors used a novel approach to estimate the impact of USI on IDD, applying a regression model derived from observational data on the relationship between the total goiter rate (TGR) and the MUIC from 24 countries. The model was used to generate hypothetical national TGR values for 2019 based on current MUIC data. TGR in 1993 and modeled TGR in 2019 were then compared for 139 countries, and using consequence modeling, the potential health and economic benefits realized between 1993 and 2019 were estimated.

Based on this approach, the global prevalence of clinical IDD (as assessed by the TGR) fell from 13.1% to 3.2%, and 720 million cases of clinical IDD have been prevented by USI (a reduction of 75.9%) (Figures 1 and 2).

USI has significantly reduced the number of newborns affected by IDD, with 20.5 million cases prevented annually. The resulting improvement in cognitive development and future earnings suggest a potential global economic benefit of nearly $33 billion. However, 4.8 million newborns will be affected by IDD in 2019, who will experience life-long productivity losses totaling a Net Present Value (NPV) of $12.5 billion.

The authors concluded that the global improvements in iodine status over the past 25 years have resulted in major health and economic benefits, mainly in low- and middle-income countries. They emphasize that efforts should now focus on sustaining this achievement and expanding USI to reach the continuing large number of infants who remain unprotected from IDD.
Figures 1 and 2 show the association between TGR and iodine status in 1993 and 2019. In the figures, the color of the bubbles corresponds to the WHO region, while the size of the bubbles reflects the size of the population affected. The target for the virtual elimination of clinical IDD is for a country TGR prevalence to be < 5% and a MUIC in the range between 100 and 299 µg/L, representing optimal iodine status at the population level.
Low iodine intakes in Israeli pregnant women

Iodine is an essential nutrient for human health throughout the life cycle, especially during early stages of intrauterine life and infancy, to ensure adequate neurocognitive development. The case of Israel may be instructive for exploring the link between iodine status and habitual iodine intake in the setting of extensive national reliance on desalinated water. The growing global reliance on desalinated iodine-diluted water raises the specter of increased iodine deficiency in several regions. The aim of this study was to explore the relationship between iodine intake, including iodized salt and iodine-containing supplements intake, and iodine status among pregnant women residing in a sub-district of Israel that is highly reliant on desalinated iodine-diluted water.

A total of 134 consecutive pregnant women were recruited on a voluntary basis from the obstetrics department of the Barzilai University Medical Center during 2018. An iodine food frequency questionnaire (iFFQ) was used to assess iodine intake. A questionnaire was used to collect data on demographic and health characteristics, and a blood sample was obtained. Elevated serum thyroglobulin values (≥ 13 μg/L), were found among 67% of participants, indicating insufficient iodine status.

The estimated iodine intake (mean ± SD, 187 ± 106 μg/d) was lower than the levels recommended by the World Health Organization of 250 μg/day (Figure 1). The prevalence of iodized salt intake and iodine containing supplement intake were 4 and 52%, respectively. While the Israeli Ministry of Health has recommended the intake of iodized salt and iodine containing supplements, this is apparently insufficient for achieving optimal iodine status among Israeli pregnant women. The evidence of probable iodine deficiency in a sample of pregnant women suggests an urgent need for a national policy of iodized salt regulation, as well as guidelines to promote iodine containing supplements and adherence to them by caregivers. In addition, studies similar to this one should be undertaken in additional countries reliant on desalinated iodine-diluted water to further assess the impact of desalinization on maternal iodine status.

Commenting on the findings, Prof. John Lazarus, IGN Regional Coordinator for Western Europe, wrote: “The data in this group of pregnant women should serve as a wakeup call to the public health community (in Israel) to correct this deficiency which is known to significantly affect child neurodevelopment. There are several issues to be addressed. The knowledge base relating to iodine nutrition especially during pregnancy is low. An educational plan is required. The strategy for achieving adequate iodine nutrition in the population and particularly before and during pregnancy requires urgent review. While iodine supplementation before and during gestation can correct iodine deficiency, the provision of iodized salt in the community is recommended, similar to more than 80% of countries in the world. It is indeed a time for action to ensure the adequate intellectual performance of Israel’s children.”

Many Israeli pregnant women have low iodine intakes, putting their babies at risk for impaired cognitive development.
Global Scorecard of iodine nutrition in 2020: optimal iodine intake in 131 countries

The Iodine Global Network has produced the 2020 version of the Global Scorecard on the status of iodine nutrition. The Scorecard contains the most recent median urinary iodine concentration (UIC) data from 194 WHO Member States plus Liechtenstein and Palestine. The 2020 update includes 26 new nationally representative surveys and sub-national data for five additional countries. In the Scorecard:

- Adequate iodine intake in school-age children corresponds to median UIC values in the range 100–299 μg/L.
- Countries in which the most recent available survey is older than 15 years (i.e., conducted prior to 2005), are marked with an asterisk (*) in the Tables on the following page.
- In population monitoring of iodine status using the median UIC, school-age children (SAC) serve as a proxy for the general population, therefore preference has been given to studies carried out in SAC. The UIC data have been selected for each country in the following order of priority: data from the most recent known nationally representative survey (N) carried out between 2005 and 2020 in (i) SAC, (ii) SAC and adolescents, (iii) adolescents, (iv) women of reproductive age (WRA), (v) other adults (excluding pregnant or lactating women), and (vi) other eligible populations. In the absence of recent national surveys, subnational data (S) were used in the same order of priority. The designations ‘N’ and ‘S’ are used in the Tables on the following page.
- WHO defines adequate iodine intake in adults as a median UIC value ≥100 μg/L. However, the scientific basis for this threshold is weak. Estimates based on populations other than SAC should be interpreted with caution.
- No surveys with sample sizes <100 are included in this compilation of data.

**FIGURE 1** Map showing data from the Global Scorecard 2020.
## Countries with deficient iodine intake, ranked by increasing mUIC

Globally, 28 countries have insufficient iodine in their diets, which can lead to long-term disability, particularly in the brain development of children and their learning potential.

<table>
<thead>
<tr>
<th>Country</th>
<th>Median UIC (μg/L)</th>
<th>Date of survey</th>
<th>Data type</th>
<th>Population surveyed</th>
</tr>
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<tbody>
<tr>
<td>Central African Republic*</td>
<td>21</td>
<td>1993</td>
<td>S</td>
<td>All</td>
</tr>
<tr>
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<td>46</td>
<td>2015</td>
<td>N</td>
<td>WRA</td>
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<tr>
<td>Cambodia</td>
<td>63</td>
<td>2014</td>
<td>N</td>
<td>WRA</td>
</tr>
<tr>
<td>Estonia*</td>
<td>65</td>
<td>1995</td>
<td>N</td>
<td>SAC</td>
</tr>
<tr>
<td>Lebanon</td>
<td>66</td>
<td>2013</td>
<td>N</td>
<td>SAC</td>
</tr>
<tr>
<td>Sudan</td>
<td>66</td>
<td>2006</td>
<td>S</td>
<td>SAC</td>
</tr>
<tr>
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<td>69</td>
<td>2005</td>
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</tr>
<tr>
<td>Morocco</td>
<td>71</td>
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<td>WRA</td>
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<tr>
<td>Lithuania*</td>
<td>75</td>
<td>1995</td>
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<td>SAC</td>
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<td>WRA</td>
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<td>WRA</td>
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<td>83</td>
<td>2016</td>
<td>N</td>
<td>SAC</td>
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<td>N</td>
<td>SAC</td>
</tr>
<tr>
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<td>84</td>
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<td>N</td>
<td>SAC</td>
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<td>WRA</td>
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<td>N</td>
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<td>N</td>
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<td>94</td>
<td>2006</td>
<td>S</td>
<td>SAC</td>
</tr>
<tr>
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<td>96</td>
<td>2017</td>
<td>N</td>
<td>Adults</td>
</tr>
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<td>96</td>
<td>2010</td>
<td>N</td>
<td>SAC</td>
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<td>Korea, DPR</td>
<td>97</td>
<td>2009-10</td>
<td>N</td>
<td>SAC</td>
</tr>
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<td>Mozambique</td>
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<td>2011-12</td>
<td>N</td>
<td>WRA</td>
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<td>2014</td>
<td>N</td>
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<td>2008-20</td>
<td>S</td>
<td>SAC</td>
</tr>
</tbody>
</table>

## Countries with excessive iodine intake, ranked by increasing mUIC

Globally, 14 countries have excessive iodine in their diets, which can lead to an increase in thyroid disorders in the adult population.

<table>
<thead>
<tr>
<th>Country</th>
<th>Median UIC (μg/L)</th>
<th>Date of survey</th>
<th>Data type</th>
<th>Population surveyed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cameroon</td>
<td>&gt;300</td>
<td>2014-2018</td>
<td>S</td>
<td>SAC</td>
</tr>
<tr>
<td>Trinidad and Tobago</td>
<td>311</td>
<td>2018</td>
<td>N</td>
<td>SAC</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>314</td>
<td>2008-09</td>
<td>N</td>
<td>SAC</td>
</tr>
<tr>
<td>Nepal</td>
<td>314</td>
<td>2016</td>
<td>N</td>
<td>SAC</td>
</tr>
<tr>
<td>Benin</td>
<td>318</td>
<td>2011</td>
<td>N</td>
<td>SAC</td>
</tr>
<tr>
<td>Solomon Islands</td>
<td>328</td>
<td>2007-10</td>
<td>S</td>
<td>SAC</td>
</tr>
<tr>
<td>Djibouti</td>
<td>335</td>
<td>2015</td>
<td>N</td>
<td>SAC</td>
</tr>
<tr>
<td>Qatar</td>
<td>341</td>
<td>2014</td>
<td>N</td>
<td>SAC</td>
</tr>
<tr>
<td>Honduras</td>
<td>356</td>
<td>2005</td>
<td>S</td>
<td>SAC</td>
</tr>
<tr>
<td>Colombia</td>
<td>407</td>
<td>2015-16</td>
<td>N</td>
<td>SAC</td>
</tr>
<tr>
<td>Somalia</td>
<td>417</td>
<td>2009</td>
<td>N</td>
<td>SAC</td>
</tr>
<tr>
<td>Korea, Republic of</td>
<td>449</td>
<td>2013-15</td>
<td>N</td>
<td>SAC, Adolescents</td>
</tr>
<tr>
<td>Uganda</td>
<td>464</td>
<td>2005</td>
<td>N</td>
<td>SAC</td>
</tr>
<tr>
<td>Equatorial Guinea</td>
<td>564</td>
<td>2007</td>
<td>S</td>
<td>SAC</td>
</tr>
</tbody>
</table>
Iodized salt in processed foods in Armenia

Hrayr Aslanyan, IGN and National Institute of Health, Armenia; Alexander Bazarchyan, National Institute of Health, Armenia; Gregory Gerasimov, IGN Regional Coordinator for Eastern Europe and Central Asia

Located in the South Caucasus, Armenia was historically affected by endemic goiter that was virtually eliminated in early 1970s as part of effective salt iodization strategy in the USSR. Iodide deficiency returned in 1991 when Armenia became independent after dissolution of the Soviet Union. However, starting from 1999, production of iodized salt was resumed by sole national salt producer “Avansalt”. In 2004 the government passed decree No. 353-N making production and importation of iodized salt mandatory as well as its use at household level and for food processing. A national survey was conducted in Armenia in 2005 showing that 97.2% of households were using adequately iodized salt while median UIC among 8-10 year-old children was slightly above 300μg/L, most likely due to a relatively high level (50 ± 10 mg/kg) of iodine content in salt [1]. Subsequently, this was reduced to 40 ± 15 mg/kg. The most recent survey (2016), confirmed that the country’s population has adequate iodine nutrition with median UIC of 242μg/L in school-age children and 226 μg/L in pregnant women [2].

A recent WHO STEPS survey revealed that adult population (18-69 years) consumes around 10 g of salt per day and the percentage of people who always or often eat processed foods high in salt is over 31% [3]. In Armenia, as many other middle-income countries, a significant part of salt intake comes from processed foods (70–80%) but the contribution of industrially-processed food salt to population iodine intake remained uncertain. To fill in this gap, in 2019 the National Working Group (NWG) on IDD led by the National Institute of Health of the Armenian Ministry of Health, with technical and financial support from IGN, used new Guidance [4] to assess the main sources of dietary iodine and the contribution of industrially-processed food salt to population iodine intake. According to Armenia Statistical Agency reports, a wide range of processed foods, including key salt-containing products, such as bread, cheese, processed meats, and pickled vegetables, are produced and largely consumed within the country. National regulation requires that only iodized salt can be used in foodstuffs produced for domestic supply, except for cases when the use of iodized salt is not allowed by production technology. In fact, only a few soft cheeses are exempt from USI requirements.

It was agreed to develop two models: one for the general (adult) population group and another for pregnant and lactating women. No modeling was possible for children under the age of 2 years and those aged 2 to 18 years, given the absence of food consumption data.

**Figure 1** Contribution to % daily RNI iodine (150 μg/day) from iodized salt from estimated per capita consumption of selected processed foods in adults in Armenia: 1 = Potential iodine intake if 100% of salt is iodized), 2 = Current iodine intake based on 93.4% of household iodized salt use, 82% for bakery salt, 7% for cheese salt, 83% for salt for meat products, 44% for pickles salt, 5% pasta salt, 0% for other foods, 3 = Potential iodine intake after 30% salt reduction.

**Figure 2** Contribution to % daily RNI iodine (250 μg/day) from iodized salt from estimated per capita consumption of selected processed foods in pregnant women in Armenia: 1 = Potential iodine intake if 100% of salt is iodized, 2 = Current iodine intake based on 93.4% of household iodized salt use, 82% for bakery salt, 7% for cheese salt, 83% for salt for meat products, 44% for pickles salt, 5% pasta salt, 0% for other foods, 3 = Potential iodine intake after 30% salt reduction.
The NWG looked into **three potential scenarios**:

1. potential iodine intake if 100% of food grade salt is iodized; (2) estimated iodine intake based on current 93.4% household coverage with iodized salt, 82% use of iodized salt in bakeries, 7% for production of cheese, 83% for meat products, 44% for pickled/preserved vegetables, 5% for pasta, and 0% for others; and (3) potential iodine intake after 30% salt reduction if current salt iodization levels are maintained.

**Results**

The modeling allowed to estimate the contribution of most important processed foods and household salt to iodine intake for Armenian population (**Figures 1 and 2**).

- Mean per capita daily salt intake from household salt and major salt-containing foods is 10.6 g, of which 4.0 g originates from household salt, 4.3 g from bread and 2.3 g from all other key salt-containing foods combined.

- The modeling showed that in Scenario 1, 196% and 118% of the daily RNI for iodine in adults and pregnant women, respectively, could be met.

- Under Scenario 1, an estimated 149% and 90% of the current daily RNI for iodine for adults and pregnant women, respectively, would be covered by the use of iodized salt in about 93.4% of households and the selected industrially-processed foods.

- In the Scenario 3, in case of 30% salt reduction, 105% and 62% of the daily iodine RNI for adults and pregnant women, respectively, could be met.

**Discussion**

Results of the modeling show that, at the current level of iodized salt use at household level and in bakeries combined, 136% of RNI for iodine in adults and 82% of the RNI in pregnant women are covered while other processed foods provide a significantly smaller share of iodine. Obviously these two sources are largely responsible for maintaining adequate iodine nutrition of the Armenian population as confirmed by 2016 Iodine survey [2]. In Armenia, bread is the leading staple food with high per capita consumption (more than 300 g/day) that is similar to many countries of the East Mediterranean Region.

Dietary patterns in Armenia are shifting towards increased consumption of processed foods; the latter are known worldwide to be a major source of salt in people’s diets. Armenia is also confronted with excessive sodium (salt) consumption making salt reduction strategies extremely relevant. The current modeling yielded an average intake of 10.6 g salt from household salt and key salt-containing foods, whereas the Armenia’s 2016 STEPS Survey [3] found a mean salt intake of 9.8 g/day in adults (11 g/day for men and 8.4 g/day for women) based on sodium excretion measured in 24 hour urine samples. In a spin-off of the 2016 Iodine Survey, sodium was measured in spot urine samples of adult women and, based on urinary Na/Creatinine ratios, average sodium intake was calculated at 5.5 g/day, equivalent to salt consumption of 13.9 g/day [2]. Under current modelling, 30% reduction in salt intake would result in optimum (105% of RNI) iodine intake in adults and potentially inadequate (62% of RNI) in pregnant women. Clearly, more studies are needed to assess salt intake in the Armenian population before developing and implementation of salt reduction policy.

Based on results of this assessment of the main sources of iodine in the diet and the contribution of industrially-processed food salt to population iodine intake, the Armenian NWG updated the national action plan and suggested several steps to strengthen the salt iodization strategy aiming to ensure sustainability of adequate iodine nutrition in Armenia.

**References**

4. IGN Programme Guidance on the Use of Iodised Salt in Processed Foods, 2019
**Profile:**

**Izzeldin Hussein, IGN Regional Coordinator in the Middle East and North Africa**

**Contributions in fighting iodine deficiency**

Dr. Izzeldin Sharief Hussein is a special advisor to the Ministry of Health in Oman and an educator at Universities in Oman and in the UK. Following his training as a medical doctor, he began his career in public health with CARE International on the Ethiopian border with Sudan where Izzeldin was initially in charge of emergency and relief services, eventually shifting to manage the health and nutrition program for over 3000 displaced persons. After a stint working for the World Health Organization (WHO) in 1990, he left for Oman to establish the Micronutrients and Salt Iodization unit in the Ministry of Health. Well known in the region as a leader for USI, Izzeldin helped develop the first salt plant in Oman to produce iodized salt and collected data on the performance of the USI program.

In 1992, Izzeldin was recruited as a consultant by UNICEF to help develop the national USI program in Egypt together with Dr. Fereidoun Azizi from Iran. He facilitated the establishment of Egypt’s first Salt Producer’s Association, which still operates today.

**Izzeldin joins ICCIDD, now known as IGN**

Izzeldin first participated in an IGN meeting (then known as ICCIDD) in 1997, and soon was recruited as a Regional Coordinator (RC) in 2006. As an RC, he has worked closely with country program managers in dozens of countries and has contributed to an increase in the supply of iodized salt in Tunisia, Egypt, Oman, Bahrain, Kuwait, KSA, UAE and Iran. He has also helped design and support the implementation of national iodine surveys in many countries, even in settings which have been political challenging such as Yemen, to help document the extent of iodine deficiency and track the performance of programs. His most notable work has undoubtedly been in his motherland of Sudan, which has long had the greatest burden of iodine deficiency in the region. Through his efforts, he has been able to bring together all key stakeholders and partners engaged in the national iodine program to significantly upgrade its salt industry, increase the supply and affordability of adequately iodized salt and encourage additional investments in modern plants.

In Feb, 2018, Izzeldin was instrumental in helping the Government of Sudan open three new salt iodization plants. Most of all, Izzeldin’s work has helped to raise awareness among policy makers about the importance of iodine nutrition. His efforts have paid off handsomely as the coverage of the population is now estimated to have reached 50%, whereas it was a 9% just a few years ago and he continues to explore how to fill the remaining gap.

**Looking toward the future**

Izzeldin firmly believes that universal salt iodization programs should be affordable and available across all areas of society, irrespective of economic barriers.

“My dream is to continue moving toward a world free of iodine deficiency. One of the most effective tools that will help with this is having IGN spread the word and draw attention to our cause, garnering more support and contributions to IGN.”
What has been the biggest success of your career and the biggest challenge?
My career spans 42 years, of which three years have been with IGN, 20 years with UNICEF, 15 years with the Government of Tanzania and the rest as an independent human development consultant specializing in the development of national multisectoral nutrition action plans focused on children and women. I joined the fight against IDD in 1979 in Tanzania and continued to do so in my career with UNICEF in the Eastern and Southern Africa and East Asia and Pacific regions. I have been with IGN for three years, since 2017, as Regional Coordinator for Eastern and Southern Africa.

I consider my biggest achievement in IDD to be the effective facilitation and promotion of the development of national IDD and Universal Salt Iodization (USI) programs in the Eastern and Southern Africa Region. My recent biggest success is as Lead Facilitator in an interagency USI-IDD Consultation held in Mombasa Kenya in November 2019, hosted by the Ministry of Health, Kenya and jointly supported by IGN, UNICEF, WHO, NI and GAIN. The Consultation was attended by 75 participants from 15 countries and it developed Country Action Plans to sustain USI and eliminate IDD in the region by 2025.

My biggest challenge in the area of IDD has been to find a sustainable way to maintain high public awareness and keeping sustainable USI and elimination of IDD high on the development agenda of countries.

What would you like people to know about the work that you do, what types of impact have you seen throughout your time with IGN?
I want people to know that at IGN, we lead the global fight to eliminate brain damage due to iodine deficiency. Our work includes coordinating effective action between diverse stakeholders, advocating and creating public awareness on the importance of universal salt iodization in the sustainable prevention and control of iodine deficiency disorders providing programmatic and scientific guidance; and tracking progress.

During the three years I have been with IGN, I have observed much progress in most countries in Eastern and Southern Africa: stakeholders are better coordinated using the convening role of IGN; advocacy and public awareness has improved and policy makers are increasingly incorporating USI and IDD programs within their broader health and nutrition programs. New, innovative and creative programmatic and scientific guidance has been developed and shared to ensure evidence-based actions; and tracking progress has led to identification and prioritization of evidence-based actions like national surveys and incorporation of iodine biomarkers in regular surveys like the DHS. The overall progress made provides us with hope that the World Health Assembly’s goal of sustainable elimination of IDD by 2025 can be achieved earlier than anticipated.
Two decades of sustained salt iodization in Sri Lanka


History of iodine deficiency and its management in Sri Lanka

Bennet and Pridham first referred to the existence of endemic goiter along the coast of Galle in the southern province of Sri Lanka in 1849. Mahadeva and his group in 1960 identified a “goiter belt” extending across the western, central, southern, sabaragamuwa, and uva provinces in Sri Lanka. The high annual rainfall in these regions led experts to believe that iodine was washed from the soil, leading to iodine deficiency. At that stage, almost no goiter had been identified in the northern, eastern, and north-western provinces. However, in 1986, Fernando described a high goiter rate of 18.8% in schoolchildren in 17 of 24 districts in Sri Lanka—a variable prevalence of 6.5% in the Matale district and 30.2% in the Kalutara district.

USI was introduced nationwide by the government in 1995 by statutory regulation [11]. This legislation banned the sale of non-iodized salt for human consumption, thus ensuring access to iodized salt to all consumers in the country. Potassium iodate was used as the vehicle of iodine supplementation, and added to salt at an optimal concentration of 50 ppm at producer level and 25 ppm at consumer level. The national reference laboratory for monitoring USI was established at the Medical Research Institute (MRI) in 2000 with the aid of UNICEF. This laboratory has the dual role of monitoring USI and of assessing its clinical impact by performing periodic national iodine surveys (NISs). External quality control is linked to the EQUIP program of the Centers for Disease Control (CDC), Atlanta, Georgia, USA [12].

Repeated national surveys show iodine sufficiency

Since the introduction of USI, four national iodine surveys have assessed the iodine nutrition status of the population. The authors retrospectively reviewed median urine iodine concentration (mUIC) and goiter prevalence in 16,910 schoolchildren (6–12 years) in all nine provinces of Sri Lanka, the mUIC of pregnant women, drinking-water iodine level, and the percentage of households consuming adequately (15 mg/kg) iodized salt (household salt iodine, HHIS).

Over this period, the mUIC of schoolchildren increased from 145 μg/L (interquartile range (IQR) = 85–240) in 2000 to 233 μg/L (IQR = 159–316) in 2016, but stayed within recommended levels (Figure 1). There was positive association between mUIC in schoolchildren and water and household salt iodine concentration (Figure 1). Goiter prevalence to palpation was a significantly reduced from 18.6% to 2.1%. In pregnant women, median UIC increased in each trimester (102 (62–147); 218 (116–313); 273 (229–338) μg/L).

The authors concluded that the introduction and maintenance of a continuous and consistent USI program has been a success in Sri Lanka. In order to sustain the program, it is important to continue to carefully monitor iodine status while tracking salt-consumption patterns to adjust the recommended iodine content of edible salt.
**Figure 1** Median urine iodine concentration (IQR) and its relationship with iodine concentrations in household salt (left) and drinking water (right) in Sri Lankan school children aged 6–12 years in 2016.
Meetings and Announcements

**German iodine intake falling**

The iodine intake of the population is still not optimal and declining again, according to the the German Federal Institute for Risk Assessment (BfR). In its recently updated FAQs document on iodine intake, BfR has emphasized the need for continual long-term measures to ensure that the German population has a sufficient iodine supply. The iodine content of domestic agricultural products is not enough to guarantee a sufficient intake of iodine with food in Germany. The iodine supply of the German population was improved by the recommended measure from the mid-1980s to use iodized table salt in the food industry and artisanal food products, and in private homes. The increasing use of iodized animal feed, which resulted in higher iodine content in milk and dairy products, had also helped to improve the situation. However, current data show that the iodine intake of the population is still not optimal and/or demonstrates a declining trend. Continued long-term measures are therefore necessary to ensure that the German population has a sufficient iodine supply, and to prevent iodine deficiency. However, in order to protect sensitive consumers, the German Nutrition Society has recommended limiting the total iodine intake from food and food supplements for adults to 500 μg per day.

→ [https://www.bfr.bund.de/en/iodine_intake_in_germany_on_the_decline_again___tips_for_a_good_iodine_supply-128779.html](https://www.bfr.bund.de/en/iodine_intake_in_germany_on_the_decline_again___tips_for_a_good_iodine_supply-128779.html)

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**2019 Annual report of FFI**

The 2019 Annual Report of the Food Fortification Initiative, entitled: “Plan, Implement, Monitor: food fortification for a healthier future” richly describes FFI’s work in 2019 around the world, including details of the countries where FFI worked, regional highlights and global grain progress updates.

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**Salt Processing & Business Solutions for USI**

The members of Salt Processing & Business Solutions (SPBS) are dedicated to making the dreams of salt entrepreneurs in emerging countries come true. SPBS develops tailored solutions for both private and the public sector regarding the universal salt iodization program in order to eliminate iodine deficiency in countries. SPBS is a specific venture designed to address small, medium and large-scale industrial salt production related issues in emerging countries. SPBS unites four experienced experts: Lorenzo Locatelli-Rossi, Francois Rossier, Christophe Guyondet and Djankou Ndjonkou. Contact: lorenzo.locatelli-rossi@salt-pbs.com. Also visit: → [www.salt-pbs.com](http://www.salt-pbs.com)

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**2019 Annual Report of IGN**

The 2019 Annual Report of the Iodine Global Network includes details on: (1) Fundraising, as IGN was named a recommended charity for sixth year in a row; (2) Communications, including the IDD Newsletter and the Iodine Blog; (3) Global progress in 2019, including details on the World Health Assembly 2019, iodine status monitoring and global iodine status in 2019; and (4) Country and regional highlights, with a focus on Nepal, Papua New Guinea, the United Kingdom, the Russian Federation and Madagascar. It also outlines global issues, including improved monitoring of USI programs, the global fortification data exchange (GFDx), double fortified salt, guidelines on the use of iodized salt in industrially processed foods and alternative methods to assess iodine status.


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**U.S. Iodine Fact Sheet**

The Office of Dietary Supplements of the U.S. National Institutes of Health have released a new Iodine Fact Sheet for Health Professionals. It has details on recommended dietary intakes, food sources, current status of the U.S. population and health effects of iodine deficiency.

Abstracts


Vegans, Vegetarians, and Omnivores: How Does Dietary Choice Influence Iodine Intake? A Systematic Review

Dietary restrictions may increase the risk of iodine deficiency. This systematic review analyzed studies that included 127,094 adults (aged ≥18 years). Vegans appeared to have increased risk of low iodine status, compared with adults following less restrictive diets.


Current Iodine Nutrition Status in Poland: Is the Polish Model of Obligatory Iodine Prophylaxis Able to Eliminate Iodine Deficiency in the Population?

In study in 2017 in five regions of Poland, pregnant women were iodine deficient with a median UIC of 112 μg/L and 8% had a thyroglobulin level >40 ng/mL. In contrast, median UIC in school children was 120 μg/L consistent with iodine sufficiency.


Factors Associated With Urinary Iodine Concentration Among Women of Reproductive Age, 40-49 Years Old, in Tanzania: A Population-Based Cross-Sectional Study

In this cross-sectional study in 2985 women of reproductive age in Tanzania, the median UICs among women consuming inadequately iodized salt and women in the lowest socioeconomic status were borderline deficient.


Iodine Nutritional Status of Pregnant Women in an Urban Area of Northern Taiwan in 2018

A hospital-based cross-sectional survey in Taiwan found a median UIC of 225 μg/L in 257 pregnant women and 79% used a prenatal multivitamin.


Long-term Iodine Nutrition Is Associated With Longevity in Older Adults: A 20-year Follow-Up of the Randers-Skagen Study

In a 20-year follow-up of Danish participants from the Randers-Skagen (RaSk) study, where at baseline, the median urinary iodine concentration was 55 μg/L in Randers and 160 μg/L in Skagen, living in Skagen was associated with lower hazard ratio (HR) of death (HR 0.60, 95% CI: 0.41-0.87, P = 0.008).

Am J Clin Nutr. 2020 Apr 22;nqaa071.

Systematic Review and Meta-Analysis of the Effects of Iodine Supplementation on Thyroid Function and Child Neurodevelopment in Mildly-To-Moderately Iodine-Deficient Pregnant Women

This systematic review concluded there is insufficient good-quality evidence to support current recommendations for iodine supplementation in pregnancy in areas of mild-to-moderate deficiency. Well-designed RCTs, with child cognitive outcomes, are needed in pregnant women who are moderately iodine deficient.


Iodine Status of Brazilian School-Age Children: A National Cross-Sectional Survey

In a cross-sectional survey including 6-14-year-old schoolchildren (n=18,864) from all 26 Brazilian states carried out in 2008-2009 and 2013-2014, the overall median UIC was 277 μg/L indicating iodine sufficiency.


The Association Between Iodine Intake and Semen Quality Among Fertile Men in China

In this cross-sectional study in Chinese men (n=1089), iodine deficiency and excess based on UICs were both associated with decreasing semen quality parameters.


Effects of an Iodine-Containing Prenatal Multiple Micronutrient on Maternal and Infant Iodine Status and Thyroid Function: A Randomized Trial in The Gambia

Gambian pregnant women (<20 weeks gestation) (n=438) were randomized to receive either a daily multiple micronutrient supplement containing 300 μg of iodine or an iron and folic acid supplement. Iodine supplementation improved maternal iodine status and reduced the blood thyroglobulin concentration. But the effects were not maintained postpartum and maternal and infant iodine nutrition remained inadequate during the first six months after birth.


Maternal Iodine Status During Pregnancy Is Not Consistently Associated With Attention-Deficit Hyperactivity Disorder (ADHD) or Autistic Traits in Children

In this analysis of 3 European population-based birth cohorts: Generation R (n = 1634), INfancia y Medio Ambiente (n = 1293), and the Avon Longitudinal Study of Parents and Children (n = 2619), there was no association of mild-to-moderate iodine deficiency during pregnancy with child ADHD or autistic traits.