Improving Public Health in the Americas by Optimizing Sodium and Iodine Intakes – A Meeting Summary

WHO/PAHO Regional Expert Group for Cardiovascular Disease Prevention through Population-wide Dietary Salt Reduction

Report from the Washington DC Meeting
2011

Table of Contents

Key Messages

In Latin American countries, reducing salt intake to prevent cardiovascular diseases appears compatible with keeping iodized salt as the main strategy to secure the sustained elimination of iodine deficiency disorders (IDD). Collaboration and synchronization of programs for dietary salt reduction and prevention of IDD through salt iodization to achieve a common goal – the optimal intake of sodium and iodine in the Americas – will be cost effective and of great public health benefit.

At current salt intake levels, mean iodine within the range of 20-40 ppm provides sufficient iodine to populations. Lowering dietary salt intake to < 5 g/day is compatible with a mean iodine level of about 40 ppm. However, commercially manufactured foods to which salt is added before products are sold are increasingly replacing foods prepared in the household, where discretionary iodized salt is used (added at the table and in cooking), making it important for the manufactured foods to contain the proportional amounts of iodine, added either by using iodized salt or introducing iodine in the fortification premixes, necessary to meet population iodine requirements.

Needed at the outset of program collaboration are up-to-date and accurate baselines of actual daily salt (sodium) and iodine excretions in urine as the main indicators of dietary salt and iodine intakes, information that is currently lacking in most countries in the Americas.

Background

The International Council for the Control of Iodine Deficiency Disorders (ICCIDD) estimates that two billion people worldwide live in areas at risk of iodine deficiency. It states that among the methods to prevent iodine deficiency disorder (IDD), using salt as a vehicle to deliver supplementary iodine to the diet is most simple, practical and effective [1]. WHO and UNICEF together with ICCIDD recommended in 1996 the mean iodine level of 20-40 ppm at the point of production, assuming an average per capita salt* intake of 10g per day [2].

In 2006, the report from a WHO Forum and Technical Meeting responding to the WHO Global Strategy on Diet, Physical Activity and Health recommended that average population level salt intake from all food sources be < 5g/day per person, (to reduce sodium intake to less than 2 g/day per person) [3]. Salt added to food is a major factor increasing the blood pressure in normotensive and hypertensive people, whether adults or children [4,5,6]. According to WHO, increased blood pressure is the leading risk factor for death worldwide and the second leading risk for disability by causing heart disease, stroke and kidney failure [7,8].

In 2007 a WHO Expert Consultation on "Salt as a Vehicle for Fortification", taking into account both the status of IDD and the evidence of harmful effects of high salt diets, emphasized the need for and benefits of collaboration between salt iodization and dietary salt reduction programs [9]. Among its recommendations –

> "Policies for salt iodization and reduction of salt to < 5 g/day are compatible, cost effective and of great public health benefit. At the country level, close collaboration between salt iodization and salt reduction programs as a coalition is urgently required so that their aims are congruent." [9, p. 15]
>
> "The level of iodine fortification needs to be adjusted by national authorities responsible for the implementation and monitoring of universal salt iodization in light of their own data regarding dietary salt intake. The average national level of salt consumption must provide key guidance for the concentration of iodine in salt." [9, p. 16]

Most recently, with dietary salt reduction efforts being mobilized in the Americas, the PAHO/WHO Regional Expert Group guiding the initiative indicated in its 2009 Policy Statement [10] that

> "Salt intake can be reduced without compromising micronutrient fortification efforts." [10, p. 1] National governments are to "review national salt

---

* For the purpose of the document the word **salt** was used to refer to **sodium** expressed as **sodium chloride**.

> fortification policies and recommendations to be in concordance with the recommended salt intake" [10, p.2] [national targets or in their absence, the internationally recommended target of < 5 g/day per person by 2020].

And the Iodine Network, in a resolution dated February 20, 2009 [11] stated

> BE IT FURTHER RESOLVED THAT the World Health Organization is urged to share with the Network Board any data, when and if it becomes available, about the achievement of salt reduction in various countries and its projected trends of salt consumption to inform Board discussion and national salt iodization programs to enable ongoing efforts to calibrate iodine fortification levels to ensure appropriate population iodine intakes.

Following up on the 2007 WHO Expert Consultation and the recommendations from 2009 of the PAHO/WHO Group for dietary salt reduction and the Iodine Network, PAHO convened a small group of technical experts and some stakeholders in both IDD prevention and dietary salt reduction programs on 3-4 January 2011 in Washington DC. They agreed that they hold a goal in common – the optimal intake of sodium and iodine in the Americas. The group then drafted objectives, expected results and a background document for a subsequent meeting involving an expanded group of experts and stakeholders in both programs to facilitate a broader collaboration and to define the next steps needed to advance the synchronization of dietary salt reduction and salt iodization programs in the region.

A multi-lateral meeting with a larger group of stakeholders was held in Washington DC on 31 March and 1 April 2011 to discuss issues related to optimizing iodine and sodium intakes. The background material provided during the meeting became the basis for this meeting, a White Paper and Framework for Collaborative Action. The meeting objectives and outcomes were as given below.

Objectives:

1. Define the common ground for simultaneous salt iodization and salt reduction initiatives and discuss a draft White Paper.
2. Agree to a framework for collaboration/coordination
3. Define next steps to operationalize the framework

Outcomes:

1. A White Paper that reflects areas of collaboration/coordination as agreed to by the main stakeholders in the Network for Sustained Elimination of Iodine Deficiency and the PAHO/WHO dietary salt reduction initiative
2. A Framework for Collaborative Action
3. Discussion on a next steps in IDD (salt iodization) and dietary salt reduction for the Americas region

On day one of the meeting, presentations brought the participants up to date on both topics of dietary salt reduction and salt iodization. They included: the evidence for why salt reduction should be implemented at the population level; recent

advances in IDD prevention; plans for the ICCIDD for Latin America and participation in the International Resources Laboratories for Iodine Network (IRLI); review of the 2007 recommendations in "Salt as a Vehicle for Fortification"; an update on the activities of the Iodine Task Force; and the WHO (global) activities on salt intake reduction. The day concluded with a guided discussion toward defining the common ground for collaboration between salt iodization and dietary salt reduction programs to be stated in the White Paper expected as a meeting outcome.

On day two, participants were divided into three groups to prepare responses to a draft version of a *White Paper on Improving Public Health by Optimizing Sodium and Iodine Intakes* that included a Framework for Collaborative Action. They also worked out several next steps to operationalize the components of the Framework, oriented at governments, consumers/the public and the salt and food industries.

Presentation Summaries

The evidence for why salt reduction should be implemented at the population level

- In 2009 WHO reported high blood pressure (systolic >115 mmHg) as the leading single risk factor for death [12]. Its impact on vascular diseases is profound, attributed to 60-70% of strokes, 50% of heart failures, 25% of heart attacks, 20% of kidney failures and is associated with dementia due to cerebrovascular damage.

- Blood pressure is well known to rise with age in modern industrialized societies. The US Framingham Heart Study reported in 2002 that men and women 55 to 65 years of age who were non-hypertensive had an estimated lifetime risk of 90% of becoming hypertensive [13]. In societies where people consume less than 3 g salt/day from unprocessed food diets and are physically active and lean, hypertension is uncommon and blood pressure does not increase with age [14].

- A vast and conclusive body of evidence, ranging from animal studies, migration studies, epidemiological studies (cross sectional and cohort, examining hypertension and vascular disease), clinical trials, and meta-analyses points out the relationship between salt intake, hypertension and vascular disease. A Cochrane review in 2006 concluded that even a modest reduction in salt intake for a duration of four or more weeks has a significant effect on blood pressure in individuals who are normotensive as well as in those with elevated blood pressure. The meta-analysis is consistent with other findings where the lower the salt intake, the lower the blood pressure [15].

- If dietary salt were reduced to recommended levels, hypertension prevalence is estimated to decrease by 30%. Even small reductions in blood pressure can lower mortality rates for stroke and coronary heart disease [16]. If dietary salt were

reduced by even 15% worldwide over 10 years, an estimated 8.5 millions deaths could be averted [17]. In the US, if salt intake fell to 3g/day/person, in one year between $10 and $30 billion could be saved, there could be up to 260,000 fewer cardiovascular disease events and up to 90,000 fewer deaths [18]. In low and middle-income countries, reducing dietary salt is slightly more cost effective than smoking reduction [17].

- A high salt diet is also a probable cause of gastric cancer, and has possible associations with osteoporosis, calcium containing renal stones and increased severity of asthma. Because salty foods can cause thirst they are possibly an important contributor to obesity among children and adolescents through association with increased consumption of high-calorie soft drinks [5,19].

- People are generally unaware of their own level of salt consumption. With few exceptions, average consumption is over 5.8 g/day after age 5 and for many, intake is over 10 g/day in both developed and developing countries [20]. In developed economies about 80% of the salt consumed is added during food processing while in less developed economies, most of the salt consumed is discretionary, that is, added at the table and in cooking. In countries undergoing nutrition transition, there is a shift in the main sources of dietary salt, from discretionary use to the "hidden" salt in processed foods as they become increasingly available to consumers [20].

- Salt intakes around the world are much higher now than the physiologic levels that supported human evolution. The current levels are linked to major causes of death and disability worldwide. Reducing dietary salt is estimated to be one of the most effective and cost effective public health interventions [17].

Recent advances in the prevention of IDD

- Iodine is an essential component of the hormones produced by the thyroid gland. Thyroid hormones regulate many key biochemical reactions, especially those associated to metabolic rate. Major target organs are the developing brain, muscle, heart, pituitary, and kidney [21]

- Severe iodine deficiency in pregnancy can cause hypothyroidism, poor outcomes of pregnancy (spontaneous abortion and stillbirth), cretinism and in some countries is a major cause of irreversible intellectual disability [22].

- Mild to moderate iodine deficiency in utero and in childhood results in less severe learning disability, poor physical growth and diffuse goiter [23;24;25].

- In adults, mild to moderate iodine deficiency appears to be associated with higher rates of more aggressive sub-types of thyroid cancer [26] and increases the risk for non-toxic and toxic nodular goiter and associated hyperthyroidism [27].

- Worldwide two billion people have insufficient iodine intake from their usual diet. In 2006, the Americas had the lowest global prevalence of insufficient iodine intake at 11% - the lowest in the developing world [28]. Despite this progress, some countries in the region (Haiti, the Dominican Republic, and Guatemala) are still under high risk.

- Strategies/options to prevent IDD include fortification of salt, bread, water and milk, and iodine supplementation. Salt iodization is the most cost effective intervention to prevent IDD [29].

Table 1: Recommendations for iodine intake (µg/d) by age or population group (summarized in reference [21])

Age or population group	IOM		Age or population group	WHO RNI
	EAR	AI or RDA		
Children 0-5 yr		110-130		90
Children 1-8 yr	65	90	Children 6-12 yr	120
Children 9-13 yr	73	120		
Adults ≥ 14 yr	95	150	Adults > 12 yr	150
Pregnancy	160	220	Pregnancy	250
Lactation	200	290	Lactation	250

Note the abbreviations and definitions: IOM is the Institute of Medicine of the US Academy of Science; EAR is Estimated Average Requirement – the daily intake value that satisfied the nutrient needs of 50% of the individuals in a life stage and gender groups; AI is Adequate Intake – used as a reference of an approximate RDA when the latter cannot be calculated; RDA is Recommended Daily Allowance – the average daily dietary intake calculated by adding two standard deviations to the EAR value and estimated to be sufficient to meet the nutrient requirements of nearly all (97.5%) individuals in a life stage and gender groups of the population; RNI is Recommended Nutrient Intake which has a similar meaning to the RDA.

Table 2: Epidemiological criteria for assessing iodine nutrition based on median urinary iodine concentrations of school-age children (≥ 6 yrs)[a] [30]

Median urinary iodine (µg/l)	Iodine intake	Iodine status
< 20	Insufficient	Severe iodine deficiency
20-49	Insufficient	Moderate iodine deficiency
50-99	Insufficient	Mild iodine deficiency
100-199	Adequate	Adequate iodine nutrition
200-299	Above requirements	Likely to provide adequate intake for pregnant/lactating women, but may pose a slight risk of more than adequate intake in the overall population
≥ 300	Excessive	Risk of adverse health consequences (iodine-induced hyperthyroidism, autoimmune thyroid diseases)

[a] Applies to adults but not to pregnant and lactating women.

Table 3: Epidemiological criteria for assessing iodine nutrition based on the median or range in urinary iodine concentrations of pregnant women[a] [30]

	Median urinary iodine (µg/l)	Iodine intake
Pregnant women	< 150	Insufficient
	150-249	Adequate
	250-499	Above requirements
	≥ 500	Excessive[b]

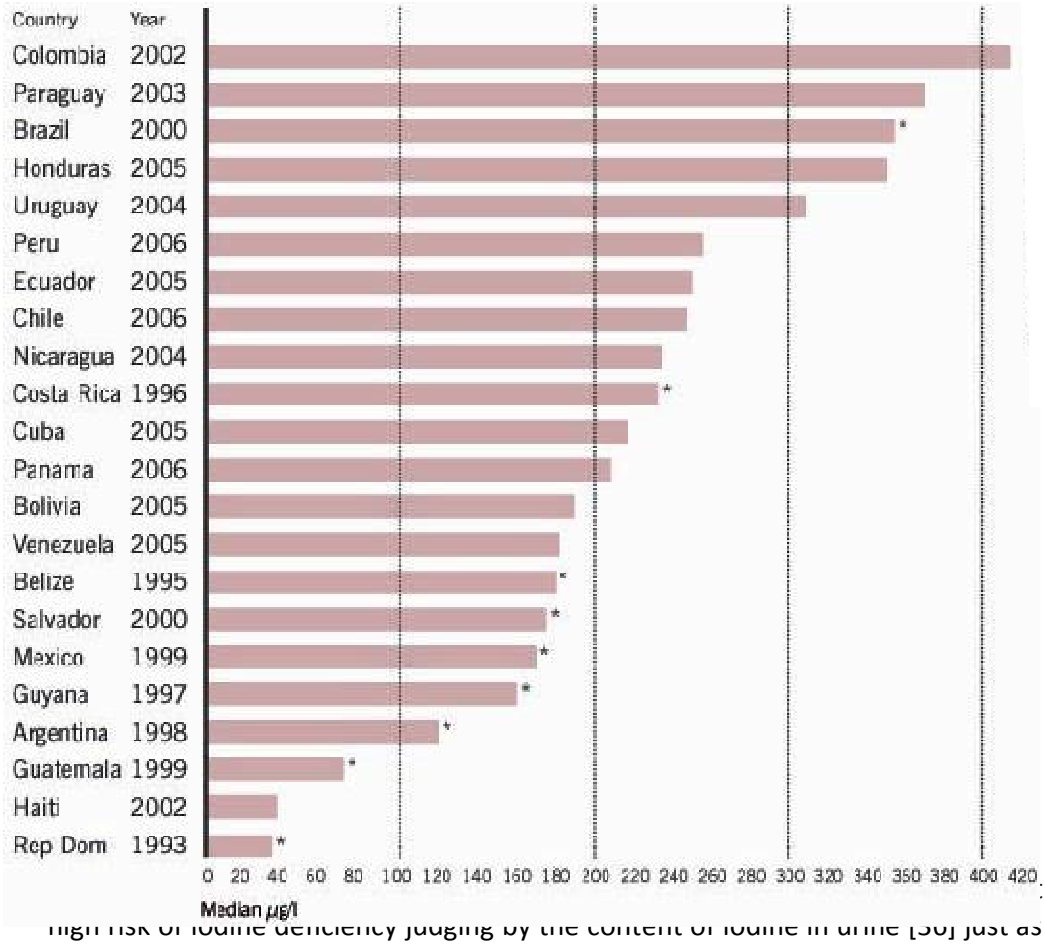
[a] For lactating women and children < 2 years of age, a median urinary iodine concentration of 100 µg/l can be used to define adequate iodine intake, but no other categories of iodine intake are defined. Although lactating women have the same requirement as pregnant women, the medium urinary iodine is lower because iodine is excreted in breast milk.
[b] The term "excessive" means in excess of the amount required to prevent and control iodine deficiency.

- There are several methods to assess iodine status: thyroid size (a population's history of iodine nutrition and its present status); urinary iodine concentration (indicator of recent iodine intake); level of thyroid stimulating hormone (useful biomarker in pregnant and lactating women as well as neonates as long as the specimen is collected at least 72 hours after birth); thyroglobulin (useful marker in children and adolescents); and thyroid hormones concentration [30;31].

- In Latin America countries, salt iodization programs have been shown to be effective in preventing IDD. In some countries, urinary iodine concentration suggests an excess of iodine intake (in school children indicated by median urinary iodine content greater than 300µg/l); in some it is so high that iodine fortification concentrations and salt consumption must be reviewed and adjusted appropriately [32]

- Excess iodine intake may cause goiter [33] and may induce hypothyroidism and autoimmune thyroiditis [34], independent of it increasing hyperthyroidism in individuals living in areas with severe iodine deficiency just after introduction of salt iodization programs, considered as a transitory adverse effect [35].

Fig. 1 Median Levels of Urinary Iodine in School-age Children in Latin American Countries [32]



high risk of iodine deficiency judging by the content of iodine in urine [30] just as are women in other developed economies [22]

- Salt iodization programs should be monitored and evaluated to assure adequate iodine intake and minimize the rate of excess intake.

Plans of the ICCIDD for Latin American Countries and Participation of the IRLI Network

- In Latin American countries, iodized salt has the potential to secure the sustained elimination of IDD at the same time that dietary salt consumption is reduced to prevent cardiovascular diseases.

- Most countries in Central and South America and the Caribbean along with Mexico have official IDD control programs with the exception of Belize, Argentina and Guyana (uncertain in Haiti). Where programs exist, coverage is nearly 100% except for Guatemala (60%), the Dominican Republic (78%) and Haiti (94%) [37].

- The quality of iodized salt, particularly salt produced by small and medium producers remains in issue in Latin American countries. In Guatemala for

example, 43.5% of small-scale production plants were found to produce iodized salt with 30-60 ppm. At the retail level, 64% of iodized salt had >15 ppm. In Mexico, where small producers account for 5% of iodized salt, 54% of their products were found to have >15 ppm at retail whereas 96% of the iodized salt supplied by large producers (83% of total iodized salt production) had >15 ppm [37].

- Across Latin American countries, the presence of salt with ≥15 ppm iodine at the retail/household level can vary from less than 5% in Haiti (2006) to 100% in Uruguay (2006) [32]

- There are two resource laboratories in Latin America[1] that are part of the International Resource Laboratories (IRLI) Network: in Lima Peru, the Laboratory of Endocrinology at the High Altitude Research Institute at Cayetano Heredia Peruvian University; and at the Institute of Nutrition of Central America and Panama (INCAP) in its central facilities in Guatemala City. The IRLI laboratories' main activities are quality assurance of laboratories for urinary iodine, technical support to improve their capacity for diagnosis and monitoring, and the processing of urine samples (surveys, research) as requested by countries.

  Laboratories processing iodine in urine
  - Centro Nacional de Investigaciones Nutricionales. Salta, Argentina
  - Instituto Nacional de Laboratorios de Salud. La Paz, Bolivia
  - Centro de Investigación y Desarrollo de Tecnología de Alimentos. Santa Cruz, Bolivia
  - Instituto de Nutrición y Tecnología de los Alimentos, Univ. de Chile. Santiago, Chile
  - Iinstituto Nacional de Salud. Bogotá ,Colombia
  - Inst. Costarricense Nutr & Enseñanza Nutr y Salud. MOH. San José, Costa Rica
  - Instituto de Nutrición e Higiene de los Alimentos, MOH. La Habana, Cuba
  - Laboratorio de Yodurias. MOH. Quito, Ecuador
  - Laboratorio de Bioquímica. INCAP. Guatemala, Guatemala
  - Lab Central de Referencia de Estudios en Salud Pública. Panamá
  - Instituto Nacional de Alimentación y Nutrición. Asunción, Paraguay
  - Laboratorio de Micronutrientes. Fac Ciencias y Filosofía, UPCH. Lima, Perú
  - Centro Nacional de Alimentación y Nutrición, MOH. Lima, Perú
  - Fac. Química. Univ. Rep. Oriental del Uruguay. Montevideo, Uruguay
  - Dep. Bioquímica, Universidad de los Andes. Mérida, Venezuela

- In countries with data on urinary iodine levels since 2005, the median µg/l ranges from approximately 190 to 440 µg/l. In countries with data before 2005, the

[1] See list of laboratory members of the IRLI at http://www.cdc.gov/immpact/projects/initiatives/iodine.html

urinary iodine levels were found to range from about 40 µg/l (Dominican Republic in 1993) to about 420 µg/l (Colombia in 2002) [32].

At this time, ICCIDD is pursuing the improvement of the quality of iodized salt, the implementation of effective monitoring and reporting systems, and sustained communication and education.

Reviewing the key recommendations in "Salt as a vehicle for fortification"

- Safe, efficacious and sustainable programs for salt iodization and dietary salt reduction require the involvement of several sectors and many players within each of them in a logical sequence where a clear separation of roles is important as is transparency of what each sector and its players are contributing. This is particularly relevant with regards to the salt and food industries whose participation is essential and at the same time needs to be specifically defined.

- Once nutritionists and researchers complete the scientific and epidemiological assessments of the appropriate sodium and iodine ratios needed, and governments prepare the national policies and strategies with corresponding standards/regulations, the "premix" manufacturers and the food industry (in the case of salt iodization) can then respond with production of fortified products to offer to populations.

- The salt and food industries also have other roles – working collaboratively with governments in social marketing and public education on what constitutes healthy intake of sodium and iodine.

- Governments must supervise and enforce the standards, and monitor and evaluate the outcomes and impacts of the program on the population.

- There were 19 recommendations in the 2007 document "Salt as a vehicle for fortification" [9]. The current initiative to realize a collaboration between salt iodization and dietary salt reduction programs provides an opportunity to analyze why the recommendations have not been implemented. At the same time it poses an important challenge – to critically examine what has been achieved with salt iodization programs and the basis on which they have been judged to be safe and successful.

- Analyzing one recommendation – "the iodine concentration in salt should be determined considering both the level of salt consumption and median urinary iodine (UI) of the population" – introduces a number of issues:
    - Urinary iodine can be found to be sufficient in various regions in a country while the classic indicators of IDD program effectiveness – the concentration of iodized salt (table salt) and its availability by region – can suggest inadequate intake because alternative sources of iodine are not taken into account. Conversely, high quality iodized table salt may be

readily available while UI is found to be insufficient, particularly in vulnerable groups (pregnant and lactating women).

- The dietary sources of salt vary. While household salt is iodized, salt used in food manufacturing may not be, and where processed foods are the main source of salt in the diet (while household table salt intake is relatively low), there is risk of iodine inadequacy. Hence salt reduction and salt iodization policies must vary from country to country based on food consumption patterns.
- There is still much to learn about UI levels e.g. how to adjust for urine daily volumes. Collaboration between salt iodization and salt reduction programs has potential to accelerate a better understanding of UI as an indicator of the effectiveness of salt iodization programs.

Update on the Iodine Task Force

- The Iodine Task Force (ITF) operates under the IDD Network umbrella. A Steering Group with WHO, UNICEF and ICCIDD helps to assure that the work is aligned with and feeds into the systematic review on salt iodization and also feeds into a revision of field-appropriate program guidelines.

- A Management Group (A. Timmer, J. Gorstein, F. van der Haar, L. Bohac) is responsible for day-to-day management, defines structures and processes, coordinates background research, supports five technical working groups, and is responsible for communication and logistic support.

- The five working groups comprise experts in the various areas from within and outside the Network member organizations. Their responsibilities are:
  - WG 1 – establishment of salt iodization standards to achieve optimal iodine intake
  - WG 2 – collection and interpretation of data on iodine status
  - WG 3 – collection and interpretation of iodine content in household and food industry salt
  - WG 4 – other iodine interventions
  - WG 5 – goal and program indicators

- The Task Force was conceived in April 2010 and was underway by September 2010. Each WG is led by a nominated focal point and consists of five to seven subject matter specialists. Each has set its expected outputs on a time trajectory. The groups will converge on a joint draft final report due at the end of May 2011.

- Linkages to salt intake reduction initiatives depend on the elements of national strategies, whether there are:
  - standards and norms affecting the supply of household salt
  - legislation concerning the salt supply to food manufacturing industry
  - legislation affecting the combination of the salt supply channels (households, food industry & livestock)
  - programs based on diverse and/or multiple food supply channels:

- Salt iodization programs to cover the whole population and/or iodine supplements (target groups) in combination with
- specialized foods containing iodine e.g. for different age groups (6-24/59 months, pregnant and lactating women, women of child bearing age, adolescent girls), for different contexts (humanitarian response, food insecure areas, development areas) and with different objectives (reduce stunting, prevent micronutrient deficiencies, address moderate acute malnutrition, improve nutrient intake and complementary feeding) and/or
- spontaneous fluctuations in salt or iodine intake e.g. special events/circumstances requiring adjustment such as high iodine intake from natural sources and natural sodium intake fluctuations.

- There are several opportunities for collaboration between the salt iodization and salt reduction programs, e.g. using each other's expertise and outcomes. Going forward, it is essential to preserve the benefits of collaboration by using realistic projections of national achievements from each policy. Salt iodization strategies (standards) have to adjust according to achievements made from national salt intake reduction policies. Programs need to work collaboratively in the monitoring of progress.

Population salt reduction strategies: activities and plans at WHO Headquarters

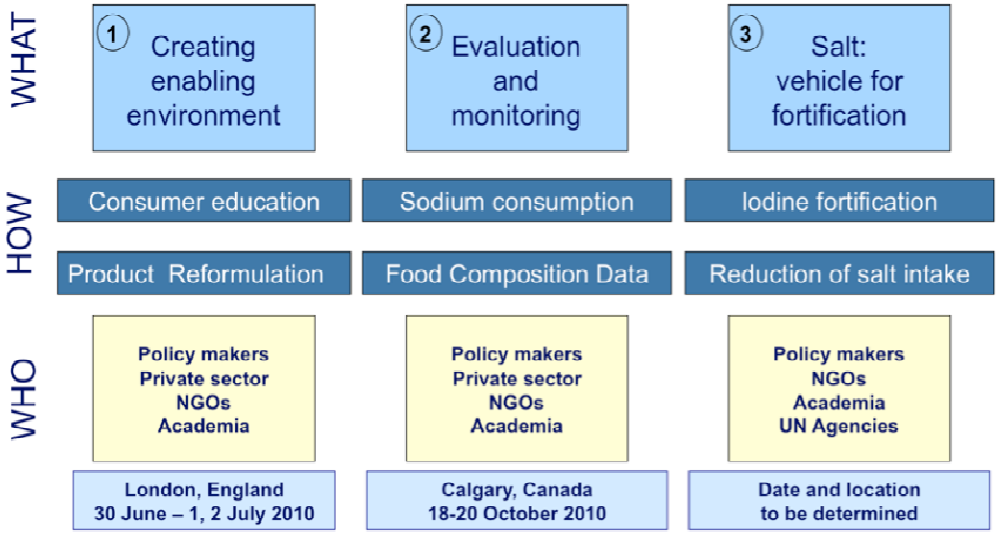
- Of the six objectives in the 2008-2013 Action Plan for the Global Strategy for the Prevention and Control of Non-communicable Diseases, directly relevant to dietary salt reduction is "reducing and preventing risk factors". Under each objective are sets of actions for Member States, a WHO Secretariat and international partners.

- The WHO population salt reduction strategy has three platforms. Platform 1 – Create enabling environments – was organized jointly with the UK FSA in the summer of 2010. There was an information exchange forum with the private sector and NGOs on population-based salt reduction strategies followed by a technical meeting.

- Platform 2 was organized jointly with the Government of Canada (Health Canada) in the fall of 2010. It was also an information exchange forum with the private sector and NGOs followed by a technical meeting, both on strategies to monitor and evaluate population sodium consumption and sources of sodium in the diet.

- Platform 3 intends to bring together dietary salt reduction and salt fortification with iodine, to facilitate the coordination of the two strategies.

WHO Population Salt Reduction Strategy



- In the meantime, a Nutrition Guidance Expert Advisory Group (NUGAG) is considering evidence that suggests lower sodium intake (1.2 g/day) may confer additional health benefits (compared to the current guideline of < 2g sodium or <5 g salt/day), and is undertaking systematic reviews of literature to answer two priority questions:
    - What is the effect of reducing sodium intake to 1.2 g/day versus 2 g/day on blood pressure and incidence of stroke, coronary heart disease, and cardiovascular disease in hypertensive and non-hypertensive adults?
    - What is the effect of reducing sodium intake to the equivalent of 2 g/day (based on caloric intake) versus > 2g/day on blood pressure in children?

- Also under consideration, at the request of CODEX, is potassium consumption for the general population, suggested by evidence to have health benefits, for which WHO does not have a current guideline/optimal level. Systematic reviews of literature currently underway are seeking to answer the question:
    - What is the effect of consuming $\geq$ 90 mmol/day of potassium versus < 90 mmol/day on blood pressure and incidence of stroke, coronary heart disease and cardiovascular disease in hypertensive and non-hypertensive adults?

- NUGAG is also updating a Cochrane systematic review from 2002 to answer – is salt iodization safe and effective for reducing IDD? Subgroups to be examined are: by age (<59 months, 5-12 years, women of reproductive age, pregnant women); population salt consumption (<5, 5-9.9, 10-14.9, ≥15g/day); iodine consumption based on urinary iodine excretion; concentration of iodine in salt (<20, 20-40, >40ppm); and availability of iodized salt (household only, processed foods only, all salt for human consumption iodized, unknown).

- NUGAG will have draft recommendations based on the findings from all reviews at a November 2011 meeting.

Meeting outcomes

The Way Forward

- Meeting participants responded to the background document prepared by the group that met in January 2011. It became the White Paper, see Appendix 1. The list of participants is in Appendix 2.

- Meeting participants prepared responses to five questions to inform the way forward with governments, the salt and food industries and consumers:
    - What arguments should be used to promote a common view as well as national ownership (for dietary salt reduction and improving iodine status to reach optimal intake of sodium and iodine)?
    - What information is needed to be convincing, and how to get it and present it?
    - What messages and attitudes should be avoided because they may hinder plans and intentions? What is still needed to overcome internal discrepancies?
    - Who should make contact with the sector, when and how?
    - What is the sequence of activities, where and at what level (regional, sub-regional, national)?

Governments

- The essential starting point to influence governments is evidence-based reviews developed through international collaborations of researchers mobilized and supported by WHO, PAHO, ICCIDD and UNICEF. With the lead agencies committed to collaboration and scientific reports ready, clear and simple messages, oriented for regional collaboration and avoiding directive approaches, can be distilled from the science such that if change is expected, solutions are obvious and allow for tailoring to suit national contexts to minimize political and public anxieties about re-balancing sodium and iodine intakes. Then on a country level, researchers and academics can be mobilized to prepare local evidence to build the case for a national initiative. They, together with representatives of the international agencies and local partners in various sectors in the country e.g. associations of health professionals, civil society leaders, NGOs and consumer associations can, as a coalition, present the case for coordinating salt reduction and salt iodization (or complementary measures) to national policy and decision makers.

- Essential for a coordinated response by the salt and food industries to achieve the optimal intakes of sodium and iodine is a sequence of actions to level the playing field for both the salt producers and food manufacturers. It begins by enhancing the existing national regulatory frameworks that currently govern the prevention of IDD through salt iodization, specifically the requirement for iodizing all salt for human consumption, known as the universal salt iodization (USI) strategy, and that food manufacturers use iodized salt where not currently in effect. This would be followed by an examination of food import policies to

ensure their congruence with the mandatory requirement for iodized salt in food products.

- As salt and iodine intakes are rebalanced, governments need to monitor both the intake levels of sodium and iodine along with the concentrations of iodine in salt and in commercially manufactured foods. Evaluations of progress need to be transparent and apply methods and indicators that are valid and reliable.

- Important to knowledge transfer is documentation of pilot projects and case studies to feature lessons learned and demonstrate the successful recalibrations of iodine to salt ratios and harmonization of salt reduction and salt iodization programs.

Salt and food industries

- With the fundamental requirement for salt iodization made mandatory, where the iodine to salt density ratio is based on total average salt intake of less than 5 g/day per person, the opportunity arises for food manufacturers to adopt a standardized salt/sodium content target for their food products. Where voluntary reformulations to reduce salt content by the food industry are protracted, and given the critical public health importance of recalibrating the iodine to salt ratio to reach the optimal intakes of both, governments can consider regulating a salt/sodium density to advance the progress of both programs.

- Essential to constructive engagement of the salt and food industries (the latter comprising food manufacturers and food service establishments) is an emphasis on positive outcomes – the reassurance that public agencies (governments, NGOs, civil society) are prepared to increase public awareness, in particular among vulnerable groups, of the benefits of combined optimal intakes of sodium and iodine and increase consumer demand for products that are in line with intake targets. Healthier foods should not have a negative impact on sales (if marketing and pricing policies are supportive) and the scientific evidence confirms that a range of iodine concentrations in salt makes no taste difference to consumers and people can adapt to lower salt content in relatively short time periods.

- Corporate leadership among the salt and food industries, especially with champions or umbrella associations, to coordinate the reduction of salt content of food products while retaining appropriate iodine fortification levels can accrue efficiencies to both industries. Governments need to be ready to congratulate the successes and where necessary provide technical and economic support to e.g. small salt producers to improve their supply of a consistent quality of iodized salt.

Consumers

- Avoiding mixed messages is crucial. Public education to raise awareness and where necessary change behaviour is essential, to disseminate the information on the positive health effects of optimal intakes of both sodium and iodine, why dietary salt needs to be reduced while iodine intake needs scrutiny especially among specific populations such as pregnant and lactating women, and pre-school age children, and where salt is added at the table and in cooking, that it should be iodized.

- Where processed foods are or are becoming the main sources of salt in the diet, consumers and their civil society organizations need to advocate more consumer control of salt intake to keep levels optimal for health. Most currently available processed and pre-prepared foods have excessive amounts of salt/sodium that is added before the product is sold.

- The engagement of experts in consumer behaviour, to design and evaluate information campaigns, is important to ensure as much as possible that messages are clear and understood, are context specific i.e. take into account whether the main sources of salt in the diet are discretionary salt use or processed and pre-prepared foods, and that vulnerable populations are being reached effectively.

- It is important for healthcare professionals to be well informed to reinforce the public education campaigns with consistent messages and advice.

Conclusions and next steps

Education and sensitization within agencies

- Agencies working in these areas should ensure staff are educated on the intersection of the two initiatives and sensitized to the potential for unintended negative consequences of their programs, particularly of advocacy and education communications.

Engage the international stakeholders

- In the next stage of the effort to coordinate salt reduction and salt iodization programs, PAHO will approach other national and international organizations for support for the recommendations in this report (e.g. UNICEF, the Inter American Heart Foundation, and Latin American Societies for Nephrology and Hypertension).
- WHO Headquarters Platform III meeting on iodine fortification will likely be attached to the upcoming NUGAG meeting in Korea on 28 November – 2 December 2011.

Discussion and further research on key technical issues

- A number of key technical issues require further thought and discussion and possibly research, involving technical sub-groups of experts, one example being the selection of target groups in the case of concurrent sodium and iodine intake surveillance.

Engage the salt and food industries

- As soon as all key stakeholders endorse the White Paper, the salt and food industries can be engaged as broadly as possible, including small and medium enterprises, to elaborate their roles in implementation.

Prepare for the pilot studies

- PAHO and the main stakeholders will establish the criteria on which to base the selection of countries in Central and South America e.g. the indicators of active and functional programs for dietary salt reduction and salt iodization, where the collaboration and harmonization of the programs can be piloted.
- PAHO and the main stakeholders will approach their respective focal points in the selected countries plus local academics to assemble teams of researchers and technical experts to initiate grant proposal preparation.

Mobilize resources

- PAHO will explore the receptivity of (NIH) NHLBI and the Child Health and Endocrinology Institute as well as the Swiss Federal Institute of Technology.

Timeline

- The White Paper will be completed by mid/end April.
- PAHO will approach the main stakeholders (ICCIDD, UNICEF, Iodine Network, GAIN, MI, Inter American Heart Foundation, Latin American Societies for Nephrology and Hypertension) to endorse the White Paper, aiming to be completed by mid May 2011.
- The full meeting report to be ready by the end of August 2011 (in time to inform the Iodine Task Force (ITF) at its next meeting).
- A technical group in mid summer convened by PAHO and ITF (using the outcomes of the five ITF working groups and the PAHO 24-hour urine sampling protocol to measure sodium and iodine intake) to identify the elements of a joint iodine and sodium surveillance protocol that are ready now (guidance and tools) and what still needs to be researched, to ultimately draft a comprehensive protocol for joint surveillance for the pilot studies.
- PAHO and ITF will prepare a joint intervention for the upcoming June 2011 annual meeting of the Institute of Food Technologists.
- The criteria for selecting countries for the pilot studies to be ready for the August 2011 ICCIDD Latin America workshop that is being planned.
- The research framework for the pilot studies to be presented to the Dietary Salt Reduction Expert Group in October 2011.

- PAHO and the main stakeholders will approach countries in Central and South America with active and functional programs for dietary salt reduction and salt iodization to pilot the coordination of programs.
- The pilot study project to be presented at the WHO Platform III meeting in November/December 2011.

References

1 ICCIDD. The Global Picture. Accessed April 5, 2011 at http://www.iccidd.org/pages/protecting-children/fortifying-salt.php.

2 World Health Organization. 1996. Recommended iodine levels in salt and guidelines for monitoring their adequacy and effectiveness. Based on a joint WHO/UNICEF/ICCIDD consultation, World Health Organization, 8-9 July 1996, Geneva, Switzerland. Accessed April 4, 2011 at http://whqlibdoc.who.int/hq/1996/WHO_NUT_96.13.pdf.

3 World Health Organization. 2007. Reducing salt intake in populations: report of a WHO forum and technical meeting, 5-7 October 2006, Paris, France. Accessed April 4, 2011 at http://www.who.int/dietphysicalactivity/Salt_Report_VC_april07.pdf.

4 He FJ, Marrero NM, MacGregor GA. Salt and blood pressure in children and adolescents. J Hum Hypertens. 2008;22:4-11.

5 He FJ, MacGregor GA. A comprehensive review on salt and health and current experience of worldwide salt reduction programmes. J Hum Hypertens. 2009;23: 363-84.

6 Feng J, MacGregor GA. Importance of salt in determining blood pressure in children: Meta-analysis of controlled trials. Hypertension. 2006;48:861-69.

7 World Health Organization. The World Health Report 2002: Reducing Risks, Promoting Healthy Life.

8 Hsu C, McCulloch CE, Darbinian J, Go AS, Iribarren C. Elevated blood pressure and risk of end-stage renal disease in subjects without baseline kidney disease. Arch Intern Med. 2005;165:923-28.

9 World Health Organization. 2008. Salt as a Vehicle for Fortification: report of a WHO expert consultation, 21-22 March 2007, Luxembourg. p 15-16. Accessed April 4, 2011 at http://whqlibdoc.who.int/publications/2008/9789241596787_eng.pdf.

10 Pan American Health Organization. Policy Statement on Dietary Salt Reduction. Accessed April 4, 2011 at http://new.paho.org/hq/index.php?option=com_content&task=view&id=2022&Itemid=1766.

11 Personal communication, Lucie Bohac, 2011, from unpublished Minutes of the Meeting of the Board of the Iodine Network on February 20, 2009 in Jaipur, India.

12 World Health Organization. 2009. Global Health Risks. Mortality and burden of disease attributable to selected major risks.

13 Vasan RS, Beiser A, Seshadri S, Larson MG, Kannel WB, D'Agostino RB, Levy D. Residual lifetime lisk for developing hypertension in middle-aged women and men – The Framingham Heart Study. JAMA. 2002;287:1003-10.

14 Meneton P, Jeunemaitre X, de Wardener HE, MacGregor GA. Links between Dietary Salt Intake, Renal Salt Handling, Blood Pressure and Cardiovascular Disease. Physiol Rev. 2005;85:679-715.

15 He FJ, MacGregor GA. Effect of longer-term modest salt reduction on blood pressure. Cochrane Database of Systematic Reviews 2004, Issue 1. Accessed April 6, 2011 at http://www.worldactiononsalt.com/evidence/docs/cochraneupdate_2006_salt_metaanalysis.pdf.

16 Whelton PK, He J, Appel LJ, Cutler JA, Havas S, Kotchen TA, Roccella EJ, Stout R, Vallbona C, Winston MC, Karimbakas J; National High Blood Pressure Education Program Coordinating Committee. Primary prevention of hypertension: clinical and public health advisory from the National High Blood Pressure Education Program. JAMA. 2002;288:1882-88.

17 Asaria P, Chisholm D, Mathers C, Ezzati M, Beaglehole R. Chronic disease prevention: health effects and financial costs of strategies to reduce salt intake and control tobacco use. Lancet. 2007;370:2044–53.

18 Bibbins-Domingo K, Chertow GM, Coxson PG, Moran A, Lightwood JM, Pletcher MJ, Goldman L. Projected Effect of Dietary Salt Reductions on Future Cardiovascular Disease. N Engl J Med. 2010;362:590-9.

19 He FJ, Marrero NM, MacGregor GA. Salt intake is related to soft drink consumption in children and adolenscents: a link to obesity? Hypertension. 2008;51: 629-34.

20 Brown IJ, Tzoulaki I, Candeias V, Elliott P. Salt intakes around the world: implications for public health. Int J Epidemiol. 2009;38:791-813.

21 Zimmermann MB. Iodine deficiency. Endocrine Reviews. 2009;30:376-408.

22 Zimmermann MB. Iodine deficiency in pregnancy and the effects of maternal iodine supplementation on the offspring: a review. Am J Clin Nutr. 2009;89 (Suppl):668S-72S.

23 Zimmermann MB. The adverse effects of mild-to-moderate iodine deficiency during pregnancy and childhood: a review. Thyroid. 2007;17:829-35.

24 Morreale de Escobar G, Obregon MJ, Escobar del Rey F. Role of thyroid hormone during early brain development. Eur J Endocrinol. 2004; 151(Suppl 3):U25–U37.

25 Williams GR. Neurodevelopmental and neurophysiological actions of thyroid hormone. J Neuroendrocrinol. 2008;20:784-94.

26 Woodruff S, Arowolo OA, Akute O, Afolabi AO, Nwariaku F. Global variation in the pattern of differentiated thyroid cancer. Am J Surg. 2010;200:462-66.

27 Stanbury JB. Ermans AE, Bourdoux P, et al. Iodine-induced hyperthyroidism: occurrence and epidemiology. Thyroid. 1998;8:83-99.

28 De Benoist B, McLean E, Andersson M, Rogers L. Iodine deficiency in 2007: Global progress since 2003. Food Nutr Bull. 2008;29:195-202.

29 Hetzel BS, Dunn JT, Stanbury JB (Ed). The prevention and control of iodine deficiency disorders. Amsterdam: Elsevier publ. 1987.

30 World Health Organization/International Council for the Control of the Iodine Deficiency Disorders/United Nations Childrens Fund (WHO/ICCIDD/UNICEF). Assessment of the iodine deficiency disorders and monitoring their elimination. Geneva: World Health Organization, 2007.

31 Ristic-Medic D, Piskackova Z, Hooper L, Ruprich J, Casqrain A, Ashton K, Pavlovic M, Glibetic M. Methods of assessment of iodine status in humans: a systematic review. Am J Clin Nutr. 2009;89:2052S-69S.

32 Pretell E. Grajeda R. Iodine nutrition in Latin America. IDD Newsletter. 2009;31:1-5.

33 Zhao J, Wang P, Shang L, Sullivan KM, van der Haar, F, Maberly G. Endemic goiter associated with high iodine intake. Am J Public Health. 2000;90:1633-35.

34 Teng W, Shan Z, Teng X, Guan H, et al. Effect of iodine intake on thyroid diseases in China. N Engl J Med. 2006;354:2783-93.

35 Stanbury JB. Ermans AE, Bourdoux P, et al. Iodine-induced hyperthyroidism: occurrence and epidemiology. Thyroid;1998;8:83-99.

36 Perrine CG, Herrick K, Serdula MK, Sullivan KM. Some subgroups of reproductive age women in the United States may be at risk for iodine deficiency. J Nutr. 2010;140:1489-94.

37 Personal communication, Eduardo Pretell, 2011.

Appendix 1

White Paper on Improving Public Health by Optimizing Salt* and Iodine Intakes

Pan American Health Organization, Washington DC – April 2011

Background

The International Council for the Control of Iodine Deficiency Disorders (ICCIDD) estimates that two billion people worldwide live in areas at risk of iodine deficiency. It states that among the methods to prevent iodine deficiency disorder (IDD), using salt as a vehicle to deliver supplementary iodine to the diet is most simple, practical and effective [1]. Together with WHO and UNICEF, it recommended in 1996 the iodine level at the point of production of 20-40 ppm, assuming an average per capita salt intake of 5-10 g per day [2].

In 2006, the report from a WHO Forum and Technical Meeting responding to the WHO Global Strategy on Diet, Physical Activity and Health recommended that average population level salt intake from all food sources be < 5g/day per person, in order to reduce the sodium intake to less than 2 g/d per person [3]. Salt added to food is a major factor increasing the blood pressure in normotensive and hypertensive people, whether adults or children [4,5,6]. Increased blood pressure is the leading risk factor for death worldwide and the second leading risk for disability by causing heart disease, stroke and kidney failure [7,8].

In 2007 a WHO Expert Consultation on "Salt as a Vehicle for Fortification", taking into account both the status of IDD and the evidence of harmful effects of high salt diets, emphasized the need for and benefits of coordination between salt iodization and dietary salt reduction programs [9]. It concluded that

> "Policies for salt iodization and reduction of salt to < 5 g/day are compatible, cost effective and of great public health benefit. At the country level, close collaboration between salt iodization and salt reduction programs as a coalition is urgently required so that their aims are congruent." [9, p. 15]

Most recently, with dietary salt reduction mobilizing in the Americas, the PAHO/WHO Regional Expert Group guiding the initiative indicated in its 2009 Policy Statement [10] that

> Salt intake can be reduced without compromising micronutrient fortification efforts. National governments are to review national salt fortification policies and recommendations to be in concordance with the internationally

* For the purpose of the document the word **salt** was used to refer to **sodium** expressed as **sodium chloride**.

> recommended target of < 5 g salt /day per person by 2020 or national targets if lower.

And the Iodine Network, in a resolution dated February 20, 2009 [11] stated

> BE IT FURTHER RESOLVED THAT the World Health Organization is urged to share with the Network Board any data, when and if it becomes available, about the achievement of salt reduction in various countries and its projected trends of salt consumption to inform Board discussion and national salt iodization programs to enable ongoing efforts to calibrate iodine fortification levels to ensure appropriate population iodine intakes.

Currently underway on the advice of the WHO Nutrition Guidance Expert Advisory Group (NUGAG) is a review of the evidence on how varying levels of population salt intake can impact the effectiveness of salt iodization programs, intending that salt reduction and salt iodization strategies work efficiently and effectively together. The results will feed into future revised WHO/UNICEF/ICCIDD salt iodization program guidelines, to become the starting point for newly coordinated efforts between iodine nutrition and dietary salt reduction. Needed as interventions are readied for implementation are current accurate baselines of actual iodine and salt intakes (assessed as sodium in the urine) and of the main sources of dietary salt and iodine (i.e. table salt and processed and pre-prepared food sources), information that is lacking in most countries. This would be followed by rigorous simultaneous measurement of urinary iodine and sodium, and food consumption patterns to monitor the progress of and feed critical information back to both programs.

Synchronization of salt iodization and dietary salt reduction programs brings together several stakeholders at international and national levels: the agencies working to optimize iodine supplementation and those focused on cardiovascular disease prevention; national governments; and various sectors of the salt and food industries. When the knowledge and experience of the stakeholders involved in the two programs are coordinated, with the stakeholders playing their respective roles within a framework for action directed at a common goal of mutual benefit, cost savings can be realized for healthcare systems.

A group of technical experts and stakeholders in both IDD and dietary salt reduction programs, convened by PAHO, has developed this White Paper to facilitate a broad collaboration between the programs, having agreed to a common goal and a Framework for Collaborative Action. It is directed to stakeholders for the two programs active within countries as well as those operating at the international level.

The Common Goal

> The achievement of optimal intakes of sodium and iodine

A Framework for Collaborative Action

1. **Common and coordinated messaging** at global, regional and national levels to
    a. policy and decision makers
    b. the salt and food industries
    c. stakeholders among the health professions
    d. the public and consumers

2. **Common advocacy platforms** to
    a. integrate the development/adjustment of iodine fortification of salt and dietary salt reduction policies and programs
        i. at national or sub-national levels taking into account localized food supplies and dietary practices
        ii. noting the need for collaboration among the diverse sectors and groups within the sectors involved in both initiatives
    b. implement effective and regular quality assurance and monitoring programs for iodization of salt and iodine nutrition
    c. synchronize national efforts to monitor iodine as dietary salt is reduced and where iodine deficiency is a concern, advance policies for the voluntary or mandatory use of iodized salt or iodine-containing premixes in commercially produced food at levels appropriate to population iodine needs
    d. harmonize wherever possible cross country approvals processes to admit new food products with low salt content and an adequate amount of iodine
    e. emphasize the importance of optimal iodine intake
    f. emphasize the importance to health and the cost savings to health care systems of reduced dietary salt intake

3. Concurrent surveillance of salt and iodine intake where feasible to inform salt iodization and dietary salt reduction programs including but not limited to
    a. methods that optimally assess and monitor salt and iodine intake including potassium where a public health concern
    b. comprehensive food surveys to distinguish the main sources of salt and iodine in the diet (including potassium where a public health concern) with questions to assess:
        i. the discretionary use of iodized salt at the table and in household cooking
        ii. salt intake through the consumption of processed foods, restaurant meals and street food and
        iii. the proportion of iodine in the diet contributed by each source
    c. methods that account for vulnerable and diverse populations
    d. establishing, promoting and supporting laboratory proficiency for iodine and sodium analysis, (and potassium where a public health concern)
    e. knowledge, attitudes and behavior surveys on salt consumption

f. monitoring the plans and patterns of the processed food industry with regards to
    i. provision of sodium (and/or salt) data on food labels
    ii. the feasibility of including iodine on labels
    iii. the markets where new salt-containing products are being or will be supplied/imported, especially in countries undergoing nutrition transition, to anticipate changes in salt intake levels and whether the products use iodized salt or are otherwise a source of iodine

4 Coordinated evaluations of national salt iodization and dietary salt reduction programs

a. applying a common set of principles including transparency and minimized conflicts of interest
b. committed to information sharing
c. independent of food and salt industries
d. demonstrating the link between action and disease outcomes

5. Strategic joint research to fill knowledge gaps relevant to both salt iodization and reduction of dietary salt that emphasizes but is not limited to pilot and case studies in countries of differing economic and cultural make-up on

a. how to most effectively optimize sodium and iodine intake
b. the most effective and feasible collaborative surveillance methods to determine sodium and iodine intake and the sources of salt and iodine in the diet

6 Shared forums with relevant sectors of the food industry to deal with iodine and sodium additives and promote

a. the voluntary or mandatory use of iodized salt or iodine-containing premixes in commercially produced food
b. improved capacity and technology of the salt industry to ensure consistent and high standards of iodization of salt of small and medium sized salt producers
c. calibration of iodization levels in salt based on the different salt intake levels with
    i. the food processing industry and the restaurant and catering sectors consistently using iodized salt
    ii. the food processing industry and the restaurant and catering sectors reducing the salt content of processed and pre-prepared foods
    iii. joint technical assistance and knowledge sharing between sectors
    iv. compatible positions on issues held in common e.g. international trade agreements and regulatory or voluntary frameworks governing the sectors such that both salt iodization and dietary salt reduction

programs can achieve their goals in the established timeframes

7 Coordinated mapping of existing and needed resources and mobilization of resources towards but not limited to

a. Concurrent surveillance, policy development, advocacy and consumer education.

…….

Disclaimer: The findings and conclusions in this meeting summary are those of the authors and do not necessarily represent the official position of their organizations or of the Pan American Health Organization.

References

1 ICCIDD. The Global Picture. Accessed April 5, 2011 at http://www.iccidd.org/pages/protecting-children/fortifying-salt.php.

2 World Health Organization. 1996. Recommended iodine levels in salt and guidelines for monitoring their adequacy and effectiveness. Based on a joint WHO/UNICEF/ICCIDD consultation, World Health Organization, 8-9 July 1996, Geneva, Switzerland. Accessed April 4, 2011 at http://whqlibdoc.who.int/hq/1996/WHO_NUT_96.13.pdf.

3 World Health Organization. 2007. Reducing salt intake in populations: report of a WHO forum and technical meeting, 5-7 October 2006, Paris, France. Accessed April 4, 2011 at http://www.who.int/dietphysicalactivity/Salt_Report_VC_april07.pdf.

4 He FJ, Marrero NM, MacGregor GA. Salt and blood pressure in children and adolescents. J Hum Hypertens. 2008;22:4-11.

5 He FJ, MacGregor GA. A comprehensive review on salt and health and current experience of worldwide salt reduction programmes. J Hum Hypertens. 2009;23: 363-84.

6 He FJ, MacGregor GA. Importance of salt in determining blood pressure in children: Meta-analysis of controlled trials. Hypertension. 2006;48:861-69.

7 World Health Organization. The World Health Report 2002: Reducing Risks, Promoting Healthy Life.

8 Hsu C, McCulloch CE, Darbinian J, Go AS, Iribarren C. Elevated blood pressure and risk of end-stage renal disease in subjects without baseline kidney disease. Arch Intern Med 2005;165:923-28.

9 World Health Organization. 2008. Salt as a Vehicle for Fortification: report of a WHO expert consultation, 21-22 March 2007, Luxembourg. p 15. Accessed April 4, 2011 at http://whqlibdoc.who.int/publications/2008/9789241596787_eng.pdf.

10 Pan American Health Organization. Policy Statement on Dietary Salt Reduction. Accessed April 4, 2011 at http://new.paho.org/hq/index.php?option=com_content&task=view&id=2022&Itemid=1766.

11 Personal communication, Lucie Bohac, 2011, from unpublished Minutes of the Meeting of the Board of the Iodine Network on February 20, 2009 in Jaipur, India.

Appendix 2: Meeting participants and contributors to the White Paper

Lucie M. Bohac Coordinator	**Iodine Network** 180 Elgin St, Suite 1000, Ottawa, ON, K2P 2K3 CANADA tel: +1 613 782-6812 fax: +1 613 782-6838 www.iodinenetwork.net	lbohac@micronutrient.org
Kimberly Harding Program Officer (Research)	**Micronutrient Initiative** 180 Elgin St, Suite 1000, Ottawa, ON, K2P 2K3 CANADA Tel: +1 613 782 6821 Fax: +1 613 782 6838 www.micronutrient.org	kharding@MICRONUTRIENT.ORG
Malia Boggs Technical Advisor Child and nutrition program	**USAID** Office of Health, Infectious Diseases and Nutrition USAID/GH/HIDN/NUT Room 3.07-041, Third Floor, RRB Washington, D.C. 20523-3700 Phone: 202-712-1294	mboggs@usaid.gov
Norm Campbell, PAHO /WHO Expert group , Chair	**Departments of Medicine, Community Health Sciences and Physiology and Pharmacology**, TRW, The University of Calgary,3280 Hospital Drive NW, Calgary Alberta, T2N 4Z6Tel: 403- 210 3955	ncampbel@ucalgary.ca
Prof. Dr.med. Michael B. Zimmermann	**Institute of Food, Nutrition and Health** Swiss Federal institute of Technology (ETH) Zürich LFV E19, Schmelzbergstrasse 7 CH-8092 Zürich, Switzerland Tel. +41 44 632 8657	michael.zimmermann@ilw.agrl.ethz.ch
Franco Cappuccio Consultant Cardiovascular Physician	Cephalon Chair – Cardiovascular Medicine and Epidemiology, Consultant Cardiovascular Physician, Director-WHO Collaborating Centre for Nutrition **University of Warwick, Warwick Medial School** Clinical Sciences Research Institute CSB bldg. UHCW Campus Clifford Bridge Road Coventry CV2 2dx, UK	F.P.Cappuccio@warwick.ac.uk

Omar Dary, expert in micronutrients PAHO /WHO Expert group , leads sub group on fortification issues	**Academy for Educational Development**. U.S. OFFICES **AED** Headquarters 1825 Connecticut Ave., NW, Washington DC Tel: 202-884-8436.	odary@aed.org
Mary L'Abbe Earle W. Mc Henry Professor	Earle W. Mc Henry Professor and Chair, Department of Nutritional Sciences **Faculty of Medicine, University of Toronto** Fitzgerald Bldg. 150 College Street Toronto, ON, Canada M5S 3E2 Tel: (416) 978-7235	Mary.labbe@autoronto.ca Lucile.lo@autoronto.ca
Barbara Legowski, Consultant, PAHO Secretariat salt initiative	17 Loch Isle Rd Ottawa, ONK 2H8G5 Canada Tel(613) 726 2625	legowski@rogers.com
Eduardo Pretell, IDD Coordinator for Americas	**Universidad Peruana Cayetano Heredia** Avenida Paseo de la República 3691 Oficina 401-A San Isidro, Lima 27, Perú	epretell@terra.com.pe
Arun Chockalingam Director, Global Health	**National Heart, Lung, and Blood Institute** Office of Global Health 31 Center Drive Suite 5A06D Bethesda, Md. 20892 Tel: 301-496-3620	chockalingama@mail.nih.gov
James Hospedales, Senior adviser, NC coordinator	**Pan American Health Organization** Area of Health Surveillance and Disease management 525 23rd street, NW Phone: 202 974 3695	hospedaj@paho.org
Lynnette Neufeld	**Micronutrient Initiative** 180 Elgin St, Suite 1000, Ottawa, ON, K2P 2K3 CANADA Tel: +1 613 782 6821 Fax: +1 613 782 6838 www.micronutrient.org	lneufeld@MICRONUTRIENT.org
Godfrey Xuereb, Team Leader (Population-based Prevention)	**WHO- HQ** Surveillance and Population-based Prevention Unit Department of Chronic Diseases and Health Promotion Tel. direct: +41 22 791 2617 Fax direct: +41 22 791 1581	xuerebg@who.int

Darwin Labarthe,Director, Division for Heart Disease and Stroke Prevention, NCCDPHP	**Centers for Disease Control and Prevention** Division for Heart Disease and Stroke Prevention National Center for Chronic Disease and Health Promotion Atlanta 770-488-8053, phone 770-488-8334, FAX	dil3@cdc.gov
Kevin Sullivan IMPACT Group	Impact Group, CDC, and Associate Professor Department of Epidemiology Rollins School of Public Health at **Emory University,** Claude Nance Rollins Bldg. (CNR), Room 3051 1518 Clifton Road, NE Atlanta, GA 30332	cdckms@emory.edu
Branka Legetic, PAHO Secretariat salt initiative	Regional adviser, non communicable disease prevention and control **Pan American Health Organization** Area of Health Surveillance and Disease management 525 23rd street, NW Phone: 202 974 3892	legeticb@paho.org
Christine Swanson Senior Nutrition Scientist	**National Institute of Health** Office of Dietary Supplements 6100 Executive Blvd. Room 7517 Tel: 301-435-2930	Swansonc@od.nih.gov
Ruben Grajeda Regional adviser, Micronutrient program	**Pan American Health Organization** Family and Community Health area 525 23rd street, NW Phone: 202-974-3853	grajedar@paho.org
Kathleen L. Caldwell Chief, Inorganic Toxicology Laboratories	National Center for Environmental Health **Center for Disease Control** 4770 Buford Hwy. Mail stop F-18 Tel: 770-488-7990	Klc7@cdc.gov
Mary E. Cogswell, RN, Dr PH Senior Scientist	**Centers for Disease Control and Prevention** Epidemiology & Surveillance Branch Division for Heart Disease and Stroke Prevention National Center for Chronic Disease and Health Promotion 770-488-8053, phone 770-488-8334, FAX	mec0@cdc.gov

Catherine (Cay) Loria, PhD, MS, MA, FAHA ,Nutritional Epidemiologist	**National Heart, Lung, and Blood Institute** Division of Cardiovascular Sciences 6701 Rockledge Dr., Suite 10018 Bethesda, MD 20892-7936 FED EX ZIP: 20817 301-435-0702 301-480-5158 (fax)	loriac@mail.nih.gov
Jessica Tilahun, Nutrition Advisor	**USAID** Office of Health, Infectious Diseases and Nutrition USAID/GH/HIDN/NUT , Third Floor, RRB Washington, D.C. 20523-3700 Phone: 202-712-0065	jtilahun@usaid.gov