

# *Salt reduction and iodine fortification strategies in public health*

Report of a joint technical meeting convened by World Health Organization and The George Institute for Global Health in collaboration with the International Council for the Control of Iodine Deficiency Disorders Global Network, Australia, March 2013



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# *Executive summary*

The World Health Organization (WHO) promotes both the implementation of programmes to reduce population salt intake as one of the cost-effective strategies to reduce the burden of noncommunicable diseases and universal salt iodization to prevent and control iodine deficiency disorders. The joint technical meeting was convened by WHO and The George Institute for Global Health in collaboration with the International Council for the Control of Iodine Deficiency Disorders (ICCIDD) Global Network. It brought together technical experts in Iodine Deficiency Disorders and dietary salt reduction and WHO representatives from all regions of the world to consider the potential for maximizing the impact of salt reduction and iodine deficiency elimination programmes through improved coordination.

Key elements of salt reduction and iodine deficiency elimination programmes were discussed and updates on progress with implementation provided. This was accompanied by presentations of new research findings and roundtable discussions with case studies from different countries. Finally, working group discussions were held to consider the priorities for supporting national and international efforts in optimizing salt and iodine intake at the population level; effective stakeholder collaboration and opportunities for a research agenda.

The meeting demonstrated the potential to synergize both programmes to ensure optimal implementation of each programme by promoting their commonalities and complementarities. Commonalities between the two programmes are that both are geared towards improving public health throughout the world through a population-wide approach. Both programmes adopt a multistakeholder approach and encompass health promotion, prevention, treatment and rehabilitation; all of which involve working closely with the food industry.

A key difference is that the iodine fortification programme is based on salt as the main food vehicle to increase iodine intake, whereas for the salt reduction programme excessive salt consumption is a main risk factor. The policies can be coherent provided that there is (a) full implementation of universal salt iodization, (b) effective implementation of salt reduction policies including regulation of salt levels in processed foods and (c) increasing iodine levels in salt as salt intakes are decreased.

A joint plan for collaborative work is to be developed to outline the common objectives. Initially, this could be two distinct programmes but with areas of overlap clearly identified and strategies in place to ensure effective complementarity. The main areas of complementarity for the two programmes at global, regional and national levels are:

- Policy development
- Research, monitoring and evaluation
- Implementation
- Advocacy and communications

WHO and the United Nations Children's Fund (UNICEF) can lead the development and coordination of a joint programme, working with ICCDD Global Network and the WHO Collaborating Centre on Population Salt Reduction at The George Institute for Global Health in Sydney, Australia. A wide range of other organizations can be involved in the implementation. Governments will be encouraged to develop strategies to engage all departments in support of universal salt iodization and effective policies and regulations to reduce salt consumption. Civil society action can be leveraged to support the joint implementation. Industry will be consulted in relation to implementation but will have no role in policy-making. Developing a consistent strategy and message as well as identifying and managing perceived or real conflicts of interest will be fundamental to the successful delivery of the strategies.

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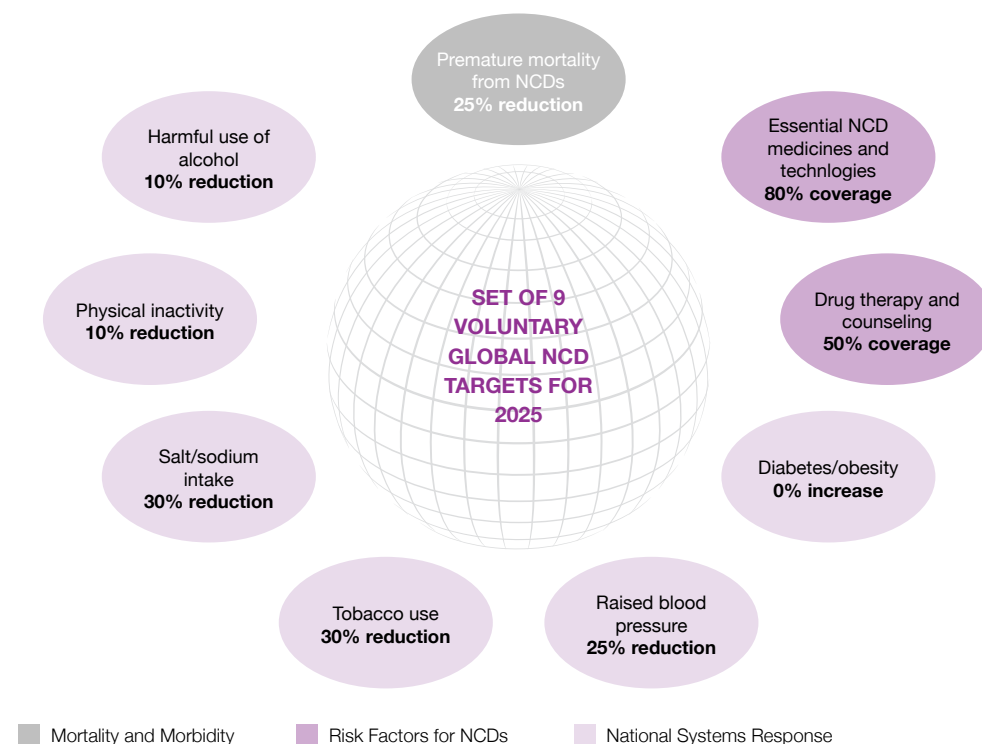
<sup>1</sup> Definitions are set out in Annex 3 at the end of this document.

# Introduction

Noncommunicable diseases (NCDs), represent a leading threat to human health and economic development. The leading risk factor for the global disease burden is raised blood pressure, estimated to cause 9.4 million deaths every year—more than half of the estimated 17 million annual deaths caused by total cardiovascular disease (1). The World Health Organization's (WHO) Global status report on *noncommunicable diseases, 2010* recommended reduced salt intake and salt content of food as cost-effective actions that should be undertaken immediately, with expected accelerated results in terms of lives saved, cases of disease prevented and costs avoided (2). This position has since been endorsed by the 2011 Political Declaration of the United Nations High Level Meeting on NCDs (3) which led to the development and adoption of the *Global Monitoring Framework and Voluntary Global Targets for the Prevention and Control of NCDs*<sup>i</sup> in which Member States have agreed a global target of a 30% relative reduction in mean population intake of salt/sodium by 2025 (Figure 1) (4).

At the same time as salt reduction is recommended globally, there is concern that iodine deficiency disorders (IDD) may re-emerge despite the fact that many countries have adopted universal salt iodization<sup>ii</sup> (USI) in response to the resolution passed in the 43<sup>rd</sup> World Health Assembly<sup>iii</sup> that addressed the elimination of iodine deficiency disorders. Iodine deficiency disorders are a global health problem that can result in impaired cognitive development and function, hypothyroidism, congenital anomalies, cretinism or endemic goitre (5). The WHO, United Nations Children's Fund (UNICEF) and the International Council for the Control of Iodine Deficiency Disorders (ICCIDD) Global Network recommend an intake of 150 µg iodine/day for adults and 220–290 µg/day for pregnant and lactating women and salt has continued to be the most common food vehicle for iodine fortification (6). WHO endorses universal salt iodization whereby all

**FIGURE 1: WHO NCD Global Voluntary Targets**



<sup>i</sup> Resolution WHA66.10. Endorsement of the Global Monitoring Framework and set of Voluntary Global Targets for the Prevention and Control of NCDs. World Health Assembly, Geneva, 20–28 May, 2013, [http://apps.who.int/gb/ebwha/pdf\\_files/WHA66/A66\\_R10-en.pdf](http://apps.who.int/gb/ebwha/pdf_files/WHA66/A66_R10-en.pdf) [accessed November 2013].

<sup>ii</sup> Universal salt iodization (USI) refers to the mandatory fortification of all food grade salt (sodium chloride) for human and animal consumption. This includes the iodization of all salt for household use as well as salt used as an ingredient of processed foods and condiments.

<sup>iii</sup> Resolution WHA43.2. Prevention and control of iodine deficiency disorders. World Health Assembly, Geneva, 7–17 May, 1990, [http://www.who.int/nutrition/topics/WHA43.2\\_idd\\_en.pdf](http://www.who.int/nutrition/topics/WHA43.2_idd_en.pdf) [accessed November 2013].

salt for human and animal consumption is iodized (including salt for processing) (7) and reaffirms that the public health goals of reducing salt and increasing iodine intake through salt iodization are compatible given that the concentration of iodine in salt can be adjusted as salt intake is reduced (8, 9). The coherence between the policy of reducing salt consumption to prevent NCDs and the policy of universal salt iodization to eliminate iodine deficiency disorders was further recognized in a WHO expert consultation in 2007. The meeting concluded that the policies for salt iodization and reduction of salt to less than 5 g/day are compatible, cost-effective and of great public health benefit (Box 1) (8). As part of the implementation of the WHO Global Strategy on Diet, Physical Activity and Health (10) and the 2008–2013 Action Plan for the Global Strategy for the Prevention and Control of NCDs (11), WHO planned to convene three multistakeholder information exchange forums and technical meetings focusing on various aspects of population sodium reduction strategies. These meetings took place in the United Kingdom, July 2010 and in Canada in October 2010. The strategies discussed included:

- Creating environments to enable the reduction of sodium intake; and
- Evaluating and monitoring population sodium consumption and sources of sodium in the diet.

To complete the series of multistakeholder information exchange forums and technical meetings on aspects of population salt/sodium reduction, the WHO Department of Prevention of Noncommunicable Diseases and the Department of Nutrition for Health and Development, in collaboration with The George Institute of Global Health and the International Council for the Control of Iodine Deficiency Disorders (ICCIDD) Global Network, convened a technical consultation on salt reduction and iodine fortification strategies in public health, which was held in Sydney, Australia, 25–27 March 2013.

The aim of the meeting was to review and discuss ongoing initiatives, policies and programmes aimed at reducing salt/sodium intake at the population level and using salt as a vehicle for iodine fortification in public health, including recognizing successes, challenges and key factors for sustainability of interventions. The specific objectives were to:

1. Review existing protocols and surveys used for monitoring of sodium and/or iodine consumption and assess potential adaptation in monitoring and evaluation of sodium and iodine intake;

### **BOX 1: Salt as a vehicle for fortification**

Recommendations of the WHO Expert Consultation, 21–22 March 2007, Luxembourg:

- Policies for salt iodization and reduction of salt intake to less than 5 g/day are both necessary and compatible
- Universal salt iodization is the recommended strategy to control iodine deficiency, and successful programmes should continue and be sustained
- Reliance of salt as a vehicle for dietary intake of iodine should not be used to justify promotion of salt intake to the public and additional vehicles should continue to be explored
- Assumption of level of iodine at 20–40 mg/kg is based on an average salt intake on 10 g/day at population level which may have changed
- The use of salt as the vehicle for new fortification initiatives other than iodine and fluoride should be discouraged
- Multinational food industries should harmonize the salt content of their products according to lowest threshold possible to avoid variations in products in different countries
- Changes in population salt intakes needs to be assessed over time via monitoring of urinary sodium excretion and levels of iodine fortification adjusted accordingly

2. Discuss the role of food manufacturers in the synergistic implementation of both the population-based salt/sodium reduction strategies and the salt iodization programmes;
3. Review ongoing research on safety, efficacy and effectiveness of use of potassium enriched (sodium reduced) iodized salt in public health;
4. Identify innovative strategies and potential barriers to ensure that the campaigns for salt/sodium reduction and salt as a vehicle for fortification can be run in parallel and with equal success.

The participants of the technical consultation included representatives of government agencies, international health organizations and academics. Annex 1 shows the list of the meeting participants and Annex 2 the meeting agenda.

# Progress in relation to implementation of salt reduction and iodine deficiency elimination policies

## Salt

Salt reduction has been identified as one of the most cost-effective interventions for reducing the burden of NCDs with the potential for saving millions of lives each year (12). In 2003, a joint expert consultation by WHO and the Food and Agriculture Organization of the United Nations (FAO) recommended a salt intake at the population level of less than 5 g/day, with a provision for ensuring the adequate iodization of salt (13). Recommendations for Member States and other stakeholders on interventions to reduce population salt intake with the long-term goal of preventing NCDs were subsequently developed in 2006 (14). Action on salt reduction was further accelerated in 2010 as part of the implementation of the WHO Global Strategy on Diet, Physical Activity and Health (10) and the 2008–2013 Action Plan for the Global Strategy for the Prevention and Control of NCDs (11). The implementation of this strategy encompassed technical meetings on creating environments which enable the reduction of sodium intake (15) as well as evaluating and monitoring population sodium consumption and sources of sodium in the diet (16). The significance of population salt reduction was further endorsed by the 2011 Political Declaration of the United Nations High Level Meeting on NCDs (3) and led to the development and adoption of the Global monitoring framework and voluntary global targets for the prevention and control of NCDs in which a 30% relative reduction of population salt intake is a core target in the aim of achieving a 25% reduction in premature death caused by NCDs by the year 2025 (4).

In parallel with these international developments there has been a considerable amount of scientific evidence relating to salt intake, raised blood pressure and risk of cardiovascular diseases. This evidence strongly supports the WHO recommendation of a reduction in sodium intake to reduce blood pressure and risk of cardiovascular disease in adults. The

### **BOX 2: World Health Organization guidelines: Sodium intake for adults and children (17)**



This guideline provides updated global, evidence-informed recommendations on the consumption of sodium to reduce NCDs in most adults and children. It should be used in conjunction with potassium and other nutrient guidelines to develop and guide national policies and public health nutrition programmes.

### **BOX 3: World Health Organization guidelines: Potassium intake for adults and children (19)**



This guideline provides the first global, evidence-informed recommendations on the consumption of potassium to reduce NCDs in most adults and children. It should be used in conjunction with sodium and other nutrient guidelines to develop and guide national policies and public health nutrition programmes.



WHO recommends a reduction to <2 g/day sodium (5 g/day salt) in adults (Box 2) (17) In addition, there is mounting evidence to suggest an increased potassium intake reduces systolic and diastolic blood pressure in adult (18). The WHO recommends an increase in potassium intake from food to reduce blood pressure and risk of cardiovascular diseases in adults and suggests a potassium intake of at least 3510 mg/day for adults (Box 3) (19).

Consequently the prioritization of salt reduction has led to an increase in the number of Member States implementing salt reduction strategies. A 2010 review of national salt reduction initiatives showed that 32 countries had strategies in place (20), most of the strategies were government-led with population salt targets and some baseline information. New policy initiatives have since been documented in the Americas (Box 4) (21) Europe (Box 5) (22) Africa, and throughout the Western Asia Pacific Region (Box 6) (23).

While many countries have begun and continued with action to reduce salt consumption in their populations, the United Kingdom has reported the most recent nationwide salt reduction programme successes. From 2004, with the voluntary engagement of the food industry, the government introduced a population-based salt reduction programme which included average and maximum salt targets for each food category and the use of a media campaign to increase public awareness and demand for change (24) Salt intake decreased from 9.5 g/day in 2001 to 8.6 g/day in 2008 and most recently data has shown that population salt intake fell a further 0.5 g (6%) to 8.1 g/day in 2011 (25). It was estimated that the salt reduction campaigns in the United Kingdom, which cost just £15 million, led to approximately 9000 fewer cardiovascular deaths per year, saving the economy more than £1.5 billion per annum (26). Notwithstanding these figures, further research focusing on salt reduction strategies remains paramount.

#### **BOX 4: PAHO/WHO Regional Office for the Americas - Technical document Salt Smart Americas (21)**



The WHO Regional Office for the Americas (Pan American Health Organization) (AMRO/PAHO) has been driving initiatives to address the prevention and control of noncommunicable disease across the Americas through effective salt reduction programmes. Salt-Smart Americas: A Guide for Country-Level Action highlights the recommendations, protocols, and guidelines developed under the PAHO regional initiative.

#### **BOX 5: WHO European Regional Office (EURO) - Mapping salt reduction initiatives in WHO European Region (22)**



In the WHO European Region (EURO), 26 of the 53 EURO Member States have operational salt reduction policies. In some countries, advocacy groups or research institutions are carrying out activities in the absence of salt reduction policies. When it comes to the existence of baseline assessment data, 31 Member States have carried out activities in this area by urine analysis, intake survey or salt levels in food categories. In total, 33 Member States have initiated some form of consumer awareness activity, either through a government programme or through the involvement of a nongovernmental advocacy organization. Labelling activities have been implemented or are planned in 17 Member States and vary as to whether they are voluntary or regulated by legislation. Involvement by industry was found to be voluntary in the majority of cases, spanning a variety of activities, including food reformulation and the production of toolkits for the general public, as part of corporate responsibility initiatives. Monitoring and evaluation activities were planned or carried out in 25 Member States in the form of urine analysis, sampling of commercial food products and measurements of the effects of campaign awareness. Voluntary self-reporting by industry also takes place.

#### **BOX 6: WHO Western Pacific Regional Office (WPRO) - Regional Consultation on Strategies to Reduce Salt Intake (23)**



Salt reduction was initiated in the Western Pacific with a Regional Consultation on Strategies to Reduce Salt Intake in Singapore, 2–3 June 2010. Baseline surveys have been conducted in Mongolia, Cambodia, the Lao People's Democratic Republic and Viet Nam. Salt reduction interventions have been initiated in 11 countries in the Western Pacific Region including Mongolia, which achieved a 10% reduction in salt content in Atar bread in May 2011. In the Pacific, Cook Islands, Fiji and Samoa are in the process of conducting baseline surveys while a total of 14 countries have held national salt reduction consultations and developed draft salt reduction strategies. Fiji and Solomon Islands have adopted mandatory standards for iodine fortification of salt and another 9 countries have draft standards in place.

## Iodine

It is estimated that 1.88 billion people worldwide remain at risk of insufficient iodine intake and approximately a third of the world's population lives in areas with some iodine deficiency (27). Iodine deficiency is particularly common in countries in the Eastern Mediterranean region, Asia, Africa, and large parts of Eastern Europe (28). Inland areas, especially mountainous areas such as the Alps, the Himalayas and the Andes are particularly prone to iodine deficiency (29). However, the issue has not been confined to low- and middle-income countries and there is evidence to suggest that recently Australia, New Zealand and the United Kingdom are now confronted with a re-emergence of mild iodine deficiency (30). Epidemiological criteria for assessing iodine nutrition based on median urinary iodine concentration have been developed by WHO (Box 7).

Food grade salt as a vehicle for the delivery of iodine is based on many factors:

- It is one of few commodities consumed by everyone; consumption is stable throughout the year.
- Importation is often limited to a few producers.
- Iodization technology is easy to implement and is available at a reasonable cost.
- The addition of iodine to food grade salt or iodized salt to processed foods does not affect colour, taste or odour.
- The quality of iodized salt can be easily monitored.

Not only is salt iodization effective, it is remarkably cost effective. As an example:

- If the cost of iodized salt is \$0.10 per person per year, the benefit–cost ratio is 26.5:1.
- If the costs are \$0.01 per person per year (as in Central America), the benefit–cost ratio is 265:1.

The estimated annual potential cost attributable to iodine deficiency disorders in the developing world prior to widespread salt iodization was \$35.7 billion per year versus \$0.5 billion per year after salt iodization, giving a benefit–cost ratio of 70:1 (33).

The International Council for the Control of Iodine Deficiency Disorders (ICCIDD) Global Network believes global progress against iodine deficiency by expanding salt iodization over the last two decades to be a major public health triumph, however these achievements are fragile and need to be sustained (Figure 2).

The use of salt as a vehicle for food fortification in poor areas of rural subsistence farming is commonly the only choice; this is particularly true in key regions such as sub-Saharan Africa, South Asia where the health and economic burden of iodine deficiency disorder is highest.

### BOX 7: Epidemiologic criteria for assessing iodine nutrition based on median urinary iodine concentration in different target groups (31).

Median urinary iodine (µg/L)	Iodine intake	Iodine status
<b>School-age children (6 years or older)<sup>a</sup></b>		
<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	May pose a slight risk of more than adequate iodine intake in these populations
≥300	Excessive <sup>b</sup>	Risk of adverse health consequences (iodine-induced hyperthyroidism autoimmune thyroid disease)
Median urinary iodine (µg/L)	Iodine intake	Iodine status
<b>Pregnant women</b>		
<150	Insufficient	
150–249	Adequate	
250–499	Above requirement	
>500	Excessive <sup>b</sup>	
<b>Lactating women and children aged less than 2 years</b>		
<100	Insufficient	
>100	Adequate	

<sup>a</sup> Also applies to adults, but not to pregnant and lactating women.

<sup>b</sup> “Excessive” means in excess of the amount required to prevent and control iodine deficiency.

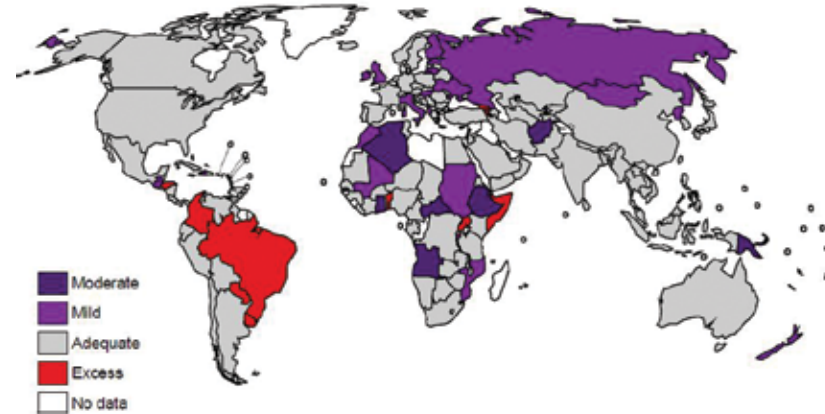
<sup>c</sup> Although lactating women have the same requirement as pregnant women, the median urinary iodine is lower because iodine is excreted in breast milk (32).

**FIGURE 2: Comparison of Iodine deficient countries 1993-2013**

**1993**  
110 countries iodine deficient



**2013**  
31 countries iodine deficient



Alternative vehicles to salt to carry iodine are being investigated especially where salt is not the main dietary condiment (e.g. iodine fortification of fish sauce in Thailand and Cambodia).

While there is no evidence that adding iodine to salt increases salt consumption or impedes the implementation of a salt reduction strategy, messages must be clear. An example used in Italy is: *Poco sale, ma iodate! (Little salt, but all iodized)*. With effective implementation of universal salt iodization, it would be easy to avoid potential misleading messages as there would be no need to promote the use of iodized salt. In addition it can be simple for national programmes to titrate iodization levels as salt intakes rise or fall, based on urinary iodine.

In Croatia for instance, all food grade salt, including salt from three national plants as well as food grade salt which is imported, is iodized. Based on estimated daily per capita salt intakes of 10 g/day, the Croatian programme iodizes all salt, used by the food industry, at 25 mg/kg to provide 250 µg/day and ensures appropriate intakes in school-age children and pregnant women:

- Median urinary iodine concentration in school-age children = 248 µg/L
- Median urinary iodine concentration in pregnant women = 159 µg/L

If salt intake fell to 5 g/day, salt iodization could be increased to 50 mg/kg without technical or sensory barriers to ensure intakes of 250 µg/day (34).

However the potential impact of salt reduction on iodine intakes will vary and likely be country- and context-specific and will depend on the interactions of various factors:

- Current salt intakes and how much salt intakes are reduced;
- Whether reductions in salt intake occur mainly in households or by industry using less salt as an ingredient;
- Extent of household coverage with iodized salt;
- Extent of use of iodized salt in food processing by the food industry;
- Relative contribution of household versus. food industry salt to iodine intakes;
- Contribution of 'hidden' dietary iodine sources (e.g. dairy products, groundwater).

Policies for salt iodization and reduction of salt intake are compatible, but the impact on iodine intakes will be highly context- and country-specific. Because of this diversity, a generalized iodization standard may have limited value as salt intake falls. This emphasizes the importance of careful monitoring of iodine status and 'tailored' iodine programmes. These issues are addressed in the Cochrane systematic review of 2013 (Box 8).

**BOX 8: Updated Cochrane review (35)**

The objective of this systematic review was to assess the safety and effectiveness of iodized salt compared to non-iodized salt for the prevention of iodine deficiency disorders: specifically the primary outcomes of all-cause mortality, goitre, cretinism, intelligence (IQ), hypothyroidism, and hyperthyroidism. Databases, including Cochrane CENTRAL, MEDLINE, CNKI, VIP, reference lists of included studies, and the WHO International Clinical Trials Search Portal (ICTRP) were searched and relevant agencies and international stakeholders were contacted to identify studies. Randomized and non-randomized controlled trials (RCT) studies that compared a group of individuals consuming iodized salt to a group consuming non-iodized salt and reported on an outcome of interest were identified. In total 89 studies: 2 RCTs, 6 non-RCTs, 20 quasi-experimental, 16 cohort, 42 multiple cross-sectional studies, and 3 studies of mixed design were included. The number of participants in individual studies ranged from 35 in one non-RCT to over 5 million in a multiple cross-sectional registry-based study. The preliminary findings suggest that while the risk of bias was high, the effect estimates were large and consistent across a vast number of studies implemented in diverse contexts in all regions of the world, increasing confidence that iodized salt is an effective intervention for the prevention of iodine deficiency disorders.

**Examples of country strategies on iodine deficiency prevention**

The following section sets out summaries of the presentations made by speakers during the meeting plenary sessions.

**AUSTRALIA**

Iodine deficiency is not confined to low- and middle-income countries. In recent years Australia, a high-income country was confronted with a re-emergence of mild iodine deficiency (30). In Australia, replacement of iodine-containing sanitizers with other chemicals in the dairy industry from the 1990s is thought to have contributed to the decline in iodine intake (36). In addition, intakes of iodine-rich fish and seafood are low (37, 38) there is a general lack of awareness within the population about the importance of iodine in the diet (39-41) and, while iodized table salt is available through voluntary fortification by salt producers, its use is low (42). Australia has not adopted universal salt iodization, but instead has mandated the iodine fortification of all salt used in the bread-making process, with the exception of organic bread, as from October 2009. Initial research has indicated that this mandatory approach has been effective in improving

iodine status (43). However, it was predicted that the change in iodine intake would not meet the needs of pregnant and lactating women. Thus supplementation of 150 µg/ day for these groups has been recommended by the National Health and Medical Research Council of Australia.

An assessment of iodine status amongst Australian non-pregnant women found: a median urinary iodine concentration (calculated using 24-hour urine sample) to be similar across varying levels of dietary sodium (41, 44). Amongst the general Australian population dietary sodium levels have been estimated at 8–12 g/day (44-46). Currently upwards of 75% of all salt consumed is from processed foods in Australia. Efforts to reduce population sodium in Australia consequently centre on reformulation of twelve food categories: breads, ready-to-eat breakfast cereals, simmer sauces, processed meats, soups, savoury pies, processed poultry, cheese, potato/corn and extruded snacks, savoury crackers, noodles and condiments. The Australian Food and Health Dialogue has established a set of voluntary sodium reduction targets for the above food categories and engages with the food industry to facilitate progress towards reformulation objectives (47).

**INDIA**

The Kangra Valley study of 1956–1972 was conducted with the aim of evaluating the effectiveness of iodized salt for the prevention of Himalayan goitre, which was highly endemic in the region at that time. The study concluded that providing iodine in the form of adequately iodized salt on a regular and continuous basis reduced the prevalence of goitre and as a result the National Goitre Control Programme (NGCP) was launched in 1962 (48). Additional surveys conducted under this programme reported specific Himalayan foci of Iodine Deficiency Disorders (IDD) and a multi-centric study in 1984 concluded that iodine deficiency disorder was a public health problem in all states and Union Territories of India (49). The government subsequently set a goal to fully implement universal salt iodization by 1992 and the National Goitre Control Programme was renamed the National Iodine Deficiency Disorder Control Programme with major objectives of:

- Restricting the use of non-iodized salt
- Production and supply of iodized salt to iodine deficiency endemic regions
- Health education and publicity on iodine deficiency prevention
- Monitoring the quality of iodized salt, iodine deficiency disorders and urinary iodine concentrations patterns

The number of salt iodization plants has increased from 12 in 1962 to 764 in 2011. However, the household coverage of iodized salt in India still remains at 71%, far below the 90% target. Strengthening the political commitment towards universal salt iodization

as well as monitoring to effectively track production, quality and movement of iodized salt will be required for coverage to improve.

The report of a task force on salt consumption patterns in India from 1996 identified the daily per capita consumption of salt to be 13.8 grams. A more recent analysis conducted in an urban south Indian population from 2007 has subsequently found intakes to be at 8.5g/day (50). Strategies for salt reduction in India are currently still in the planning stages. However there is a view to integrating salt reduction strategies into the existing policies and programmes that address the control of NCDs and cardiovascular diseases. Informal consultation on the public health implications of salt consumption have recently taken place in Vadodara in the Indian State of Gujarat, where it was concluded that salt reduction strategies should be developed with the aim of achieving a 30% reduction in population salt/sodium intake by 2025. It was noted that achieving this would require the creation of an enabling environment towards population salt reduction, including champion institutions and individuals, consumer motivation and education, and the development of a context-specific approach for engaging the food industry.

### **LATIN AMERICA AND THE CARIBBEAN**

Globally, Latin America and the Caribbean are regarded as having the greatest regional coverage with salt iodization programmes, with the exception of Haiti, the Dominican Republic, Guatemala, and in some years El Salvador (51). The common feature of non-complying countries is the total or partial dependence on salt produced, iodized, and packaged by small and unorganized operations. Recent analysis of the urinary iodine concentration in spot samples from women of reproductive age in Guatemala and the Dominican Republic suggests that iodine intake is excessive. In the Guatemalan highlands (the poorest area), one third of salt samples are non-iodized, and the average content of the remaining is 20 mg/kg, which has shown to be sufficient to provide adequate population requirements. In the Dominican Republic where only 27% of the discretionary salt for household use (cooking and table salt) is iodized, the excessive intakes of iodine identified are the result of increasing use of bouillon cubes and powder soups that are manufactured with imported iodized salt containing 60 mg/kg. Analysis by the Food Composition Laboratory of the Institute of Nutrition of Central American and Panama shows that one serving size of any of these products supplies 80–180% of the estimated average requirement of iodine for an adult person, together with 1–2 g of salt. These alternative vehicles for iodization use iodized salt as an ingredient and have impacted positively on the iodine status of the population. However, at the same time they are contributing to the escalating salt intakes in these countries.

The 2006 WHO/UNICEF/ICCIDD recommended salt to be iodized with an average iodine content of between 20 and 40 mg/kg. This recommendation originated from average

estimations of salt intakes of 10 g and 5 g/day, respectively. Recently, concern about an insufficient supply of iodine during pregnancy and lactation has been expressed. This is due to the highest requirement of iodine being necessary during these physiological stages. The calculations based on comparative energy intakes point out that the iodine content in salt to satisfy the requirements of household members, even during pregnancy and lactation, can be 22.5 to 45 mg/kg salt intake. This translates to an adult male salt intake of 5–10g/day. In general, the actual iodization contents in Latin American and the Caribbean coincide, or are well beyond those values. This situation suggests that in Latin America and the Caribbean reduction of salt intake might be suitable not only to decrease sodium intake but also to avoid excessive intakes of iodine (52).

The National Programme for the Control of the Iodine Deficiency Disorders of Ecuador has been reducing the iodine content in salt from 50–100 mg/kg before 2002, to 30–50 mg/kg until 2010, and to 20–40 mg/kg most recently. These changes have been monitored through annual and national determinations of urinary iodine concentrations on school-age children. This demonstrates that iodine content in salt can be adjusted to the population salt intake. If in the future the salt intake in Ecuador decreases, it is only a matter of returning to higher iodine content in the salt. Adding more iodine to salt is not a limiting factor.

### **SLOVENIA**

Slovenia launched a comprehensive national salt reduction programme in 2007 with three main pillars: communications, reformulation, and monitoring. A household budget survey from 2000–2009 determined the main sources of sodium in the Slovenian diet to be bread and bakery products, followed by meat products, processed vegetables and cheeses. Consequently there has been engagement with the bakery, meat and catering sectors and a voluntary agreement between the Ministry of Health and industry for reformulation (53). Baseline and follow-up data assessed through 24-hour urinary sodium excretion showed an 8.9% (12.4 g/day to 11.3 g/day) reduction in population salt consumption from 2007–2012. Mandatory table salt iodization was introduced in 1956, and an updated regulation was implemented in 2003 and 2004 whereby all salt sold to the food industry, with the exception of sea salt, was required to contain 25 mg potassium iodate per kilogram of salt. A 2007 assessment of iodine status among Slovenian adolescents found that adolescents were iodine sufficient, demonstrating that the salt iodization programmes have been successful (54). The study attributed the adequate intakes of iodine to high dietary sodium, especially amongst adolescent boys. An assessment, through food frequency questionnaire, of the main sources of iodine and sodium in the Slovenian diet, found table salt to be both the main source of iodine and sodium, followed by beverages and milk products for iodine, and bread and salty snacks for sodium (55). Several nutritional interventions have been proposed to reduce total salt

intake while ensuring adequate iodine intake. These include promoting the consumption of 'low-sodium/high-iodine' food sources, fortification of one commonly-consumed staple food with iodine, and increasing the iodine content of household salt (table salt) while recommending that table salt consumption as a whole be reduced.

### **SOUTH AFRICA**

In 2013, South Africa became the first country globally to mandate maximum salt levels in processed foods, with the aim of reducing population salt intake from the current 8–10 g/day to less than 5g/day. This will be implemented in 2016. The maximum salt levels were set for 11 food categories including bread, breakfast cereals, processed meats and stocks. The reduction in sodium in these food categories has been estimated to decrease the average salt intake by 0.85 g/day/person resulting in 7400 fewer cardiovascular disease deaths and 4300 fewer non-fatal strokes per year compared with 2008, with a cost saving of up to US\$ 30 million (56). The national targets were set using a three-pronged approach: (i) identification of salt intake patterns and food sources, (ii) development and consumer-testing of reduced sodium variants of commonly consumed foods, and (iii) a randomized controlled trial to assess the

impact of these reduced sodium foods on blood pressure. South Africa imposed a voluntary iodization of salt policy in 1954 following the identification of widespread endemic goitre. In 1995 mandatory iodization of salt was legislated and the mean iodine content of table salt at retailer level increased from 14 to 33 mg/kg in one year (although with wide variation) and a 1998 national survey identified iodized salt use in some processed foods including bread, margarine and salt snack flavourings. The median urinary iodine concentration was also found to be 100–199 µg /l, assessed in a 1998 national survey in schoolchildren. A recent study concluded that iodine status was similar across varying salt intakes and therefore that there was no association between urinary iodine concentration and urinary sodium excretion (57). Given that discretionary salt use is estimated at 40% (equating to 4 g/day) (58) and assuming salt iodization levels of 50 mg/kg the estimated iodine provided by table salt would be approximately 200 µg/ day. Halving this amount would still provide over two thirds the recommended daily allowance with the remainder of iodine contributed from other sources. Continued monitoring of both iodine status and uptake of salt reduction limits in proposed food categories will be necessary for ongoing revision of mandatory salt iodization levels (currently set at 35–65 mg/kg).

# *Towards a common agenda*

The following section is a summary of the presentations made by speakers during the plenary sessions and the comments raised in the working groups.

## *Synergizing salt reduction and iodine fortification strategies*

Previous work has highlighted the fact that policies for salt iodization and the reduction of salt to less than 5 g/day are compatible, cost effective and of great benefit to public health (Box 9) (52, 59, 60). However, optimal impact of each requires (a) full implementation of universal salt iodization as recommended by WHO and UNICEF, particularly as more and more countries are moving through nutrition transition, (b) effective implementation of salt reduction policies, including regulation of salt levels in processed foods, and (c) increasing iodine levels in salt as salt intakes are reduced, based on an agreed scale. At the country level, close collaboration between salt iodization and salt reduction programmes is required to ensure aims are congruent (8).

The solutions to reducing salt and preventing iodine deficiency disorders are complex in all countries. The problems are different in low-, middle- and high-income countries, as the sources of salt or iodine are different. This is especially complex in countries undergoing nutrition transition where the amount and sources of salt in the diet are likely to be changing. Most low- and middle-income countries may not have the resources for a separate programme to monitor salt reduction and iodine intake, or to negotiate with industry; integration would therefore result in improved cost efficiencies and improved health for all.

### **BOX 9: *Commonalities of the two strategies***

Excess dietary salt and lack of natural dietary iodine are of concern to public health because they affect billions of people worldwide. Both are consequently major global public health priorities. The policies also share other commonalities in that they:

- are highly cost effective interventions to improve health;
- have similar surveillance modalities (dietary surveys and urine collection);
- require complex negotiations with the food industries;
- depend on strong political support for optimum policy implementation;
- rely on improved knowledge, attitudes and behaviours of health care professionals;
- rely on increased public knowledge, attitudes and behaviours;
- are affected by a lack of food industry action;
- rely heavily on education (e.g. “use iodized salt but less of it”) particularly in low-middle-income settings where most salt is added in the home;
- require a stable non-commercial funding source to be sustained.

## Is increasing the fortification level of iodine feasible?

Increasing fortification levels of iodine is possible given the current flexibility in recommended fortification levels (i.e. 20–40 mg/kg). However, challenges include:

- Setting a global target for salt levels in foods; salt levels are different not only between countries but within countries
- Limited capacity of countries to monitor iodine levels
- Imported foods and related laws
- Variety and number of salt producers – some countries have up to 10,000 small salt producers
- Supply chain issues related to the access of iodine

Overcoming these challenges will require working together for stronger advocacy at global, national and manufacturer and policy level, as well as continued monitoring. Adding iodine to all food grade salt would reduce the need to “mix” the message to consumers about increasing iodine while reducing salt.

## Challenges and opportunities for integration

Challenges	Opportunities
<ul style="list-style-type: none"> <li>• Governments may be reluctant to modify and potentially “harm” a successful iodine deficiency disorders programme by supporting salt reduction.</li> </ul>	<ul style="list-style-type: none"> <li>• Potential for sharing lessons learned in the successful reduction of iodine deficiency disorders.</li> <li>• Salt reduction is a public health priority – there is potential to leverage and share resources.</li> <li>• Regular dialogues between respective academic and non-government organization communities to advocate a coherence of strategies.</li> </ul>
<ul style="list-style-type: none"> <li>• Iodine deficiency disorders elimination views salt as a vehicle for increasing iodine intake, whereas salt reduction efforts sees salt as a risk factor.</li> </ul>	<ul style="list-style-type: none"> <li>• Both strategies concerned ultimately with improving public health.</li> <li>• Coordination of messages to convey the need to reduce salt at the same time as all salt being iodized.</li> <li>• Coordinated approach to working with industry.</li> </ul>
<ul style="list-style-type: none"> <li>• Both salt and iodine intakes can be difficult to monitor.</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce cost and duplication of effort by co-ordinating surveillance activities.</li> <li>• Increase quality assurance through coordination.</li> </ul>
<ul style="list-style-type: none"> <li>• Potential for mixed messages to consumers regarding increasing iodine while reducing salt.</li> </ul>	<ul style="list-style-type: none"> <li>• Full implementation of universal salt iodization.</li> </ul>

## The importance of universal salt iodization

WHO endorses universal salt iodization whereby all salt for human and animal consumption is iodized (including salt for food processing) (7). However, few countries have adopted universal salt iodization, as this requires appropriate legislation, regulation and surveillance. Most countries have opted for mandatory fortification of table/household salt or the use of fortified salt in one or a range of foods (e.g. the use of fortified salt as an ingredient for bread-baking in Australia), yet this strategy can have limitations. It is generally inequitable and may pose major difficulties in monitoring (61). By contrast, universal salt iodization mandated by law and successfully implemented can be a more equitable strategy, reaching most of the population. Such a programme can be readily monitored allowing adjustments in the fortification level and hence is more likely to be sustainable (61).

## Factors that determine salt iodine content and how they could be modified

Appropriate legislation constitutes the basis of virtually all national salt iodization programmes and provides the framework within which the salt iodization programme functions. Regulations specify the iodine content in salt at the point of production for both human and animal consumption and methods for monitoring compliance. The only way to change iodine intake through salt iodization therefore is to modify or change any law relating to salt iodization within a specific country. On the other hand modification of the level of iodization of salt at the production site is a simple technical exercise.

## Managing risks and safety of changes in salt iodization

The important issues in managing risks and safety include:

- Promotion of full implementation of universal salt iodization;
- Robust, regular, reliable population monitoring system for salt and iodine intakes;
- Increasing the iodine concentrations in food grade salt in response to any decrease in population salt intake;
- Development, or modification, of existing national salt iodization laws and accompanying regulations to accommodate changes in prescribed iodine concentrations in food grade salt. Those countries without a legal framework should be encouraged to implement one, according to guidelines;
- Revision of guidance for programme managers document (6) to accommodate these changes and to promote lower salt intakes in populations;



- Ongoing monitoring to determine adequate levels of iodization and the need for additional supplementation in countries where universal salt iodization has not been implemented or is unlikely to be implemented in a population (for example Australia and New Zealand where there is mandatory iodization of all salt used as an ingredient in bread-baking) and countries with voluntary permissions only.

### *Identifying and engaging stakeholders*

To achieve the goal of salt reduction and iodine deficiency disorders elimination will require bringing together a multidisciplinary team of experts in health and other fields including: public health (treatment and prevention), law, advertising, behavioural psychology, economics, behavioural economics, commerce and trade, and political science.

### *Bringing people together*

Defining the common public health agenda, or project, will be critical to working together effectively and sustainably. Questions such as “why should I be here?”, “what is in it for me?” and, “what do I bring to the dialogue?” need to be explained. Leadership will be fundamental and a transcendent approach which facilitates collaboration, vision, and empowers people to do what they are good at, should be encouraged to leverage and optimize the direction of the project. The opportunities for working together are grand and include resource-sharing, increasing power, legitimacy and credibility. These, among other strengths, can be used to influence and negotiate with other networks (e.g. government and food and manufacturing industries), ultimately achieving public health gains through the common goals of the project. While there are challenges, these can be overcome by being cognisant of different ideologies, understanding different project histories and perspectives and using differences in a positive way (Box 10). The rules of engagement also need to be defined – individuals and groups must declare any conflicts of interest and this information will be used to determine on what basis groups are “ruled in” and “ruled out”.

#### **BOX 10: Situational Analysis**

A situational analysis is a systematic collection and evaluation of past and present economic, political, social, and technological data, aimed at:

- (1) identification of internal and external forces that may influence the performance and choice of strategies; and
- (2) assessment of the current and future strengths, weaknesses, opportunities and threats.

### **STAKEHOLDERS MAY INCLUDE:**

#### **Globally:**

- Many of the same stakeholders were also identified on the international level. These include WHO, UNICEF, the Food and Agriculture Organization (FAO), the World Trade Organization (WTO), the World Bank, non-governmental organizations and interest groups such as ICCIDD Global Network, the Global Alliance for Improved Nutrition (GAIN), NCD Alliance, Micronutrient Initiative (MI), Consumers International, the private sector (including the food, salt, salt substitute industries), European Union, the Caribbean Community (CARICOM) and other regional economic integration organizations.
- Funding organizations were also identified as important stakeholders, including the U.S. Agency for International Development (USAID), the Australian Government Overseas Aid Programme (AusAID), the Association of Southeast Asian Nations (ASEAN), the South Asian Association for Regional Cooperation (SAARC) and relevant Development Banks.
- Bringing these international stakeholders together could maximize resources and save costs.
- Some challenges in partnerships with diverse stakeholders could include strained relationships with the salt industry (especially in the case of ICCIDD Global Network) as well as stakeholders being placed within different government departments.

#### **Nationally:**

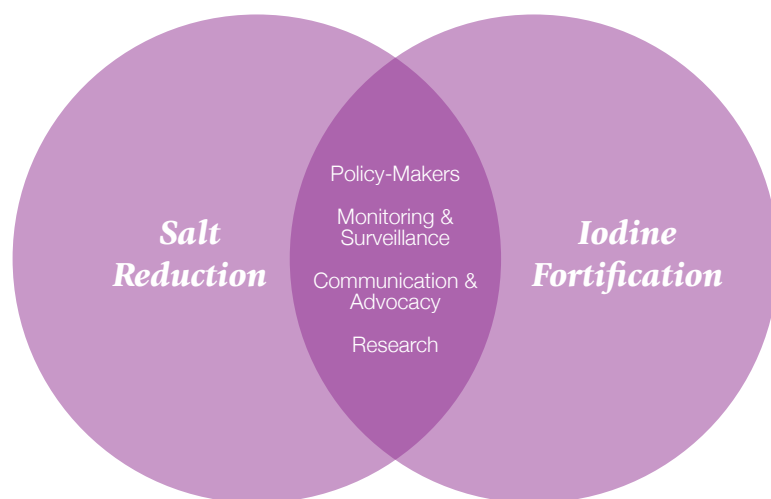
- Stakeholders related to iodine deficiency elimination were identified as ICCIDD Global Network, national nutrition societies, The Thyroid Foundation, maternal and child health organizations.
- Stakeholders related to sodium reduction generally include national stroke, heart and hypertension societies, noncommunicable disease coordinators or organizations, World Action on Salt and Health (WASH), the food industry.
- Other stakeholders could potentially include UNICEF and other UN agencies, non-governmental organizations such as women’s associations, the Global Alliance for Improved Nutrition (GAIN), the Micronutrient Initiative (MI), and national and international regulatory bodies.
- Common stakeholders were identified as the salt industry, ministries of health, departments of nutrition and public health associations.
- An overarching interdisciplinary of major stakeholders was thought necessary at the national level to coordinate research, advocacy as well as communication.

# Areas for integration

While there was some discussion about the potential for moving towards one fully integrated programme to reduce salt and iodine deficiency disorders, it was felt that at this stage it would be more beneficial to work towards more effective integration in a number of key areas both globally and nationally (Figure 3). These included:

- Policy development
- Communication and advocacy
- Monitoring and surveillance
- Research

**FIGURE 3: Areas of Integration between Salt Reduction and Iodine Fortification Strategies**



## Policy development

While the emphasis of each policy will differ, both salt reduction and iodine deficiency elimination policies can recognize and reinforce the importance of maintaining optimal iodine levels at the same time as reducing salt. This could include:

### Globally:

- International organizations such as ICCIDD Global Network, WHO, UNICEF and others publishing a statement of intent, including common goals, metrics and milestones;
- Existing guidelines and frameworks being redrafted with a view to including harmonized initiatives that can be incorporated by field staff and country offices in a wide range of contexts including ensuring a sound understanding of the science related to each programme;
- Quality assurance systems for salt reduction and iodine deficiency elimination disorders being developed and promoted.

### Nationally:

- Governments developing or amending policies for salt reduction and iodine deficiency elimination to reflect the integrated approach, harmonizing goals, conveying unity, assigning leadership and establishing independent mechanisms for coordinated monitoring;
- Joint forums between the teams responsible for NCDs and vitamin and mineral malnutrition (particularly iodine deficiency disorders) being established with a view to assuring coherence between the two programmes including:
  - Undertaking situational analysis in terms of evidence, solutions and policy on both salt reduction and salt iodization;
  - Initial assessment of the major contributor of salt in the diet (discretionary versus nondiscretionary) to tailor messages accordingly;

- Developing country-specific resources and guidance documents to integrate and facilitate a joint strategy;
- Joint technical assistance and knowledge sharing between sectors;
- Development of joint positions on issues such as international trade agreements;
- Harmonization of cross-country approval processes to admit new food products with low salt content and an adequate amount of iodine.
- Shared forums being held with relevant sectors of the food industry to deal with iodine and sodium reduction to promote:
  - Reduction in the salt content of foods and meals by the food processing industry and the restaurant and catering sectors;
  - Consistent and high standards of iodization of food grade salt of small and medium-sized salt producers;
  - Calibration of iodization levels in relation to different salt intake levels and urinary iodine concentrations.

#### ***Challenges might include:***

- Different motivations for food industry engagement;
- Diverse food profiles between countries and regions;
- Potentially conflicting messages from the health sector e.g. “eat salt to ensure you get adequate intake of iodine”; “reduce salt to prevent cardiovascular disease.”

### ***Communication and advocacy***

Integrating communication and advocacy strategies can help to increase the understanding of the importance of maintaining optimal iodine levels while reducing salt and to ensure coordinated messaging.

#### ***Globally and nationally:***

- Coalitions of stakeholders can be established to mobilize additional support for action, including clear messaging for advocacy and knowledge raising campaigns.
- Target audiences need to be identified and specific questions asked, such as: Does this include relevant industry sectors? Are all stakeholders being targeted? Is the focus on general population versus vulnerable populations for cardiovascular diseases as well as for iodine deficiency disorders? Which Ministries and other decision makers should be targeted?
- Common messages should be developed and delivered to:
  - Policy- and decision-makers;
  - Salt and food manufacturing industries;
  - Stakeholders among the health professions;

- The public and consumers.
- An overarching communication strategy can be developed including Frequently Asked Questions, covering both the impacts and cost-effectiveness of both strategies.
- The communication strategy needs to be made accessible so that it can be easily distributed to the media.
- Methods of communication need to be identified and should include:
  - Web sites, advocacy materials, fact sheets, influential people, different types of media, health professionals.

#### ***Challenges might include:***

- Potentially conflicting messages by healthcare professionals and others e.g. “eat salt to ensure you get adequate intake of iodine”; “reduce salt to prevent cardiovascular disease.”
- Potential challenges could arise in terms of changing demand, labelling, working with industry, creating a supportive environment.

### ***Monitoring and surveillance***

Integration would enable enhanced concurrent surveillance of salt and iodine intake to inform salt iodization and dietary salt reduction programmes through:

#### ***Globally:***

- Collation of a list of national policies for both sodium reduction and iodization to track progress and identify where action is needed;
- Adoption of existing frameworks and guidelines – iodine reporting every three years, 30% reduction in salt consumption by 2025 to ensure continued monitoring;
- Collection of country specific data (i.e. main sources of iodine, salt/sodium, programme coverage, dietary intakes);
- Joint approach to monitoring in terms of quality assurance;
- Review of the methods and indicators of both iodine and sodium to consider which measures can be harmonized, how to ensure adequate coverage, and development of shared protocols.

#### ***Nationally:***

- Coordination of monitoring of salt and iodine intake levels through the collection of 24-hour urine samples from a representative sample of individuals in the population;
- Development of optimal methods for assessing contribution of salt and iodine to the diet including comprehensive food surveys to distinguish the main sources of salt and iodine in the diet with questions to assess:

- Discretionary use of iodized food grade salt for household use (cooking and table salt)
- Salt intake through the consumption of processed foods, restaurant meals and street food
- Proportion of iodine in the diet contributed by each source
- Monitoring the plans and patterns of the processed food industry with regards to:
  - Provision of sodium (and/or salt) data on food labels
  - Feasibility of including iodine data on food labels
  - Markets where new salt-containing products are being or will be supplied or 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

#### ***Challenges might include:***

- Monitoring of different target groups for the two programmes (e.g. pregnant women and children for iodine, adults for salt and sodium)
- Limited resources (in both time and money) for each of the programmes

#### ***Research***

Integration would facilitate the development of strategic joint research to identify priority areas relevant to both salt iodization and the reduction of dietary salt at the country and global level to drive the agenda forwards.

#### ***Existing research programmes***

The following section is a summary of the presentations made by speakers during the plenary sessions.

#### ***Salt and iodine nutrition surveillance and programme implementation***

There are many opportunities for improving surveillance and programme implementation. Currently, population baseline data on actual daily salt (sodium) and iodine excretion is lacking in many countries. Enhancing concurrent surveillance through comprehensive urinary analysis studies combined with national food nutrition surveys, to determine the source of salt (sodium) and iodine in people's diet including salt intake from processed foods, iodized/non-iodized, as well as discretionary use of salt, iodized/non-iodized, in households can inform both iodine deficiency disorders elimination and salt reduction

programmes. Developments around the world have seen an increasing trend in the consumption of processed foods, especially in low- and middle-income countries. This nutrition transition will impact iodine deficiency disorders elimination and salt reduction efforts. There is a need for clear policy to prohibit the food industry using non-iodized salt in their products. A coordinated and coherent collaboration by the salt and iodine nutrition groups could strongly influence food industry practice resulting in a great public health triumph. Through creating a strong coalition, the two groups could increase the reach of current surveillance programmes, better informing programme implementation and strongly influence government and the food industry to implement iodized salt in processed foods. The next steps should be the development of coherent messaging between the two groups.

#### ***Alternative vehicles for iodine fortification***

Optimizing iodine intake, with the aim of eliminating iodine deficiency disorders, is an important public health intervention. The primary strategy for sustainable elimination remains universal salt iodization. In some countries implementation of salt iodization programmes may not be feasible in all areas, thus resulting in insufficient access to iodized salt for some groups. In these cases, in addition to strengthening universal salt iodization programmes, some international organizations advocate for additional complementary strategies including increased iodine intake through supplementation and/or iodine fortification of foods other than salt to ensure optimal iodine nutrition in relevant groups (62). Potentially suitable staple food vehicles for iodine fortification public health programmes include water; fish sauce; rice; edible vegetable oils and fats; wheat, and maize flours; condiments and seasonings; and powdered or liquid milk (63). To assess the benefits, harms and costs of fortifying staple foods other than salt (such as water, other beverages, condiments and seasonings) with iodine alone (or with other vitamins and minerals) on iodine status and health-related outcomes in the population a Cochrane Review entitled 'Iodine fortification of foods and condiments, other than salt, for preventing iodine deficiency disorders' (64) has been commissioned by WHO.

#### ***Potassium enriched (sodium reduced) salt***

Potassium-enriched salt as a means of lowering blood pressure has proven successful in a number of trials, working in two ways: (a) a reduction in sodium chloride decreases blood pressure by removing the blood pressure-raising effect of sodium; and (b) the addition of potassium chloride decreases blood pressure by the blood pressure-lowering effect of potassium. The Salt Substitute Study in Rural China (65) is a double-blind randomized control trial with an objective of establishing the long-term effects of salt substitution on blood pressure. The results to date show that the mean overall difference in systolic and diastolic

blood pressure between the two groups at the 24-month follow-up was 2mmHg (95% confidence interval (CI) 0–4mmHg,  $P<0.05$ ) and 2mmHg (95% CI 1–3mmHg,  $P<0.05$ ), respectively. For subjects with hypertension, the mean overall decrease in systolic blood pressure showed a 4 mmHg (95% CI 2–6mmHg,  $P<0.05$ ) decrease between the two groups. Diastolic blood pressure was not affected by salt use in the hypertensive group. Salt substitution lowered systolic blood pressure in hypertensive patients and lowered both systolic and diastolic blood pressure in normotensive controls. The study authors concluded that salt substitution, therefore, could be an effective adjuvant therapy for hypertensive patients and the potential efficacy in preventing hypertension in normotensive individuals. Potential applications of using potassium chloride include reducing regular salt with potassium-enriched salt substitute in processed foods including condiments and discretionary salt use. Policy implementations to increase usage include stakeholder engagement with the food and manufacturing industries, access, availability and affordability including addressing opportunities for tax reductions on the sales of salt substitutes.

## Research gaps

This section summarized comments raised during the working groups. The groups identified four main areas of research where there are still gaps in the knowledge and evidence. These were:

1. Optimizing policy implementation;
2. Ensuring effective monitoring and coordination of monitoring;
3. Understanding the potential of using potassium enriched low sodium iodized salt;
4. Understanding the potential impact of using different vehicles for iodine fortification.

In each area specific gaps in the research were identified and highlighted to form a potential research agenda in this area of work.

### 1. Optimizing policy implementation

- Review policies for elimination of iodine deficiency disorders around the world and how they are implemented;
- Current information on iodine intakes for various ages and population groups;
- Information on sources of iodine (food and water) and sources of sodium in the diet (country level data on consumption patterns, global assessment);
- Dietary survey data to understand sources of both iodine and sodium in the diet;
- How to best educate people in different settings (e.g. low- and high-income countries in nutrition transition) about the need to use less salt but also to ensure what salt they use is iodized;
- Pilot and case studies in countries of differing economic and cultural make-up;

- Feasibility studies, or modelling exercises, looking at implementing salt reduction programmes where iodine deficiency disorders work already exists;
- Work surrounding effectiveness of food labelling and evaluation of different labelling schemes;
- Proportion discretionary versus non-discretionary salt intake;
- Situational analysis on the country level; socioeconomic status; sources of iodine (i.e. availability of milk and sources of milk).

### 2. Ensuring effective monitoring and coordination of monitoring

- Continued and sustained monitoring: market share of iodized salt, food composition, and urinary iodine excretion;
- Improvement of food composition databases in relation to iodine and sodium for staple foods;
- Monitoring iodine levels in relation to iodine in all foods by expanding indicators such as percentage of households using iodized salt to include foods containing iodized salt
- Research into social differences with regard to Knowledge, Attitudes and Behaviours related to sodium and iodine;
- Cost-saving using volunteers for 24-hour urine samples versus population sampling;
- Understanding the most effective and feasible collaborative surveillance methods to determine sodium and iodine intake and the sources of salt and iodine in the diet.

### 3. Understanding the potential of using potassium enriched low sodium iodized salt

- Studies to investigate effectiveness in real world contexts;
- Investigating issues of acceptability, affordability and availability both at individual and industry level;
- Understanding the stability of iodine in low sodium salt and potential for use in pickling/fermenting processes;
- Investigate possible long-term harms associated with potassium chloride and iodized potassium chloride at population level.

### 4. Understanding the potential impact of using different vehicles for iodine fortification

- Technical feasibility of iodization of alternative food vehicles (other than salt) at population level;
- Cost-effectiveness of alternate vehicle in comparison to salt;
- What is the potential for bio fortification (e.g. fertilizer, animal feed, individual crops)?
- Monitoring and surveillance of fortification;
- How can agriculture and other sectors be influenced to examine ways of getting iodine through food by leveraging the food supply chain?

# Conclusions and actions

There are opportunities to synergize both programmes to ensure optimal implementation of each by promoting the commonalities and complementarity of both programmes. Commonalities between the two programmes are that both are geared towards improving public health throughout the world through a population-wide approach with an emphasis on vulnerable groups. Both programmes adopt a multistakeholder approach and encompass health promotion, prevention, treatment and rehabilitation, and both programmes involve working closely with the food and catering industry.

The key difference is that the iodine fortification programme is based on salt being a vehicle to assure adequate iodine nutrition whereas for the salt reduction programme, salt is the main risk factor for cardiovascular disease. However this is not a barrier provided that there is a) full implementation of universal salt iodization (which would require a better and modified definition of USI); b) effective implementation of salt reduction policies including regulation of salt levels in foods; and c) increasing iodine levels in salt as salt intakes are decreased.

## Moving forward

A joint programme of work can be developed to outline the common project. Initially this would be two distinct programmes with overlapping areas clearly identified and strategies in place to ensure effective complementarity, and would address the following:

- Policy development and implementation
  - Coordinated strategies and programmes of work so that all policy documents recognize the importance of reducing salt and eliminating iodine deficiency disorders with an outline of the areas of complementarity;
  - Close collaboration and exchange of experience between teams responsible for implementing the two programmes (usually NCD and vitamin and mineral malnutrition);
  - Shared forums with relevant sectors of the food industry;

- Joint consumer education programmes and materials.
- Monitoring and evaluation
  - Coordinated cross-disciplinary research programmes geared towards maximizing effectiveness of implementation of both programmes;
  - Shared surveillance of salt and iodine intake through urinary analysis and dietary surveys;
  - Coordinated evaluations of national salt iodization and dietary salt reduction programmes against disease outcomes.
- Communication and advocacy
  - Shared messages emphasizing the importance of reducing salt and optimizing iodine intake;
  - Development of clear strategies to avoid inadvertent conflicting messages.
- Research
  - Identification of joint priorities for research;
  - Integration of salt reduction into existing iodine research programmes and vice versa.

## Leadership and roles

The core functions of WHO include providing leadership on matters critical to health and engaging in partnerships where joint action is needed; shaping the research agenda and stimulating the generation, translation and dissemination of valuable knowledge; setting norms and standards and promoting and monitoring their implementation; articulating ethical and evidence-based policy options; providing technical support; catalyzing change and building sustainable institutional capacity; and monitoring the health situation and assessing health trends. All these core functions are essential for these strategies to function coherently. UNICEF and a diverse group of public and private sector organizations are working to eliminate iodine deficiency through universal salt iodization. These agencies can join forces to coordinate and implement the joint programme of work with ICCIDD Global Network and the WHO Collaborating Centre on Population Salt

Reduction in Sydney, Australia as technical experts. A multisectoral effort will involve a wide range of other organizations in the implementation, including ministries of health, non-government organizations, advocacy agencies, academic institutions, civil society and international industry (i.e. the processed food and non-alcoholic beverage industry and salt industry).

Governments will be encouraged to develop strategies to engage all departments (health, trade, finance, business) in support for universal salt iodization and effective policies and regulations to reduce salt consumption. The strategies should include targets for salt levels in foods; ensuring coordination of programme implementation through close engagement of noncommunicable disease and nutrition interest groups; and exploring a range of other fiscal and regulatory options – as an example, trade standards that promote importation and exportation of healthy foods and incentives for low sodium iodized salt.

Civil society action will be leveraged to support the joint implementation of the salt reduction and iodine deficiency elimination programmes and to promote both issues to relevant groups. This will include health organizations, legal advisors, stroke, heart and thyroid foundations, consumer groups, other affected groups and professional associations. International academic forums could also be used to promote programme integration.

Industry will have no role in policy-making but has an important role in implementation and therefore should be consulted with regards to implementation strategies. The salt industry is important in relation to universal salt iodization and salt substitutes/replacers may provide a commercial opportunity to support salt reduction strategies. Mechanisms to safeguard against potential conflicts of interest need to be established. Developing a consistent strategy and message, and identifying and managing conflicts of interest, will be key to the successful delivery of the strategy.

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## Annex 2

# Meeting agenda

### Tuesday 26 March 2013 – Technical Meeting

**Objectives:** Review and discuss ongoing initiatives, policies and programmes aimed at reducing salt/sodium intake at the population level and using salt as a vehicle for iodine fortification.

<b>08:30–09:00</b>	<b>Welcome</b> <ul style="list-style-type: none"> <li>- Objectives and expected outcomes of the meeting</li> <li>- Welcome and Introduction of the participants and verbal declaration of conflicts of interest</li> <li>- Nomination of chair, co-chair and rapporteur and adoption of agenda</li> <li>- Administrative arrangements</li> </ul>	Dr Douglas Bettcher Professor Bruce Neal and Dr Michael Zimmermann
<b>09:00–09:20</b>	Disease burden attributable to NCDs and micronutrient deficiencies in Australia and internationally	Professor Jane Halton
<b>09:20–09:40</b>	Overview of conclusions from the WHO Consultation: Salt as a vehicle for food fortification	Dr Juan Pablo Pena Rosas
<b>09:40–10:00</b>	Progress and key elements of what makes salt reduction strategies effective? Current levels of salt intake, monitoring and evaluation	Dr Jacqui Webster
<b>10:30–11:00</b>	Progress and key elements of what makes iodization strategies effective? Current levels of iodine intake, monitoring and evaluation	Dr Michael Zimmermann
<b>11:00–11:30</b>	What is the evidence that salt reduction and iodine fortification strategies are compatible?	Professor Norm Campbell
<b>11:30–12:00</b>	Update on Cochrane systematic review on the effects of salt iodization to prevent iodine deficiency disorders	Dr Nancy Aburto
<b>12:00–13:30</b>	<b>Lunch</b>	
<b>13:30–14:15</b>	Roundtable with case studies on salt iodization and salt reduction strategies from South Africa, Australia, India and Slovenia	Professor Karen Charlton Dr Rajan Sankar Professor Franco Cappuccio
<b>14:15–15:00</b>	Roundtable discussion	
<b>15:30–16:30</b>	Working group: What are the priorities for supporting national and international efforts in optimising salt/sodium and iodine intake at the population level?	Facilitators
<b>16:30–17:30</b>	Working group presentation and discussion	Chair



## Wednesday 27 March 2013

**Objectives:** Review current recommendations for iodine fortification and implementation by stakeholders. Review the potential use of potassium enriched (sodium reduced) iodized salt and other vehicles for fortification.

<b>08:30–09:00</b>	<b>Welcome and summary of Day 1</b>	Dr Cherian Varghese
<b>09:00–09:30</b>	Roles of stakeholders and how they can effectively work together	Professor Rob Moodie
<b>09:30–10:00</b>	Is the recommended level of iodine in salt adequate and how should it change as salt intakes are reduced?	Professor Cres Eastman
<b>10:00–10:30</b>	Experiences in salt iodization in Latin America and their implication in salt reduction policies	Dr Omar Dary
<b>11:00–12:00</b>	Working group: How can each stakeholder work together in support of global efforts for reducing salt intake and preventing iodine deficiency disorders?	Facilitators
<b>12:00–12:30</b>	Working group presentation and discussion	Chair
<b>12:30–13:30</b>	<b>Lunch</b>	
<b>13:30–14:30</b>	Roundtable discussion on research priorities including: a) Iodine fortification of staple foods and condiments (other than salt) in public health b) Feasibility for the use of potassium enriched (sodium reduced) salt c) Iodine nutrition surveillance and programme implementation	Ms Mary Anne Land Professor Yanfeng Wu Professor Mu Li
<b>14:30–15:30</b>	Working group: Opportunities for a research agenda in potassium enriched (sodium reduced) iodized salt and other interventions	
<b>16:00–17:00</b>	Feedback from working groups and discussion	Chair
<b>17:00–18:00</b>	Summary of key considerations and plenary discussion on next steps Closing remarks	Chair Director PND and Director NHD

## Annex 3

# Acronyms and abbreviations

<b>AWASH</b>	Australian Division of World Action on Salt and Health	<b>NCD</b>	Noncommunicable Disease
<b>AMRO</b>	Regional Office for the Americas	<b>PAHO</b>	Pan American Health Organization
<b>ASEAN</b>	Association of Southeast Asian Nations	<b>RCT</b>	Randomized controlled trial
<b>AusAID</b>	Australian Government Overseas Aid Programme	<b>SAARC</b>	South Asian Association for Regional Cooperation
<b>CARICOM</b>	Caribbean Community	<b>UN</b>	United Nations
<b>EURO</b>	Regional Office for Europe	<b>UNICEF</b>	United Nations Children's Fund
<b>FAO</b>	Food and Agriculture Organization of the United Nations	<b>US</b>	United States
<b>GAIN</b>	Global Alliance for Improved Nutrition	<b>USAID</b>	U.S. Agency for International Development
<b>ICCIDD</b>	International Council for the Control of Iodine Deficiency Disorders Global Network	<b>USI</b>	Universal salt iodization
<b>ICTRP</b>	International Clinical Trials Search Portal	<b>WASH</b>	World Action on Salt and Health
<b>IDD</b>	Iodine deficiency disorders	<b>WHA</b>	World Health Assembly
<b>IQ</b>	Intelligence quotient	<b>WHO</b>	World Health Organization
<b>MI</b>	Micronutrient Initiative	<b>WPRO</b>	Regional Office for the Western Pacific
<b>NGCP</b>	National Goitre Control Programme	<b>WTO</b>	World Trade Organization



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