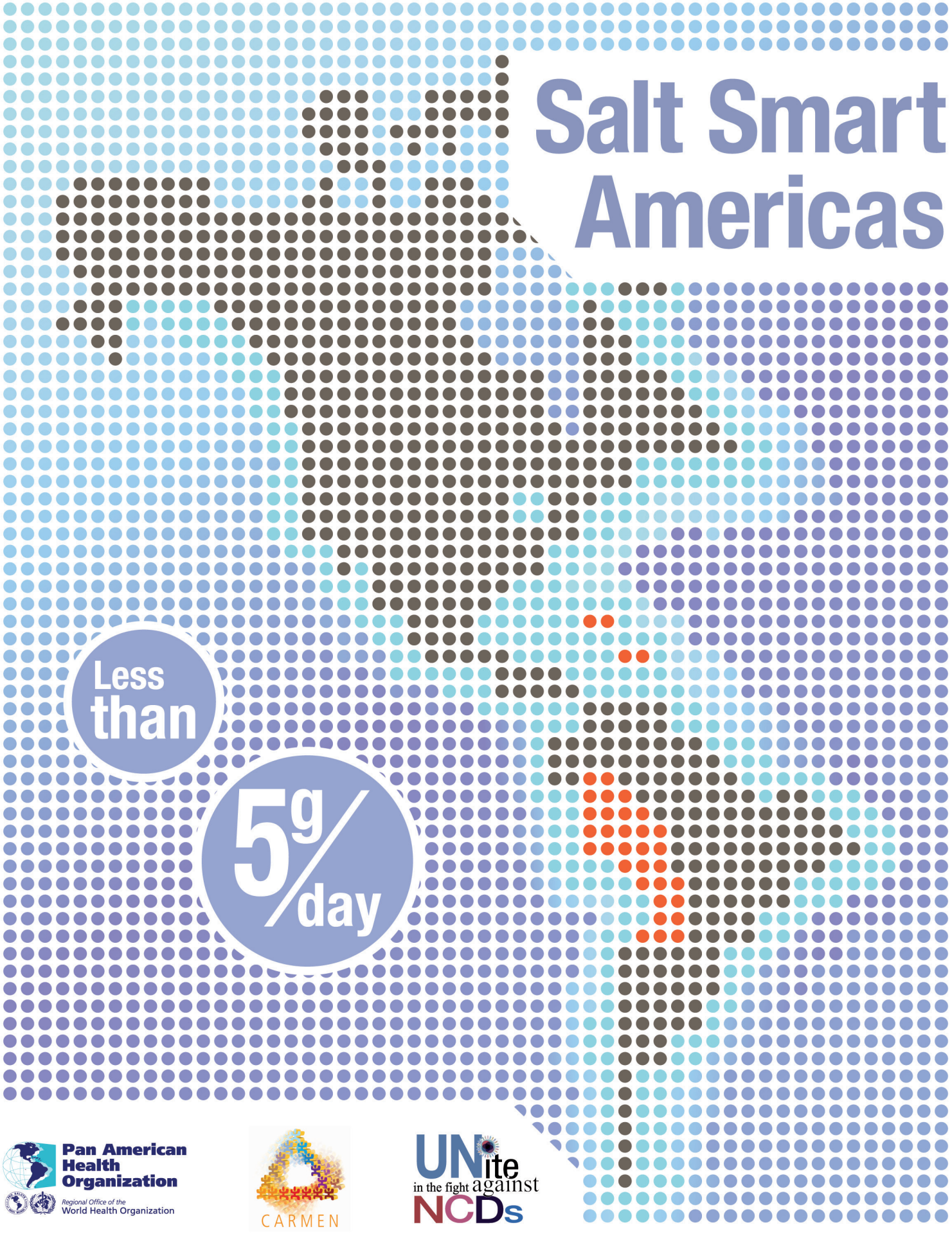
Salt Smart Americas



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Recommendations for Americas

Policy Statement: Preventing Cardiovascular Disease in the Americas by Reducing Dietary Salt Intake Population-Wide

The PAHO/WHO Regional Expert Group on Cardiovascular Disease Prevention through Dietary Salt Reduction has produced this policy statement. It has the rationale and recommendations for a population-based approach to reduce dietary salt intake among all people in the Americas, be they adults or children.

Policy Goal

A gradual and sustained drop in dietary salt intake to reach national targets or in their absence, the internationally recommended target of less than 5g/day/person by 2020.

Audience

Policy and decision makers in government, leaders in non-governmental organizations (representing consumers, health, scientific and health care professionals), civil society, the food industry (including food processors and distributors), among food importers and exporters, and in PAHO.

Rationale

- Increased blood pressure world-wide is the leading risk factor for death and the second leading risk for disability by causing heart disease, stroke and kidney failure.
- In the Americas, between 1/5 and 1/3 of all adults has hypertension and once age 80 is reached, over 90% can be expected to be hypertensive.
- In 2001, the management of non-optimal blood pressure i.e. systolic pressure over 115 mmHg consumed about 10% of the world's overall healthcare expenditures.
- As dietary salt consumption increases, so does blood pressure. Typical modern diets provide excessive amounts of salt, from early childhood through adulthood.
- The recommended intake of salt is less than 5g/day/person. In the Americas, intake can be over double the recommended level. All age groups including children are affected.
- Adding salt at the table is not the only problem. In most populations by far the the largest amount of dietary salt comes from ready-made meals and pre-prepared foods, including bread, processed meats, and even breakfast cereals.
- Reducing salt consumption population-wide is one of the most cost-effective measures available to public health. It can lower the rates of a number of related chronic diseases and conditions at an estimated cost of between $0.04 and $0.32 US per person per year. Population-wide interventions can also distribute the benefits of healthy blood pressure equitably.
- Governments are justified in intervening directly to reduce population-wide salt consumption because salt additives in food are so common. People are unaware of how much salt they are eating in different foods and of the adverse effects on their health. Children are especially vulnerable.
- Salt intake can be reduced without compromising micronutrient fortification efforts.

Recommendations for Policy and Action

The recommendations below are consistent with the World Health Organization's three pillars for successful dietary salt reduction: product reformulation; consumer awareness and education campaigns; and environmental changes to make healthy choices the easiest and most affordable options for all people.

To National Governments

- Seek endorsement of this policy statement by ministries of health, agriculture and trade, by food regulatory agencies, national public health leaders, nongovernmental organizations (NGOs), academia, and relevant food industries.
- Develop sustainable, funded, scientifically based salt reduction programs that are integrated into existing food, nutrition, health and education programs. The programs should be socially inclusive and include major socioeconomic, racial, cultural, gender and age subgroups and specifically children. Components should include:
  - Standardized food labeling such that consumers can easily identify high and low salt foods.
  - Educating people including children about the health risks of high dietary salt and how to reduce salt intake as part of a healthy diet.
- Initiate collaboration with relevant domestic food industries to set gradually decreasing targets, with timelines, for salt levels according to food categories, by regulation or through economic incentives or disincentives with government oversight.
- Regulate or otherwise encourage domestic and multi-

national food enterprises to adopt the lowest of a) best in class (salt content to match the lowest in the specific food category) and b) best in world for the national market (match the lowest salt content of the specific food produced by the company elsewhere in the world).

- Develop a national surveillance system with regular reporting to identify dietary salt intake levels and the major sources of dietary salt. Monitor progress towards the national target(s) for dietary salt intake or the internationally recommended target.
- Review national salt fortification policies and recommendations to be in concordance with the recommended salt intake.
- Extend official support to the Codex Alimentarius committee on food labeling for salt/sodium to be included as a mandatory component of nutrition labels.
- Develop legislative or regulatory frameworks to implement the World Health Organization (WHO) recommendations on advertising of food products and beverages to children.

To Nongovernmental Organizations, Healthcare Organizations, Associations of Health Professionals

- Endorse this policy statement.
- Educate memberships on the health risks of high dietary salt and how to reduce salt intake. Encourage involvement in advocacy. Monitor and promote presentations on dietary salt at national meetings and the publication of articles on dietary salt.
- Promote and advocate media releases on dietary salt reduction to reach the public, including children and particularly women given their integral roles in family health and food preparation.
- Broadly disseminate relevant literature.
- Educate policy and decision makers on the health benefits of lowering blood pressure among normotensive and hypertensive people, regardless of age.
- Advocate policies and regulations that will contribute to population-wide reductions in dietary salt.
- Promote coalition building, increase organizational capacity for advocacy and develop advocacy tools to promote civil society actions.

To the Food Industry

- Endorse this policy statement.
- Make current best in class and best in world low salt products and practices universal across global markets as soon as possible. Make salt substitutes readily available at affordable prices.
- Institute reformulation schedules for a gradual and sustained reduction in the salt content of all existing salt-containing food products, restaurant and ready-made meals to contribute to achieving the internationally recommended target or national targets where applicable. Make all new food product formulations inherently low in salt.
- Use standardized, clear and easy-to-understand food labels that include information on salt content.
- Promote the health benefits of low salt diets to all peoples of the Americas.

To the Pan American Health Organization

- Ensure good communications and information sharing between regional and international initiatives to foster best practices.
- Develop a template for national report cards and report to Member States on comparative national baselines and progress at pre specified time points (e.g. in 2010 the baseline, progress in 2015 and 2020).
- Work with Member States to monitor dietary salt consumption in the Americas.
- Develop and foster a network of endorsing governments, NGOs, and expert champions on dietary salt in the Pan American region.
- Develop a web based 'toolbox' with educational materials and programs on dietary salt for the public, patients, health care professionals that are culturally appropriate to sub-regions of the Americas.
- Develop and advocate conflict of interest guidelines to assist health organizations and scientists in the Pan American region in their interactions with the food industry.
- Foster research on the economic and health impacts of high dietary salt in the countries and sub-regions of the Pan American region.
- Assist Member States to revise national and sub-regional fortification programs to be consistent with efforts to reduce dietary salt.
- Collaborate with the Food and Agriculture Organization (FAO), UNICEF, the Codex Alimentarius Commission and other relevant UN bodies to achieve a consistent and coordinated approach to reducing dietary salt.
- Educate policy and decision makers on the health benefits of lowering blood pressure among normotensive and hypertensive people, regardless of age.
- Advocate policies and regulations that will contribute to population-wide reductions in dietary salt.

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* The findings and conclusions in this report are those of the author(s) and do not necessarily represent the views of the respective agencies.

Background

Prevalence of Hypertension

About one in four adults worldwide had hypertension in 2000. [1] As populations age, rates of hypertension will increase. The Framingham study found that 90% of normotensive people aged 55 to 65 will develop high blood pressure if they reach average life expectancy. [2] By 2025, without intervention, 29% of adults around the world are expected to have hypertension. [1]

In Canada, one in five adults has hypertension [3] and in the United States, 29% of adults were estimated to be hypertensive in 2003-04. [4] In the different countries of Latin America, the prevalence of hypertension ranges from 26 to 42% of the general adult population. [5]

Non-Optimal Blood Pressure, Health and Salt

WHO states that increasing blood pressure worldwide is the leading risk factor for death [6] and the second leading risk for disability by causing heart disease, stroke and kidney failure. [7] Whereas most health care professionals consider systolic blood pressure at 140 mmHg and over to be "hypertension", the relative risk for cardiovascular diseases (CVD) begins to rise when blood pressure goes above 115 mmHg. Thus a much wider range of non-optimal blood pressure is adversely affecting health, and has been attributed to most CVD deaths from ischemic heart disease and stroke. [8]

There is strong evidence that salt added to food is a major factor increasing the blood pressure in normotensive and hypertensive people, whether adults or children. A high salt diet also increases the risk of left ventricular hypertrophy and kidney damage, is a probable cause of gastric cancer, and has possible associations with osteoporosis, calcium containing renal stones and increased severity of asthma. Because salty foods cause thirst they are likely an important contributor to obesity, especially among children and adolescents, through association with increased consumption of high-calorie soft drinks. [9,10,11]

A technical report for the WHO and FAO recommends salt intake of less than 5g/day/person, the target for a healthy diet, equivalent to 2000 mg of sodium. [12] Among the countries in the Americas where standardized and comparable sodium excretion was studied, salt intake was found to be as high as 11.5g/day/person. [13] Data for the United States for 2005-06 show average daily intake of sodium among people

aged 2 years and over to be 1.5 times the recommended upper limit (UL). [14] In Canada, over 85% of men and 60% of women between 19 and 70 years of age have salt intake exceeding the UL. Over 90% of Canadian children aged 4 to 8, and 83% of girls and 97% of boys aged 9 to 13 ingest more than the recommended maximum. The situation is the same in almost 80% of Canadian children between ages 1 and 3. [15]

Population-Wide Salt Reduction Is Cost-Effective and Equitable

In 2001, the management of nonoptimal blood pressure and its resulting diseases consumed about 10% of global healthcare expenditures, considered a conservative estimate. If the welfare losses due to premature death are added, the costs could be 20 times higher. [8] Effectively lowering blood pressure on a universal scale requires actions with population-wide reach. Individual advice and instruction, part of any comprehensive approach to healthy blood pressure, have a limited impact. On the other hand, reducing salt in the diet of whole populations, not only what is used at the table but more importantly what is added to processed and ready-made foods like bread, processed meats and breakfast cereals, can distribute the benefits of lowered blood pressure broadly and equitably. [16,17]

Governments are justified in taking a population based approach to reduce salt intake because salt additives in food are so common. People are unaware of how much salt they are eating in different foods and of the adverse effects on their health. Children are especially vulnerable.

Lowering blood pressure through population-wide salt intake reduction is cost effective. [17,18] A strategy that combines mass-media awareness campaigns with regulation of the salt content of food products has been estimated to cost between $0.04 and $0.32 US per person per year. Over 10 years, the strategy is predicted to avert 8.5 million deaths world-wide, mostly from CVD. [17]

The savings to healthcare budgets can be dramatic. Researchers in the UK estimate that achieving dietary salt intake of less than 6g/day could potentially reduce the need for anti-hypertensive drugs by as much as 30%. [19] Already, a 10% reduction in salt intake in the UK since 2000-01, attributed to the combined gradual and sustained efforts of industry lowering the salt in certain food products and to the Food Standards Agency's information campaign, has yielded an annual cost saving benefit of £1.5 billion. [20]

In the US, if average population intake fell to 5g/day, there could be 11 million fewer cases of hypertension, saving approximately $18 billion in healthcare and gaining about $32 billion in quality adjusted life years. [21] In Canada, reducing salt food additives is estimated to decrease hypertension prevalence by 30% and almost double the rate of successful treatment and control. Direct savings to the health system just from reduced hypertension management costs were estimated at $430 million/year. [22]

Fortification Alternatives

Salt is used in some areas of the Americas as a vehicle for iodine and similarly in some cases to fortify fluoride intake. Alternative vehicles for fortification exist, such as vegetable oils and milk. Changes in practice need to be coordinated with policies to reduce dietary salt.

References

1 **Kearney PM, Whelton M, Reynolds K, Muntner P, Whelton PK, He J.** Global burden of hypertension: analysis of worldwide data. Lancet. 2005;365:217-23.

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

3 **Joffres MR, Ghadirian P, Fodor JG, Petrasovits A, Chockalingam A, Hamet P.** Awareness, treatment and control of hypertension in Canada. Am J Hypertens. 1997;10:1097-1102.

4 **Ong KL, Cheung BMY, Man YB, Lau CP, Lam KSL.** Prevalence, awareness, treatment and control of hypertension among United States adults 1999 –2004. Hypertension. 2007;49:69-75.

5 **Sanchez RA, Ayala M, Baglivo H, Velazquez C, Burlando G, Kohlmann O, Jimenez J, Jaramillo PL, Brandao A, Valdes G, Alcocer L, Bendersky M, Ramirez AJ, Zanchetti A**; Latin America Expert Group. Latin American guidelines on hypertension. J Hypertens. 2009;27:905-22.

6 **World Health Organization.** The World Health Report 2002: Reducing risks, promoting healthy life. Available at: http://www.who.int/whr/2002/en/ Accessed September 13, 2009.

7 **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.

8 **Gaziano TA, Bitton A, Anand S, Weinstein MC** for the International Society of Hypertension. The global cost of non-optimal blood pressure. J Hypertens. 2009; 27:1472-77.

9 **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.

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

11 **Mohan S, Campbell NRC, Willis K.** Effective population-wide public health interventions to promote sodium reduction. CMAJ. 2009;DOI:10.1503/cmaj.090361. Available at: http://www.cmaj.ca/cgi/rapidpdf/cmaj.090361v1.pdf. Accessed October 20, 2009.

12 **WHO Health Organization.** Reducing salt intake in populations: Report of a WHO forum and technical meeting, 5-7 October 2006, Paris, France. Available at: http://www.who.int/dietphysicalactivity/Salt_Report_VC_april07.pdf. Accessed September 13, 2009.

13 **Intersalt Comparative Research Group.** Intersalt: an international study of electrolyte excretion and blood pressure. Results for 24 hour urinary sodium and potassium excretion. BMJ. 1988;297:319-28.

14 **Centers for Disease Control and Prevention.** Application of lower sodium intake recommendations to adults - United States, 1999-2006. MMWR Morb Mortal Wkly Rep. 2009;58:281-3.

15 **Garriguet D.** Sodium consumption at all ages. Statistics Canada Health Reports. 2007;18:47-58. Available at: http://www.statcan.gc.ca/pub/82-003-x/2006004/article/sodium/9608-eng.pdf. Accessed September 7, 2009.

16 **Feng JH, MacGregor GA.** Salt in food. Lancet. 2005; 365: 844-45.

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 **Murray CJ, Lauer JA, Hutubessy RC, Niessen L, Tomijima N, Rodgers A, Lawes CM, Evans DB.** Effectiveness and costs of interventions to lower systolic blood pressure and cholesterol: a global and regional analysis on reduction of cardiovascular disease risk. Lancet. 2003; 361: 717-25.

19 **Walker J, MacKenzie AD, Dunning J.** Does reducing your salt intake make you live longer? Interact Cardiovasc Thorac Surg. 2007;6:793-98.

20 **Food Standards Agency (UK).** Agency publishes 2012 salt reduction targets. Monday 18 May 2009. Available at: http://www.food.gov.uk/news/pressreleases/2009/may/salttargets. Accessed September 22, 2009.

21 **Palar K, Sturm R.** Potential societal savings from reduced sodium consumption in the US adult population. Am J Health Promotion. 2009;24:49-57.

22 **Joffres MR, Campbell NR, Manns B, Tu K.** Estimate of the benefits of a population-based reduction in dietary sodium additives on hypertension and its related health care costs in Canada. Can J Cardiol. 2007;23:437-43.

Who/Paho Regional Expert Group For Cardiovascular Disease Prevention Through Population-Wide Dietary Salt Reduction

Final Report
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Forward

In September 2009, the Pan American Health Organization (PAHO) launched the initiative – *Cardiovascular Disease Prevention through Population-wide Dietary Salt Reduction* – by convening an Expert Group with a 24-month mandate. Its key contribution was to supply tools and issue recommendations for strategies and interventions in aid of reducing sodium intake levels in populations in the Region. Its activities were to be in line with and support the World Health Organization global platforms for dietary salt reduction and were to take into consideration the specific features and context of the Region and its Member States. Critical among the latter are: that salt is still seen predominantly as a vehicle for micronutrient fortification; many countries in Central America and the Caribbean import much or most of their foods; surveillance capacities are often limited; national food regulatory agencies and capacities are often lacking; small and medium enterprises, the informal food sector and discretionary salt use can account for large proportions of total salt intake in many countries; and the nutrition transition emerging in several countries calls for timely action.

When we launched the regional initiative, three countries reported active national strategies to reduce salt intake at the population level. Two years later, several countries have strong approaches that stand at the forefront of a growing momentum that involves multiple sectors and stakeholders. The Expert Group has not only fulfilled its mandate, having provided technical inputs, products and guidance proven to be useful to Member States and globally, it has also strengthened the science that supports national cardiovascular and/or non communicable disease (NCD) and nutrition policies that include dietary salt reduction. These contributions will help countries in the Region to implement key interventions identified in the Political Declaration of the recently concluded UN High Level Meeting on NCDs in New York.

To the members of the Expert Group, the technical advisors who provided additional expertise and support, to the countries that directly supported the development of various products and to the secretariat for the initiative, I extend congratulations for a job well done. For its part, PAHO recognizes that more needs to be done, that several complex issues require careful and sustained attention. We will continue to facilitate experts to support countries in the Americas to initiate, secure and expand national action, to further catalyze and stimulate non-governmental organizations, civil society, international organizations and the private sector to meaningfully participate in and contribute to reducing the overconsumption of salt, and we will include dietary salt reduction as a major area of work in our Pan American Forum for Action on NCDs.

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Executive Summary

High salt* diets are a major cause of raised blood pressure, increasing the risk for cardiovascular and kidney disease and death. Already in 2000, about one in four adults world-wide had hypertension. Prevalence is expected to rise from a combination of people generally living longer and prevention of raised blood pressure being largely ineffective up to now.

Reducing dietary salt at the population level is the most cost-effective public health measure available to lower blood pressure and mortality. It can save lives and healthcare dollars across low, middle and high-income countries. Knowing this, the Pan American Health Organization (PAHO) in September 2009 convened a group of independent international experts on salt and health to guide the first two-years of a regional initiative – Cardiovascular Disease Prevention through Dietary Salt Reduction.

The Expert Group and its five sub-groups, supported by additional technical expertise, addressed issues and prepared resources to assist Member States in engaging the food industry on product reformulation; advocacy and communication; surveillance (sources of salt in the diet, salt intake and public knowledge and opinions on salt and health); salt fortification with iodine; analysis of health and economic impacts of dietary salt reduction; and review of scientific evidence. The work is consistent with and supportive of the concurrent WHO global initiative for dietary salt reduction.

This report marks the completion of the first two years of the regional initiative and the 24-month mandate of the Expert Group. The report summarizes the progress made and the lessons learned to date by the stakeholders, and it features the achievements of and resources prepared by the Expert Group and its sub-groups. It also presents the Expert Group's key messages and recommendations directed to the major stakeholders in dietary salt reduction: Members States; the food and salt industries; non-government organizations (NGOs) and civil society; WHO/PAHO and other international organizations.

There is momentum and potential for a second phase of activity in the region. Several of the challenges identified by countries, whether active or not yet, can be addressed through the dissemination and facilitated implementation of the tools and resources collected and developed by the Expert Group. The target and timeline commitments made by the multinational and large national food companies in Brazil and to the US National Salt Rreduction Initiative (NSRI) (which in addition received restaurant chain commitments) are evidence of what can be anticipated with regards to food reformulation and can be examples to other markets and countries in the region. The occasions for dissemination are also opportunities to continue and expand networking and sharing of plans, resources and approaches.

For low- and middle-income countries that have not yet launched dietary salt reduction initiatives and are considering where to start, the experiences in the southern cone countries, especially regarding bread – a major source of salt – provide important lessons and direction. The national experiences with and tools for public information and awareness raising campaigns are potentially of great value to these countries – they can inform public health policy makers who need to build the broad public support that can secure the issue on political agendas.

Key Messages

Salt intake exceeding biologically adequate levels has a causal and direct relationship with greater-than-optimum levels of blood pressure.

Countries should launch national initiatives to reduce the overconsumption of salt as part of non-communicable disease prevention or healthy nutrition policies, taking advantage of the lessons learned and momentum in other countries and the region, using entry points and action sequences most appropriate to country contexts, adopting at least the internationally recommended target of less than 2000 mg sodium or 5 g salt from all sources per person per day by 2020.

Countries should use the most reliable and valid methods feasible to determine a baseline of the main sources of salt in the national diet (salt in commercially processed foods and restaurant/catered foods that is added before products are sold, and the salt or high salt products added at the table and in cooking (personal discretionary use)) and population level salt intake. While secondary data can supply estimates of total salt intake, there should be provision made for 24-hour urine sampling to confirm findings.

Countries should take advantage of health economic analysis models and methods currently available to

*The word salt is used to refer to sodium and the term "reducing dietary salt intake" implies the reduction of total sodium intake from all dietary sources including, for example, salt added during food manufacturing and processing, sodium additives such as monosodium glutamate and other sodium-based preservatives or taste enhancers, as well as salt added at the table and in cooking. Where salt substitutes are advocated (partially replacing sodium with potassium and other components) sodium reduction may be achieved without salt reduction thereby requiring the distinction between the two terms.

demonstrate the disease burden of high salt diets and conversely the benefits to population health and economic development of reducing the overconsumption of salt.

Where packaged foods and food service establishments (restaurants and caterers) are a major source of dietary salt or are emerging as such, countries working with the food industry should set targets and timelines for reducing salt content. When doing so, countries should review the reformulation commitments and low salt products made by food companies in and for other markets in the region and elsewhere as evidence of what can be done. Countries can begin with voluntary targets for high volume food categories followed by targets for all foods that contribute salt to the diet. Should voluntary efforts lag or fail, the salt content of foods should be regulated within the national food safety and health protection legislative frameworks to ensure market-wide impact and coverage of all relevant food categories.

Countries should include broad public awareness and education campaigns in their national initiatives targeting high salt intake. The campaigns should mobilize relevant non-government organizations, consumer organizations, civil society, public policy makers, public health and healthcare professionals and the food and salt industries and their trade associations, and be guided by national knowledge on population level salt intake and the main sources of salt in the diet.

Countries should establish systems to objectively and transparently monitor food industry progress against the targets and timelines and evaluate and publicly disclose whether or not industry commitments for salt reduction, whether voluntary or mandatory, are being met. At the same time countries should continue to monitor population salt intake levels and sources of dietary salt through risk factor studies to determine the impacts of food product reformulations and reductions in the personal use of salt.

Countries should routinely monitor population level iodine intake as dietary salt is reduced and, where iodine deficiency is a concern, develop 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.

Recommendations

To Member States

Recognizing that people in the Americas are over consuming salt, resulting in raised blood pressure and increased risk of cardiovascular and kidney disease, and understanding that unhealthy diet is a major threat to the health of populations and to sustained economic growth and productive workforces, the governments of Member States should take a leadership role and:

Reduce exposure

Launch national multi-stakeholder initiatives to reduce people's exposure to high salt diets as part of national non-communicable disease prevention or nutrition policies. Taking guidance from the *WHO Global Strategy on Diet, Physical Activity and Health*, use entry points and action sequences most appropriate to country contexts, using processes where collaboration with stakeholders is transparent and conflicts of interest are minimized.

Strengthen surveillance

Develop or adjust and sustain surveillance mechanisms, using the most reliable and valid methods feasible in country contexts, to first determine a baseline and then monitor the main sources of salt in the diet (salt in commercially processed foods and in foods prepared by food service establishments (restaurants/caterers) where the salt is added before products are sold, and the salt added at the table and in cooking (personal discretionary use)) and population level salt intake. While secondary sources e.g. salt industry sales per capita, can supply estimates of salt intake, there should be provision made for 24-hour urine sampling to confirm findings of total salt intake. Refer to the tools and guidance prepared by WHO/PAHO specific for surveillance of dietary salt.

Adopt timelines

Establish a schedule of national targets and timelines for a salt reduction program based on the knowledge of salt intake levels and the main sources of salt in the national diet, setting the ultimate target as at least the internationally recommended intake of less than 2000 mg sodium or 5 g salt from all sources per person per day by 2020. Establish interim targets e.g. at 3 and 5 year points as a means to monitor progress and allow adjustment of targets as needed.

Address economics

Estimate the health and economic development benefits of whole populations achieving the optimal level of salt intake to make the case for concerted all-of-society action. Take advantage of currently available models and methods.

Set targets

Engage multinational and national food industries – food manufacturers and food service establishments

– in meaningful dialogues to establish sustainable and transparent processes where the industries commit to follow schedules to meet gradually lowered and measurable targets for the salt content of food categories, taking into account, as evidence of what can be done, the low salt products, reformulation schedules, targets and technologies applied by food companies in other countries where national salt reduction programs are underway. Closely monitor and disclose publicly the progress against commitments.

Consider regulation

Consider regulating the salt content of foods within the national food safety and health protection legislative frameworks to ensure market-wide impact and coverage of all relevant food categories.

Institute advocacy

Build or improve the capacities of the public institutions responsible for developing and maintaining a national initiative, specific to national needs, and demonstrate to policy makers at all levels and in various sectors the benefits and potential contributions of population level dietary salt reduction.

Clarify labeling

Mandate clear and simple labeling of packaged foods and foods prepared by food service establishments for the purchaser to easily identify the amount of salt contained in each serving (or per reference amount used in the national labeling system) and easily understand if the product is high versus low in salt content. At the same time, discourage the marketing of processed foods as "healthy" solely on the basis of being sodium-reduced given that unhealthy properties may remain e.g. high density, high fat, high sugar.

Require reporting

Require food manufacturers and food service chains to annually disclose and report the nutritional content of their products including their sales volumes and use this information to track trends in the salt content of the products and their consumption. Establish the mechanisms e.g. databases necessary to monitor trends. Databases should be publically accessible for use by consumers and researchers and civil society.

Communicate effectively

Coordinate and collaborate with, and where necessary train non-government organizations, consumer organizations and civil society to assist in broad and multifaceted educational campaigns to ensure that consumers, public health and healthcare professionals, public policy makers and the food and salt industries are informed and educated about the harmful effects of excess salt on health, about the main sources of salt in their diets and the amounts in food products.

Protect children

Refer to the 2010 WHO *Set of Recommendations on the Marketing of Foods and Non-alcoholic Beverages to Children* to guide the design of or strengthen existing national policies to reduce children's exposure to the marketing of foods high in saturated fats, trans fatty acids, added sugars or salt.

Standardize procurement

Develop standardized food procurement policies for all public institutions and for the use of public funds consistent with healthy nutrition guidelines. Policies should include criteria limiting the amount of salt in products purchased.

Enlist workplaces

Encourage workplace wellness programs in public and private sectors that include access to healthy food choices including those that are low in salt.

Monitor iodine

Monitor iodine intake at the population level in order to adjust iodization levels of salt, both discretionary salt (added at the table and in cooking) as well as that used by the food industry where applicable. Where iodine deficiency disorders remain a problem, pursue or strengthen 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.

Engage with PAHO and other international agencies to develop an overarching comprehensive action framework for countries in the region that complements existing regional and national efforts for dietary salt reduction.

Disseminate successes

Use the sub-regional economic platforms to facilitate dissemination of best practices that reduce the

* CARMEN is an acronym for Collaborative Action for Risk Factor Prevention and Effective Management of Non-communicable Diseases and Conjunto de Acciones para la Reducción Multifactorial de Enfermedades No Transmisibles – the network of countries in the Caribbean and Latin America that are applying integrated community-based approaches to preventing and managing non-communicable diseases and their risk factors.

salt content of the food supply for food safety and food quality purposes and to reduce salt in foods imported and exported across common markets.

Utilize CARMEN

Through the CARMEN network* promote the advances of national programs and disseminate lessons learned.

To the food and salt industries

Recognizing that progress has been made in certain markets with new and reformulated low/no salt products, all multinational and national food manufacturers, private label retailers, food service establishments (restaurants and caterers) and the food services sector should:

Be transparent

Make public the plans to reduce salt in all products, prioritizing mainstream and biggest sellers, and monitor progress on the plans and make public the results.

Set targets

Cooperate with national governments in setting and making public reformulation targets and timelines that will meaningfully contribute to reaching the ultimate national intake target and implement corresponding product development and reformulation schedules.

Supply globally

Supply to all countries in the Americas now, and continue to supply as they become available, the products with the best nutrient composition including the lowest salt content in a company's product line available anywhere in the world.

Transfer technologies

Transfer the technologies that have delivered low/no salt content products in such countries as the United Kingdom and the United States to all branches and/or subsidiaries in countries in the Americas including the products with internationally recognized brands.

Communicate responsibly

Ensure that public messages related to salt and health used in advertising, marketing and promotional activity is consistent with and reinforce those of WHO and the PAHO Policy Statement. Inform consumers responsibly that taste preferences for salt can be changed.

Clarify labelling

Ensure clear and simple labelling of packaged foods and foods prepared by food service establishment for the purchaser to easily identify the amount of salt contained in each serving (or per reference amount used in the national labelling system) and easily understand if the product is high versus low in salt content.

Supply information

Regularly provide up-to-date nutrition information to government in the format specified by government for the purposes of monitoring the salt content of foods.

Protect children

Act according to the WHO Set of Recommendations on the Marketing of Foods and Non-alcoholic Beverages to Children.

Honour commitments

To members of the International Food and Beverage Alliance who pledged to WHO in 2008 to support its Global Strategy on Diet, Physical Activity and Health, act meaningfully on the commitments made with regards to reformulation and new food product development to offer consumers low/no salt alternatives world-wide.

Recognizing that the salt in packaged foods and foods prepared by food service establishments are increasingly if not already replacing discretionary salt as the main source of salt in the diet, and that these processed foods should therefore contain appropriate amounts of iodized salt or include iodine in fortification premixes, food manufacturers should:

Conduct research

Invest in research to determine how to efficiently manufacture foods to deliver iodine at levels appropriate to population needs.

To non-government organizations and civil society

Recognizing that NGOs and civil society, including also researchers and the academic community, have shown themselves to be powerful advocates and activists, their work can be parallel to or stimulate that of governments to move public health agendas. They can also motivate private sector responses to public issues or demands. Where not already mobilized on the issue of overconsumption of salt, NGOs, consumer associations and civil society should:

Build capacities

Build internal capacity to advance salt reduction

efforts. Societies of healthcare professionals and organizations representing consumers or patients should mobilize their memberships and build coalitions to impress upon individuals the need to reduce the personal use of salt and to pressure food manufacturers and food service establishments to reduce the salt content of their products.

Standardize messages

Use standardized educational messages to promote a consistent understanding of the health issues related to high salt diets and solutions. Emphasize public education where discretionary salt – added at the table and in cooking – is the major source of salt in the diet. Where commercially prepared and restaurant/catered foods are or are becoming the main sources of salt, raise public awareness and mobilize consumers to demand greater choice and control over the salt content in the foods they buy. Use the fact sheets and other materials made available by WHO/PAHO, designed to facilitate common messaging to make the case.

Advocate transparency

Advocate processes where public health collaboration with stakeholders is transparent and conflicts of interest are minimized.

Monitor industry

Be the "watch dog" to monitor food industry adherence to voluntary or mandatory reformulation schedules or the government oversight of targets, and keep consumers informed of progress or lack there-of.

Advocate healthy procurement

Advocate standardized healthy food procurement policies for public and private sectors that include placing limits on the salt content of foods purchased and served.

Advocate labelling

Advocate clear and simple labelling of packaged foods and foods in food service establishments for the purchaser to easily identify the amount of salt contained in each serving (or per reference amount used in the national labelling system) and easily understand if the product is high versus low in salt content.

Engage governments

Engage with and strengthen relationships with governments using existing communication channels and broadening them when the opportunities arise.

Engage media

Engage with the media as broadly as possible to disseminate sound scientific evidence and advances in salt reduction in support of campaigns and advocacy for public and private sector actions. Put forward champions or prominent public figures as advocates to strengthen the actions to reduce population level salt consumption and initiate/support consumer demand for salt reduction across the food supply.

Protect children

Facilitate and support efforts to implement the WHO Set of Recommendations on the Marketing of Foods and Non-alcoholic Beverages to Children.

Engage internationally

Engage with PAHO and other international agencies to develop an overarching comprehensive action framework for the region to leverage existing regional and national NGO and civil society efforts for dietary salt reduction.

To PAHO-WHO

Recognizing its primary role in facilitating dialogue, providing technical support to Member States and intervening with national and international agencies on behalf of Member States, PAHO should:

Advocate all-of-society approaches

Advocate among governments and all stakeholders the need for a population-based all-of-society approach to salt reduction as a proven cost-effective and cost-saving intervention.

Build databases

Develop, maintain and make publicly available a database of national policies with a dietary salt reduction component including descriptions of mechanisms and instruments being applied and the national targets and timelines set for food category reductions.

Facilitate dialogues

Facilitate meaningful dialogue among national governments, the food and salt industries, NGOs and civil society to develop an overarching comprehensive and multisector action framework for the region that complements existing regional and national efforts for dietary salt reduction and salt iodization programs.

Utilize CARMEN

Ensure that learning and best practices in countries that are lowering dietary salt are shared through the

CARMEN network and continue to provide technical and expert support to countries as needed.

Encourage networks

Encourage development of other networks and more generally the linking of similar initiatives to optimize the exchange of specific experiences and knowledge.

Facilitate analyses

Facilitate the national assessments of the population health and economic development advantages of lowering dietary salt through regional or sub-regional workshops on health economics modelling.

Stimulate research

Stimulate country-based and regional collaboration with research communities to evaluate and publish relevant findings, especially the evidence of cost-effectiveness and cost-savings from lower dietary salt, along with the initiatives and innovations implemented in low- and middle-income countries as models appropriate to the economies and cultures of the Americas.

Protect children

Facilitate countries to implement the WHO Set of Recommendations on the Marketing of Foods and Non-alcoholic Beverages to Children.

Facilitate synchronization

Promote and support the synchronization of national salt iodization with salt reduction programs by facilitating collaboration with international stakeholders and with them jointly support country-level pilot studies.

Advocate reporting

Engage the relevant international and national agencies to advocate transparent and publicly available food composition data and database development.

I. Introduction

The consumption and overconsumption of salt

The human body requires sodium to regulate body fluids and maintain critical body functions. Over the millennia of human evolution, the small amount of sodium found naturally in foods was physiologically sufficient by virtue of the body having developed mechanisms to retain and conserve it [1].

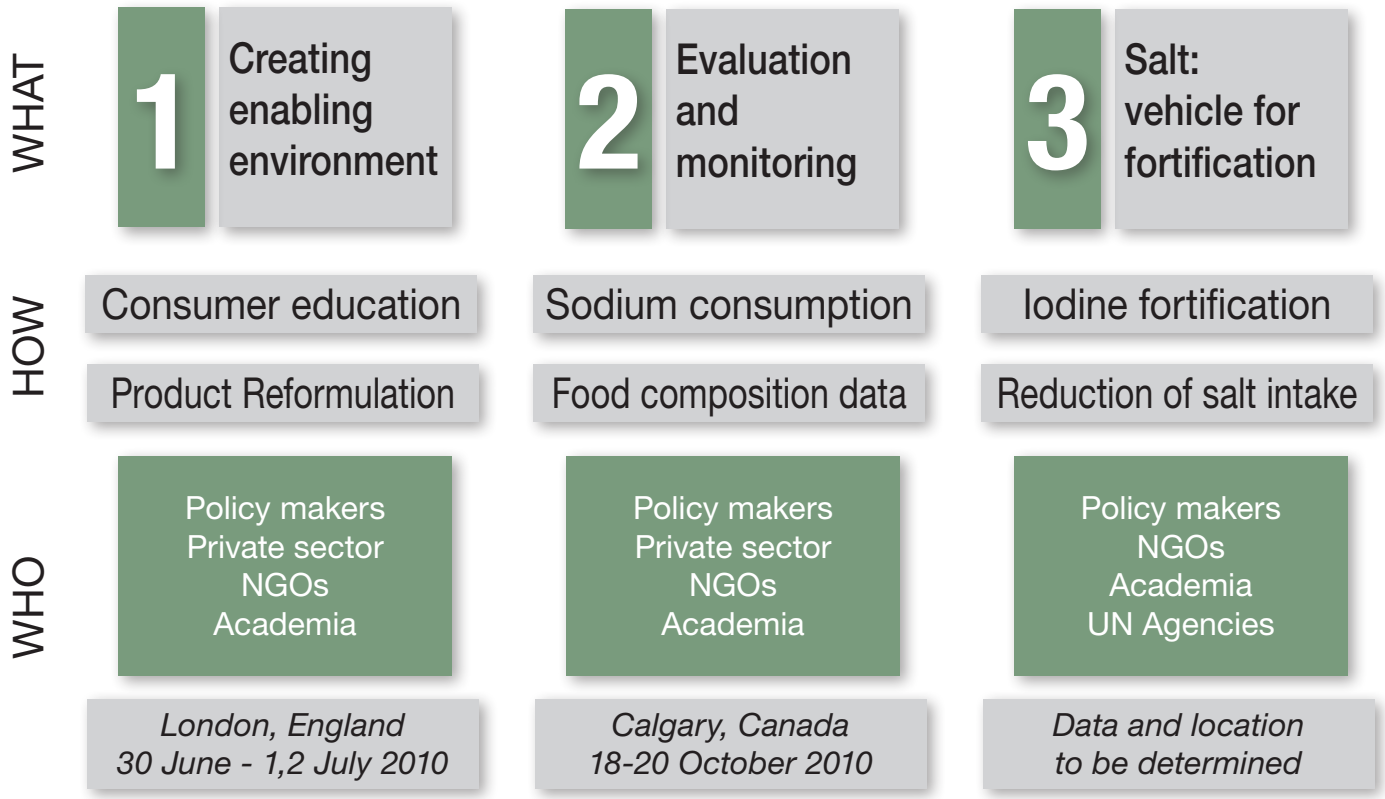
It has been approximately 5000 years since salt was first added to food to preserve it and enhance taste and thus added salt became the major source of dietary sodium. But whereas salt was originally a precious commodity with cultural and even religious significance and hence carefully used, increased mining and ease of transportation over the centuries made it gradually more accessible and inexpensive. With the developments in industrialized food processing over the last few hundred years, salt has become an almost ubiquitous additive to food with additional functions in e.g. food texture and appearance. Consumption is now so reliable that table salt is used as the principle vehicle for supplementary micronutrients e.g. iodine to prevent iodine deficiency disorders. Today in modern diets, naturally occurring sodium found in unprocessed foods accounts for less than 12 % of total sodium intake; the balance of sodium intake is attributed to added salt [2]. In high income economies, salt is particularly concentrated in commercially manufactured food products [1-3].

The internationally recommended salt intake level is less than 5 g/person/day [4-5]. Actual consumption levels are with few exceptions high world-wide, proven for the first time by the INTERSALT Study (1985-87) that determined comparable standardized sodium intake levels from 52 population samples in 32 countries based on 24-hour urine collections. The subsequent INTERMAP Study from 1996-99 in four countries provided similar findings and several recent dietary and urinary sodium data from observational and interventional studies continue to show excess intake [6].

In the Americas, recent dietary and urinary sodium excretion estimates confirm high per capita salt intake: Brazil at 11 g of salt/day [7]; Argentina with 12 g of salt/day [8]; Chile at 9.8 g of salt/day [9]; the United States with 8.7 g of salt/day [10].] and Canada with 7.7 g/day [11]. Sources of dietary sodium vary: in the United States [10] and Canada [11], 75% and 77% respectively of sodium consumed comes from processed foods; in parts of Brazil, 70% is attributed to discretionary salt (added in household cooking or at the table) [7].

High salt intake is unsafe

Salt intake exceeding biologically adequate levels has a causal and direct relationship with greater-than-optimum levels of blood pressure [12-13]. Excess salt consumption increases the blood pressure of infants and children, of normotensive and hypertensive adults [14-17] and is attributable to 30% of the prevalence of hypertension [18-19] found in one in four of the world's adult population. Increased blood pressure even within the normal range is a major cause of disability and is the leading risk for premature death in the world [14]. Based on it increasing blood pressure and its probable promotion of gastric cancer, high salt intake is estimated to be the 7th leading risk for



premature death in the United States and the second leading risk in Chile [20-21]. High salt intake also causes kidney stones and has a strong pathophysiological basis and association with osteoporosis, increased asthma severity, and obesity [22-24].
The prevalence of elevated blood pressure is expected to rise from a combination of people generally living longer and prevention of rising blood pressure being largely ineffective up to now, making the condition almost inevitable with advancing age. In 2001, nonoptimal blood pressure and its resulting diseases consumed about 10% of global healthcare expenditures, considered a conservative estimate [25].

Lowering salt intake is cost-effective and cost-saving

Lowering blood pressure by reducing salt intake even a small amount (15%) is estimated to prevent 8.5 million premature deaths in 10 years in low- and middle-economies and can deliver cost-savings in high-income countries [26-28]. Three countries have proven that sustained wide-ranging initiatives can reduce salt intake population-wide and in two countries, health benefits have accrued:

- Between 1955-89 average salt consumption in Japan dropped from 13.5 g to 12.1 g per day resulting in a gradual fall in blood pressure and a marked decline in deaths from stroke [29].
- Finland reduced population level salt intake by 25% over two decades beginning in the 1970s and similarly observed a marked reduction in blood pressure and stroke deaths [24].
- England reduced salt consumption in the population from 9.5 g in 2001 to 8.6 g in 2008 [30].

WHO platforms for dietary salt reduction

WHO and the UN Food and Agriculture Organization (FAO) issued a joint report in 2003 in which the recommended individual salt intake be less than 5 g/day. Then as part of the implementation of the WHO *Global Strategy on Diet, Physical Activity and Health (DPAS)* and the *2008-2013 Action Plan for the Global Strategy for the Prevention and Control of Non-communicable Diseases*, WHO established a salt reduction strategy with three platforms shown below.

WHO Population Salt Reduction Strategy

- WHO with the UK FSA jointly organized Platform 1 – Create enabling environments – in the summer of 2010. It included an information exchange forum

with the private sector and NGOs on population-based salt reduction strategies followed by a technical meeting. Discussed were interventions for consumer education and reformulation of industrially produced foods to enable consumers to make appropriate choices to reduce the total sodium content of their diet [31].

- In the fall of 2010, WHO/PAHO with the Government of Canada (Health Canada) organized Platform 2 – Evaluation and monitoring – also as an information exchange forum with the private sector and NGOs followed by a technical meeting where monitoring sodium intake levels at population level, assessment of dietary sources of sodium, and knowledge, attitudes and behaviours towards sodium and health were discussed [32].
- Platform 3 will bring together stakeholders in dietary salt reduction and salt fortification with iodine, to facilitate the coordination of the two strategies.

II. The PAHO initiative – Cardiovascular Disease Prevention through Population-wide Dietary Salt Reduction

Background

Seminal to PAHO launching a regional dietary salt reduction initiative was the 2007 article in The Lancet – *Chronic disease prevention: health effect and financial costs of strategies to reduce salt intake and control tobacco use* [26]. It concluded that a voluntary or legislated programme of reformulations by the food industry to use less salt and sodium additives in food products, combined with a public health campaign to raise consumer awareness of the dangers of high salt intake and encourage less salt use in household cooking and at the table, is the most cost-effective public health policy available to countries whether they are low-, middle- or high-income.

In 2008/09, PAHO surveyed the Member States in the central and south sub-regions as to national salt reduction activities underway or intended. The 12 responding countries[1] reported the following main aspects of their approaches:

- five (Argentina, Brazil, Chile, Costa Rica and Uruguay) had national recommendations to limit salt intake (four had the target of less than 5 g/day/person and one recommended less than 6 g);
- four had qualitative recommendations for moderate use of salt (Grenada, Guyana, Panama and St. Vincent);
- five were conducting research on sources of sodium in the diet (Argentina, Bolivia, Brazil, Chile and Ecuador); and
- two had working groups/task forces leading national initiatives for salt intake reduction (Argentina and Chile).

With countries already demonstrating their intentions to reduce dietary salt, PAHO with the Public Health Agency of Canada organized a regional meeting in Miami in early 2009 as a forum to exchange information on action in and outside the region and to define what next steps would be of most assistance to advance the action in the Americas. Discussions identified a number of the key challenges to be taken into consideration as the region moved forward:

- Salt is still seen predominantly as a vehicle for micronutrient fortification (in particular for iodine and fluoride) therefore messages and actions to reduce salt intake must be synchronized with those addressing the prevention of micronutrient deficiency.
- Because many Central American and Caribbean countries import much or most of their foods, it is essential for salt to be on the agendas of regional political / trade bodies.
- National food regulatory agencies are still rare in the region, existing only in Brazil, Canada, Chile, Costa Rica, Mexico and the United States, therefore instruments such as mandatory nutrition labeling and nutrient analysis and monitoring, proven elsewhere to be effective in influencing the food industry to remove or reduce harmful ingredients like trans fats and high salt, are uncommon in the region. The public commitment of many countries to the "right to health" of their populations can be used as an argument while regulatory capacities grow.
- Small and medium enterprises and the informal food sector are very common in the region, with products from the latter virtually uncontrolled. This "atomization" of food provision poses special challenges for engagement, effective collaboration and monitoring.
- Taking action now is critical. Trade liberalization and economic growth in several countries in the region, particularly in Central and South America, are increasing consumer purchasing power and as a result, changing lifestyles. Among the changes is a shift in food preferences from home cooking to greater consumption of commercially processed products, many of them highly salted, that multinational and large national companies are increasingly making available on local markets. At this juncture, reducing the salt content across the food supply in the context of promoting healthy diet

1 Argentina, Bolivia, Brazil, CFNI (Bahamas, Dominica, Grenada, Guyana, St. Lucia, St. Vincent and the Grenadines) Chile, Costa Rica, Ecuador, Honduras, INCAP (Guatemala) Panama, Paraguay, Uruguay.

and lifestyles is timely, to the benefit of population health and by extension supporting the economic development apparent in the region.

The key outcome of the Miami meeting was the call for PAHO to lead a region-wide initiative to mobilize Member States to reduce the overconsumption of salt. PAHO responded, convening in September 2009 a group of independent international experts on salt and health from within and outside the region to guide and support an initiative – Cardiovascular Disease Prevention through Population-wide Dietary Salt Reduction – encompassing North, Central and South America and the Caribbean, intended as multifaceted and multistakeholder.

The Expert Group and its sub-groups

The Expert Group comprises academics and researchers, and representatives of international health organizations, consumers, non-government organizations active in health and of health institutions in Member States working on dietary salt reduction and cardiovascular and chronic disease prevention. The Group operated with a Chair and two co-chairs, one each for the Caribbean and Latin America, supported by a secretariat led by PAHO.

The Group was to issue recommendations for strategies and interventions in line with the WHO strategy that can be employed to reduce salt intake levels among people in the Americas. Its terms of reference to serve the region and sub-regions were as follows:

- Estimate the impact of a successful program to reduce salt consumption in the Americas on hypertension and cardiovascular disease prevalence
- Initiate regional contacts with industry
- Identify advocates in the region
- Connect main players in the region
  - Prepare a Policy Statement on salt reduction to be signed by key players in the region.
- Develop common resources.
  - Sets of common messages to raise awareness among consumers and healthcare professionals
  - Guidance for surveillance and monitoring.
- Provide guidance and support directly to governments (e.g. national task forces, national awareness raising campaigns, national target setting, etc.)
  - Support establishment of national task forces
  - Support national efforts to build awareness in governments and the general population in countries regarding salt reduction.
  - Identify necessary technical expertise for development of country targets and timelines setting.

The Group divided itself into sub-groups and with additional technical expertise, developed policy recommendations and resources (products) for the areas that reflected its terms of reference and were seen as most helpful to Member States (already taking action as well as those not yet active): engaging the food industry on product reformulation and new product development; advocacy and communication; surveillance of salt intake, sources of salt in the diet and public knowledge and opinions on salt and health; salt fortification with iodine; and promoting national level health economic impact studies on salt reduction. The Group and vari-

For the governments of Uruguay and Costa Rica, their endorsement of the Policy Statement served as a foundation for launching national initiatives.

For civil society in Latin America, led by Consumers International and the Inter-American Heart Foundation, the Policy Statement was the basis for organizing around information exchange, for mobilizing action and providing support for the regional initiative.

The Healthy Caribbean Coalition has developed culturally tailored material to raise awareness of high salt diets and their harmful effects. The Heart Federation of Jamaica promoted "Drop the Salt – Protect Your Health" as the theme for Salt Awareness Week in 2011.

More than 40 Latin American civil society organizations launched the Healthy Latin American Coalition (Coalición Latino América Saludable -CLAS) in Buenos Aires in early 2011. It declared the grave impact of non-communicable diseases in the region – a deterrent to human development and obstacle in preventing poverty. The Coaltion developed an initiative specific to salt and health (ALASS –Asocociacion Latino Americana Sal o Salud) for the exchange of information, to build proposals for funding and provide different platforms for knowledge dissemination.

The Chilean affiliate of WASH International was launched in June 2011.

Three countries in the region have applied the 24-hour sodium excretion Protocol:

- the SALMEX study, conducted by the National Medical Science and Nutrition Institute Salvador Zubiran over 2010/11 involving a worker cohort, is the first 24-hour urinary sodium excretion study in Mexico;

- the Chronic Disease Research Centre in Barbados determined a national baseline for sodium excretion in 24-hour urine in 2010/11 as part of a national Salt Intake Study;

- the New York City Department of Health and Mental Hygiene measured sodium excretion in 24-hour urine samples from 1700 resident non-institutionalized adults in 2010 [33].

A food frequency questionnaire first developed for the Barbados National Cancer Study in 2000 was adjusted in 2010 to account for changes in the Barbadian diet and at the same time allow a specific evaluation of salt consumption.

The National Household Budget Survey (HBS – Pesquisa de Orçamentos Familiares) administered between July 2002 and June 2003 by the Brazilian Institute of Geography and Statistics (IBGE, Instituto Brasileiro de Geografia e Estatística) provided the data from which the main sources of salt in the Brazilian diet were derived [7].

ous members published the advances made in the region and promoted the initiative at regional and global meetings and conferences. A scientific review committee was also formed to examine and respond to new research released during the period of the Group's mandate.

Purpose of this report

This report marks the completion of the initial two-year mandate of the initiative. It presents the work of the Expert Group, the progress made to date by countries in the region and the Expert Group's key messages and recommendations for further advancement directed to the major stakeholders in dietary salt reduction: Members States; the food and salt industries; non-government organizations (NGOs) and civil society; WHO/PAHO and other international organizations involved in dietary salt reduction and salt iodization.

III. Tools, resources and achievements

The Expert Group and sub-groups developed tools and resources and formulated guidance to assist Member States to start and strengthen national strategies for dietary salt reduction. In some cases, tools and resources were already available and with assistance from PAHO and Expert Group members, were made culturally appropriate and translated where necessary. In other cases, the Expert Group and sub-groups initiated the development of materials, this through participative processes often involving additional technical expertise, supported by PAHO. Described below are the products prepared for each of the areas to which the Expert Group applied itself plus there are examples of achievements relevant to each.

Advocacy and communication

The Policy Statement

The Expert Group's first product – a Policy Statement, the road map for the initiative – was launched in November 2009 in Santiago Chile at a symposium organized during a meeting of the Latin American Society of Nutrition (SLAN). It set the goal – the internationally recommended intake of less than 5 g salt per capita per day (in the absence of equivalent or lower national targets) – to be reached by 2020 among people in the Americas.

The intended audience for the Statement is policy and decision makers in government; leaders in non-governmental organizations representing consumers, health, scientific and healthcare professionals; civil society; the food industry (including food processors and distributors) and food importers and exporters; and PAHO. As of May 2011, there are 56 endorsements of the Policy Statement, listed in Appendix 1.

Fact sheets, presentations, core references

The sub-group adjusted a standardized presentation on salt reduction and a set of fact sheets to be culturally appropriate, covering salt and hypertension, salt and osteoporosis and salt and kidney failure. The materials are intended for the general public, health professionals and policy makers. The sub-group also compiled a list of core references that underpin the scientific basis and benefits of dietary salt reduction.

Information dissemination
Over the course of its two-year mandate, the Expert Group issued press releases and offered webinars through PAHO; published articles in peer reviewed journals; members made presentations at international conferences and meetings; and otherwise, experiences, scientific information and the Policy Statement were made available at relevant events. Appendix 2 has a complete list of dissemination activities.

Regional support for the WHO Platform I Meeting on Creating Supportive Environments
Members of the Expert Group participated in the Platform I Meeting in July 2010 in London, joining representatives from other WHO regions. They presented the Pan American initiative, the profile of the Expert Group and its subgroups, their objectives and achievements to date.

Surveillance

Surveillance of actual salt intake, determining the main sources of salt in the diet and understanding what people know about salt and its effects on health are the critical underpinnings to the design of a national effort to reduce the consumption of salt. They point out where to place the emphasis and what goals to set. With baselines known, ongoing monitoring demonstrates whether goals are being met.

Protocol for Determining Population Level Sodium Intake in 24-hour Urine Samples
With support from the National Institute of Public Health in Cuernavaca (Mexico) and the Salvador Zubiran National Institute of Medical Sciences and Nutrition in Mexico City, the sub-group for surveillance prepared the *Protocol for Population Level Sodium Determination in 24-hour Urine Samples.* The 24-hour urine sampling method applied to a representative sample of the population provides the most valid and reliable data on salt intake in a country. The Protocol also recommends the concurrent assessment of potassium and iodine intakes as they are important dietary constituents to take into account in salt reduction programs.
While secondary sources can supply estimates of salt intake, there should be provision made for 24-hour urine sampling to confirm findings.

A Review of Methods to Determine Main Sources of Salt in the Diet
With support from the Brazilian Ministry of Health, the subgroup developed the Review, a companion document to the *Protocol*. It serves as a guide to selecting the most appropriate method, given country resources and circumstances, to identify the complete profile of dietary sources of salt as baseline information and for ongoing monitoring:

- foods that people consume and the amounts and frequency of consumption.
- salt content of the most commonly consumed foods
- the amount of salt added at the table and in cooking
- intake of high-salt foods that are culturally or regionally-specific.

Literature review of 24-hour urine and spot sampling methods
A systematic review of literature, underway, is assessing the validity and reliability of sodium and iodine intake values derived from spot urine samples to estimate salt and iodine consumption compared to the 24-hour urinary excretion method considered to be the gold standard. The analysis of multiple studies has so far found current spot urine methods to be unreliable in representing daily sodium consumption.

Studying knowledge, attitudes and behaviour
Expert group members initiated two projects directed at consumers' knowledge, attitudes and behaviours (KAB) regarding salt/sodium and food labels. The Consumers International (CI) representative on the Expert Group led the first project, assisted by other Group members, in which a KAB instrument and methodology were developed and then tested in five countries among consumers approached in an ad hoc manner on the street. The findings informed a meeting of the CODEX Alimentarius Committee on Food Labeling (see below). A second phase on KAB, to involve interviews with focus groups applying qualitative research methods, is being led by INCIENSA (Costa Rican Institute for Research and Education on Nutrition and Health) working with researchers in Costa Rica, Ecuador and Argentina.

Building regional capacity for food composition data
Essential to an assessment of the main sources of salt in the diet are up-to-date food composition data. Specific to foods in Latin America is the database of LATINFOODS – the Latin American Network of Food Data Systems [34]. In 2011, the Expert Group member from Costa Rica facilitated a survey of LATINFOODS members and related food analysis laboratories in 19 countries on the status of their data on the sodium content of foods [35].

Participation in an international collaborative project to compare and monitor the nutritional composition of processed foods
Ten countries in the Americas region (Argentina, Barbados, Brazil, Canada, Costa Rica, Ecuador, Guatemala, Mexico, Panama, Peru) are participating with eight others elsewhere in an international initiative to survey processed foods in major food categories using a standardized methodology. The objective is to compare the nutritional composition between coun-

CI together with researchers in Chile, Argentina, Ecuador, Costa Rica and Canada tested the KAB instrument. The results (unpublished) showed poor knowledge on salt levels in food and of the effect of salt on health both in the general population as well as among individuals with hypertension, indicating that more knowledge dissemination on the topic is required.

Knowledge, perceptions and behaviour in relation to salt intake and dietary sodium, its association with health and the nutrition labeling declaration in foods. Multicenter collaborative study sponsored by WHO/PAHO, 2011-2012. In Argentina, Costa Rica and Ecuador, in-depth semi-structured interviews with two focus groups in each country, one rural and one urban, six adults in each (12 total), will explore KAB issues, supplemented by direct observation.

The LATINFOODS members and other laboratories responded to a questionnaire on whether they had data on the sodium content in 14 categories of processed and pre-prepared foods. While 68% of respondents reported having some information on sodium content in all food categories (mainly breads, cereals and snacks), all respondents indicate that data need to be updated and a high majority requires resources and training to do so. All respondents are supportive of the regional initiative to reduce dietary salt.

tries, between food companies and over time. The George Institute for Global Health in Australia is coordinating and secretariat to the project.

Regional support for the WHO Platform II Meeting on Surveillance for Population Salt Reduction

PAHO with the Government of Canada, assisted by the Chair of the Expert Group, co-hosted a WHO Platform II meeting on surveillance in October 2010 in Calgary, Alberta. Expert Group members contributed the knowledge and experiences with surveillance in the region and featured the related products – the *Protocol for Population Level Sodium Determination in 24-hour Urine Samples*, the results of the KAB survey by CI and research partners, the planned focus group based research on KAB, and the findings up to that point from the review of literature regarding 24-hour urine sampling versus spot urine methods to determine sodium intake.

The outcome was the WHO publication *Strategies to monitor and evaluate population sodium consumption and sources of sodium in the diet – Report of a joint technical meeting by WHO and the Government of Canada, Canada, October 2010.*

Food industry engagement

Industry questionnaire (for multinational and national food manufacturers)

The PAHO secretariat with members of the industry sub-group engaged with several multinational food companies that participated in the PAHO 2009 Partners Forum and had joined a healthy eating working group to continue their involvement. These Forum participants agreed to pilot a questionnaire with two objectives:

- determine a baseline on the nature and extent to which commercial food processors are reformulating food products to reduce their sodium content or are formulating new product lines with low/no sodium; and
- identify the leaders in (re)formulation.

Questions were specific to reformulation plans and efforts; the food categories/food items in company portfolios undergoing salt content reductions or low salt items being supplied in the region; and the food companies' interests in various actions to be coordinated with PAHO to support dietary salt reduction.

The questionnaire was also designed as a resource for Member States to facilitate their engagement with and understanding of the intentions and efforts of national and multinational food manufacturers whose products are available on their respective national markets.

Joint PAHO and World Economic Forum on Latin America meeting and the "2011 Statement of Rio de Janeiro"

PAHO with members of the Expert Group collaborated with the World Economic Forum (WEF) on Latin America and representatives of the food industry, governments, regulatory agencies and civil society to produce *Dietary Sodium/Salt Reduction in the Americas 2011*

Statement of Rio de Janeiro. It is the first position document created jointly by governments, the food industry and civil society that distills elements in the Policy Statement into a set of priorities and commitments regarding their respective roles and responsibilities in reducing the overconsumption of salt. It is a potential contribution to the PAHO/WEF submission to the high level meeting of the UN General Assembly on the prevention and control of non-communicable diseases in September 2011. It is also expected to facilitate dialogue on salt reduction at regional and national levels beyond the UN meeting.

Informing committees of CODEX Alimentarius

Expert Group members joined the International Workshop on Salt and Health in October 2010 in Santiago Chile to contribute to the CODEX Committee on Nutrition and Foods for Special Dietary Uses (CCNFSDU) dealing with nutrient reference values for nutrients (like sodium) associated with diet-related risks for non-communicable diseases. The Workshop, promoting salt/sodium content of foods to be framed as a food safety issue, provided additional information and evidence to CCNFSDU.

PAHO on behalf of the Expert Group also made submissions to directly inform two meetings of the CODEX Alimentarius Committee on Food Labelling (CCFL) in 2010 and 2011. The Expert Group position was:

1) That it be mandatory for sodium/salt content to be declared on food nutrition labels whether labelling is voluntary or mandatory;
2) That the decision about whether sodium or salt is declared be determined by nationally recognized competent scientific authorities in each country;
3) That it be mandatory for sodium or salt content to be effectively communicated to consumers as determined by nationally recognized competent scientific authorities e.g. front-of-package information;
4) That the nutrient reference value for sodium be set at a level as low as possible in keeping with an achievable health promoting diet or be a limit, such as adequate intake, established by nationally recognized competent scientific authorities.

For the CCFL meeting, the results of the KAB survey on salt led by CI, where consumer understanding of salt and sodium on food labels was probed, were also submitted and highlighted in the meeting summary. The CCFL meeting conclusion reflected the Expert Group position – that while sodium is the correct scientific term to include on labels, national authorities can choose to have the total amount of sodium expressed as a salt equivalent on labels in cases where the public demonstrates a better understanding of the term salt than sodium.

Some key findings from the pilot:
- The more supportive the local government e.g. raising consumer awareness about dietary salt, the easier it is for food companies to undertake salt reduction in their products. An informed consumer helps industry, otherwise a company that unilaterally lowers its salt content risks losing market share.
- Important to a multinational is for governments to play a strong role in encouraging local/regional food manufacturers to engage in reducing salt in their products.
- Food companies plan and operate on the basis of markets that in the case of multinationals can represent regions or sub-regions (e.g. common markets), not necessarily countries. Therefore engaging them to reformulate or anticipating product distribution may require a multi-country approach i.e. taking the market perspective as defined by industry.

In mid 2010 the Secretariat interviewed representatives of five national initiatives where voluntary targets and timelines had been establisehd or were in the process of being negotiated with the food industry – in Argentina, Brazil, Chile, Mexico and the US NSRI. The interviews gave insights to the facilitators and challenges to industry engagement and to government action in the context of working with industry. See section III Status of Action.

In the Statement of Rio de Janeiro, governments, the food industry and civil society together strongly commit to the principle of sustainable food consumption; recognzie that international organizations have a strong role to play in convening stakeholders; and encourage stakeholders to act now to improve the health of the people of the Americas using a comprehensive multisectoral approach to specifically reduce dietary salt.

The framework for action in the White Paper has seven areas in which collaboration by salt iodization and salt reduction programmes is recommended: common and coordinated messaging; common advocacy platforms; concurrent surveillance; coordinated evaluation; strategic joint research; shared forums with relevant sectors of the food industry; and coordinated mapping of existing and needed resources and mobilizing them.

Researchers in Argentina estimated the burden of acute coronary heart disease and stroke and the cost-effectiveness of preventative population-based and clinical interventions. Two interventions were particularly cost-saving: lowering salt intake in the population by reducing salt in bread and multidrug therapy [36].

Researchers in Canada conducted a preliminary study of the effect of various levels of dietary sodium reduction on cardiovascular disease mortality and morbidity in 18 Latin American countries combined (Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay and Venezuela). They found that if sodium intake fell by 10% every year from a current average of 3700 mg daily, the optimal intake (1200-1500 mg daily) would be reached in 11 years. There would be about 593,000 fewer CHD and stroke events and about 54,000 fewer deaths in these countries by the end of the period [37].

Synchronizing salt iodization and salt reduction programs

White Paper on Improving Public Health in the Americas through Optimal Intake of Sodium and Iodine

A WHO supported technical consultation from 2007, the PAHO Expert Group's Policy Statement (2009) and an international Iodine Network resolution from February 2010 agree that there is no inherent conflict between salt iodization and salt reduction initiatives. Stepping off from this position, PAHO convened two meetings in early 2011: the first in January with a small group of international and regional technical experts on iodine deficiency disorders and dietary salt reduction, among them members of the Expert Group, who confirmed that collaboration between and synchronization of the two programmes 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; and a second larger meeting in April where representatives of regional and international agencies working to optimize iodine supplementation along with PAHO and Expert Group members agreed to a *White Paper on Improving Public Health in the Americas through Optimal Intake of Sodium and Iodine*. The White Paper includes a framework for action with recommendations to national governments, civil society, various sectors of the salt and food industries and international organizations active in the region. Participants agreed to an immediate next step – the selection of pilot countries in the region where implementation of the two programs can be coordinated, guided by the framework for action, with the experiences to become case studies for dissemination.

Intervention with the US Institute of Food Technologists (IFT)

The framework for *Improving Public Health in the Americas through Optimal Intake of Sodium and Iodine* was featured during the IFT 2011 annual meeting, specifically the symposium on "The role of food processors world-wide in preventing iodine deficiency disorders". Participants recognized that: processed foods, the main source of salt in high-income economies, should be the focus for reformulation; culinary and food science collaborations are necessary to address salt reductions in both retail and food service markets; and customized reformulation approaches are needed within and across food categories.

Nutrition Guidance Expert Advisory Group

Expert Group members have contributed to the WHO Nutrition Guidance Expert Advisory Group (NUGAG) as

it reviews the evidence on how varying levels of population salt intake can impact the effectiveness of salt iodization programs.

Economic studies on the cost-effectiveness and cost-savings of population level dietary salt reduction

The sub-group on health economic analysis identified two readily available models that can demonstrate the health and economic development benefits of population level dietary salt reduction using a minimal data set: the WHO CHOICE model (generalized cost-effectiveness) and the Coronary Heart Disease (CHD) Policy Model. PAHO and University of California in San Francisco are collaborating to prepare countries in the region to evaluate the projected and observed effectiveness and cost-effectiveness of their national dietary salt reduction programs, aiming to maximize impacts within each national context.

IV. Status of action in the Americas

This section begins with the country-specific summaries of activities relevant to dietary salt reduction collected through a 2011 survey of Member States administered by the secretariat. A standardized questionnaire was used to determine:

- which Member States have and do not have national initiatives to reduce the overconsumption of salt
- the nature of the initiatives currently underway, what has facilitated them, the barriers encountered and the kind of assistance needed to make further progress
- the barriers in countries with no initiatives to reduce dietary salt at the population level and what would facilitate overcoming them.

Following the country status reports is the description of food categories for which salt content reductions are underway or intended in the most active countries in the region. Then there is a compilation of the lessons learned so far and challenges to be addressed. The section concludes with a synthesis of the momentum and potential for specific advancements in the region to inform a next phase of the initiative.

Country-specific summaries

The table below presents countries that have national scale initiatives underway. This is followed by a synthesis of the information reported by countries not yet active.

Summaries for countries reporting strategies

Strategy	Key activities	Lead and participating organizations
Country: ARGENTINA		
"Menos Sal Más Vida" (less salt, more life) launched in 2010, part of CVD prevention and the National Strategy for the Prevention and Control of NCDs. Lead organizations are the Ministry of Health, National Nutrition Institute, National Institute of Industrial Technology, and National Commission for NCD Prevention and Control (the latter comprising ministries of health, agriculture, social development, science and technology; the National Institute of Industrial Technology, food companies, NGOs, consumers and universities). Recommended intake 6 g salt per food code	Mass media campaigns; creation/dissemination of education materials; meetings with the food industry and voluntary industry target setting; investigation to determine main sources of salt; assessing cost-effectiveness of reducing overconsumption of salt. Menos Sal Más Vida is extending to large food industries with salt content baseline analysis and target setting. As of October 2011, 2 and 4 year targets are set for reductions of salt content (between 5 and 18%) for various products and commitment obtained from 41 leading food industries and signed. Otherwise under development are surveillance plans and monitoring strategies: food analysis; labelling and self-reporting of sodium content data; a national nutrition survey for 2012 with a sub-sample of participants to supply a 24-hour urine sample for sodium analysis; a household expenditure survey in 2012. The salt content of French bread and other bakery products has already been reduced by 25%.	Secretary of Regulatory Institute, Secretary of Health Policy, National Institute of Nutrition

Strategy	Key activities	Lead and participating organizations
Country: BRAZIL		
National Plan for Reducing Salt Consumption in Brazil, complementing the national nutrition and CVD prevention strategies and the overall National Plan for Tackling Chronic NCDs (2011-2012). Launched in 2011, under the general joint coordination of the Ministry of Health and the national food regulatory agency (ANVISA) and involving the Brazilian Association of Food Industries (ABIA). Recommended intake 5 g salt (2000 mg sodium)/day/person	Mass media campaigns ("Menos Sal") with e.g. a website about salt reduction; the food guide for the Brazilian population; Primary Health Books; other materials to educate and sensitize consumers, food industries, health professionals and other partners; nutrition facts labels that include salt; meetings with the food industry and voluntary target setting for specific food categories; Family Budget Survey Food Availability Modules used to estimate current salt intake levels; research to determine main sources of salt; plans to coordinate the salt reduction program with iodine supplementation program	National food regulatory agency (ANVISA), Brazilian Associations of Food Industries, of Pasta and Dough Industries, of Wheat and Bakeries, Brazilian Association of Supermarkets (ABRAS), National Health Council, National Food and Nutrition Security Council
Country: CANADA		
2010 Sodium Reduction Strategy for Canada, Recommendations of the Sodium Working Group (SWG) – calls for reduction of population level sodium intake from the current 3400 mg/day to an average of 2300 mg/day by 2016 with an eventual goal of 95% of the population consuming less than 2300 mg/day. Draft sodium reduction targets for 2016 for a number of food categories with interim milestone targets for 2012 and 2014.	Sodium Reduction Strategy has four action areas: structured voluntary sodium reductions in food; public education campaigns; food science and health research related to sodium; planned, periodic monitoring and reporting of sodium intake levels and sodium reduction program evaluation. Detailed actions [38]: estimation of the impact of high dietary sodium on hypertension and CVD and costs of health care; development of tools to educate the public, healthcare professionals and policy makers; clinical and scientific sessions on salt and health at regional and national meetings of national health NGOs; extensive national media campaigns led by NGOs regarding high salt content of processed, manufactured and restaurant foods and negative health effects; government research to determine main sources of dietary salt and population survey of 24-hour urinary excretion; studies on knowledge, attitudes and behaviours of the general population and hypertensives relating to dietary salt; research and development of food procurement policies for public institutions; advocacy to restrict marketing of food and beverages to children; combined funding from Canadian Institute for Health Research, NGO and private sector for the Canada Chair in Hypertension Prevention and Control. Federal, Provincial and Territorial (FPT) Health Ministers agree to a target of sodium intake of less than 2300 mg/day. An FPT Sodium Task Group is reviewing the recommendations of the SWG including the identification of potential FPT regulatory mechanisms to achieve the 2016 target. The first full report of targets and timelines for food reformulations, a monitoring and evaluation program and a social marketing program are expected in the fall of 2011.	Health Canada, Public Health Agency of Canada, Canadian Institute for Health Research, Statistics Canada, provincial and territorial ministries of health, the food industry, health NGOs, scientific organizations.

Strategy	Key activities	Lead and participating organizations
Country: CHILE		
Strategy to Reduce Salt/Sodium Consumption in Chile, complementing the Strategy Against Obesity, the Nutrition Intervention Strategy through the human life cycle, the Cardiovascular Health Program and the Choose Healthy Living Campaign that is focused on a healthy population especially children. Leadership lies with the Ministry of Health, Subsecretary of Public Health, Division of Public Policy, Department of Food and Nutrition. Recommended intake 1200-1500 mg sodium/day, according to age for children under 18.	Mass media campaigns; nutrition facts labels that include salt; front of pack labelling; creation/dissemination of education materials; talks at academic meetings for societies of hypertension, cardiology, nephrology, and paediatrics; meetings with the industry and voluntary target setting; survey of physical measurements to estimate current level of dietary intake; research to determine main sources of intake; question included in National Quality of Life Survey on how often table salt is added to food; and development of a public consultation with the following objectives: understand the population's opinion on salt reduction; inform new feasible strategies to reduce salt intake; and increase the population's perception of the risks of high salt intake.	Medical societies of hypertension, cardiology, pediatrics, and nephrology; Food industry; Ministry of Health; associations of artisanal bread makers and supermarkets.
Country: COSTA RICA		
National Plan to Reduce the Consumption of Salt/Sodium in the Population of Costa Rica within the National Policy on Food Security and Nutrition (2011-2021), led by the Ministry of Health, Institute for Research and Education in Nutrition and Health [39]. Recommended intake 5 g salt/day/person	Action plan based on the WHO Population Salt Reduction Strategy and includes research to gather the evidence base to support the three platforms in Costa Rica: KAB regarding salt consumption and health in one population group and sodium analysis of two specific food groups is ongoing; previous research needs to be completed with other representative populations and food groups; and estimation of the impact of high dietary sodium on hypertension and CVD and costs of health care. In the next 12 months: mass media campaigns; workshops on how to reduce dietary salt; creation/dissemination of educational tools; meetings with the industry including food service establishments (restaurants); survey of physical measurements to estimate current level of dietary intake; identification of sources of salt; coordinating the salt reduction program with the iodine and fluoride supplementation programs; monitoring and evaluation.	
Country: CUBA		
Salt reduction is among the comprehensive actions and governmental policies of the 2010 National Program of Non-Communicable Diseases, led by Ministry of Public Health, NCD Department, National Institute of Nutrition and Food Hygiene. Recommended intake of no more than 2300 mg sodium / day (5 g of table salt).	Mass media campaigns; nutrition facts labels that include salt; workshops on how to reduce dietary salt; national implementation of Cuban dietary guidelines; meetings with the industry; studies on knowledge attitudes and beliefs; coordinate salt reduction program with iodine supplementation program.	Progressive actions are taken for a period of three years by the Ministry of Food Industry of Cuba to complete the global strategy to reduce salt.

Strategy	Key activities	Lead and participating organizations
Contry: MEXICO		
Acuerdo Nacional para la Salud Alimentaria, Estrategia para el Sobrepeso y la Obesidad, Programa de Acción en el Contexto Escolar. Specific to salt is "Mas Agua, Menos Sal". Recommended intake of <2g/day of sodium	Mass media campaigns; nutrition facts labels that include salt; front of pack labelling; limit foods high in sodium within preschool, primary and secondary schools; creation/dissemination of educational tools; meetings with the industry; voluntary agreement with goals and timeline for specific food categories; survey of physical measurements to estimate current level of dietary intake; other survey (national nutrition and health survey 2012); cost effective analysis	Secretary of Health/Subsecretary of prevention and promotion, Secretary of public education, Secretary of the economy
Country: SURINAME		
National Approach for Reducing salt use in our food/ Een Nationale Aanpak ter Vermindering van het Zoutgebruik in ons Voedsel), launched in 2010, led by the Ministry of Health.	Action to being in the next 12 months: Mass media campaign; nutrition labels that include salt; front of pack labelling; workshops on how to reduce dietary salt, creation/dissemination of educational tools; meetings with the industry; a survey of physical measurements to estimate current dietary intake; research to determine main sources of salt in the diet	
Country: URUGUAY		
No formal title to the initiative, part of the national NCD prevention and national nutrition programs, led by the Ministry of Health. Recommended intake less than 5 g salt/day/person	Nutrition labels that include salt; nutrition education using the food-based dietary guidelines; workshops on how to reduce dietary salt; creation/dissemination of educational tools; meetings with the industry; other survey method to determine salt intake – National Survey of Expenditures and Household Income. Bakers Industrial Centre of Uruguay plans to decrease the sodium content of baked goods on a voluntary basis	
Country: UNITED STATES		
US actions are not housed under one program. At the federal level activities include national goals (Healthy People 2020), and Dietary Guidelines for Americans (see below), labelling initiatives of FDA and USDA, educational efforts including the National High Blood Pressure Educaton Program, scientific and monitoring efforts, procurement strategies and funding community efforts. The National Salt Reduction Initiative (NSRI) is a partnership of 70+ city and state health authorities and health organizations focusing on reducing sodium in packaged and restaurant foods. Complete details of government initiatives are given in Appendix B of the IOM Strategies to Reduce Sodium in the United States [10] The 2010 Dietary Guidelines for Americans recommend limiting intake of sodium to 1500 mg per day for people aged 51 years and older, African Americans, and those who have high blood pressure, diabetes, or chronic kidney disease (the majority of US adults). All others should reduce sodium intake to less than 2300 mg per day.	Mass media campaigns; nutrition labels that include sodium; proposed rule by USDA for labelling of enhanced meats and sodium information available upon request in restaurants; workshops on how to reduce dietary salt; creation and dissemination of education tools; meetings with the industry (NSRI set food category sodium reduction targets for 2012 and 2014, received voluntary corporate commitments, and is monitoring progress through the creation of packaged and restaurant food data bases); surveys to determine salt intake (National Health and Nutrition Examination Survey (NHANES) and the NYC 24-hour urinary sodium study associated with NSRI); studies on knowledge attitudes and beliefs regarding salt consumption and health; assessing health benefits and cost-effectiveness of salt reduction programs; coordinating salt reduction with iodine supplementation programs; food procurement policies for public institutions – the Health and Sustainability Guidelines for Federal Concessions and Vending Operations. CDC is currently conducting a 24-hr urine calibration study and examining trends in estimates of 24-hour sodium excretion using spot urines from stored samples. Proposing to conduct 24-hr urine collections on a sub-sample of adult NHANES participants starting in 2013-2014.	FDA, CDC, NIH, USDA, NSRI. Several food processors, manufacturers and retailers have committed to lower sodium in their products. See Appendix 3, US NSRI Corporate Commitments and Comments.

Summary for countries reporting no current plan or plans under development

The seven countries of Central America (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama) and the Dominican Republic through El Consejo de Ministros de Salud de Centroamérica (COMISCA) agreed to a common health plan – Plan de Salud de Centroamérica y República Dominicana 2010-2015 – that includes the commitment to set policies to regulate sodium and trans fats levels in food products [40]. At the same time Costa Rica (see table above) and Guatemala have national strategies relevant to salt intake reduction. But while Guatemala reported mass media campaigns, nutrition labels that include salt, a survey of physical measurements to estimate current level of dietary intake, application of an inventory method to estimate current salt intake and a recommended per capita salt intake of less than 5 g per day, full implementation is dependent on synchronization with the iodine fortification program.

Bolivia reported no current plan to reduce population level dietary salt while Ecuador and Paraguay have plans in development but no implementation timeline. Nevertheless, countries report activities underway that are relevant to addressing the overconsumption of salt e.g. mass media campaigns, nutrition labels that include salt, workshops on how to reduce dietary salt, creation/dissemination of educational tools and KAB studies regarding salt.

Columbia reports that an initiative is under consideration but no decision has been made on how to start, largely due to overconsumption of salt not yet being recognized because of a lack of data to make the case (e.g. on salt intake, the main sources of salt in the diet, nutritional patterns and the household food basket (the latter needed by administrative regions in the country). There is a possibility of adding questions on salt to the national study on nutrition and health. Of benefit would be technical support to design a national strategy including the research to determine baselines for and subsequent monitoring of key indicators. To date, Columbia has nutrition labels and conducts public health mass media campaigns.

Food categories for which salt content is being reduced

As of July 2011, national public health authorities have or are in the process of negotiating national scale voluntary targets and timelines with the food industry in six countries in the Pan American region – three in the southern cone (Argentina, Brazil, Chile), and three in the north (Mexico, Canada and the US NSRI). The food categories currently being addressed in each country are shown below divided into two broad groups –packaged and unpackaged foods. At this point, common to all countries except Mexico is government and food sector collaboration to reduce the salt content of bread (artisanal bread, packaged breads or both) and packaged meat products.

Argentina	Packaged	Unpackaged
	meats and derivatives; dairy products; cookies and derivatives; soups and dressings	artisanal bakery bread
Brazil	**Packaged**	**Unpackaged**
	instant pasta (cup noodles and ramen pasta); industrially produced bread and buns; cakes and cake mixes; snacks; processed meat products; condiments and sauces; margarines; mayonnaise; breakfast cereals; dairy products; industrially produced meals; biscuits; cookies; ready meals.	artisanal bakery bread
Canada	**Packaged (including restaurant foods)**	
	bakery products; cereals and ready-to-eat cereals; dairy products; fats and oils; fish products; combined dishes; processed meat products; sauces; soups; snacks; sauces, dips, gravies, condiments; canned vegetables; fresh meat products; seasoning mixes; pasta and noodles; legumes; drinks and beverages; meat alternatives; baby and infant food; rice; nut butter.	
Chile	**Packaged**	**Unpackaged**
	sausages, cheese	artisanal bakery bread and private label supermarket bread
Mexico	Foods supplied to and available in the school environment (limiting salt plus fat and sugar content and the caloric value per portion)	
US NSRI	**Packaged**	
	bakery products; cereal and other grain products; meats; dairy products and substitutes; fats and oils; sauces, dips, gravies and condiments; snacks; soups; potatoes; mixed dishes; vegetables; legumes; canned fish; seasoning mixes; nut butters. restaurant foods: hamburgers; chicken; seafood; sandwiches; breakfast sandwiches; pizza; Mexican food; potatoes; soup; bakery products.	

All countries have opted for structured gradual voluntary food reformulations (with targets, timelines and monitoring of progress). All except Mexico have at this point schedules of interim targets and timelines for specific food categories. Links to the detailed country-specific food categories, targets and timelines are in Appendix 3.

Common action on bread

Bread is a staple in national diets across the Americas, consumed in consistent quantities by virtually all segments of the population and on the whole has relatively high salt content. Argentina, Brazil, Canada, Chile and the US NSRI all include bread in their salt reduction initiatives. In the three southern cone countries – Argentina, Brazil and Chile – where a limited number of food categories is currently the focus for salt content reductions, bread was either the first or among the first products to be addressed. The experiences in these countries are highlighted below as examples especially relevant to countries that have not yet addressed salt reduction of how a national initiative can begin with bread. For Argentina and Chile in particular, the countries were able to work with existing or few additional resources and in the case of Argentina, have already achieved a 25% reduction in the salt content of bread.

Lessons learned so far

The two information gathering exercises conducted by the secretariat (in mid 2010 and mid 2011) provided insights into what has in general terms facilitated and hindered their actions and attempts to reduce the overconsumption of salt on national scales and in specific terms, what the countries have learned in the process of engaging the food industries to reduce their use of salt. Findings are summarized below.

The regional initiative and the activities of the Expert Group have had a positive impact

Countries reported the following about the initiative and the Expert Group:

- has helped advocacy to priorize the issue as a national public health problem concerning CVD and its relationship to high salt consumption.
- the tools, resources and recommendations are informing and assisting with national plans and strategies.
- assisted with analysis of available evidence and identification of effective interventions.
- has made available a network of accessible experts to provide advice and collaborate on research.
- provided updates on experiences across the Americas.
- has provided the opportunity to explore the current epidemiological situation and promoted a review of policies and interventions and development of recommendations based on evidence.
- the evidence and recommendations for the standardized methodology to measure and monitor salt intake in the population allows national results to be compared with the rest of Latin America permitting an evaluation of national interventions.
- facilitated collaborations between countries and members of the LATINFOODS network, coupled with information on how issues are being handled elsewhere.

Many experiences with industry engagement are transferrable

- Upon entering into negotiations of targets and timelines, most important is information about what food companies have already achieved elsewhere as evidence that reformulation and new product development are feasible. Very relevant in the region are the experiences of low- and middle-income countries (LMIC) with similar resources and capacities. It is understood to be many times easier to implement changes if it can be shown that in other countries the same or similar changes are being made.
- Where regulation to limit salt content is pending, industry has appeared particularly motivated to voluntarily reformulate to reduce the market impact and extent of formulation changes necessary once regulations come into effect.
- Some countries in the region that are actively engaging with the food industry are doing so through national associations that represent various sectors of the industry e.g. artisanal bread makers, meat producers, supermarkets, food and beverage associations, etc. Other countries have found that directly approaching major and progressive food manufacturers has been effective in reaching reformulation target and timeline agreements.
- Positive relationships between public health and the food industry, established e.g. in Chile and Argentina with associations of artisanal bread makers when the use of fortified flour was mandated, facilitated the launch of national dietary salt reduction first through bread products. Bakers were supported by national public campaigns

promoting lower salt intake that featured the changes in bread products. In Chile, small bakery businesses even stated a preference for regulation on an acceptable limit for salt in bread products to "level the playing field".

- The scale of salt content reductions across food categories is dependent on national capacities to first engage food industries in target and timeline setting and then subsequently monitor progress. Canada and the NSRI have engaged food manufacturers and chain-restaurant for salt content reductions across all food categories with products that contain salt. On the other hand, the southern cone countries have begun with food categories that are the main contributors of salt to national diets and are gradually adding other categories.
- A draft national action plan can be useful in engaging stakeholders to advance dietary salt reduction. The plan can be tabled with groups convened to consider the issue, presented as a template awaiting concrete commitments to emerge from stakeholders through a participatory process of priority and target setting.
- Argentina, Canada and the United States have identified failed experiments with fully voluntary approaches and self-regulation. In Argentina for example, the Ministry of Health was initially willing to accept self-regulation and engaged national food industry associations on this basis. When results were not forthcoming, the government intervened to stimulate action with structured voluntary targets and timelines and monitoring of progress. Similarly in the United States, voluntarily reductions in the use of salt additives in food, relying principally on consumer pressure, without close government oversight and monitoring, produced no meaningful declines in salt additive use or salt intake at the population level [9].

Challenges

- Considered a major barrier in LMIC is the lack of up-to-date objective measures of dietary patterns, the main sources of salt in the diet and levels of salt intake. The information that is available often comes from a few studies that are not representative of the national population or is derived from food consumption methodologies developed for other purposes however scaling up or instituting specific national surveys requires capacity and infrastructures that are not available. Countries have relied on secondary data sources e.g. household budget surveys and production and sales data from the food industry from which food consumption and salt intake information has been derived. While the information has been used effectively to launch dietary salt reduction initiatives, with regards to salt intake, 24-hour urine sampling is needed to confirm findings.
- There is no centralized up-to-date data source on the salt content of foods as there is no current requirement, at national levels or otherwise, for disclosure.
- In some cases LMIC lack the public sector capacities to uphold their roles in either voluntary reformulation agreements or other aspects considered important to reducing dietary salt intake. For example, if the food industry makes commitments to reach specific salt content targets, and if food-labeling requirements are regulated or even if voluntary, government agencies with the authority to evaluate industry claims on labels and analyze food products need specific and sometimes new institutional capacity to accommodate the tasks.
- In a number of countries, there is uncertainty as to how and where to start population level dietary salt reduction or while plans may be under development, there is uncertainty as to how to coordinate salt reduction with iodine fortification. Some medical sectors advocating for prevention of iodine deficiency disorders are reluctant to accept salt reduction policies.
- The overconsumption of salt is still in some cases not recognized as a public health issue or is recognized but not a priority for action. There is a low overall perception of risk by the general public and health professionals and a low level of recognition as to the role of the food industry and its corporate social responsibility towards dietary salt reduction given that the salt content of processed food products is a food safety issue. And there are competing important nutrition priorities including those related to obesity.
- Having adopted a voluntary approach for food reformulations, industry is proposing conservative goals and the negotiation processes are prolonged. Questions are arising as to whether voluntary agreements are strong enough instruments to have measurable population level impacts in a timely manner.
- Undertaking to standardize regulations e.g. for nutrition labeling across a common sub-region-

al market requires negotiation and consensus building.

- Communicating salt content reductions in food to consumers requires careful and coordinated messaging between the public health sector and the food industry.
- There are difficulties with the transfer of reformulation technology from large to small companies.
- Building and maintaining a multi-stakeholder and multi-sector approach requires sustained commitment on the part of the public health sector.
- In many countries, the technical capacity to evaluate the cost-benefit, cost-effectiveness and/or the cost-savings from reduced dietary salt is lacking.
- In some cases, the food industry has complained about the requirement to modify the original content of their food products, arguing that they lack the necessary infrastructure to reformulate and that there is no enough time allowed to comply with new requirements.
- Where the general population has not been sufficiently sensitized to the issue, in particular the role and responsibilities of the food industry, there has been opposition to reformulation requirements, with the public preferring personal and/or parental choice in food selection.

V. Momentum and potential in the Region

- The concentration of momentum in the southern cone countries in Latin America – Argentina, Brazil and Chile – suggests the potential for action to spread to other countries, especially to those in the MERCOSUR common market. In general, common markets in the region can facilitate the distribution of reformulated foods from countries where salt reduction policies are being implemented and may contribute to spreading market demand.
- For LMIC countries that have not yet launched dietary salt reduction initiatives and are considering where to start, the experiences with bread in the southern cone countries provide lessons and direction. They are important examples of how national associations of artisanal bread makers and of supermarkets with private labels can be mobilized. And there are health economic analyses from the region to support taking action on bread.
- The range of target and timeline commitments made by the multinational and large national food companies in the southern cone countries and to the US NSRI are evidence of what can be achieved, if not of the specific product reformulations or new low/no salt product availability, then of the technical feasibility of reducing the salt content of common food categories that contribute significant amounts of salt to the diet.
- Several of the challenges identified by countries, whether active and not yet, can be addressed through the dissemination and facilitated implementation of the tools and resources collected and developed by the Expert Group e.g. how to determine the main sources of salt in the diet or how to conduct health economic analyses.
- The national experiences with and tools to disseminate information and raise awareness among the public and communities of health professionals are potentially of great value in countries where public health initiatives are under consideration. They supply evidence to policy makers who need to apply pressure for the issue to be recognized and build up the broad public support necessary to secure the issue on political agendas in the midst of competing priorities.
- Research partnerships have and are evolving e.g. between IDD prevention and salt reduction programmes, increasing the potential to respond to calls for and access research grants.

References

1 **Eaton SB, Konner M.** Paleolithic nutrition. A consideration of its nature and current implications. N Engl J Med. 1985;312:283-9.

2 **Mattes RD, Donnelly D.** Relative contributions of dietary sodium sources. Am J Clin Nutr. 1991;10:383-93.

3 **Scientific Advisory Committee on Nutrition (UK).** Salt and Health. Norwich, England: The Stationary Office; 2003. Accessed August 2011 at http://tna.europarchive.org/20090810121540/http://www.sacn.gov.uk/pdfs/sacn_salt_final.pdf.

4 **Brown IJ, Tzoulaki I, Candeias V, Elliott P.** Salt intakes around the world: implications for public health. Int J Epidemiol 2009; 38(3):791-813.

5 **World Health Organization.** Reducing Salt Intake in Populations: Report of a WHO Forum and Technical Meeting 5-7 October, 2006 Paris, France. Geneva, Switzerland: World Health Organization; 2007.

6 **World Health Organization.** Creating an enabling environment for population-based salt reduction strategies. Report of a joint technical meeting held by WHO and the Food Standards Agency, United Kingdom, July 2010 2011; 1(1):3-42.

7 **Sarno F, Claro RM, Levy RB, Bandoni DH, Ferreira SRG, Monteiro CA.** Estimated sodium intake by the Brazilian population, 2002-2003. Rev Saúde Pública. 2009;43:219-25.

8 **Encuesta nacional de nutrición y salud 2004-05.** Accessed June 2011 at http://www.msal.gov.ar/htm/Site/ennys/download/Implementaci%C3%B3n.pdf.

9 **Encuesta nacional de salud ENS Chile 2009-2010.** Accessed October 2011 at http://www.minsal.gob.cl/portal/docs/page/minsalcl/g_home/submenu_portada_2011/ens2010.pdf

10 **Committee on Strategies to Reduce Sodium Intake, Food and Nutrition Board, Institute of Medicine (US); Henny JE, Taylor CL, Boon CS, Editors.** Strategies to Reduce Sodium Intake in the United States. Washington, DC: The National Academies Press; 2010.

11 **Sodium Working Group.** Sodium Reduction Strategy for Canada, Recommendations of the Sodium Workiing Group. Ottawa, Canada: Health Canada; 2010. Accessed June 2011 at http://www.hc-sc.gc.ca/fn-an/alt_formats/pdf/nutrition/sodium/strateg/index-eng.pdf

12 **He FJ, MacGregor GA.** Salt reduction lowers cardiovascular risk: meta-analysis of outcome trials. The Lancet. 2011;378:380-2.

13 **Campbell NRC, Cappuccio FP, Tobe SW.** Unnecessary controversy regarding dietary sodium: a lot about a little. Can J Cardiol. 2011;27:404-6.

14 **World Health Organization.** Global health risks: Mortality and burden of disease attributable to selected major risks. Geneva, Switzerland: WHO; 2009.

15 **He FJ, MacGregor GA.** Effect of modest salt reduction on blood pressure: a meta-analysis of randomized trials. Implications for public health. J Hum Hypertens 2002;16:761-70.

16 **He FJ, MacGregor GA.** Importance of Salt in Determining Blood Pressure in Children. Meta-analysis of Randomized Controlled Trials. Hypertension 2006;48:861-9.

17 **He FJ, MacGregor GA.** Effect of longer-term modest salt reduction on blood pressure. The Cochrane Database of Systematic Reviews 2004;(1):1-64.

18 **Joffres M, Campbell NRC, Manns B, Tu K.** Estimate of the benefits of a population-based reduction in dietary sodium additives on hypertension and its related health care costs in Canada. Can J Cardiol 2007; 23(6):437-443.

19 **Committee on Public Health Priorities to Reduce and Control Hypertension in the U.S.** Population (IoM). A Population-Based Policy and Systems Change Approach to Prevent and Control Hypertension. Washington DC: National Academy of Sciences; 2011.

20 **Departamento de Epidemiologia Ministerio de Salud.** Chilean Health Report. Gobierno De Chile, Ministerio De Salud; 2003.

21 **Danaei G, Ding EL, Mozaffarian D, Taylor B, Rehm J, Murray CJ et al.** The preventable causes of death in the United States: comparative risk assessment of dietary, lifestyle, and metabolic risk factors. PLoS Med. 2009;6:e1000058.

22 **Panel on Dietary Reference Intakes for Electrolytes and Water, Standing Committee on the Scientific Evaluation of Dietary Reference Intakes.** Dietary Reference Intakes for Water, Potassium, Sodium, Chloride and Sulfate. Scientific Evaluation of Dietary Reference. Washington, DC: National Academies Press; 2004.

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

24 **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.

25 **Gaziano TA, Bitton A, Anand S, Weinstein MC for the International Society of Hypertension.** The global cost of nonoptimal blood pressure. J Hypertens. 2009;27:1472-7.

26 **Asaria P, Chisholm D, Mathers C, Ezzati M, Bea-**

glehole R. Chronic disease prevention: health effects and financial costs of strategies to reduce salt intake and control tobacco use. The Lancet. 2007;370:2044-53.

27 **Cobiac LJ, Vos T, Veerman JL.** Cost-effectiveness of interventions to reduce dietary salt intake. Heart 2010; 96(23):1920-1925.

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

29 **Meneton P, Jeunemaitre X, de Wardener HE, MacGregor GA.** Links between dietary salt intake, renal salt handling, blood pressure, and cardiovascular diseases. Physiol Rev 2005; 85(2):679-715.

30 **He FJ, MacGregor GA.** Reducing population salt intake worldwide: from evidence to implementation. Prog Cardiovasc Dis. 2010;52:363-82.

31 **World Health Organization.** Creating an enabling environment for population-based salt reduction strategies. Report of a joint technical meeting held by WHO and the Food Standards Agency, United Kingdom, July 2010. Geneva: World Health Organization, 2010. Accessed July 2011 at http://whqlibdoc.who.int/publications/2010/9789241500777_eng.pdf.

32 **World Health Organization.** Strategies to monitor and evaluate population sodium consumption and sources of sodium in the diet. Report of a joint technical meeting convened by WHO and the Government of Canada, October 2010. Geneva: World Health Organization, 2011. Accessed July 2011 at http://whqlibdoc.who.int/publications/2011/9789241501699_eng.pdf.

33 **New York City Department of Health and Mental Hygiene.** Sodium study confirms that New Yorkers eat too much salt. Accessed August 2011 at http://www.nyc.gov/html/doh/html/pr2011/pr005-11.shtml

34 **Tabla de Composición de Alimentos de América Latina.** Accessed October 2011 at http://www.rlc.fao.org/es/bases/alimento/default.htm

35 **Blanco-Metzler A, Montero-Campos M, Chan V, Campbell N.** Survey on data of sodium in processed and prepared foods of Latin America. 9th International Food Data Conference. Norwich UK, September 2011.

36 **Rubinstein A, Colantonio L, Bardach A, Caporale J, et al.** Estimation of the burden of cardiovascular disease attributable to modifiable risk factors and cost-effectiveness analysis of preventative interventions to reduce this burden in Argentina. BMC Public Health. 2010;10:627 doi:10.1186/1471-2458-10-627.

37 **Joffres M, Alimadad A.** Effect of sodium reduction on cardiovascular disease (Latin American countries). Faculty of Health Sciences, Simon Fraser University, British Columbia. Unpublished paper.

38 **Campbell NRC, Willis KJ, L'Abbé M, Strang R, Young E.** Canadian Initiatives to Prevent Hypertension by Reducing Dietary Sodium. Nutrients. 2011;3:756-64.

39 **Oficialización del Plan de Reducción del Consumo de Sal/Sodio de Costa Rica.** Accessed October 2011 at http://portal.campusvirtualsp.org/virtualcampus/costarica/drupal/?q=node/64

40 **Plan de Salud de Centroamérica y República Dominicana 2010 – 2015.** Accessed October 2011 at http://www.sica.int/busqueda/Noticias.aspx?IDItem=45368&IDCat=3&IdEnt=143&Idm=1&IdmStyle=1

41 **Ferrante D, Apro N, Ferreira V, Virgolini M, Aguilar V, Sosa M, et al.** Feasibility of salt reduction in processed foods in Argentina. Rev Panam Salud Publica. 2011;29:69–75.

Appendix 1 – Organizations that have endorsed the Policy Statement as of September 2011

ORGANIZATION	DATE OF ENDORSEMENT
1. Blood Pressure Canada	November 2009
2. Inter American Heart Foundation	November 2009
3. Canadian Stroke Network	November 2009
4. Canadian Diabetes Association	November 2009
5. Canadian Heart Failure Network	November 2009
6. Canadian Hypertension Society	November 2009
7. Canadian Medical Association	December 2009
8. Healthy Caribbean Coalition	February 2010
9. Caribbean Cardiac Society	February 2010
10. World Hypertension League	March 2010
11. Canadian Public Health Association	March 2010
12. Sociedad Ecuatoriana de Cardiología	April 2010
13. PROTESTE-Associação Brasileira de Defesa do Consumidor	April 2010
14. International Diabetes Federation	May 2010
15. Heart Foundation of Jamaica	May 2010
16. Instituto Brasileiro de Defesa de Consumidor	May 2010
17. Asociación Argentina de Dietistas y Nutricionistas Dietistas	May 2010
18. Sociedad Argentina de Nutrición	May 2010
19. American Heart Association	May 2010
20. International Federation of Kidney Foundations	May 2010
21. Asociación Solidaria de Insuficientes Renales	April 2010
22. Colegio de Médicos y Cirujanos de Costa Rica	April 2010
23. Sociedade Brasileira de Medicina de Familia e Comunidade	April 2010
24. Sociedad Chilena de Hipertensión	May 2010
25. Minsterio de Salud de Chile	August 2010
26. Minsterio de Salud Venezuela	August 2010
27. Ministry of Health Suriname	August 2010
28. Ministerio de Salud de Uruguay	November 2010
29. Ministerio de Salud de Argentina	September 2011
30. Ministério da Saúde Brasil	confirmed pending letter
31. Ministerio de Salud de Costa Rica	January 2011
32. Asociación Latinoamericana de Diabetes	March 2011
33. Sociedad Latinoamericana de Nefrología e Hipertensión	March 2011
34. Fundación InterAmericana del Corazón Argentina	March 2011
35. Federación Nacional de Operadores de Mercados Fruti hortícolas de la República Argentina	March 2011
36. Federation Argentina de Cardiología	March 2011
37. Sociedad Latinoamericana de Arterosclerosis	March 2011

38. ForoSalud, Red Peruana de Pacientes, Enlace Red Andina de Pacientes	March 2011
39. Centro de Investigación Epidemia del Tabaco, Framework Convention Alliance	March 2011
40. Asociación Lupus Chaco – Pacientes Online	March 2011
41. Dirección de Salud Mental	March 2011
42. Fundación para Prevención y Control de Enfermedades Crónicas No-Transmisibles para América Latina	March 2011
43. Sociedad Mexicana de Salud Pública / International Union Against Tuberculosis and Lung Disease	March 2011
44. Alianza Internacional al Pacientes	March 2011
45. Union Antitabaquica Argentina	March 2011
46. Del Plata Adventist University, School of Health Sciences	March 2011
47. International Federation Medical Students Association	March 2011
48. Red Familiar, Usarios y Voluntarios	March 2011
49. Sociedad Sudamericana de Cardiología	March 2011
50. Asociación Latinoamericana de Tórax	March 2011
51. American Cancer Society	March 2011
52. Fundacion Cardiologica Correntina	March 2011
53. Unión de Usuarios y Consumidores, Filial Rosario	March 2011
54. LATINFOODS (Latin American Network of Food Data Systems)	July 2011
55. Ministry of Social Protection, Vice Ministry of Public Health, Colombia	September 2011
56. Consumers International South America	March 2011

Appendix 2 – Dissemination activities

Articles

Campbell N, Dary O, Cappuccio FP, Neufeld L, Harding K, Zimmermann MB. A call for action to coordinate programs to improve global health by optimizing salt and iodine intake. Accepted for publication in the World Health Organization Bulletin.

Legetic B, Campbell N. Reducing salt intake in the Americas: Pan American Health Organization actions. J Health Communication. 2011;16:37-48.

Campbell N, Correa-Rotter R, Neal B, Cappuccio FP. New evidence relating to the health impact of reducing salt intake. Nutrition, Metabolism & Cardiovascular Diseases. 2011;21:617-9.

Campbell NRC, Legowski B, Legetic B. Mobilizing the Americas for dietary salt reduction. The Lancet. 2010;377:793-5.

Blanco-Metzler A, Legetic B, Campbell NRC. Los países de las Américas se movilizan para disminuir la hipertensión y las ECV mediante la reducción del consumo de sal en la población. Archivos Latinoamericanos de Nutrición. 2010;60:Artículo No.1.

Campbell NRC, Legowski B, Legetic B, Wilks R, Pinto de Almeida Vasconcellos AB. A new initiative to prevent cardiovascular disease in the Americas by reducing dietary salt. CVD Prevention and Control. 2009;4:185-7.

Campbell NRC, Legowski B, Legetic B, Wilks R, Pinto de Almeida Vasconcellos AB, on behalf of the PAHO/WHO Regional Expert Group on Cardiovascular Disease Prevention through Dietary Salt Reduction. PAHO/WHO Regional Expert Group Policy Statement – Preventing cardiovascular disease in the Americas by reducing dietary salt intake population-wide. CVD Prevention and Control. 2009;4:189-91.

Presentations

Norm Campbell – October 2009, World Hypertension Conference in Beijing, China.

Norm Campbell, Branka Legetic, Ricardo Uauy – November 2009, Congress of the Latin American Society for Nutrition (SLAN) in Santiago, Chile.

Branka Legetic – June 2010, World Cardiology Congress in Beijing, China.

Norm Campbell – September 2010, scientific meeting of the International Hypertension Society in Vancouver, Canada.

Ricardo Correa-Rotter – December 2010, by invitation from the Ministry of Health of Uruguay, Uruguayan Cardiology Association, Hypertension Society and Academy of Medicine, and the PAHO office in Uruguay.

Branka Legetic – September 2010, the II World Congress on Public Health Nutrition and the European Salt Action Network in Portugal.

Branka Legetic, Norm Campbell, Kirsten Bibbins-Domingo, Ricardo Correa-Rotter – March 2011, symposium on salt reduction as a cost-effective method for prevention of cardiovascular disease, 14th Congress on the Investigation in Public Health, Mexico.

Norm Campbell, Ricardo Correa-Rotter, Sonia Angell and Adriana Blanco-Metzler – March 2011-Participación en representación de la Iniciativa de la OPS en la Reunión Técnica de los Participantes en la Consulta Regional de Alto Nivel de las Américas contra las Enfermedades Crónicas NO Transmisibles (ECNT) y la Obesidad, Mexico.

Adriana Blanco-Metzler, Branka Legetic, Norm Campbell – September 2011, the PAHO Initiative on Cardiovascular Disease Prevention through Dietary Salt Reduction, at the 9th International Food Data Conference in Norwich UK.

Adriana Blanco-Metzler, M.A Montero-Campos, Victoria Chan, Norm Campbell – September 2011, Survey on Data of Sodium in Processed and Prepared Foods of Latin America, at the 9th International Food Data Conference in Norwich UK.

Adriana Blanco-Metzler – September 2010, Iniciativa de la OPS: Prevención de las ECV en las Américas mediante la reducción de la ingesta de la sal alimentaria en toda la población at the Workshop for the validation of the "Plan Nacional de Reduccion del Consumo de Sal/Sodio en Costa Rica" in Costa Rica.

Adriana Blanco-Metzler – March, 2010, Iniciativa de la OPS: Prevención de las ECV en las Américas mediante la reducción de la ingesta de la sal alimentaria en toda la población/proyecto investigación ITCR-INCIENSA. Expert Pannel of Research in Foods and Nutrition, Curso Metodología de la Investigación I. Nutrition Scholl, University of Costa Rica.

Branka Legetic, Adriana Blanco-Metzler – June 2009, Movilización sobre Reducción del consumo de sal en las Américas Workshop de la Red LATINFOODS: Iniciativa regional sobre salud cardiovascular OPS-OMS. LATINFOODS Workshop in Argentina.

Appendix 3 – Country-specific targets and timelines

Argentina / Campaña "Menos Sal, Mas Vida", accessed August 2011 at http://www.msal.gov.ar/htm/Site/noticias_plantilla.asp?Id=274

Brazil / Orientações para redução do consumo de sódio, accessed August 2011 at http://nutricao.saude.gov.br/sodio.php

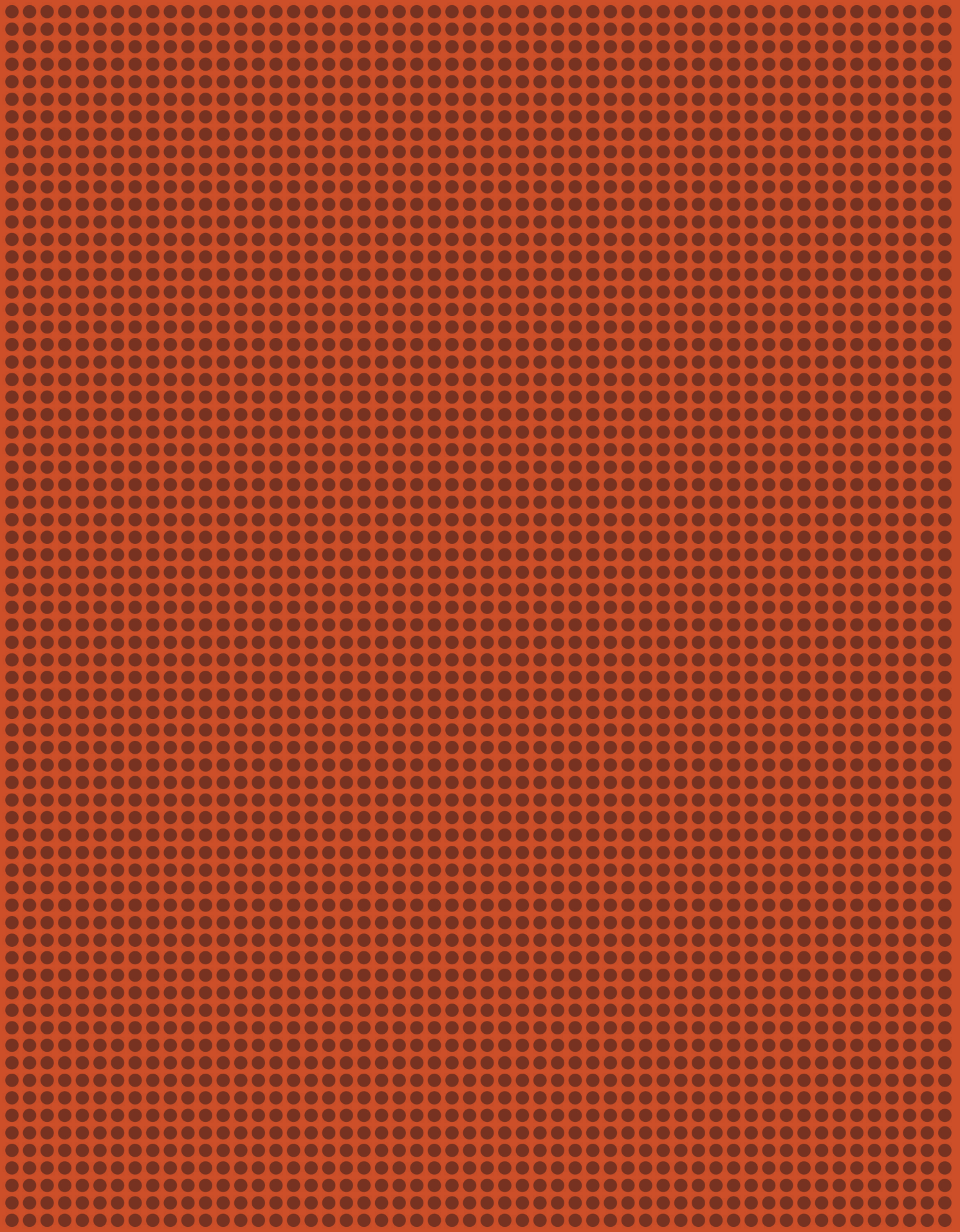
Canada / Draft sodium reduction targets and label data for prepackaged foods, accessed August 2011 at http://www.hc-sc.gc.ca/fn-an/consult/2011-sodium/append-a-eng.php

Chile / Estrategia de Reducción de SAL/SODIO en los Alimentos, accessed August 2011 at http://www.redsalud.gov.cl/portal/url/page/minsalcl/g_proteccion/g_alimentos/reduccion_sodio.html

Mexico / Lineamientos técnicos para el expendio o distribución de alimentos o bebidas en los establecimientos de educación básica, accessed August 2011 at http://www.insp.mx/alimentosescolares/index.php

US NSRI

- Targets for packaged food, accessed August 2011 at http://www.nyc.gov/html/doh/html/cardio/cardio-salt-initiative-packagedfood.shtml and http://www.nyc.gov/html/doh/downloads/pdf/cardio/cardio-salt-nsri-packaged.pdf
- Targets for restaurant food, accessed August 2011 at http://www.nyc.gov/html/doh/html/cardio/cardio-salt-initiative-restaurantfood.shtml
- Corporate Commitments and Comments, accessed August 2011 at http://www.nyc.gov/html/doh/downloads/pdf/cardio/cardio-salt-nsri-commitments.pdf



Monitoring & Evaluation of Consumption, Sources and Knowledge and Behaviors

Protocol For Population Level Sodium Determination In 24-Hour Urine Samples

Prepared by:

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

Sub-group for Research and Surveillance

May 2010

Section 1: Introduction

Overview of the WHO/PAHO Protocol for Population Level Sodium Determination in 24-hour Urine Samples

The PAHO/WHO Protocol for Population Level Sodium Determination in 24-hour Urine Samples is a resource to countries that want to start, contribute to and share information on dietary salt reduction initiatives. It will assist with:

- Planning and preparing the scope and environment for a survey study to estimate dietary salt intake
- Recruiting and training field staff for data collection
- Reporting and disseminating the results

While the substance of concern to health is sodium, strategies to reduce its intake are aimed at its main source in the diet – salt (sodium chloride) – used in the household at the table or in cooking and as an additive in industrially-manufactured foods.

Primary aims

- Estimate the average intake of dietary salt in men and women in the Americas in the age stratum 25 to 64 through measurement of 24 hour urinary sodium excretion.
- Provide information for designing and implementing interventions aimed at reducing population level dietary salt.
- Determine subsequent estimates of salt intake in the same population in aid of monitoring intake over time.
- Provide trends in salt intake against which to monitor and evaluate the effectiveness of interventions aimed at population level dietary salt reduction.

Additional aims

- Estimate the average intake of dietary potassium through joint measurement of 24-hour urinary potassium excretion.
- Estimate the average intake of iodine through joint measurement of 24-hour urinary iodine excretion.
- Determine creatinine excretion.

Other possible aims

- Estimate intake of sodium, potassium and iodine in populations otherwise differentiated e.g. by ethnicity, socio economic status, geographic location, other target age groups, etc.
- Support health economic analysis by estimating salt intake for specific age strata.
- Estimate fluoride excretion as well.

Intended audience

The protocol is primarily intended for principle investigator (s) of studies of sodium, potassium and iodine intake. Parts of the manual are also intended for field staff who are to interact with survey participants.

Structure

The protocol has seven Sections following a sequence that helps to implement population level sodium, potassium and iodine determination in 24-hour urine samples. Section 8 shows the full dataset required for health economic analysis of sodium reduction strategies.
There is both general information and specific instructional material that can be extracted and used for:

- Training
- Data collection

Important conversions

5g salt (NaCl)=2,000 mg sodium=87 mmol sodium=87 mEq sodium

23 mg sodium = 1 mmol sodium

39.1 mg potassium = 1 mmol potassium

126.9 mg iodine = 1 mmol iodine

113.12 g creatinine = 1 mol creatinine

Rationale for Population Level Sodium Determination in 24-hour Urine Samples

Background

In Latin America and the Caribbean, chronic non-communicable disease (CNCD) is the main cause of disability and premature mortality. [1] Hypertension, a principal risk factor for a number of CNCD, in particular cardiovascular (CVD) and renal diseases, affects up to a third of adults in the Pan American Region. [2] There is compelling evidence (epidemiological, clinical and animal-experimental) of the direct relationship between salt consumption and blood pressure (BP) and that current levels of salt intake are a major factor increasing BP.[3,4,5] If people reduce dietary salt, whether they are normotensive or hypertensive, raised blood pressure can be avoided, hypertension better controlled, thousands of deaths from stroke, heart and renal disease prevented [6] and healthcare systems spared substantial treatment and health-related costs. [7,8,9,10,11]

PAHO is spearheading an initiative, guided by an Experts Group, to reduce dietary salt intake at the population level across the Americas. Its first product, a Policy Statement, has the goal – reduce salt intake to the internationally recommended target of <5g per adult per day by 2020.[12]

Rationale for surveillance of salt intake

Fundamental to the PAHO initiative is for Member States to estimate a baseline of population level dietary salt intake, and from there, to monitor trends in intake and the effectiveness of any interventions within and betweeen populations.

The best estimate of the population profile distribution and average level of dietary salt intake is provided by measuring 24-hour urinary sodium excretion in a representative sample of individuals. [13]

Rationale for complementary food consumption information

To guide policy development and associated population level interventions aimed at reducing dietary salt, not only is information needed on salt intake but also on the main food sources of salt in the diet and the typical frequency of their consumption. There are several methods available to collect information on food consumption, among them 24-hour food recall. The INTERMAP Study is an international, cross-sectional, epidemiologic study where in-depth 24-hour dietary recall was used to identify foods that account for most dietary sodium intake. [14]

While the instruments that collect food consumption information are typically very detailed in terms of the food products listed in order for survey participants to be able to select the specific products they consume, it is recommended to group the products into a smaller number of broad categories. They become the basis for raising awareness among consumers as to the food categories that contribute the most salt to the diet, and are also the basis for policies and interventions with industry that include target setting per category. If a category is too wide and varied, it is difficult to set a target; if there are too many categories, target setting and monitoring can become unmanageable.

There are a number of examples of food categories to consider, among them the 12 food categories used in the Salt Campaign of the European Commission [15] and the 19 basic product groups and 8 non-basic groups in the Choices Programme [16].

Rationale for joint surveillance of potassium

Low dietary potassium is associated with hypertension [17] and stroke [18] and supplementing potassium to hypertensive individuals lowers blood pressure [19] and reduces the use of anti-hypertensive medications [20]. Increased potassium intake also reduces the hypertensive response to high dietary sodium. Some populations are deficient in dietary potassium if they rely on processed foods, however there is a deficiency in data on intake of potassium in most populations. Estimating potassium and sodium intake at the same time can inform the design of potential population interventions to improve both sodium and potassium intakes.

Rationale for joint surveillance of iodine

To address the concern regarding the possible detrimental effect of dietary salt reduction on programs to prevent Iodine Deficiency Disorder (IDD) that rely on salt as a carrier of iodine, it is recommended that iodine intake be assessed along with salt. The inclusion of this variable in studies of salt intake that use 24-hour urine samples would in fact benefit IDD-prevention programs. The method provides the most accurate and appropriate indicator of whether populations, regardless of age, gender or climatic environment, are receiving the recommended amounts of this nutrient, which, judging from current salt intake and salt iodization levels, may be insufficient, sufficient and even excessive. [21]

Use of spot- or timed urine testing

Collecting 24-hour urine samples has been considered difficult, and therefore the use of the spot-urine method has been proposed as an alternative. To estimate intake of sodium, potassium and iodine, the use of spot urine is not recommended unless the following conditions are met:

- A baseline estimate of these analites has been conducted using the recommended methods for 24-hour urine assessment.
- A calibration study for use of spot urine has been done in the specific population of interest.

Once the above conditions are met, 'timed' urine collections (over three or more hours with provision of water) are preferred over non-timed ('spot') samples as they reduce the errors due to residual urine in the bladder.

Even if the above conditions are met, the results are likely to be unreliable especially for population subgroups or time trends. See Section 7 for further information and advice on calibration.

Section 2: Field Protocol

Overview of the Field Protocol

Components

The protocol for Sodium Determination in 24-Hour Urine Samples can stand-alone or be an additional module to an existing CNCD risk factor instrument (e.g. PanAmerican STEPS – the Pan American Version of the WHO STEPwise Approach to Risk-Factor Surveillance [22]). If stand-alone, the following are the required components of the protocol:

	Description	Purpose
1	Questionnaire on demographic and behavioral information	To obtain data on: Socio-demographic information Tobacco and alcohol use Dietary habits Physical activity Knowledge, attitudes and behavior towards dietary salt
2	Questionnaire on personal medical history, including drug treatment	To determine the proportion of adults that: Currently suffer from CNCD, and their complications Are under daily long term medical treatment for any condition
3	Physical measurements with simple methods	To determine the proportion of adults who: Are overweight and obese, and Have high blood pressure
4	24-hour urine sample collection	To determine sodium, potassium and iodine excretion. To determine creatinine excretion.
5	A 50-100 g sample of household salt	To determine the iodine content of household salt.

If performed as part of another risk factor study that collects the data described in components 1 to 3, only components 4 and 5 of the protocol are required. The data elements for components 1 to 3 are provided below. They were developed with reference to the framework for risk factor surveillance in PanAmerican STEPS and an instrument from the University of Warwick WHO Collaborating Centre for Nutrition. The WHO/PAHO Expert Group for Cardiovascular Disease Prevention through Population-wide Dietary Salt Reduction developed the questions on knowledge, attitudes and behavior towards dietary salt.

Core and expanded data

Each of the first three components of the protocol has a minimum core of required data and a set of expanded desirable data for collection, shown below. Whether core or core plus expanded data are collected depends on what can realistically be accomplished in each country setting (financially, logistically and in terms of human and clinical resources).

	Core	Expanded

1	• Basic demographic information including:
	  • Country and region of origin (if relevant)
	  • Age
	  • Sex
	• Tobacco use
	• Alcohol consumption
	• Physical activity
	• Sedentary behavior
	• Fruit and vegetable consumption
	• Knowledge, attitudes and behavior towards dietary salt
		• Expanded demographic information including:
		  • Ethnicity
		  • Highest level of education
		  • Employment
		  • Household income
		• History of tobacco use
		• Patterns of alcohol drinking
		• Oil and fat consumption
		• History of raised blood pressure
		• History of diabetes

2	Current drug treatment used Personal medical history	Family medical history
3	Height (cm) and weight (kg) Waist circumference (cm) Systolic and diastolic blood pressures (mmHg) and heart rate (bpm)	Hip circumference (cm)

Planning and Conducting a 24-hour Urine Collection Study

Below are the recommended tasks to plan and conduct a 24-hour urine collection study. The timeframes will be situation specific, to be estimated to support the planning process.

Intended audience

This information is primarily intended for those fulfilling the following roles:

- Site coordinator
- Coordinating committee

Tasks and timeframes	
Tasks	Timeframe
Develop implementation plan	
Identify scope of study	
Gain ethical approval	
Schedule data collection	
Adapting and translating the Field Protocol Questionnaire	
Pilot test	

Selecting the Sample

Sample population

The sample size is determined by precision, variability within and between subjects, statistical power, play of chance, representativeness, feasibility and cost. Below is a matrix showing the relationship between sample size, precision in the difference in excreted sodium to be detected and variations in measurements.

In general, to detect approximately 1 g reduction in salt intake over time using 24-hour urinary sodium excretion, with a standard deviation of 75 mmol/day (alpha = 0.05, power = 0.80), a minimum sample of 120 individuals per age and sex stratum is recommended. To account for attrition (e.g. non participation, incomplete collection or implausible values), which may be as high as 50%, up to 240 people per age and sex stratum should be invited to participate.

Requirements for sample selection

- Random or otherwise probabilistic sample
- Sample selected using culturally appropriate methods.
- Stratification by age group and sex with a minimum of four groups i.e. men and women each in two age groups 25-44 and 45-64 (or men and women each in four age groups 25-34, 35-44, 45-54, 55-64).
- If a sentinel site is selected, must be justifiable and feasible for long term monitoring.
- Age and sex of respondents and non-respondents are noted.
- If sodium excretion data from 24-hour urine samples are to inform health economics analysis of changes in sodium intake, see the table below for the full dataset required.

Exclusion criteria

- People unable to provide informed consent.
- Those with known history of heart or kidney failure, stroke, liver disease.
- Those who recently began therapy with diuretics (less than two weeks).
- Any other conditions that would make 24-hour urine collection difficult.

If pregnant women are included in the sample, their results must be analyzed separately from those of other adult participants.

Matrix to Determine Sample Size

Minimum difference in sodium excretion to be detected δ (mmol/day)	Standard deviation s (SD)	Sample size n (for each age stratum)
10	10	16
10	15	35
10	20	63
10	25	98
10	30	141
10	35	192
10	40	251
10	45	318
10	50	392
10	55	475
10	60	565
10	65	663
10	70	769
10	75	883
10	80	1005
20	10	4
20	15	9
20	20	16
20	25	25
20	30	35
20	35	48
20	40	63
20	45	79
20	50	98
20	55	119

$$n = 2\frac{\left[z_{\frac{(1-\alpha)}{2}} + z_{(1-\beta)}\right]^2}{\Delta^2}$$

where α = 0.05 and (1-β= 0.80, 1.96 and 0.8416 respectively

$\Delta = \delta/s$
where Δ = standardized difference i.e. (μ1 - μ2) / s
δ = clinically important difference to be detected
s = standard deviation

Minimum difference in sodium excretion to be detected δ (mmol/day)	Standard deviation s (SD)	Sample size n (for each age stratum)
20	60	141
20	65	166
20	70	192
20	75	221
20	80	251
30	10	2
30	15	4
30	20	7
30	25	11
30	30	16
30	35	21
30	40	28
30	45	35
30	50	44
30	55	53
30	60	63
30	65	74
30	70	85
30	75	98
30	80	112
40	10	1
40	15	2
40	20	4
40	25	6
40	30	9
40	35	12
40	40	16
40	45	20
40	50	25
40	55	30
40	60	35
40	65	41
40	70	48
40	75	55
40	80	63
50	10	1
50	15	1
50	20	3
50	25	4
50	30	6
50	35	8
50	40	10
50	45	13
50	50	16
50	55	19
50	60	23
50	65	27
50	70	31
50	75	35
50	80	40

$$n = 2\,\frac{\left[z_{\frac{(1-\alpha)}{2}} + z_{(1-\beta)}\right]^2}{\Delta^2}$$

where α = 0.05 and (1-β= 0.80, 1.96 and 0.8416 respectively

$\Delta = \delta/s$
where Δ = standardized difference i.e. ($\mu 1 - \mu 2$) / s
δ = clinically important difference to be detected
s = standard deviation

Implementation Plan

A detailed implementation plan for the 24-hour Urine Sample study is needed for all stakeholders involved in the surveillance process.

Purpose

The implementation plan is to:

- Set out the scope of the surveillance and desired goals.
- Identify required resources.
- Lay out an action plan.
- Develop a communication strategy.
- Provide a budget as the basis for funding.

Core parts of the implementation plan

Below are the core parts needed for the implementation plan. Some have references to Sections within this document where there is information to assist with preparation.

Core part	Detail	References
Executive summary	High level summary of main points including: Current situation Goals and objectives Scope Resources Budget	Section 1
Current situation	Specify: Whether the study will determine a baseline of sodium intake or assess change in intake If to assess change in intake, reference the baseline study If a risk factor survey has already been conducted If there is an existing infrastructure (human capacity, equipment, other studies) on which the 24-hour urine sample collection could be built.	
Goals and objectives	Identify planned goals and use of the information collected to: Describe the current level of dietary salt intake in populations (if available) Track the direction and magnitude of trends in salt consumption Plan and evaluate a health promotion or preventive campaign Collect data from which to predict likely future demands for health services Specify objectives that support gathering 'essential' information only. Describe broad timeframes.	
Scope	Specify the scope of surveillance to be conducted (coverage of core and expanded data) Specify if future sodium determination surveillance can be assured	Section 2
Sampling method	Identify the sample size and sample frame that will be used. Identify geographical coverage Describe sample design	Section 2
Resources	Specify the resources in terms of all personnel and equipment required for sodium determination in 24-hour urine sampling study. Describe resources that have been committed or expected, including support from WHO/PAHO. Specify resources from other organizations.	
Action plan	Prepare a chart of the main tasks with estimated start date and time-frame for completion of each.	Section 2
Communication strategy	Specify the methods for informing and involving all stakeholders relevant to the sodium determination project, including community leaders, members of the public, and media.	
Budget	Provide a detailed budget that includes: Total funds required for each year planned to implement all sodium determination activities as identified in the scope (including future surveys). Sources of funding. Funding gaps.	

Applying for Ethical Approval

Studies that are to use the WHO/PAHO Protocol for Sodium Determination in 24-hour Urine Samples must undergo technical and ethical review and approval. This is to ensure that the study:

- Is conducted in a technically and ethically sound manner;
- Recognizes and protects the rights of participants; and
- Ensures wide access to the information collected in the study.

Process

Usually, ethical approval should be sought by submission of a proposal and application to a national ethics review committee or other equivalent body. However, if such a body is not institutionalized, it is recommended that an application for ethical review be prepared and submitted through an ad hoc local mechanism within the Ministry of Health.

Informed consent

The informed consent must be obtained from every survey participant before conducting any interviews or collection of any samples.

Making a submission

Use the existing templates for proposals supplied by the appropriate ethics committee or equivalent body. If such a template does not exist, identify and contact the relevant bodies, seek guidance on rules, the submission process and any procedures to follow.

Timeframes and Data Collection Considerations

Data collection should be carefully planned to take place over a defined period of time and during appropriate seasons.

General timeframes

The following table shows the recommended phases of a sodium determination study. Timeframes are situation specific:

Phase	Timeframes
Planning and scoping	
Recruiting and training	
Data collection	
Data analysis and reporting	

Data collection

Some key factors to consider when identifying an appropriate time to conduct the study:

Factors to consider	Guidelines
Seasons	Confine the study period to one season to avoid dietary changes Avoid festive seasons (E.g. Ramadan, Christmas, Holy Week, and other national or religious holidays) Avoid seasons when food is in unusually short supply.
Calendar year	Confine the study to one calendar year
Major events	Avoid data collection during periods prior to local, regional, or national elections to avoid confusion with political campaigns.
Civil unrest, turmoil, famine, etc.	Avoid conducting a study at any time when pressing matters occupy the minds and lives of the population.
Collection timeframe	Keep the timeframe as close as possible (within reason) to the recommended timeframe.

Data collection locations

It is recommended that all components of the study be conducted/administered in the household setting. Ideally participants/respondents are to collect all their urine samples at home and otherwise, they are to bring home any urine passed away from home. The total urine passed in the 24-hour period is to be picked up at the household within one day of the 24-hour collection period. It is recommended that if food consumption information is collected, this is done during the second visit to the household.

Adapting the WHO/PAHO Protocol for Sodium Determination in 24-hour Urine Samples

Using a standardized protocol for Sodium Determination in 24-hour Urine Samples enables comparisons between countries. However, some adaptations may be required to account for differences in cultures or settings.

When to adapt the protocol

Adaptations may be needed to provide valid data from the surveillance. The following are often what need adaptation: terminology, providing additional information, deleting questions on behaviors that do not apply.

Process

The process of adapting the protocol may involve the following:

- Identifying the instructions or questions that require local adaptation.
- Adding or deleting questions.
- Adding other forms as appropriate.

- Seeking feedback and advice.
- Translating and back translating the adapted instructions or questionnaires.
- Pilot testing the questionnaires.

Documents to translate
Below are some of the documents that may need translating, including where they can be found:

Documents	References
Component 1 questionnaire	PanAmerican STEPS
Component 2 questionnaire	PanAmerican STEPS
Guidelines for field work	Section 3
Consent forms	PanAmerican STEPS
Knowledge, attitudes and behavior questionnaire	Section 4
Instructions to participants	Section 5

Pilot Testing

A pilot test of the entire data collection process must be conducted among a limited number of people with a broad range of backgrounds prior to implementing the actual full study. Pilots should involve all aspects of the survey including:

- Approaching potential participants.
- Seeking and obtaining informed consents.
- Making arrangements/appointments for second visits after the participant-led 24-hour urine sample collection.
- Site preparation and set-up.
- Collecting all data needed.
- Identifying participants who may need a follow-up.
- Basic analysis.

Test group
Identify and approach willing participants to be part of the pilot test. The test group should include the following:
- Both men and women.
- Cover the age range 25-64.
- More than one ethnic group (if appropriate).
- Participants with different levels of education.
- Participants from a range of socio-economic groups.
- Participants from distinctly different regions in the same country.

Test environment
Where possible conduct the pilot test under the field conditions expected for the final full study i.e. the household setting.

Timeframe
When planning the pilot test, allow sufficient time for adjustments to be made prior to starting full data collection.

Section 3: Data Collection Guide

Guidelines for data collection for components 1 through 3 of the protocol can be obtained from the Pan American STEPS Manual, Part 3, Sections 1 through 4, except for the core questions on knowledge, attitudes and behavior towards dietary salt, which are in Section 4 of this manual.
The information below serves the field staff/survey team involved in components 4 and 5 of the protocol for 24-hour urine sample collection.

Instructions for Field Staff, Equipment and Analytic Methods

Instructing participants
Field staff must explain the collection protocol, obtain informed consent and provide the record sheet on which participants note the start and finish times of their 24-hour urine collection, any missed urine collections, and any medication taken during the collection.
In the morning of the start of the 24-hour period, the participant must void the bladder and note the time. **This "first-pass urine" is discarded**. All urine passed thereafter is collected in the container provided, including the first urine of the following morning, with the final time recorded.
Respondents are given detailed written instructions (see Section 5).
At the time of the first visit to the household, field staff must inform the participant of the second visit.
The second visit must be made within one day of the completion of the 24-hour collection period. A sample of household salt is taken during the second visit.
If food consumption information is required, it is collected during the second visit.

Equipment supplied to participants
- A 5 liter capacity screw cap container to store the collected urine.
- A 1 litre container with a wide opening into which urine is voided, with or without the use of a funnel.
- Optional 2 liter capacity screw cap container for temporal collections of urine made away from the home.
- Funnel for women to be used during urine collection, kept inside a re-sealable plastic bag when not used.
- Plastic carrier bags for transporting the equipment away from home.
- An aide-memoire to help participants remember to collect their urine e.g. a safety pin to pin the under- and outer gar-

ments together during the period of the collection as a reminder that the urine about to be passed should be collected.

The use of PABA to assess completeness of the urine collection is not recommended. It requires that each participant take a PABA pill three days prior to the start of collection thereby increasing the risks of non-compliance and attrition. In addition, laboratory facilities for the testing of PABA in the urine are limited and where they exist, will increase the costs of the study.

At the completion of the collection

- Field staff measure the total volume of urine, mix it thoroughly in its container and withdraw three 10-ml aliquots into separate labelled tubes for storage and shipping for analysis. The rest of the urine is discarded.
- Sodium, potassium, iodine and creatinine content in the urine are to be measured in certified laboratories, as is the iodine content of the household salt.

Analytic methods

- Sodium and potassium content in the urine may be determined through Ion Selective Electrode (indirect) with a Beckman Coulter Synchron CX5PRO System.
- Creatinine content may be determined through the Creatinine (urinary) Jaffe kinetic method, standardized, also to be measured by Beck Coulter synchron CX5PRO System.
    - Iodine in urine may be determined with the traditional kinetic method of Sandell-Kolthoff [23] or by Inductively Coupled Plasma (ICP) Spectrometry.
    - Iodine content of household salt can be determined quantitatively with the titration method. In addition to the titration method, there are possibilities of using potentiometry or spectro-photometry. [23]

Guide to Physical Measurements

Component 3 of the WHO/PAHO protocol for Sodium Determination in 24-hour Urine Samples requires that selected physical measurements be taken to determine the proportion of participants in the study who:

- Have raised blood pressure.
- Are overweight and/or obese.

Below is a description of:

- The physical measures and what they mean.
- The equipment needed.
- How to assemble and use the equipment.
- How to take the measurements and accurately record the results.

Physical measurements

Blood pressure is measured to determine the proportion of participants with raised BP. Heart rate, measured at the same time as BP with automated devices, is a common independent cardiovascular risk factor. Height and weight measurements are taken to calculate the body mass index (BMI), needed to determine the prevalence of overweight and obesity in the population. Waist circumference measurements provide additional information on overweight and obesity. Hip circumference is an expanded data option to measure overweight and obesity.

Units of measurement

Below are the standard units for the physical measurements in component 3 of the protocol, including their upper and lower limits for data entry purposes.

Physical Measure	Unit	Minimum	Maximum
Systolic blood pressure (SBP)	mmHg	40	300
Diastolic blood pressure (DBP)	mmHg	30	200
Height	cm	100	270
Weight	kg	20	350
BMI (Body Mass Index)	kg/m^2	11	75
Waist circumference	cm	30	200
Hip circumference	cm	45	300
Heart rate	beats/minute	30	200

Sequence of questions and measurement

As is the case with many risk factor studies, physical measurements are to be taken immediately after the personal medical history. Physical measurement results are to be recorded on the same participant instruments as personal medical history.

Participant instructions

Prior to taking physical measurements, explain to the participant that the following measurements will be taken:

For core

- Blood pressure
- Heart rate
- Height
- Weight
- Waist circumference

For expanded, additional

- Hip circumference

Measuring Blood Pressure and Heart Rate

Equipment needed

Validated digital automatic blood pressure monitor e.g. OMRON. For the choice of validated blood pressure measuring devices see http://www.bhsoc.org/bp_monitors/automatic.stm.

- Appropriate size cuffs

Preparing the participant

Prior to measuring blood pressure, ask the participant to sit in a quiet comfortable place for at least 5 minutes with back support and his/her legs uncrossed. If the questions in components 1 and 2, on behavior and personal medical history, have been asked just before the physical measurements are to be taken, the participant should rest for at least 5 minutes before blood pressure measurement is started. Do not talk to the participant whilst BP is being taken.

Three measurements

WHO recommends taking three blood pressure measurements. During the data analysis, the mean of the second and third readings is calculated. The participant must rest for one minute between each of the readings. The measurement and recording of heart rate should be done three times along with the measurement and recording of blood pressure. Heart rate and blood pressure results are displayed simultaneously with automated equipment.

Recording the blood pressure measurements

The following steps are required:

- after each of the three measurements, record the result in the participant's instrument;
- after all three readings are taken, double-check that all three results are correctly recorded in the instrument;
- inform the participant of their blood pressure readings only after the whole process is completed.

OMRON procedure

The instructions below apply to the use of an OMRON blood pressure monitor. However, more detailed operating instructions are included with the device and should be reviewed before taking any blood pressure measurements.

Note that if a different digital automatic blood pressure monitor is used, instructions should be read carefully.

Applying the OMRON cuff

Follow the steps below to select an appropriate size of cuff and apply it:

Step	Action
1	Place the **left arm*** of the participant on the table with the palm facing upward.
2	Remove or roll up clothing on the arm.
3	Select the appropriate cuff size for the participant using the following table: Mid Arm Circumference (cm) / Cuff Size 17-22 / Small (S) 22-32 / Medium (M) >32 / Large (L) If the cuff is the correct size, the marker at the end of the cuff will fit between two other markers in the mid section of the cuff. The cuff is the wrong size if the end is outside the markers. It is advisable to select the larger size cuff if there is a question of which size is best. Some Omron cuffs are not marked in which case they must be labeled with markers.** Otherwise, use the mid arm circumference of each arm to select the correct cuff size.
4	Position the cuff above the elbow and aligning the mark ART on the cuff with the brachial artery.
5	Wrap the cuff snugly onto the arm and securely fasten with the Velcro. **Note:** The lower edge of the cuff should be placed 1.2 to 2.5 cm above the inside of the elbow joint.
6	Keep the level of the cuff at the same level as the heart during measurement.

*If the right arm is used, indicate this in the right hand side margin of the participant's Instrument.

**Even if cuffs are marked by the manufacturer to indicate the acceptable range of arm circumference for the size of cuff, the markings may not agree with the current recommended range and need to be checked and possibly remarked. [24] Marking can be performed easily using a ruler and permanent marker. The ideal arm circumference for a cuff is 2.5 times the cuff's bladder width. Cuffs can be used on arms that have a circumference ±4 cm of 'ideal'. To mark or remark the cuff, start the measurement at the end that contains the bladder. Permanently mark the cuff at the ideal arm circumference then draw a line across the cuff at 4 cm on either side of the ideal (ie draw two lines). The cuff is the right size if when wrapped around the mid arm, the end is between the two marked lines.

Taking the BP measurement with an OMRON

Follow the instructions below to take the blood pressure measurements:

Step	Action
1	Switch the monitor on (dark purple button) and press START (light purple button).
2	The monitor will start measuring when it detects the pulse and the "heart" symbol will begin to flash. The systolic and diastolic blood pressure readings should be displayed within a few moments (systolic above and diastolic below). The heart rate will also be displayed.
3	Record the reading in the participant's instrument.
4	Switch the monitor off, but leave the cuff in place.
5	Wait one minute, then repeat steps 1-4 two more times.
6	Inform the participant of the blood pressure readings only after the whole process is completed.

When to use a sphygmomano-meter

The sphygmomanometer is generally not recommended, but may be used in the following circumstances:

- the OMRON is not functioning
- the OMRON display shows multiple errors;
- to cross check OMROM blood pressure readings in various clinical states such as irregular pulse, peripheral circulatory disturbance, extreme hypotension;
- when systolic BP is >200 mmHg (appropriate measurement of systolic BP requires inflating the cuff to a pressure of 40 mmHg above the systolic BP; OMRON maximum inflation pressure seldom exceeds 240 mmHg);
- for calibration of the OMRON Monitor.

Procedure for sphygmomano-meter

Follow the steps below and refer to the operating instructions included with the device to measure the blood pressure of a participant using the sphygmomanometer.

Step	Action
1	Apply the cuff (as detailed above).
2	Put stethoscope earpieces in ear and set to bell.
3	Palpate pulse at either brachial or radial artery. Take a pulse on count for one full minute.
4	Pump up pressure and inflate cuff until unable to feel pulse.
5	Continue to inflate cuff 40 mmHg beyond this point.
6	Apply the bell of the stethoscope to the right antecubital fossa.
7	Listen for pulse sounds while deflating the cuff slowly.
8	Record the systolic blood pressure (SBP) when a pulse is first audible.
9	Record the diastolic blood pressure (DBP) when the pulse sound disappears.
10	Deflate the cuff fully and let the arm rest for one minute (between each reading).
11	Repeat Steps 2-10 twice to obtain three readings. Record the readings to the nearest 2 mmHg.*
12	Check that all readings re correctly filled in on the instrument.
13	Inform the participant of the blood pressure readings only after the whole process is completed.

* Analyze blood pressure readings by 2 mmHg to test for terminal digit preference as a quality assurance method. (Terminal digit preference is the tendency to record to 10 mmHg rather than 2 mmHg.)

Measuring Height

Equipment needed

Portable height/length measuring board.

Assembling the measuring board

Follow the steps below to assemble the measuring board:

Step	Action
1	Separate the pieces of board (usually 3 pieces) by unscrewing the knot at the back.
2	Assemble the pieces by attaching each one on top of the other in the correct order.
3	Lock the latches in the back.
4	Position the board on a firm surface against a wall.

Measuring height

Follow the steps below to measure the height of a participant:

Step	Action
1	Ask the participant to remove their: -footwear (shoes, slippers, sandals, etc) -head gear (hat, cap, hair bows, comb, ribbons, etc.) Note: If it would be insensitive to seek removal of a scarf or veil, the measurement may be taken over light fabric.
2	Ask the participant to stand on the board facing you.
3	Ask the participant to stand with: feet together heels against the back board knees straight
4	Ask the participant to look straight ahead and not tilt their head up.
5	Make sure eyes are the same level as the ears.
6	Move the measuring arm gently down onto the head of the participant and ask the participant to breathe in and stand tall.
7	Read the height in centimeters at the exact point.
8	Ask the participant to step away from the measuring board.
9	Record the height measurement in centimeters in the participant's Instrument.

Measuring Weight

Equipment needed

- portable electronic weighing scale;
- a stiff wooden board to place under the scales, if you are likely to have problems with uneven surfaces (such as dirt or mud floors or carpet);
- a generator, if electronic scales are being used and electricity is not guaranteed in all survey areas (check if scale can work with batteries)

Set up requirements
Make sure the scales are placed on a firm, flat surface. Do not place the scales on:

- carpet.
- a sloping surface.
- a rough, uneven surface.

Electronic scales
Follow the steps below to put electronic scales into operation:

Step	Action
1	Put the scale on a firm, flat surface.
2	Connect the adaptor to the main power line or generator.
3	Turn on the scale.
4	Switch the scale on and wait until the display shows 0.0.

Measuring weight
Follow the steps below to measure the weight of a participant:

Step	Action
1	Ask the participant to remove their footwear (shoes, slippers, sandals, etc) and socks.
2	Ask the participant to step onto scale with on foot on each side of the scale.
3	Ask the participant to: ▶ stand still ▶ face forward ▶ place arms on the side and wait until asked to step off.
4	Record the weight in kilograms on the participant's instrument. If the participant wants to know his/her weight in pounds, convert by multiplying the measured weight by 2.2.

Measuring Waist Circumference

Equipment needed

- constant tension tape (for example, Figure Finder Tape Measure).
- pen.
- chair or coat stand on which the participant will place their clothes.

Privacy
A private area is necessary for this measurement. This could be a separate room, or an area that has been screened off from other people within the household.

Preparing the participant
This measurement should be taken without clothing, that is, directly over the skin.
If it is not possible, the measurement maybe taken over light clothing. It must not be taken over thick or bulky clothing. This type of clothing must be removed.

How to take the measurement
This measurement should be taken:

- at the end of a normal expiration;
- with the arms relaxed at the sides;
- at the midpoint between the lower margin of the last palpable rib and the top of the iliac crest (hip bone).

Measuring waist circumference
Follow the steps below to measure the waist circumference of a participant:

Step	Action
1	Standing to the side of the participant, locate the last palpable rib and the top to the hip bone. You may ask the participant to assist you in locating these points on their body.
2	Ask the participant to wrap the tension tape around themselves and then position the tape at the midpoint of the last palpable rib and the top of the hip bone, making sure to wrap the tape over the same spot on the opposite side. Note: Check that the tape is horizontal across the back and front of the participant and as parallel with the floor as possible.
3	Ask the participant to: ▶ stand with their feet together with weight evenly distributed across both feet; ▶ hold the arms in a relaxed position at the sides; ▶ breathe normally for a few breaths, then make a normal expiration.
4	Measure waist circumference and read the measurement at the level of the tape to the nearest 0.1 cm, making sure to keep the measuring tape snug but not tight enough to cause compression of the skin.
5	Record the measurement on the participant's Instrument.

Measuring Hip Circumference

Equipment needed

- constant tension tape (for example, Figure Finder Tape Measure).
- pen.
- chair or coat stand on which the participant will place their clothes.

Privacy
A private area is necessary for this measurement. This

could be a separate room, or an area that has been screened off from other people within the household. Hip measurements are taken immediately after waist circumferences.

Preparing the participant
This measurement should be taken without clothing, that is, directly over the skin.
If it is not possible, the measurement maybe taken over light clothing. It must not be taken over thick or bulky clothing. This type of clothing must be removed.

How to take the measurement
This measurement should be taken:
- with the arms relaxed at the sides
- at the maximum circumference over the buttocks.

Measuring hip circumference
Follow the steps below to measure the hip circumference of a participant:

Step	Action
1	Stand to the side of the participant, and ask them to help wrap the tape around themselves.
2	Position the measuring tape around the maximum circumference of the buttocks.
3	Ask the participant to: ▶ stand with their feet together with weight evenly distributed over both feet; ▶ hold their arms relaxed at the sides.
4	Check that the tape position is horizontal all around the body and snug without constricting.
5	Record the measurement on the participant's Instrument. Note: measure only once and record.

Section 4: Questionnaire on Knowledge, Attitudes, Behavior toward Dietary Salt

1. *Do you add salt to food at the table?*
   a) never
   b) rarely
   c) sometimes
   d) often
   e) always

2. *In the food you eat at home salt is added in cooking*
   a) never
   b) rarely
   c) sometimes
   d) often
   e) always

3. *How much salt do you think you consume? (READ LIST)*
   a) Far too much
   b) Too much
   c) Just the right amount
   d) Too little
   e) Far too little
   f) Don't Know
   g) Refused

4. *Do you think that a high salt diet could cause a serious health problem?*
   a) Yes
   b) No
   c) Don't know
   d) Refused

5. *If Yes in 4 above, what sort of problem?*
   a) high blood pressure
   b) osteoporosis
   c) stomach cancer
   d) kidney stones
   e) none of the above
   f) all of the above
   g) don't know
   h) refused

6. *How important to you is lowering the salt/sodium in your diet?*
   a) Not at all important
   b) Somewhat important
   c) Very important

7. *Do you do anything on a regular basis to control your salt or sodium intake?*
   a) Yes
   b) No (SKIP to QX)
   c) Don't know
   d) Refused

8. *If answer is Yes in 7 above, what do you do?*
   a) Avoid/minimize consumption of processed foods
   b) Look at the salt or sodium labels on food
   c) Do not add salt at the table
   d) Buy low salt alternatives
   e) Buy low sodium alternatives
   f) Do not add salt when cooking
   g) Use spices other than salt when cooking
   h) Avoid eating out
   i) Other (specify) _____

Section 5: Detailed Instructions for Participants in 24-hour Urine Collection

We are interested in measuring the dietary intake of certain nutrients – sodium, potassium and iodine. The best way to get this information is by analyzing the urine sample you collect during a 24-hour period.
We cannot get this essential information in any other way!
We are not testing for drugs or viruses.
Your co-operation is very much appreciated.

Why 24 hours?
The content of some nutrients in urine fluctuates according to what we last ate, how much fluid we drink, how much we exercise and also on the weather. Collecting urine over 24 hours gives much more reliable information than a single sample about the typical intakes of these nutrients in a person's diet.

Equipment provided
You have the following equipment provided for making your collections. All equipment is disposable and used only for this study.

1. A sheet to record the essential information about the collection.
2. Urine-collecting equipment for the home:
   a. 5 litre screw-capped plastic collection bottle to store the collected urine during the day. This bottle contains a preservative for keeping the urine at room temperature.
   b. a 1 litre plastic jug and funnel for temporal reception of the urine samples.
   c. a funnel to help women collect urine, which may also help participants in transferring urine samples from the 1-L plastic jug to the 5-L plastic bottle.
   d. a safety pin (to attach to your underclothes or nightwear simply as a reminder for you to make your collection)
3. Urine-collecting equipment for outside the home:
   a. a 2 liter screw-capped plastic collection bottle (without preservative)
   b. two plastic bags for carrying the equipment outside the home

Don't forget to take the jug and 2 liter bottle with you if you leave your home during the day.

Before making the urine collection
The health professional will help you choose the day on which you would like to make the 24-hour urine collection. You may prefer to choose a day when you will be mostly at home or only going out for a short time.
If you are female, you should not make your collection during menstruation.

How to make your collection for the whole day (24 hours)
You have been asked to collect all the urine you pass in one day into the container you have been given. It is not difficult; here is how you do it.

- On the day that you start your collection, you will pass urine – DISCARD this urine, DO NOT put it into the container. Collect from the second time you pass urine. Record the date and time on the Collection Sheet as follows:

Date started	Day ☐☐	Month ☐☐	Year ☐☐
Time started	Hour ☐☐	Minutes ☐☐	

- From then onwards until the next day, ALL urine you pass in the next 24 hours, both during the day and night, must be collected.
- The last collection is the urine you pass on the second day at approximately the same time you started the day before.
- This completes the 24-hour collection. Record the following on the Collection Sheet:

Date finished	Day ☐☐	Month ☐☐	Year ☐☐
Time finished	Hour ☐☐	Minutes ☐☐	

Note: do not worry if you have not collected for 'exactly' 24 hours, as long as you record exact time of start and finish.

- You should pass all urine directly into the 1 litre plastic jug, then pour the urine into the large container, using the funnel if necessary. If you need to open your bowels, always remember to pass urine first before you pass a stool.
- Each time you add a new urine specimen to the large container, screw the lid tight and swirl the urine around a few times, to mix it with the preservative.
- Any urine collected in the small bottle must be transferred to the large bottle as soon as possible e.g. after returning home.

If you miss a sample
If during the 24-hour collection period a sample is missed for any reason, such as because of a bowel movement, record this on the Urine Collection Sheet.

Once you have completed your collection
As soon as possible after you have completed your 24-hour urine collection, the health professional will arrange a time for him/her to pick up the large container with the total volume of collected urine. In the meantime, store your complete collection in a cool, dark place.

If you have any other questions
We hope this leaflet answers the questions you may have. If you have any other questions, contact the health professional. You are free to withdraw from this study at any point.

Section 6: Household Salt Collection and Iodine Determination

This protocol requires assessments of the iodine content of table and cooking salt. It is therefore important to ask participants for large samples of both types of salt (50-100 gm) where both are used in the household. Because this amount of salt might represent the whole supply in the household, field staff should bring sufficient amounts of both types of salt to replace the samples taken.
In the laboratory, both salt samples should be thoroughly mixed using the same procedure of dry samples to ensure homogeneity. Then, the presence of iodate in the salt should be first identified using a qualitative test kit. For samples that produce a positive reaction (usually a change in color), the quantity of iodine in the samples should then be determined by titration, solubilising not less than 10 gm for refined and small crystal-size salt, and not less than 50 gm for raw or large crystal-size salt. Samples that are negative with the test kit should be analyzed for the quantitative content of iodide using an appropriate method with the same amounts of salt as specified above for the positive samples.

Section 7: Use of Spot Urine to Estimate 24-hour Excretion of Sodium, Potassium and Iodine

Some researchers have used spot-urine samples to determine the daily excreted amounts of either sodium, potassium or iodine. The sample is only one urine pass collected during the day, frequently not the first pass of the morning made just after awakening. [25] However, the content of sodium, potassium or iodine would depend on the volume of urine, which may be very variable among individuals of the same population, and highly affected by age, sex, ethnic background, weather and body mass index and physical activity. Some "correction" has been proposed by dividing the analyte concentration by the creatinine concentration, based on the fact that creatinine excretion is more constant during the day within an individual, as it mainly depends on lean body mass. However, this correction has been found even less precise than expressing the absolute content by volume, especially in populations with undernutrition. [26] Although the use of spot-urine is discouraged as a method to determine sodium, potassium or iodine intake because of the limitations and uncertainty inherent in the method, for some populations it may be used to approximate 24-hour excretion of these analytes if a "calibration" is carried out. This "calibration" could be made based on the expected 24-h volume of urine or the 24-h total excretion of creatinine, by appling one of the two following equations:

Approximate 24-h analyte excretion = [analyte] (mg or µg/L) x 24-h urine volume (L) (A)
or
Approximate 24-h analyte excretion = [analyte/Creatinine] (mg or µg/g creatinine) x expected 24-h creatinine excretion (g) (B)

With either equation, the "correction factors" should be calculated in a subsample of individuals from the same population subjected to the same environmental conditions and studied in a 24-hour period. Although equations associated to general parameters, such as body weight and height, age and gender have been published [27,28,29,30], they are specific to certain populations and cannot be reliably extrapolated from one site/population group to another. Thus, in many instances the calculation of these "correction factors" is as difficult as determining directly the 24-hour total excretion of the analytes of interest. Finally, it has been suggested that a spot urine in the afternoon/early evening could provide advantages when compared to a morning one. [31] Here, it is important to point out that **even if the above conditions are met, the results are likely to be unreliable especially for population subgroups or time trends. Until more studies are carried out to assess simpler but reliable methods of urine collection for the purpose of estimating daily excretions of these analytes, 24 hour urine collections are recommended.**

Section 8: Dataset for Health Economic Analysis

	Chronic disease risk factor variable	Required breakdown
1	**Salt intake (NaCl as g per day)**	
	Mean	By sex and (adult) age group
2	**Smoking (prevalence)**	
	Mean	By sex and (adult) age group
3	**Systolic blood pressure (mmHg)**	
	Mean	By sex and (adult) age group
4	**BMI (kg/m2)**	
	Mean	By sex and (adult) age group
5	**Total blood cholesterol (mmol/L)**	
	Mean	By sex and (adult) age group

	25-34	35-44	45-54	55-64
Male				
Female				
	25-34	35-44	45-54	55-64
Male				
Female				
	25-34	35-44	45-54	55-64
Male				
Female				
Male				
Female				
	25-34	35-44	45-54	55-64
Male				
Female				
Male				
Female				
	25-34	35-44	45-54	55-64
Male				
Female				
Male				
Female				

References

1. **Pan American Health Organization.** Regional Strategy and Plan of Action on an Integrated Approach to the Prevention and Control of Chronic Diseases. Washington, DC: PAHO; 2007. Available at: http://www.paho.org/english/ad/dpc/nc/reg-strat-cncds.pdf. Accessed 29 April 2010.
2. **Pan American Health Organization.** Health in the Americas. Volume I. 2002 ed. Washington, DC: PAHO; 2002. Available at: http://www.paho.org/English/DBI/MDS/HIA_2002.htm. Accessed 29 April 2010.
3. **Law M.** Salt, blood pressure and cardiovascular diseases. J Cardiovasc Risk 2000; 7:5-8.
4. **Penney S.** Dropping the salt: Practical steps countries are taking to prevent chronic non-communicable diseases through population-wide dietary salt reduction. Public Health Agency of Canada, Revised version: August 2009. Available at: http://www.paho.org/English/AD/dpc/nc/salt-mtg-phac-paper.pdf. Accessed 29 April 2010.
5. **He FJ, MacGregor GA.** A comprehensive review on salt and health and current experience of worldwide salt reduction programmes. J Human Hypertension 2009; 23:363-84.
6. **Strazzullo P, D'Elia L, Kandala N-B, Cappuccio FP.** Salt intake, stroke and cardiovascular disease: a meta-analysis of prospective studies. BMJ 2009; 339: b4567
7. **Sacks FM, Svetkey LP, Vollmer WM et al.** Effects on blood pressure of reduced dietary sodium and the Dietary Approaches to Stop Hypertension (DASH) diet. DASH-Sodium Collaborative Research Group. New Engl J Med 2001; 344:3-10.
8. **Kumanyika SK, Cook NR, Cutler JA, Belden L, Brewer A, Cohen JD, Hebert PR, Lasser VI, Raines J, Raczynski J, Shepek L, Diller L, Whelton PK, Yamamoto M** for the Trials of Hypertension Prevention Collaborative Research Group. Sodium reduction for hypertension prevention in overweight adults: further results from the Trials of Hypertension Prevention Phase II. J Human Hypertension 2005; 19:33-45.
9. **Asaria P, Chisholm D, Mathers C, Ezzati M, Bea-**

glehole R. Chronic disease prevention: health effects and financial costs of strategies to reduce salt intake and control tobacco use. Lancet 2007; 370:2044–53.

10. **Murray CJ, Lauer JA, Hutubessy RC, Niessen L, Tomijima N, Rodgers A, Lawes CM, Evans DB.** Effectiveness and costs of interventions to lower systolic blood pressure and cholesterol: a global and regional analysis on reduction of cardiovascular disease risk. Lancet 2003; 361:717-25.
11. **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 Eng J Med 2010; 362:590-99.
12. **Pan American Health Organization.** Policy Statement – Reducing dietary salt in the Americas as a population-based approach to cardiovascular disease prevention. 2009. Available at: http://new.paho.org/hq/index.php?option=com_content&task=view&id=2022&Itemid=1766.
13. **MRC – Human Nutrition Research, National Centre for Social Research.** An assessment of dietary sodium levels among adults (aged 19-64) in the UK general population in 2008, based on analysis of dietary sodium in 24 hour urinary sodium samples. June 2008. Available at: http://www.food.gov.uk/multimedia/pdfs/08sodiumreport.pdf. Accessed 8 April 2010.
14. **Anderson CAM, Appel LJ, Okuda N, Brown IJ, Chan Q, Zhao L, Ueshima H, Kesteloot H, Miura K, Curb JD, Yoshita K, Elliott P, Yamamoto ME, Stamler J.** Dietary Sources of Sodium in China, Japan, the United Kingdom, and the United States, Women and Men Aged 40 to 59 Years: The INTERMAP Study. J Am Dietetic Association 2010; 110:736-45.
15. **European Commission.** EU Framework for National Salt Initiatives. Available at: http://ec.europa.eu/health/nutrition_physical_activity/high_level_group/nutrition_salt_en.htm. Accessed 20 May 2010.
16. **Choices International Foundation.** The Choices Programme. Available at: http://choicesprogramme.org/en/about_the_choices_programme/product_criteria. Accessed 21 May 2010.
17. **Elliott P, Stamler J, Nichols R, Dyer AR, Stamler R, Kesteloot H, Marmot M.** Intersalt revisited: further analyses of 24 hour sodium excretion and blood pressure within and across populations. BMJ 1996; 312:1249-53.
18. **Khaw K-T, Barret-Connor E.** Dietary potassium and stroke-associated mortality. A 12-year prospective population study. N Engl J Med 1987; 316:235-40.
19. **Cappuccio FP, MacGregor GA.** Does potassium supplementation lower blood pressure? A meta-analysis of published trials. J Hypertens 1991; 9:465-73.
20. **Siani A, Strazzullo P. Giacco A, Pacioni D, Celentano E, Mancini M.** Increasing the Dietary Potassium Intake Reduces the Need for Antihypertensive Medication. Ann Intern Med 1991; 115:753-9.
21. **Andersson M, de Benoist B, Rogers L.** Epidemiology of iodine deficiency: Salt iodisation and iodine status. Best Pract Res Clin Endocrinol Metab 2010; 24:1-11.
22. **Pan American Version of the WHO** STEPSwise Approach to Chronic Disease Risk Factor Surveillance. Available at: www.paho.org/English/AD/DPC/NC/panam-steps.htm. Accessed 20 May 2010.
23. **World Health Organization.** Assessment of iodine deficiency disorders and monitoring their elimination : a guide for program managers. Third edition (updated 1st September 2008). Available at: http://www.who.int/nutrition/publications/micronutrients/iodine_deficiency/9789241595827/en/index.html. Accessed 20 May 2010.
24. **Campbell NRC, McKay DW, Chockalingam A, Fodor JG.** Errors in Assessment of Blood Pressure: Sphygmomanometers and Blood Pressure Cuffs. Can J Public Health 1994; Supplement 2: S22-S25.
25. **Rasmussen LB, Ovesen L, Christiansen E.** Day-to-day and within-day variation in urinary iodine excretion. Eur J Clin Nutr 1999; 53:401-7.
26. **Furnée CA, van der Haar F, West CE, Hautvast JGAJ.** A critical appraisal of goiter assessment and the ratio of urinary iodine to creatinine for evaluating iodine status. Am J Clin Nutr 1994; 59:1415-17.
27. **IOM, National Academy of Sciences of the USA.** Dietary Referemce Intakes, Iodine. 2000:258-89. Avaialable at: http://www.nap.edu/openbook.php?record_id=10026&page=258. Accessed 29 April 2010.
28. **Tanaka T, Okamura T, Miura K et al.** A simple method to estimate populational 24-h urinary sodium and potassium excretion using a casual urine specimen. J Hum Hypertens 2002; 16:97-103.
29. **Kawano Y, Tsuchihashi T, Matsuura H, Ando K, Fujita T, Ueshima H.** Report of the Working Group for dietary salt reduction of the Japanese Society of Hypertension: (2) Assessment of salt intake in the management of hypertension. Hypertens Res 2007; 30:887-93.
30. **Knudsen N, Christiansen E, Brandt-Christensen M, Nygaard B, Perrild H.** Age- and sex-adjusted iodine/creatinine ratio. A new standard in epidemiological surveys? Evaluation of three different estimates of iodine excretion based on casual urine samples and comparison to 24 h values. Eur J Clin Nutr 2000; 54:361-63.
31. **Mann SJ, Gerber LM.** Estimation of 24-hour sodium excretion from spot urine samples. J Clin Hypert 2010; 12:174-80.

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A review of methods to determine the main sources of salt in the diet

Prepared by:

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2010

Section 1: Introduction

For countries to effectively direct their policies and interventions at lowering dietary salt, they need to monitor how much salt people are eating and identify the main food sources of salt . To determine total salt intake, there is a Protocol for Population Level Sodium Determination in 24-hour Urine Samples, prepared by the WHO/PAHO Regional Expert Group for Cardiovascular Disease Prevention through Population-wide Dietary Salt Reduction. For the Protocol, see http://new.paho.org/hq/index.php?option=com_content&task=view&id=3072&Itemid=2376.
This Review is the companion to the Protocol, intended to assist governments and other public health agencies in determining the main sources of dietary salt, to inform their decisions on how best to reduce salt intake. The description of methods is a compilation of general information and the specific experiences of a number of nutrition science experts in North, Central and South America and the Caribbean, identified in the list of acknowledgements.

Primary aims

The Review features the combination of methods and data sources that will deliver a complete profile of the dietary sources of salt by identifying:

- foods that people eat and the amounts and frequency of consumption.
- sodium content of the most commonly consumed foods.
- the amount of salt added at the table and in cooking.
- intake of high-sodium foods that are culturally or regionally-specific.

The variety of methods employed to assess the sources of salt in the diet reflect the complexity and dynamic nature of food supplies. This Review is designed to assist countries in selecting what is appropriate to their resources and circumstances. Once baseline data on the of sources and amounts of dietary salt are determined, ongoing monitoring is needed to keep up with changes e.g. the introduction of new and reformulated food products and population shifts in eating habits.

Other factors to consider

- Data on several nutrients of concern to public health nutrition policy, in addition to sodium, can be captured with the methods described here, for example, saturated fats, trans fatty acids, fibre and total sugar.
- If the individual food products in food consumption surveys and in the food composition tables are grouped into broad categories such as breads, processed meats, etc, they can become the basis for raising awareness among consumers as to the food categories that contribute the most salt to the diet.
- Grouping food products according to common formulations, functions or processes can also serve as a useful basis for setting reduced-sodium targets with the food industry.
- Questions on knowledge, attitudes and behaviour (KAB) can be added to a food consumption survey to gain more information about consumers' perspectives on salt that can inform interventions and communication strategies. A sample set of KAB questions is provided in the Protocol mentioned above.
- Countries with fairly common food cultures in a particular region can explore opportunities for joint approaches or harmonized tools that may provide economies of scale to determining the main sources of salt in diets.

Intended audience

Governments, public health agencies and principle investigator(s) for studies of nutritional habits to determine the sources of sodium in the diet.

Section 2: Food Consumption Surveys

2.1 Overview

Ideally, a national food consumption survey is cross-sectional in nature, capturing food consumption data from which nutrient intakes are calculated as well as collecting height/weight measurements of respondents and sometimes their nutritional and health status. Below are considerations when designing a nutrition survey.

Who to survey

Which ages – infants, children, adolescents, adults, elderly people.

What to survey

All foods consumed by the population whether at home, in restaurants, canteens, cafeterias in schools or workplaces, etc. (depends on who is being surveyed and where they eat).

Possible exclusions

People in remote locations, the military, institutions such as nursing homes, hospitals etc. (depends on who is being surveyed)

Representativeness

- Nationally (and/or state/provincially) representative, or representative sentinel sites, based on census data for each age/gender group (groups should be consistent with age groups

used for national nutritional recommendations).
- Where census data are lacking, different sampling methods can be applied such as convenience samples in urban and rural settings.

Other data to collect

May want to collect information on selected health conditions, socioeconomic or demographic characteristics.

When and how often to survey

- Ideally continuously with national commitment for cycle repeats e.g. every 3, 5, 10 or 20 years, or
- Periodically as national resources permit.

General challenges with surveys

Need to systematically use probing questions and if possible observe existing foods and preparations, to ensure that respondents accurately record all foods eaten and amounts

- Need to measure serving sizes, portions eaten (and frequency of consumption if applicable)
- Need to calculate ingredients and amounts in recipes
- Consumption of mixed dishes can make it difficult for participants to recall and assess items and amounts of food consumed during a meal
- Store-bought versus restaurant versus homemade foods – are not always the same in terms of ingredients, serving size, or nutrients
- Anticipate specific challenges when surveying young children and the frail elderly
  - need to question parents, daycares, caregivers.
  - often not sure how much is served versus eaten.
- Households eating from a communal pot during meals can make it difficult to assess food consumption of individuals.
- Some diets may include complex stews and soups, in which water and extra ingredients are added to an existing dish over a day or more, and portions are taken as needed.
- Can be difficult to estimate sodium losses with some food preparation practices e.g. soaking or rinsing of foods prior to preparation or discarding salted cooking water [1]
- Food terminology can vary.
- Household measures can vary.
- Foods consumed must be linked to relevant food composition databases/tables to determine sodium content (see Section 3).

Challenges specific to accounting for foods with salt/sodium additives

- Once changes and reformulations start occurring, the composition of similar food products may vary greatly between manufacturers.
- In some circumstances, a variety of sodium additives can be used interchangeably.

2.2 Methods that Provide Direct or Primary Data on Food Consumption

A number of methods can provide direct or primary data on food consumption, requiring participants to provide personal information on what they typically eat and drink in a defined period of time [2,3,4]. The main methods used currently for dietary assessment are described below with examples following.

Descriptions and considerations

24-hour food intake recall

A systematic questionnaire/survey designed to capture all foods consumed in a defined 24-hour period.

- ideal method commonly used by government agencies for national surveys.
- foods with a certain threshold of intake and sodium content per serving can be added [15]
- a number of governments have extensive experience with this survey methodology (see below the US National Health and Nutrition Examination
- Survey (NHANES) and the Canadian Community Health Survey (CCHS) 2.2) may be expensive.
- requires considerable analysis to categorize foods and extensive follow-up questions to ensure complete recalls.
- may not be representative of usual consumption patterns if limited to a single day recall.
- distribution of single day intakes shows larger variance than usual intake distribution; requires a repeat recall on a different day (ideally a week day and a weekend day) from a sub-sample of respondents to estimate usual intakes.
- difficult to model usual intake for episodically consumed foods e.g. seasonally available
- can have large variations by geographic area e.g. rural versus urban statistical challenges: need to account for days without food consumption; allow for consumption-day amounts that are positively skewed.
- recent improvements include computer assisted questionnaires (see the multi-pass method below).

Food frequency questionnaires (FFQ)

Participants indicate their usual dietary intake – how

frequently certain foods and food groups on a pre-defined list are consumed during a specified period of time.

- suitable for population surveys.
- relatively inexpensive.
- most amenable to web-based administration.
- recent improvements include a number of on-line and web-based versions which are often easier and quicker to complete.
- can capture intake of all nutrients of interest to national nutrition policy and can inform on overall dietary adequacy.
- can be expanded or contracted to include or isolate high salt/sodium food items.
- can add questions on salt added at table or in cooking.
- can add questions on respondents' willingness to reduce dietary sodium.
- can add questions on consumption away from home to monitor the nutrition transition.
- In lower resource situations, can consider sentinel food surveillance.
- usually requires validation food diaries done in a sub-sample of the same population.
- represents usual nutrient intake, as diet is assessed over long periods of time (e.g. previous 12 months).
- field staff require extensive training to ensure data consistency.
- are typically long because of the need to be comprehensive of common food products.

3-day, 7-day food diaries

Written records of all foods and beverages consumed and amounts over 3 or 7 days.

Duplicate food collection or weighed food consumption

The preparation of two identical plates of every food consumed one of which is sent to a laboratory for chemical analysis of nutrient content.
Accurate weighing of all foods consumed combined with analysis or calculation of nutrient composition.

- usually used only for research projects.
- very time consuming with heavy burden on participants.
- relatively expensive.

Example 1: US NHANES 24-hour food recall

NHANES is a program of studies designed to assess the health and nutrition status of adults and children in the United States, combining interviews with physical examinations. For survey questionnaires, examination components and laboratory components for 2009-2010, see http://www.cdc.gov/nchs/nhanes/nhanes2009-2010/questexam09_10.htm. A dietary screener module is available at http://www.cdc.gov/nchs/data/nhanes/nhanes_09_10/mi_dtq_f.pdf and a dietary data tutorial is available at http://www.cdc.gov/nchs/tutorials/dietary/index.htm to promote broader and more proficient use of NHANES data.
NES also includes some FFQ modules. English and Spanish versions of the NHANES FFQ are available at http://riskfactor.cancer.gov/diet/usualintakes/ffq.html

Example 2: CCHS 2.2 24-hour food recall

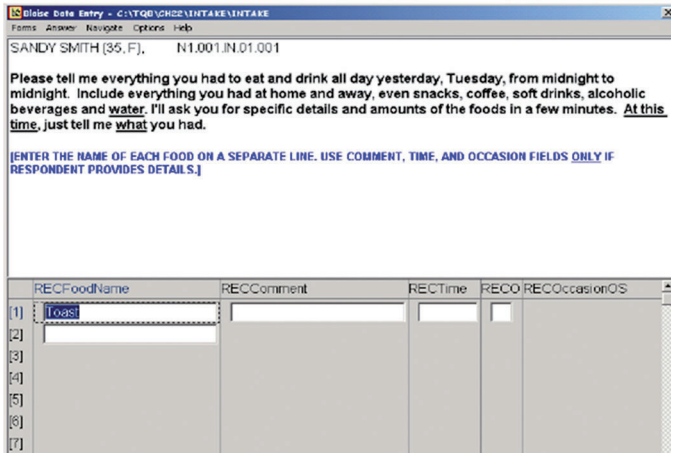
The survey provides national nutrition data about the food and nutrient intakes of Canadians and the relationship between diet and a wide range of health correlates. The 24-hour recall instrument is described at http://www.statcan.gc.ca/cgi-bin/imdb/p2SV.pl?Function=getSurvey&SDDS=5049&lang=en&db=imdb&adm=8&dis=2.
The last CCHS survey also included a series of short questions on health, demographics and socio-economic status, and had several targeted FFQs, for example on use of salt, supplements, fruit and vegetable consumption, etc. A guide to help with assessing and interpreting the data is available at http://www.hc-sc.gc.ca/fn-an/alt_formats/hpfb-dgpsa/pdf/surveill/cchs-guide-escc-eng.pdf

Example 3: Automated multiple-pass method for 24-hour recall

Automated multi-pass method (AMPM) is a computerized method for systematically collecting interviewer-administered 24-hour dietary recalls either in person or by telephone. The field staff follow five research-based steps designed to enhance complete and accurate food recall and reduce respondent burden (see below). Information about the AMPM is available at the USDA web site – http://www.ars.usda.gov/Services/docs.htm?docid=7710.

Step 1	Quick List • Everything you had to eat or drink yesterday
Step 2	Forgotten Foods • List of foods often forgotten e.g. coffee, tea, soft drinks, milk, juice, water
Step 3	Time and Occasion • Breakfast, lunch, dinner, snacks
Step 4	Details • Types – e.g. bread (white, brown, rye, etc) • Amounts – number, size of unit (use pictures, models)
Step 5	Final Probe • Anything else, even small amounts at e.g. meetings, while shopping, cooking, etc.

Sample Screen Viewed by Field Staff



Example 4: National Cancer Institute diet history questionnaire

Diet History Questionnaire II (DHQ II) is a food frequency questionnaire developed by the US National Cancer Institute. It consists of 134 food items and includes both portion size and dietary supplement questions. It takes about one hour to complete and was designed to be easy to use. Web based versions are likely to take less time to complete. Full information about the DHQ (forms, web versions, data analysis) is available at http://riskfactor.cancer.gov/dhq2/about/.

The original DHQ was validated against a number of other food frequency questionnaires, with response rates varying from 70-85%, not statistically different from shorter FFQs. Diet*Calc PC software can be used to analyze DHQ data for nutrient intakes. A Dietary Assessment Resource Manual is available in Spanish, published in 2006 by the Instituto de Nutrición de Centro América y Panamá (INCAP).

2.3 Using Indirect or Secondary Data Sources

Indirect or secondary data on food consumption are typically collected by departments of finance or agriculture or by market research companies for purposes other than nutrient intakes or nutrition policy. While these data sources cannot provide precise estimates of individual food intake, they have long been used to track information on national supply and household availability of sometimes thousands of food items, summarized into broad categories of food commodities such as cereals, grains, fruits and vegetables to correspond to dietary guidelines. Estimating the intake of high salt/sodium products from secondary sources like these requires additional set of information to be included in the household budget surveys and careful setting of assumptions. For an example of sodium intake estimated from a household budget survey, refer to the experience in Brazil.[5]

Descriptions and considerations

Household income and expenditure (budget) surveys

Designed to provide information on the consumption patterns and economic conditions of private households in a specific time period, typically income, savings as well as consumption.

- With regards to food, detailed information on household level purchases of food items (including beverages) is recorded (brand information is generally not available).
- Average market prices are used to estimate the total amount acquired of each item (if not originally available).
- Inexpensive in that secondary use of budget data (to determine food consumption) is usually free.
- Additional information (such as brand information or total acquired amount of each item) can be included in the study.
- Can rely on periodicity.
- Is generally representative of the national population and the large sample size permits deductions for different strata (urban and rural, socioeconomic levels, regions, provinces).
- Comparable methodologies applied across countries.
- Household consumption is divided by the number of inhabitants.
  • Individual intake is refined by estimating the proportional intake of energy by each member of the household using the adult male as the reference (i.e. the adult equivalent concept where for example an adult woman is 0.7 adult equivalents or in other words consumes 70% of the energy of an adult male). [16]
- May be able to add modules to gather data on individual food consumption with specificity for high salt/sodium products e.g. table salt, bouillon cubes, high salt condiments (see also Section 5).
- Foods purchased and consumed away from home are not usually captured, therefore may be less useful if these foods are a main source of salt/sodium.
- Non-monetary food acquisitions (such as gifts, home produced foods) are considered
- Family member participation in household food consumption may be unclear.

- Household food stocks at beginning and end of survey are not assessed (assumed to be equal).
- Does not account for losses or product uses for other than food preparation.
- Individual food and salt intake may differ from the estimated proportion of energy intake for each household member.
- Can expect to overestimate salt intake

Household food disappearance data

Estimates total salt used by the household and approximates the per capita (or per adult equivalent) intake.

- Typically, direct measurement is limited to a sub-sample of a population that is participating in a national or regional survey on food consumption or is resident in a sentinel site that is being studied.
- Relatively easy to implement to capture the total salt used from additions at the table and in cooking, bouillon cubes or dried soup mixes, fish and soy sauces and other highly salt products by counting and/or weighing the disappearance of these salt sources during a specific period of time (e.g. 7 days), and dividing that amount by the number of days and by the number of inhabitants in the household. (See also Section 5.)
  - Individual intake is refined by estimating the proportional intake of energy by each member of the household using the adult male as the reference (i.e. the adult equivalent concept where for example an adult woman is 0.7 adult equivalents because she requires 70% of the energy of an adult male).
- Requires before-and-after measurement of all salt sources in the household.
- Does not account for losses or product uses for other than food preparation.
- Individual food and salt intake may differ from the estimated proportion of energy intake for each household member.
- Usually overestimates salt intake [11].

National food disappearance data; food production data; food import/export data

Designed to capture production and consumption of agricultural commodities as well as import/export data.

- Do not reflect salt/sodium consumption.
- If salt is considered a broad general commodity, usually cannot separate salt used for food from that used for other purposes e.g. animal feed, water softening, road salt for de-icing, etc.

Food sales data; scan data

Retail sales information usually collected by private sector market researchers

- With regards to food, designed to collect detailed information on the sales of main retailers so brand information is likely to be available.
- Information about food consumption away from home (e.g. restaurants and cafeterias) is not included.
- Market or retailer specific i.e. there is no information on who is buying the products or how much individuals are consuming.
- Expensive to purchase.
- Can provide estimates of salt in cooking ingredients or processed foods when linked to nutrient information in appropriate food composition databases.
  - Geographic data and economic stratifications of households are likely available in markets where the surveys are conducted
  - Can rely on periodicity.
  - Represents a large share of the sales.
  - Comparable methodologies applied across countries.
  - Utility increased when combined with data on food consumption patterns.

2.4 Attaching Questions or Modules to Existing Chronic Non-communicable Disease Risk Factor Surveys

As an alternative to stand-alone food consumption surveys, it is worth considering whether questions or modules specific to salt intake can be attached to existing survey instruments that collect data on risk factors for chronic non-communicable diseases. Examples of such surveys are the WHO STEPwise approach available at http://www.who.int/chp/steps/en/ and PanAm STEPS at http://www.paho.org/english/ad/dpc/nc/panam-steps.htm.

A set of standard questions is suggested in Population Level Sodium Determination in 24-hour Urine Samples, available at http://new.paho.org/hq/index.php?option=com_content&task=view&id=3072&Itemid=2376.

Section 3: Sodium Content of Foods

3.1 Overview

Food composition tables or databases provide detailed profiles of the nutritional composition of foods, usually for a particular country. They can contain information on a variety of components, among them: energy, macronutrients, minerals (such as sodium) and vitamins, and sometimes, individual fatty acids, amino acids and/or vitamin fractions [6]. They are essential to determining the sodium content of foods consumed as identified in food consumption surveys.

Countries can use a variety of methods to construct national food composition tables, using direct or indirect data. Chemical analysis of major national foods and the calculation of values using yield and nutrient retention factors provide direct or primary data. Countries can also develop national food composition database by starting with data from another country with a similar food supply and then modifying and adding data to reflect national food culture. Some adjustments to data from other countries can required to e.g. account for country-specific regulations on food fortification levels, the use of permissible sodium containing food additives and local food products. New or additional data can come from secondary sources, typically from industry, on food labels or in scientific literature.

- Given that data accuracy varies across sources, it is important to identify for each source in the food composition database, the country of origin of the data, whether it is primary or secondary data, if primary – the sample collection date, analytical methods used, number of samples and detailed food name identification, and if secondary – detailed food name identification and the original data sources. This will greatly assist the process of updating the database when new values become available.

3.2 Methods that Provide Direct or Primary Data

Descriptions and considerations

National/regional food composition databases

Reflects food products consumed in a country or in a region whose countries have a common food culture

- Usually provide averages or generic composite values for certain food categories rather than brand-specific data.
- Require ongoing commitment to be kept up-to-date as food supplies are dynamic in that the nutrient composition of food products changes e.g. the elimination of trans fats, reductions in sodium, discretionary addition of nutrients, new processes e.g. moisture enhancement of meats, and depending on the sales volumes of certain brands of a changed product e.g. white bread, the average sodium content for that particular food product may shift.
- Need to account for local traditional foods, indigenous peoples' foods and ethnic foods, foods provided by restaurants and street vendors.

Modifying/updating existing database from another country

- May save resources in that a large proportion of food products may already be accounted for in existing databases (with primary and secondary data)
- Need to supplement with some analysis of national foods to account for differences in e.g. national regulations on fortification levels and the addition of local traditional foods, indigenous peoples' foods and ethnic foods, foods provided by restaurants and street vendors.
- Can supplement with data from national secondary sources or scientific literature that reflects the national food culture.
- Need to recognzie geographic variations – using values from other country databases can introduce unexpected errors.
- Within brand differences – same brand products available globally may have different formulations (e.g. added sodium) at sub-regional or country (local) levels, or have different inherent sodium content of base ingredients in various national markets, therefore it is important to note the country of origin for the product (where produced or processed).
- Requires ongoing commitment to be kept up-to-date.

3.3 Food Composition Tables and Databases from Selected Countries and Regions

Below are examples of national food composition databases and where they can be found. Other examples can be found through Langual at http://www.langual.org/langual_linkcategory.asp?CategoryID=4&Category=Food+Composition and http://www.fao.org/infoods/directory_en.stm.

ARGENTINA ARGENFOODS (Argentina Tabla de Composición de Alimentos)	http://www.unlu.edu.ar/~argenfoods/Tablas/Tabla.htm
NEW ZEALAND FSANZ (Food Standards Australia New Zealand) – Australian Food Composition Tables (NUTTAB 2006)	http://www.foodstandards.gov.au/consumerinformation/nuttab2006/
BRAZIL TBCAUSP (Tabela Brasieira de Composição de Alimentos)	http://www.fcf.usp.br/tabela/
CANADA Canadian Nutrient File	http://webprod.hc-sc.gc.ca/cnf-fce/index-eng.jsp
CHILE Tabla de Composición Química de Alimentos Chilenos	http://mazinger.sisib.uchile.cl/repositorio/lb/ciencias_quimicas_y_farmaceuticas/schmidth03/index.html
CENTRAL AMERICA INCAP – Tabla de Composición de Alimentos de Centroamérica	http://www.tabladealimentos.net/tca/TablaAlimentos/inicio.html
COSTA RICA Tablas de Composición de Alimentos de Costa Rica (Macronutrientes y fibra dietética, Alimentos fortificados, Ácidos grasos)	http://devserver.paho.org/virtualcampus/costarica/drupal/
EUROPE EuroFIR (European Food Information Resource)	http://www.eurofir.org/eurofir_knowledge/european_databases
LATIN AMERICA LATINFOODS (Tabla de Composición de Alimentos de América Latina)	http://www.into.cl/latinfoods/
UNITED KINGDOM UK Food Standards Agency - UK Nutrient Databank, Composition of Foods Integrated Dataset (CoF IDS) and The McCance and Widdowson's – The Composition of Foods (CoF) book series (6th Summary Edition, 2002)	http://www.food.gov.uk/science/dietarysurveys/dietsurveys/#h_1
UNITED STATES USDA (United States Department of Agriculture) – National Nutrient Database for Standard Reference	http://www.nal.usda.gov/fnic/foodcomp/search/

3.4 Using Indirect or Secondary Data Sources

Food composition databases can be constructed or modified using secondary sources of data, a process known as data compilation. In this case, a number of factors need to be addressed, key among them discussed in the table below.

A thorough discussion of quality in the compilation of nutrient data for a food composition database is provided in Chapter 10: Quality considerations in the compilation of a food composition database. In Greenfield H and Southgate DAT. (2003). Food Composition Data: Production, Management and Use (pp.171-186). Rome: FAO, available at http://books.google.co.cr/books?hl=es&lr=&id=KQRzKDr9bgcC&oi=fnd&pg=PR7&dq=Food+composition+data.+Production+management+and+use,+FAO&ots=nXTxTEoJ0c&sig=nOEjo0RB-sZ2nFrFcBqDx16FJOg#v=onepage&q=Food%20composition%20data.%20Production%20management%20and%20use%2C%20FAO&f=false

Specific to LATINFOODS, Electronic Conferences Reports are available http://www.inta.cl/latinfoods/conferencia_electronica.html.

One on “Compilación de datos para bases de datos y tabla de composición química de alimentos” is available at http://www.rlc.fao.org/foro/latfoods/infofinal.pdf.

Another on “Evaluación de la calidad de los datos para bases de datos y tablas de composición química de alimentos” is available at http://www.inta.cl/latinfoods/inf_final_conferencia_esp.pdf.

Descriptions and considerations

Industry-provided data

Food label review for branded products

- need to ascertain the source
- determine if the data are from laboratory analysis and if so the number of samples analyzed, sample preparation procedure and analytic method used, or whether values were taken/calculated from another data source e.g. calculation software, other databases, etc.
- determine age/date of the data (may need to be tagged for collection or confirmed by the food company)
- data may be limited e.g. only major brands, only certain cuts of meat
- label information is brand specific, need to account for all major brands
- can link label information on salt/sodium content to market share weighting (using the universal product code) to identify relative contribution of products to sodium intake
- should have some quantitative data to confirm the accuracy of label values in the country or the industry provided data (requires capacity to sample and analyze available data to confirm accuracy)
- where certain products are typically imported, it is useful to know the origin(s) and whether imports from there are constant or not, as similar products can have variable formulations depending on the producer/country of origin
- where nutrition labelling is voluntary, nutrient data may not be consistently available

- where nutrition labelling is mandatory but does not require declaration of salt/sodium content, will need to find other sources of complementary data
- need to recognize issues with labels – rounding of values, application of compliance tolerances, conservative labelling practices, label information may not keep pace with reformulations
- popular products for which nutrition labelling is not required may need chemical analysis

Restaurant chain nutrition information

- Usually web based
- Generally less consistently available
- Variability in information due to customization; usually only data for standard menu items are available

Nutrition science literature for analyzed values

- Judgement is required to evaluate the relevance of the data to one's country, the sampling plan applied, the analytical and technical expertise of the laboratory and methods used before deciding on whether or not to use the published data

Section 4: Salt Added at the Table and during Cooking

If food consumption data indicate that processed and packaged foods are the main contributors of salt in the diet, typical in higher income countires, determining qualitatively the frequency with which salt is added at the table and in cooking in households – the discretionary use of salt – provides sufficient information on which to base consumer awareness campaigns to curb the personal use/addition of salt.

4.1 Qualitative Methods

Descriptions and considerations

Supplementary questions in national, regional or sentinel site food consumption surveys or KAB surveys

- For salt added at the table, 24-hour dietary recalls, FFQ surveys or KAB studies are supplemented with questions on "added salt" such as "what type of salt is usually added" and "how often", with typical responses about frequency being "rarely", "occasionally" or "very often".
- To probe cooking practices in households, a sample question is "how often is ordinary or seasoned salt added in cooking or preparing foods in the household" and should include "don't know if salt is added in cooking" in case others in the household are cooking.
- Also select or probe if the respondent is the cook in the household and if yes, ask about the number of people for whom he/she prepares food.

4.2 Direct Quantitative Methods

In countries, regions or sub-populations undergoing nutrition transition – where households are known to rely on home-prepared meals at the same time that consumption of commercailly prepared foods is increasing – it is important to quantify the intake of discretionary salt to differentiate it from other sources.
A number of quantitative methods are available to measure the amount of salt added at the table and in cooking [7]. Typically, direct measurement is limited to a subsample of a population that is participating in a national or regional survey on food consumption or is resident in a sentinel area being studied. Other than the lithium tagging method, most of the methods described below require further research and validation and the resulting data represent rough estimates of discretionary salt use at the population level.

Descriptions and considerations

Lithium tagging of household salt

- a metabolic method
- normal household salt in sample households is for a specific period of time replaced by salt tagged with lithium. For each individual in the household, daily urinary excretion of lithium combined with that of sodium measures both discretionary and total salt intake [8,9,10].
- the gold standard providing the most accurate data on discretionary salt consumed
- can be cumbersome to the extent that is not feasible
- requires 24-hour urine collection from usually all members of the household (refer to the Protocol for Population Level Sodium Determination in 24-hour Urine Samples)
- data have limited geographic and socio-economic strata comparability method requires review and validation for population level application

Weighed household salt (disappearance method)

- household salt is replaced by a defined quantity of salt that is measured after a specific timeframe to determine how much was used
- can significantly exaggerate consumption because of the large amounts of salt discarded in cooking water [11]

Using simulated meals

- participants add salt to food models or pictures

of meals which is then collected and measured
- simple to measure
- limited to what is assumed to be representative of typical meals
- limited to research studies or targeted individuals

Observing cooking practices
- the amounts of salt added during cooking are observed
- semi-quantitative in that the observer estimates the amount of salt added by the cook
- difficult to generalize to large populations as household recipes can be highly variable

4.3 Indirect "Subtraction" Method

Estimating absolute and proportional intake of discretionary salt using urinary salt excretion and primary or secondary food consumption data
- estimates intake of discretionary salt as:
- discretionary salt intake = 24-hour salt excretion – salt intake attributed to commercially-available foods
- Requires the estimation of sodium (salt) urinary excretion for a 24-hour period.
- Accuracy is highly dependent on the precision and certainty of measurements of the consumption of commercially prepared foods.
- Must account for the commercially prepared foods consumed outside the home
- Despite the effort to account for non-food uses and losses, the values may still overestimate discretionary salt intake.

4.4 Secondary Sources

Both qualitative and quantitative determinations of the discretionary use of salt may be derived from or supplemented by scientific literature, with the cautions noted below.

Nutrition science literature
- Judgment is required to assess whether local/regional patterns of adding salt at the table and in cooking are similar to what is published in the literature.
- Assumptions on which to base accepting/adjusting the data may be necessary.

Section 5: Culturally or Regionally-specific High-sodium Foods

It is very important to account for what can be considered a sub-set of the general category of processed and packaged foods that in some countries is subject to discretionary use in the household – the high-sodium prepared foods that are specific to the national food culture or to a region or sub-population within a country. Even though used in relatively small amounts at any one time, these products can contribute very high levels of salt to the diet because they are so frequently consumed. Examples are some pickled foods, salted fish, condiments, sauces (soy sauce, fish sauce, tomato sauce, specialty local sauces), marinades, curry pastes and soup mixes. Usually there are only a few such products in a given country. The sodium level per product is usually determined from manufacturer-provided data if laboratory analysis data are not available [12,13].

Descriptions and considerations

Supplementary questions in national, regional or sentinel site food consumption surveys, KAB surveys, household budget surveys, household food disappearance studies

Specific local products known to be popular can be:
- queried in the 24-hour recall,
- listed in FFQs,
- added to household budget surveys,
- household food disappearance studies or
- included with questions about salt added at the table and in cooking,
- the survey instrument is customized to reflect national, regional or even more localized food cultures.

Nutrition science literature

Unless the food product featured in the literature is known to be the same or very similar in terms of salt/sodium content and patterns of use, and whose differences can be accounted for through a set of reasonable assumptions, published data on a very specific product from another country or region are not likely to accurately reflect intake in another country or region.

Section 6: Recommendations

Knowing the main sources of salt in the diet is essential to "making the case" for reducing dietary salt in that the information points out the directions for action. With key high-salt food products identified, frequency of their consumption measured and discretionary salt use understood, national public health agencies can frame the issue with baseline information, begin raising consumer awareness and at the same time engage with the food industry to encourage reformulations to lower salt/sodium content across the food products of concern. In cases where limits on the salt content of food products are regulated, monitoring the main sources of salt in the diet and their salt levels informs the national authorities with the mandate to enforce regulations.

How the main sources of salt in the diet are determined depends on what would be most efficient, cost-effective and feasible in the context of a country's existing national nutrition policies, the capacities and resources that support them and what is already known about food and nutrient consumption. So as not to assume what countries may have in hand, the recommendations in this Section are presented in a sequence that begins with a fundamental question and progresses as information is accumulated. An overarching recommendation applying to any aspect of the sequence is for countries to use as much as possible existing processes and instruments that are known to be reliable and valid, and in the case of surveys, for them to have the required periodicity and representativeness, to which questions or modules specific to salt intake can be added at marginal cost. While the recommendations here are based on the methods reviewed in the previous sections, the preferred approach uses as much as possible validated methods, some with training materials and/or software. Nevertheless, it may be necessary to use approaches that require further validation, and where this is the case, investigators are encouraged to design their studies such that they can inform the refinement of the methods and to plan for dissemination of findings.

6.1 Determining Baseline Data on the Major Contributors to Salt Intake

Step 1: What is the overall use of discretionary salt?

In low and middle income countries and where there is evidence of nutrition transition, it is important to assess at the outset the overall discretionary use of salt in the household – salt added at the table and In cooking and the use of specific high sodium products – as this may be the most significant source of sodium in the diet. And since the quantities of salt and high sodium products added cannot be measured through 24-hour recalls, a combination of direct and indirect methods is needed.

- KAB surveys can be designed to give preliminary qualitative information on discretionary salt
- Local food/nutrition experts can provide qualitative insights based on their experience in the area. These preliminary findings can be then further refined through e.g. focus groups.
- Household food disappearance studies can isolate the use of table salt and specific high sodium food products at the table and in cooking.
- If data on 24-hour sodium excretion are available as well as estimates of salt intake from commercially prepared foods, subtract one from the other for an estimate of discretionary use. *(Note that if salt from commercially prepared foods is negligible, salt intake estimated by food disappearance together with changes in urinary sodium excretion may be sufficient to set intake baselines and subsequent monitoring.)*
- To differentiate at the population level the personal use of table salt (added at the table and in cooking) from all other sources, the lithium-tagged salt method can be considered with results potentially contributing to further validation of this method.

Step 2: What are the food consumption patterns?

- Investigate whether established survey instruments with reliable periodicity and appropriate representativeness e.g. household income and expenditure surveys, food disappearance surveys or risk factor surveys, can be vehicles for questions or modules on food consumption that specifically investigate salt intake.
- If there is a possibility of administering 24-hour recalls or FFQS, conduct small sentinel site surveys e.g. one urban and one rural, to collect initial data on sources of dietary salt to confirm protocols and determine the expertise and resources (financial and personnel) needed to scale up to a systematic national survey.
- Conduct national surveys using 24-hour recalls or FFQs applying/adapting as much as possible the tools that are validated and supported.

Step 3: What is the proportional importance of discretionary sources versus commercially prepared foods?

- Combine data on discretionary sources with salt intake from commercially prepared foods to get the proportion of each
- If data on 24-hour sodium excretion are available as well as estimates of salt intake from commercially prepared foods, subtract one from the other and calculate the relative proportion of discretionary sources.

6.2 Establishing and maintaining food composition databases and tables

Regardless of the methods chosen to determine baseline data on the main sources of dietary salt, using national or international food composition databases is essential to ascertain salt/sodium intakes from food. National investments are therefore required to establish food composition tables from primary or secondary sources, and then to verify and maintain the quality of data given their importance to nearly all activities in nutrition and food quality and safety [14].

Key questions to ask are:

- is there a national food composition database with nutrient data including sodium that are reliable, up-to-date and available for local foods and processed and packaged foods
- is there a food composition database in another country that can be adapted to national food products
- is there an international or regional food composition database to which a country can contribute for the benefit of all countries using the database
- if adjustments need to be made to a national or international database, what are the resources and expertise at hand, and in what timeframe is information needed

The outcome being sought is determining the amount of salt consumed and identifying the main contributors of salt in the national diet in a manner that allows for setting targets, monitoring change in these sources and capturing new sources on an ongoing basis.

6.3 Deciding on Targets and Interventions

Based on knowledge about the main contributors to salt intake in a country, targets can be set for either the food groups that contribute the most to salt intake, for the full food chain, and/or for reductions in discretionary use, both table/cooking salt and high sodium food products. Targets can be set as averages, as maximums (upper limits) or sales weighted means per food category (see the examples below).

If targets are to apply to processed and pre-prepared food products, they should be set jointly with the food industry. A recommended first step is engaging with the sector of the food industry that accounts for high volume products that contribute a significant proportion to salt intake. Several countries have begun with the bread sector, working with associations of small independent bakers and in some cases also supermarket chains that have in-store bakeries. Other countries have started with the producers of bread products and processed meats. Still others have approached several food producers to address salt levels in a full range of categories of packaged processed foods that are the main sources of dietary salt. Depending on resources and capacities available, subsequent or concurrent interventions can deal with food retailers, restaurants and street food vendors.

Examples of targets and descriptions of how specific countries have negotiated with the food industry are shown below:

- For the United Kingdom, see http://www.food.gov.uk/healthiereating/salt/saltreduction [check if works]
- For the [US] National Sodium Reduction Initiative, packaged food targets are at http://www.nyc.gov/html/doh/downloads/pdf/cardio/cardio-salt-nsri-packaged.pdf and restaurant food targets are at http://www.nyc.gov/html/doh/downloads/pdf/cardio/cardio-salt-nsri-restaurant.pdf.
- For the Canadian sodium reduction targets, see http://www.hc-sc.gc.ca/fn-an/nutrition/sodium/sodium-reduction-targets-cibles-eng.php.

6.4 Monitoring and Evaluation

Monitoring food consumption and the main sources of salt in the diet also requires collecting primary and/or secondary data as is the case with setting the baseline. It can be limited to the same food groups that determined the baseline to optimize resources, or just the targeted foods, or can include reassessing food consumption and updating food composition tables for new sources and levels of salt. The ultimate impact analysis or evaluation of dietary salt reduction policies and interventions can include food product analysis, food consumption patterns, health status (mean blood pressure), and sodium intake measured through urine samples.

References

1. **Khohkar S, Pandar A, Cade J.** Eating habits: Food preparation and serving practices in ethnic populations: critical review and assessment of dietary survey requirements. Report to the Food Standards Agency, London, UK. FSA Project: N08015.
2. **Ferr-Luzzi A.** Keynote Paper: Individual food intake survey methods. Accessed September 18, 2010 at http://www.fao.org/docrep/005/y4249e/y4249e0a.htm.
3. **FAO.** Uses of Food Consumption and Anthropometric Surveys in the Caribbean – How to transform data into decision-making tools. Accessed September 18, 2010 at ftp://ftp.fao.org/docrep/fao/008/y5825e/y5825e00.pdf.
4. **Garriguet D.** Sodium consumption at all ages. Available at http://www.statcan.gc.ca/pub/82-003-x/2006004/article/sodium/9608-eng.pdf. Accessed October 1. 2010.
5. **Sarno F et al.** Estimated sodium intake by the Brazilian population, 2002-2003. Rev. Saúde Pública. 2009; 43:219-25. Available at http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0034-89102009000200002&lng=en&nrm=iso. Accessed September 18, 2010
6. **Merchant AT, Dehghan M.** Food composition database development for between country comparisons. Nutr J. 2006; 5: 2. Available at http://www.nutritionj.com/content/pdf/1475-2891-5-2.pdf. Accessed September 18, 2010
7. **Melse-Boonstra A, Rexwinkel H, Bulux J, Solomons NW, West CE.** Comparison of three methods for estimating daily individual discretionary salt intake: 24 hour recall, duplicate-portion method, and urinary lithium-labelled household salt excretion. Eur J Clin Nutr. 1999; 53:281-7.
8. **Leclercq C, Avalle V, Ranaldi L, Toti E, Ferro-Luzzi A.** Simplifying the lithium-marker technique used to assess the dietary intake of discretionary sodium in population studies. Clin Sci (Lond). 1990; 79:227-31.
9. **Sánchez-Castillo CP, James WP.** Accurate assessment of the quantitative significance of different sources of salt in the diet. Arch Latinoam Nutr. 1994 Sep;44(3):145-50.
10. **Venezia A, Barba G, Russo O, Capasso C, De Luca V, Farinaro E, Cappuccio FP, Galletti F, Rossi G, Strazzullo P.** Dietary sodium intake in a sample of adult male population in southern Italy: results of the Olivetti Heart Study. Eur J Clin Nutr. 2010; 64:518-24.
11. **Sánchez-Castillo CP, James WP.** Defining cooking salt intake for patient counseling and policy making. Arch Latinoam Nutr. 1995; 45:259-64.
12. **Sharma S, Harris R, Cao X, Hennis AJ, Leske MC, Wu SY, et al.** Nutritional composition of the commonly consumed composite dishes for the Barbados National Cancer Study. Int J Food Sci and Nutr. 2007; 58:461-74.
13. **Sharma S, Yacavone MM, Cao X, Samuda PM, Cade J, Cruickshank K.** Nutritional composition of commonly consumed composite dishes for Afro-Caribbeans (mainly Jamaicans) in the United Kingdom. Int J Food Sci and Nutr, 2009; 60 Supp 7:140 – 50.
14. **Bangkok** Declaration at the 8th International Food Data Conference, Bangkok, Thailand, 3rd October 2009. Accessed September 18, 2010 at www.fao.org/infoods/Bangkok%20Declaration.final.doc.
15. **Charlton KE, Steyn K, Levitt NS, Jonathan D, Zulu JV, Nel JH.** Development and validation of a short questionnaire to assess sodium intak. Public H Nutr. 207;11:83-94.
16. **Levy RB, Claro RM, Bandoni DH, Mondini L.** Per capita versus adult-equivalent estimates of calorie availability in household budget surveys. Cad. Saúda Púlica, Rio de Janeiro. 2010;26:_____.

Appendix – Examples from the Region

Barbados

The Barbados National Commission for Chronic Non-Communicable Disease is spearheading a country-wide nutrition intervention and improvement programme aiming to reduce chronic diseases (in particular, heart disease, stroke and diabetes). The prevalence of hypertension, the principal risk factor for cardiovascular disease, exceeds 50% in the 40 to 80 age group, making the Barbadian high salt diet a target for intervention.

In 2010, the Barbados Ministry of Health sent out a request for proposals to develop a Salt Intake Study with two components to:

- determine a baseline of actual sodium intake (through 24-hour urine sampling)
- identify the main sources of dietary sodium in the population.

By 2005, a quantitative food frequency questionnaire (QFFQ) had been developed and was in use in the Barbados National Cancer Study through a collaboration between Stony Brook University in New York, the University of the West Indies and the Cancer Research Center of Hawaii. The list of foods in this QFFQ instrument had been derived from food intake data collected in 2000 through the Barbados Food Consumption and Anthropometric Survey (BFCAS). For the BFCAS, 1600 respondents 18 years of age and over completed a single 24-hour dietary recall, and 50 (of 63) randomly selected residents gave additional updated information on foods that they consumed. All foods, beverages and supplements reported by at least two BFCAS participants were included in the draft QFFQ. This instrument was piloted in a random sample of individuals (n=50) selected from the nationwide electoral register. Participants completed a 24 hour dietary recall followed by an interviewer-administered QFFQ. Foods with minimal contribution to nutrient intake were excluded, and the final QFFQ contained 148 food and drink items.

There was evidence of some secular changes in the Barbadian diet between 2005 and 2010, and the current QFFQ, will therefore have to be amended for use in the Salt Intake Study. To this end ongoing work to date has entailed:

- Phase 1 – a pre-pilot in April 2010:
  - to update and amend the existing QFFQ by the inclusion of additional food items and to create a more comprehensive QFFQ to allow the evaluation of salt consumption;
- Phase 2 – a pilot of the amended QFFQ in May 2010;
- Phase 3 – administration of the updated QFFQ to a nationally representative sample of the population.

It is anticipated that these new dietary data will provide information on nutrient intake and cooking practices to be targeted for a nutritional intervention aimed at reducing salt intake.

The first step of Phase 1 began with the selection of a random sample of participants from the electoral register who were mailed a letter of invitation to participate in the study, followed by telephone or personal contact by study staff to make appointments for recall interviews. Nutritionists were trained to conduct a series of three non-consecutive 24 hour dietary recalls with each participant. These recalls also included questions probing for additions to the diet such as salt, sugar, seasonings and condiments. Information on portion size (using food models, standard units or household utensils, later converted to standardized weights), specific types of foods and drink including brand names, cooking methods (boiled, fried, baked, “lime and salt”) and food sources were also recorded.

Twenty-five men and 27 women (aged 25 to 90 years; mean ages were 46 and 55, respectively) participated in Step 1 (83% response rate). Data represented 148 days of dietary recall. Preliminary results showed that the mean daily sodium intake among men aged 27-50 years and 51-73 years was 4,313 mg and 2,653 mg, respectively, while women 25-50 years and 51-90 years consumed 2,897 mg and 2,126 mg of sodium per day, respectively. The leading dietary sources of sodium were rice and peas (5.4%), fried flying fish (4.4%), and macaroni pie (3.2%). Bread, fish, rice, poultry, and sweets were major food group sources of sodium, contributing a combined 50% to total sodium consumption. Mean sodium intake levels exceeded Adequate Intake recommendations across all gender-age groups.

In Step 2, a focus group with Barbadian nurses, a dietician and researchers facilitated the draft of the QFFQ with the addition of new food items reported more than once by participants in Step 1, with particular attention paid to items rich in sodium e.g. condiments and preserved foods. Of note, questions about the practice of adding salt at the table and others asking about participants’ willingness to reduce dietary sodium were included. The new draft QFFQ was initially piloted in May 2010 with 25 respondents who added other foods they frequently consumed. Final updates were completed by July 2010.

The Salt Intake Study has now been approved by the funding agency and the start of data collection is anticipated in mid-2011.

Prepared in collaboration with Professor Sangita Sharma, Endowed Chair in Aboriginal Health, Professor in Aboriginal and Global Health, University of Alberta, Canada and Anselm Hennis, Professor of Medicine and Epidemiology, the University of the West Indies, Cave Hill Campus, Barbados.

Brazil

The National Household Budget Survey (HBS – Pesquisa de Orçamentos Familiares) administered between July 2002 and June 2003 by the Brazilian Institute of Geography and Statistics (IBGE, Instituto Brasileiro de Geografia e Estatística) provided the data from which the main sources of sodium in the Brazilian diet were derived [4]. The HBS is designed to obtain information on the earnings and expenditures of families in order to adjust the structure of the national consumer price index.

The 2002/03 version of the HBS surveyed a probabilistic sample representative of all Brazilian households as well as each of the country's five macro-regions (according to the urban/rural status of the household) or 26 states. Sampling was based on a complex (two-stage) strategy involving 443 previously defined socio-geographic strata of census tracts (aiming to assure high representativeness with a minimum sample size). Subsequently, census tracts were selected from within each stratum and households were selected from within each tract. Finally, in order to make data collection uniform across the four trimesters of the year, the interviews carried out within each stratum were spread out across the 12 months of the survey. A total of 48,470 households participated in the survey.

With regards to diet, the HBS collects detailed information on all food and drink purchases made by households during a period of seven consecutive days, including the name and specification of each item, its price and where it was acquired (i.e. grocery store, bakery). The 48,470 households contributed a total of 969,989 records. Data were collected electronically with the help of portable computers and specially developed software.

Since the seven-day reference period is not sufficient to characterize the food-purchase pattern of each household, the survey unit was adapted to be groups of households (rather than individual households) corresponding to the 443 HBS strata.

The household units in each stratum are homogeneous in terms of territorial domain and family socioeconomic status and they were surveyed uniformly throughout the trimesters of the year.

Initial data analysis excluded any non-edible fraction from each of the purchases using correction factors recommended by IBGE. The edible fraction of each food item was then converted into energy (kcal) and sodium (grams) using version 1 of the Brazilian Food Composition Table (TACO – Tabela Brasileira de Composição dos Alimentos), or where an item was not in TACO, using the United States official food composition table version 15. (An extension to the statistical package Stata – AQUINUT – was developed for this purpose [5].) In the specific case of foods preserved in salt such as salted/dried beef and salted fish, an additional adjustment allowed the sodium concentration of these items to refer to the desalted product. Thus for each survey unit (household stratum), the daily per capita availability of energy and sodium was calculated.

Given that meals eaten outside the home and the fraction of food purchases not consumed are unknown, the household sodium availability to actual intake was estimated by considering the sodium content per 2,000 kcal of total energy consumed – the Brazilian recommendation for daily per capita energy intake. Food and beverages were then classified into four groups: 1) salt and salt-based condiments; 2) processed foods with added salt; 3) in natura foods, or processed foods without added salt; and 4) ready-made meals. The proportion that each food group contributes to total household sodium availability was described for the country as a whole and according to quintiles of per capita income distribution.

The results indicate that the amount of sodium available for consumption in Brazilian households was 4.7 g/person/day, more than two times the maximum internationally recommended intake level of 2 g/person/day. Excessive consumption was identified in all regions, in both rural and urban settings, and across all income strata. Although most of the available sodium in all income strata originates from discretionary salt (added at the table and in cooking) and salt-based condiments, the proportion derived from processed foods has a strong and growing importance as household purchasing power increases in Brazil. The complete set of results was published in the journal “Revista de Saúde Pública” [6].

Canada

In 2004, Statistics Canada carried out the Canadian Community Health Survey (CCHS) 2.2 – Nutrition using a 24-hour food recall instrument to which a statistically representative sample (based on census data) of over 35,000 people responded from all provinces (the survey excluded members of the armed forces, residents of the three northern territories, people living on native reserves, in institutions and some remote locations). A subset of respondents (>10,000) completed a repeat recall three to 10 days later (to assess day-to-day variation, which was used for determining usual intakes). The response rate was 76.5% and 72.85% respectively. The survey provided information on the then current intakes of dietary sodium by the Canadian population, which is the baseline against which the effectiveness of strategies to reduce salt consumption would be measured.

Respondents were asked to list all foods and beverages consumed during the 24 hours (from midnight to

midnight) before the day of their interview. Interviewers used a Canadianized version of the USDA Automated Multi-pass Method with five steps to help respondents remember what they had had to eat and drink:

- a quick list (respondents reported all items in whatever order they wished)
- questions about specific food categories and frequently forgotten foods
- questions about the time and type of meal
- questions seeking more detailed, precise descriptions of foods/beverages and quantities consumed
- a final review

An additional salt questionnaire was administered. People who replied "None" when asked "What type of salt do you usually add to your food at the table?" were classified as "never adding salt at the table". Otherwise, respondents were asked how often they added salt to their food, with the answer options of rarely, occasionally, or very often. Respondents were also asked about certain health conditions that were expected to last or had already lasted six months or more that had been diagnosed by a health professional. Those who answered "yes" to "Do you have high blood pressure?" were defined as having hypertension [7; 8].

The nutrient values, including sodium levels for foods that respondents consumed were obtained from Health Canada's Canadian Nutrient File (version 2001b) [9]. The average daily intakes of sodium, as well as percentages of the population who exceed the Upper Level (UL) were reported for each DRI age and sex group for age 1 up [7]. Proportions of the population who reported adding salt to food at the table or in cooking as well as the 10 main sources of sodium were provided. Additional analyses were done by province and by frequency of high blood pressure (adults aged 31 and older).

The CCHS survey were used for a further detailed analysis of food sources of sodium for four age groups derived by regrouping the Dietary Reference Intakes (DRI) age–sex groups according to expected similarities in sodium intake patterns [8]. The child DRI age–sex groups were divided by age into two groups: young people aged 1 to 8 years and those aged 9 to 18 years. The adult DRI age–sex groups were divided by sex into two groups: males aged 19 years and older, and females aged 19 years and older.

The food groups used in this study were based on an established classification system developed in the Food Directorate of Health Canada and used in previous nutrition surveys. Some of the food groups were altered for sodium modelling purposes e.g. by separating them into canned, pickled, smoked, or dried foods, usually higher in sodium than the rest of the group.

The analyses focused on estimating the sources of sodium by food group, with a number of parameters being reported for each food group:

- food intake per person, in grams per day, calculated as the total grams of the foods reported within the group divided by the total population;
- the sodium amount in foods, in milligrams per 100 g, calculated from the total sodium consumed, divided by the total grams of the foods consumed within the group;
- the percent of total sodium intake, calculated from the total sodium consumed within the group divided by the total sodium consumed by the population;
- the daily sodium intake per person in milligrams per day, calculated as the total sodium intake within the group divided by the total population;
- the percent of the population consuming the food, calculated from the number of consumers having reported eating at least one of the foods within the group divided by the total population; and
- the daily sodium per consumer in milligrams per day, calculated as the total sodium intake within the group divided by the number of consumers having reported eating at least one of the foods within the group.

In addition, the average daily energy provided by each food group was calculated by multiplying the energy density in kcal per gram by the per capita food intake for each food group. The amount of sodium provided by the quantity of food supplying 100 kcal of energy was determined by dividing the daily per capita sodium intake from each food group by the per capita energy intake for that group.

The analyses conducted in this study [8] were based on first-day recalls only. Usually a repeat recall is used to adjust for intra-individual variability to estimate the usual intake distribution. However, for the food groups considered in the sodium modeling, the frequency of their consumption did not meet the requirements for estimating a usual intake distribution from the CCHS 2.2 sample.

1 **Hennis A, Wu SY, Nemesure B, Leske MC; Barbados Eye Studies Group.**Hypertension prevalence, control and survivorship in an Afro-Caribbean population. J Hypertens. 2002 Dec;20(12):2363-9.

2 **Sharma S, Cao X, Harris R, Hennis AJ, Leske MC, Wu SY;** Barbados National Cancer Study Group Dietary intake and development of a quantitative food-frequency questionnaire for the Barbados National Cancer Study. Public Health Nutr. 2007 May;10(5):464-70.

3 **Sharma S, Harris R, Cao X, Hennis AJ, Leske MC, Wu SY:** Nutritional composition of the commonly consumed composite dishes for the Barbados National Cancer Study. Int J Food Sci Nutr 58:461-474, 2007

4 **Instituto Brasileiro de Geografia e Estatística.** Coordenação de Índices de Preços. Pesquisa de Orçamentos Familiares 2002-2003: análise da disponibilidade domiciliar e estado nutricional no Brasil. IBGE; 2004.
5 **Núcleo de Pesquisas Epidemiológicas em Nutrição e Saúde.** Conversor de aquisições de alimento em energia e nutrientes (AQUINUT): versão 1.0 [internet] [cited 2007 Oct 12]. Available from: http://www.fsp.usp.br/nupens
6 **Sarno F, Claro RM, Levy RB, Bandoni DH, Ferreira SRG, Monteiro CA.** Estimated sodium intake by the Brazilian population, 2002-2003. Rev. Saúde Pública. 2009; 43:219-25. Available at http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0034-89102009000200002&lng=en&nrm=iso. Accessed September 18, 2010.
7 **Garriguet D.** Sodium consumption at all ages. Health Reports. 2007;18:47-52.
8 **Fischer PWF, Vigneault M, Huang R, Arvaniti K, Roach P.** Sodium food sources in the Canadian diet. Appl. Physiol. Nutr. Metab. 2009;34:884-92.
9 **Health Canada. 2001.** The Canadian Nutrient File. Available at www.healthcanada.gc.ca/cnf. Accessed on January 11, 2011.

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Survey on knowledge, attitude and behavior toward dietary salt and health Protocol

Introduction

In September 2009 PAHO established an expert group to explore the current epidemiological situation regarding cardiovascular disease and its link to excessive salt consumption in the Americas and review existing policies, interventions and programs aimed as reducing dietary salt and issue evidence-based recommendations for salt reduction in the region.
Clear food labeling with regard to salt and/or sodium together with consumer awareness can help reduce the salt intake and is therefore recommended.

Justification

The 37th session of the CODEX Committee on Food Labeling did not reach consensus whether salt or sodium should be used on food labels and established an Electronic Working Group. Section C of the comments of the EWG members (Annex to CCFL minutes of the 38th session, Canada, May 2010) show that in Latin America no research has been undertaken with respect to public/consumer understanding of the terms salt and sodium, little campaigning to raise consumer awareness on the consumption of high amounts of salt has been undertaken, while all countries show to have guidelines and recommendations to this respect.

Main objective

For this reason the PAHO expert group proposed to conduct a survey to be realized in 5 countries by national consumer associations, a project to be led by Consumers International and financed by PAHO. The overall aim of this quantitative survey is to establish a base line on consumer knowledge, behavior and labeling preference with respect to salt and sodium. This can be used to provide input to the next CODEX committee meeting on salt vs. sodium labeling of food and to an in-depth qualitative follow-up survey on the same topic.

Hypothesis

Using 20 (multiple options and open) questions, we intend to establish:

- the attitudes of consumers with regard to salt and health.
- the knowledge of consumers with respect to his/her use of salt or sodium in food.
- the average knowledge of consumers of the relation between high salt consumption and possible health problems.
- whether the consumer suffers/has suffered from a salt-related disease (and has knowledge of this condition).
- whether the consumer does something to control his/her salt intake.
- the preference of consumers for labeling food (salt, sodium, both, warning labels, percentages, absolute quantity).
- relations of the above-mentioned with age, sex, educational level, attitude.

A direct relationship is expected between educational level or the fact that consumers suffer from a salt-related disease and knowledge of the possible health problems high salt consumption can provoke. A direct and inverse relationship between age of healthy consumers and knowledge of the possible health problems high salt consumption can provoke is expected.
Limited knowledge of the possible health problems high sodium consumption can provoke is expected in the majority of the respondents. Labeling preference for salt is expected for consumers with lower levels of education.
This survey should confirm these expectations or prove them incorrect.

Methodology and data analysis

The consumer organizations will conduct the survey with the following remarks:

- establish first the ***effectiveness*** of the questions, i.e. make sure they are understandable for the people in your country and avoid technical language where possible (e.g., do not use scientific names of diseases), once this has been done print sufficient forms.
- find out if in your country a consent of some ethical review board is needed to conduct the survey; if yes, please make sure you obtain one (and change questions if necessary).
- ask a minimum ***400*** different respondents in your country in two batches (so in the second batch, emphasis can be given to missing demographic groups)
- provide an even distribution of men and women (e.g., if two people conduct the interviews, one can only interview women while the other only interviews men).
- provide an even distribution in age as much as possible; please ask ***only*** adults (> 18 years).
- if possible, divide the sample in two representative groups; one group consisting of people living in cities, the other of people living in rural areas (please make sure these groups can be identified).

- avoid that the interviewee can read the questionnaire as much as possible (e.g., use a notebook computer or a notepad).
- avoid leading the interviewee, i.e., stick to the questions.
- answer the questions in the order provided, i.e. do ***not*** turn back to correct earlier answers.
- when using paper forms:
  - identify the questionnaires by using initials of the interviewer and a number (e.g., AB-001).
  - circle the options clearly on the questionnaire; in case of corrections mark the first answer given by X and circle the correct one; except where indicated ***only one option*** is allowed.
  - write open answers clearly legible on the questionnaire.
- when using a notebook :
  - indicate correct answer with color or erase other options; except where indicated ***only one option*** is allowed.
  - type open answers on the form.
  - do not forget to save the form; the filename can be the identification of the interviewer, e.g., AB-001.
- Q1–Q3 + Q6 +Q8 + Q10 + Q12–Q14 + Q16–Q19: read the question aloud and the options if needed.
- Q4: read question aloud but ***not*** the options; indicate option(s) mentioned (more than one option allowed) and write down in case "Other" is chosen.
- Q5: read question aloud and the options; each should get an answer.
- Q7: read question aloud and write down the answer.
- Q9: ask only if Q8 = yes; read question aloud and write down the answer including unit (e.g. grams), if Q8 ≠ yes, skip this question.
- Q11: ask only if Q10 = yes; read question aloud and write down the answer; if Q10 ≠ yes, skip this question
- Q15: ask only if Q14 = salt/sodium/salt & sodium; read question aloud and write down the answer, if Q14 ≠ yes, skip this question.
- Q20: read question aloud and the options; only one is allowed.
- Q21: in case the interviewee has any comments, please note those here.
- after the interview, make sure all questions have been answered, thank the interviewee and hand out a PAHO Patient/Consumer factsheet on salt to the interviewee.
- process each form using the attached excel spreadsheet*.
  - in case there are not sufficient worksheets (40) within the spreadsheet, please copy the entire spreadsheet (always keep one clean copy of the spreadsheet).
  - please name each sheet using the initials and numbers to identify the interview.
  - please mark options with "x".
  - send electronic file(s) to Consumers International Santiago.

All answers will be processed as percentages of subgroups or the total of respondents, except:

- age (will be used to establish age groups).
- Q7 (what is done to control salt intake; groups of similar answers will be established).
- Q9 (recommend daily salt intake; answers will be shown as a range).
- Q11 (difference between salt and sodium; groups of similar answers will be established).
- Q15 (reason for labeling preference; groups of similar answers will be established).
- Q21 (groups of similar comments will be established).

Budget

Each consumer organization will receive US$ 700,-- to follow the steps above, i.e. adapt questions to national idiosyncrasy (if necessary), obtain consent (if necessary), print questionnaires or provide interviewers with a notebook computer, print PAHO consumer/patient fact sheets, conduct a minimum of 400 interviews, process the answers and send the excel spreadsheets.
The consumer organizations are invited to use the survey as a contact moment with the public, i.e. to also provide information about their organization and its activities.
Once the filled in excel spreadsheets have been received, the 700 dollars will be sent.

References

http://www.surveysystem.com/sdesign.htm

*To save time, when using a notebook computer, the interviewer can type the answers directly into the excel sheets instead of the word forms.

Optimizing salt and iodine intake

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

Pan American Health Organization, Washington DC – April 2011

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

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 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 Nurition 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.

Improving Public Health in the Americas by Optimizing Sodium and Iodine Intakes

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

Report from the Washington DC Meeting 2011

Key Messages

In Latin American countries, iodized salt has the potential to secure the sustained elimination of iodine deficiency at the same time that dietary salt consumption is reduced to prevent cardiovascular diseases. Synchronization of programs for salt iodization and dietary salt reduction 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.

Lowering dietary salt intake to < 5 g/day is compatible with salt iodization programs based on flexible iodization levels for salt.

Needed at the outset of program coordination are up-to-date and accurate baselines of actual salt (sodium) and iodine intakes and the main sources of dietary salt and iodine (i.e. household iodized salt added at the table and in cooking or other sources), information that is currently lacking in most countries in the Americas.

Background

An estimated two billion people worldwide live in areas of iodine deficiency [1]. The International Council for the Control of Iodine Deficiency Disorders (ICCIDD) 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 [2]. WHO and UNICEF together with ICCIDD recommended in 1996 iodine concentrations in salt that assume an average per capita salt intake of 10g per day [3].

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 per person per day [4]. Salt added to food is a major factor increasing the blood pressure in normotensive and hypertensive people, whether adults or children [5,6,7]. 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 [8,9].

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 [10]. 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.

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.

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 [11] 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 recommended salt intake [national targets or in their absence, the internationally recommended target of < 5 g/day/person by 2020].

And the Iodine Network, in a resolution dated February 20, 2009 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.

The larger group of stakeholders met in Washington DC on 31 March and 1 April 2011. The background material became the basis for a Position Document and Framework for Collaborative Action. Their 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 position document.
2. Agree to a Framework for Collaboration/Coordination.
3. Define next steps to operationalize the Framework.

Outcomes:

1. A Position Document that reflects areas of collaboration/coordination.
2. A Framework for Collaborative Action.
3. Discussion on 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 Labora-

tories 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 Position Document expected as a meeting outcome.

On day two, participants were divided into three groups to prepare responses to a draft version of a *Position Document to Improve 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.

NB For the purpose of this document, the word **salt is** used to refer to **sodium** and **sodium chloride**.

Presentation Summaries

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

- 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 eat unprocessed foods, are physically active and lean, they do not develop hypertension [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. 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. In low and middle-income countries, reducing dietary salt is slightly more cost effective than smoking reduction.
- 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 cause thirst they are likely an important contributor to obesity among children and adolescents through association with increased consumption of high-calorie soft drinks [6,17].
- People are generally unaware of their own level of salt consumption. With few exceptions, average consumption is over 5.8g/day after age 5 and for many, intake is over 10g/day. 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, 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 [18].
- 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 [19].

Recent advances in the prevention of IDD - Ruben Grajeda

- Iodine is an essential component of the hormones produced by the thyroid gland. Thyroid hormones

regulate many key biochemical reactions, especially protein synthesis and enzymatic activity. Major target organs are the developing brain, muscle, heart, pituitary, and kidney.

- 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 mental retardation.
- Mild to moderate iodine deficiency in utero and in childhood results in less severe learning disability, poor physical growth and diffuse goiter.
- In adults, mild to moderate iodine deficiency appears to be associated with higher rates of more aggressive sub-types of thyroid cancer and increases the risk for non-toxic and toxic nodular goiter and associated hyperthyroidism.
- Worldwide two billion people have insufficient iodine intake from their usual diet. In the Americas 98 million people are estimated to have insufficient iodine intake. In 2006, the Americas had the lowest global prevalence of insufficient iodine intake at 10%. Between 2003 and 2006, the rate in the Americas was stable while in other WHO regions it fell [20,21].
- 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. Recommended intakes are standardized by age and population group [22]

Table 1. Recommendations for iodine intake (µg/d) by age or population group

Age or population group	IOM		Age or population group	WHO RNI
	EAR	AI or RDA		
Infants 0-12 months		110-130	Children 0-5 yr	90
Children 1-18 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

IOM, Ref. 8; WHO, Ref. 54

Table 2. Epidemiological criteria from the WHO for assessment of iodine nutrition in a population based on median or range of UI (Refs. 4 and 54).

UI (ug/liter)	Iodine intake	Iodine nutrition
School-aged children		
<20	Insufficient	Severe iodine deficiency
20-49	Insufficient	Moderate iodine deficiency
50-99	Insufficient	Mild iodine defficiency
100-199	Adequate	Optimum
200-299	More than adequate	Risk of iodine-induced hyperthyroidism in susceptible groups
>300	Excessive	Risk of adverse health (iodine-induced hyperthyroidism, autoimmune thyroid disease)
Pregnant women		
<150	Insufficient	
150-249	Adequate	
250-499	More than adequate	
≥500[a]	Excessive	
Lactating women[b]		
<100	Insufficient	
≥ 100	Adequate	
Children less than 2 yr of age		
< 100	Insufficient	
≥ 100	Adequate	

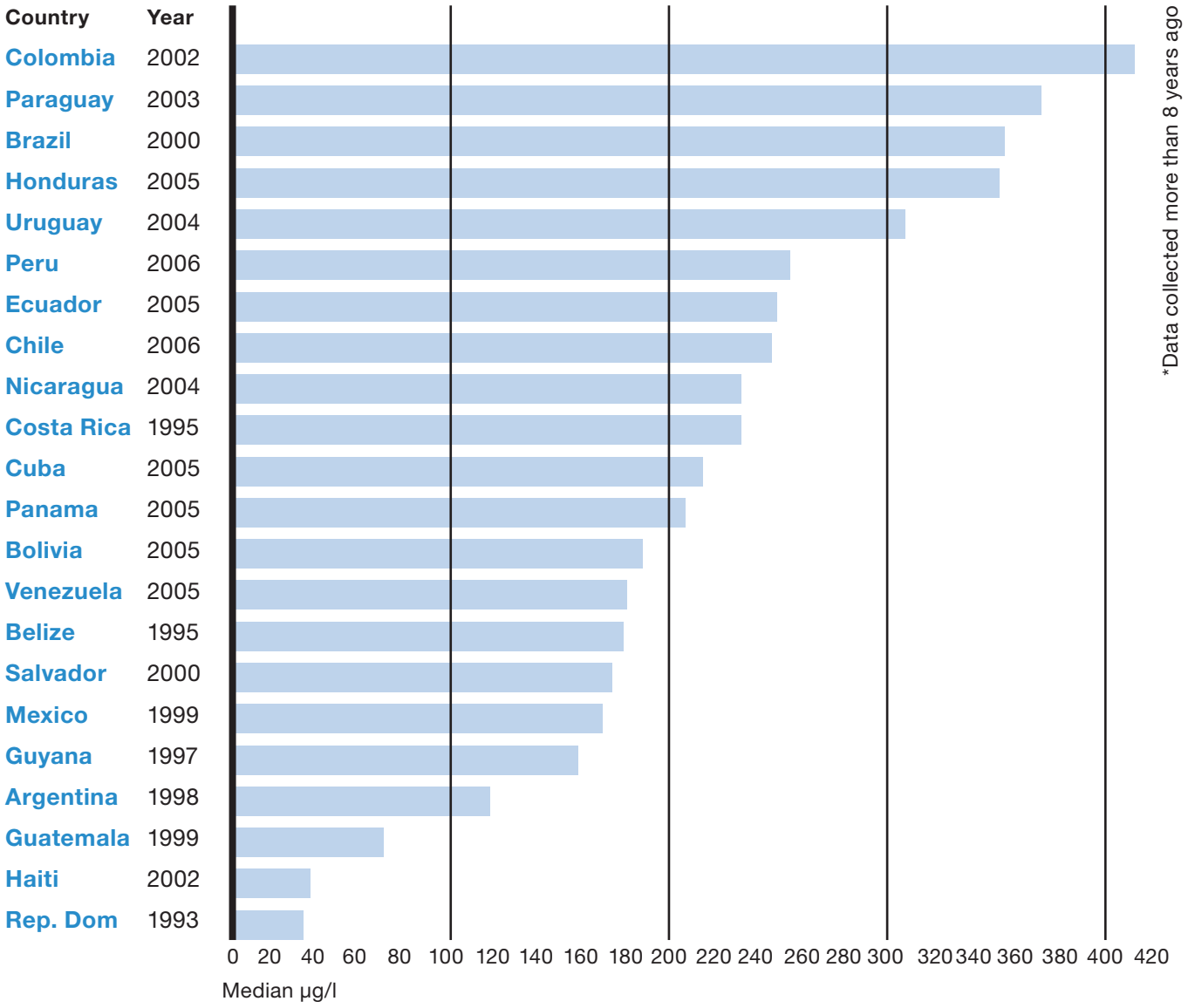
There is no information about iodine nutrition for pregnant and lactating women in the WHO assessment table, and the upper limits of the median UI for lactating women and children less than 2 yr of age were not specified.

a The term excessive means in excess of the amount needed to prevent and control iodine deficiency.

b In lactating women, the numbers for median UI are lower than the iodine requirements because of the iodine excreted in breast milk.

- 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 neonates, pregnant and lactating women); thyroglobulin (useful marker in children and adolescents); and thyroid hormone concentration. (30-31)
- Excess iodine intake induces hypothyroidism, autoimmune thyroiditis with chronic hypothyroidism and hyperthyroidism after long-standing iodine deficiency (producing goiters).

Fig. 2: Urinary Iodine



- In the US, even though iodine status is adequate, pregnant women are at high risk of iodine deficiency just as are women in other developed economies [23].
- Salt iodization programs should be monitored and evaluated to assure adequate iodine intake.

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

- In Latin American countries, with improvements in the production and monitoring of iodized salt, salt as a vehicle for iodine 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 with the household use of iodized table salt is 100% except for Guatemala (60%), the Dominican Republic (78%) and Bolivia (94%).
- Rudimentary technology to produce iodized salt remains an obstacle to the provision of good quality iodized salt in many countries in Latin America. In about half of the countries, small/medium scale producers provide all the iodized salt. In Guatemala

for example, only 43.5% of the iodized salt at production level contained 30-60 ppm of iodine and at retail, 64% of iodized salt had >15 ppm. In Mexico, where small/medium scale producers account for 17% of iodized salt, only 54% of their products were found to have >15 ppm whereas 96% of the iodized salt supplied by large producers (83% of total iodized salt production) had >15 ppm.

- 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).
- The resource laboratory for Latin America that is part of the International Resource Laboratories (IRLI) Network is in Lima Peru – the Laboratory of Endocrinology at the High Altitude Research Institute at Cayetano Heredia Peruvian University. 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.
- In 2006 the Peru resource laboratory was at that time able to provide technical support to laboratories in Argentina, Bolivia, Brazil, Chile, Costa Rica, Cuba, El Salvador, Mexico, Panama, Paraguay and Uruguay. Six professionals from Argentina, Brazil, Cuba and Mexico were trained and supported to set up laboratories.
- There were 25 registered laboratories in Latin American countries in 2006 but only 15 were operative, listed below. An inter-laboratories assay run from 2003 to 2006 showed 12 out of 21 participating laboratories to have made significant progress.

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.
- Regular monitoring of iodine nutrition is not carried out in all countries. In half of the countries with data on urinary iodine levels since 2005, the median µg/l ranges from approximately 190 µg/l to 440 µg/l (Paraguay, Honduras, Peru, Ecuador, Chile, Cuba, Panama, Bolivia, Venezuela). In countries with data before 2005, the urinary iodine levels were found to range from about 40 µg/l (Dominican Republic in 1993) to about 420 µg/l (Columbia in 2002).
- At this time, ICCIDD is mainly pursuing the improvement of the quality of iodized salt, the implementation of effective monitoring and reporting systems, and sustained communication and education. A regional meeting is planned for 1-2 August 2011 in Lima Peru with the following agenda:
  - discussion of the IDD control programs in each country.
  - how to improve the capacity and responsibility of the salt industry.
  - importance of optimal iodine nutrition in early life
  - implementation of WHO recommendations.
    - securing the elimination of IDD by USI strategy.
    - reduction of salt consumption (sodium) to prevent cardiovascular disease.
  - current and future role of Agencies and NGOs.
- Reaching the above objectives will facilitate the implementation of programs for dietary salt reduction.
- Starting pilot studies to reduce dietary salt without risking optimal iodine intake could be considered in one or two countries where effective IDD programs are implemented. This will require the collaboration/integration/coordination of various stakeholders in both salt iodization and salt reduction programs including ICCIDD given its network of volunteer experts/focal points in almost all Latin American countries.

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

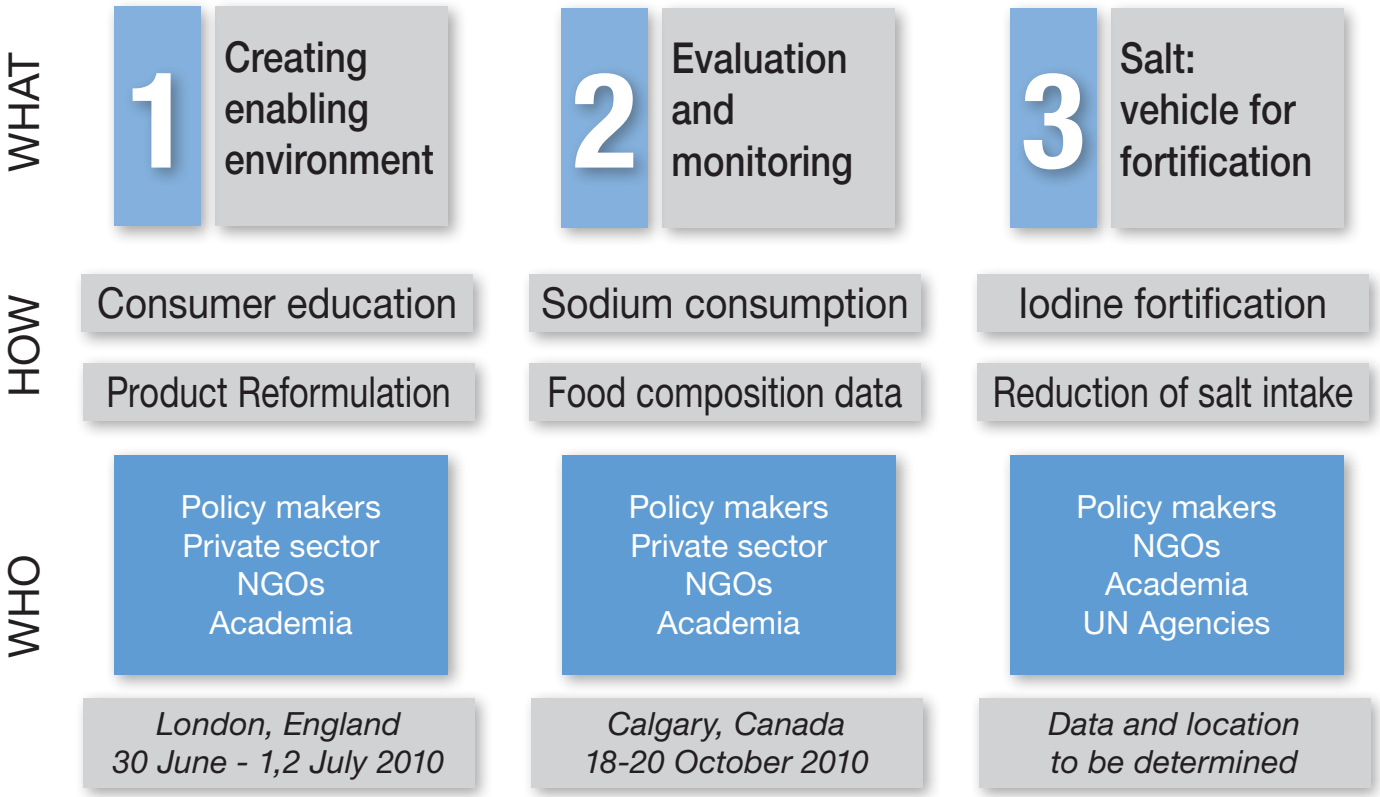
- Safe, efficacious and sustainable programs for salt iodization and dietary salt reduction require the involvement of several sectors and many players within each of them in a logical sequence where a

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.

- Currently the use of iodized salt in food processing is not consistent across countries in the Americas. A potential approach to make universal the use of iodized salt would have the following sequence. Nutritionists and researchers would first complete the scientific and epidemiological assessments of the appropriate sodium and iodine ratios needed in a country, and governments would then prepare the national policies and strategies with corresponding standards/regulations. The "premix" manufacturers (in the case of salt iodization) could then respond with production of micronutrient premixes that the food industries incorporate into their production processes. The salt and food industries also have a role, working collaboratively with governments, in social marketing and public education on what constitutes healthy intake of sodium and iodine.
- 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 and at the same time it poses an important challenge – to critically examine what has been achieved with salt iodization programs and the bases 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:
  - While UI is found to be sufficient in various regions in a country, the concentration of iodized salt (table salt) and its availability (indicators of IDD program effectiveness) by region do not correspond, in some cases, suggesting inadequate intake. Conversely, high quality iodized table salt is 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; the use of iodized salt in processed foods is not currently measured or monitored. Where processed foods made with un-iodized salt are the main source of salt in the diet (while household table salt intake is relatively low), there is risk of iodine deficiency. Hence salt reduction and salt iodization policies must vary from country to country based on food consumption patterns.
  - The extent to which natural sources of iodine are present in the diet and the use of iodine supplements (or not) need to be considered.
  - There is still much to learn about UI levels e.g. how to adjust for urine 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 – Lucie Bohac

- 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:
  - USI (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. USI 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 – Godfrey Xuereb

- 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.
- In the meantime, a Nutrition Guidance Expert Advisory Group (NUGAG) is considering evidence that suggests lower sodium intake (1.2g/day) may confer additional health benefits (compared to the current guideline of <2g sodium or <5g 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 2g/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 > 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, USI, 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 Position Document, see Appendix 1.
- 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)?
  - 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, consumer associations, can as a coalition present the case for coordinated salt reduction and salt iodization (or alternatives for the latter) 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 with an enhancement of existing national regulatory frameworks that currently govern the prevention of IDD through salt iodization, that being regulation to require universal

salt iodization (USI) and the universal requirement for food manufacturers to use it where not currently in effect. This would be followed by an examination of food import and export 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 of salt in food products. 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 USI made mandatory, where the iodine to salt density ratio is based on total average salt intake of less than 5g/day/person, the opportunity arises for food manufacturers to adopt a standardized salt/sodium content target for their food products, e.g. mg Na/kcal value of the food, to deliver optimal iodine and sodium levels together. 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 behavior 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 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 need to become aware that they can demand control of their salt intake to keep it optimal for their 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 behavior, 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 involved in salt iodization and dietary salt reduction programs should ensure that staff is educated on the intersection of the programs and sensitized to the potential for unintended conflicting advocacy and education messages.

Engage the international stakeholders

- Once the currently involved stakeholders approve the Position Document, PAHO will approach UNICEF for its endorsement. Other stakeholders to be approached are e.g. 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 approve the Position Document, 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 and governments in the region will establish the criteria on which to base the selection of countries in Central and South America eg 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 Position Document will be completed by mid/end April.
- All key stakeholder approval to be completed by mid May 2011.
- The full meeting report to be ready by the end of June 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, place to be determined, (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 MI 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 in Peru.
- The research framework for the pilot studies to be presented to the Dietary Salt Reduction Expert Group in September 2011.
- The pilot study project to be presented at the WHO Platform III meeting in November/December 2011.

References

1 **de Benoist B, McLean E, Andersson M, Rogers L.** Iodine Deficiency in 2007: Global progress since 2003. Food Nutr Bull. 2008;29:195-202.

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

3 **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.

4 **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.

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

6 **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.

7 **Feng J, MacGregor GA.** Importance of salt in determining blood pressure in children: Meta-analysis of controlled trials. Hypertension. 2006;48:861-69.
8 **World Health Organization.** The World Health Report 2002: Reducing Risks, Promoting Healthy Life.
9 **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.
10 **World Health Organization. 2008.** Salt as a Vehicle for Fortification: report of a WHO expert consultation, 21-22 March 2007, Luxembourg. Accessed April 4, 2011 at http://whqlibdoc.who.int/publications/2008/9789241596787_eng.pdf.
11 **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.
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.worldaction-onsalt.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 **He FJ, Marrero NM, MacGregor GA.** Salt intake is related to soft drink consumption in children and adolenscents: a link to obesity? Hypertension 2008 Mar;51(3): 629-34.
18 **Brown IJ, Tzoulaki I, Candeias V, Elliott P.** Salt intakes around the world: implications for public health. Int J Epidemiol. 2009;38:791-813.
19 **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.
20 **de Benoist B, McLean E, Andersson M, Rogers L.** Iodine deficiency in 2007: global progress since 2003. Food Nutr Bull. 2008;29:195-202.
21 **Pretell E. Grajeda R.** Iodine nutrition in Latin America. IDD Newsletter. 2009;31:1-5.
22 **Zimmermann MB.** Iodine deficiency. Endocr Rev. 2009;30:376-408. Epub 2009 May 21.
23 **Caldwell KL, Makhmudov A, Ely E, Jones RL, Wang RY.** Iodine Status of the U.S. Population, National Health and Nutrition Examination Survey, 2005-2006 and 2007-2008. Thyroid. Epub 2011 Feb 16.

Appendix 1:
Position Document to Improve Public Health in the Americas by Optimizing Salt* and Iodine Intakes

Pan American Health Organization, Washington DC – April 2011

Background

An estimated two billion people worldwide live in areas of iodine deficiency. The International Council for the Control of Iodine Deficiency Disorders (ICCIDD) states that among the methods to prevent iodine deficiency disorder (IDD), the iodization of salt is most simple and practical and has been proven effective [1]. Together with WHO and UNICEF, it recommended in 1996 iodine concentrations in salt that assume 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 per person per day [3]. There is strong evidence that salt added to food is a major factor increasing the blood pressure in normotensive and hypertensive people, in both adults and children [4,5,6]. High 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.*

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

And the Iodine Network, in a resolution dated February 20, 2009 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 universal 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.

The Common Goal

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 directed at national governments to
a. implement effective and regular quality assurance and monitoring programs for iodized salt and iodine nutrition
b. coordinate 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
c. emphasize the importance of optimal iodine intake
   i. require the universal iodization of salt (iodization of all salt for human and animal consumption including salt used in food processing) such that populations do not rely solely on the discretionary use of iodized table salt
d. synchronize national efforts to monitor iodine and salt intake in order to adjust standards for salt iodization based on optimal salt consumption
e. indicate the importance to health and the cost savings to heath care systems of reduced dietary salt intake
f. examine the rationale for the current concentration of iodine in salt, whether it is based on current evidence of iodine intake levels

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)
   i. assessing the discretionary use of iodized salt at the table and in household cooking
   ii. the consumption of processed foods, restaurant meals and street food and
   iii. the proportion of iodized salt 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, salt 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 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

g. Coordinated evaluation of national salt iodization and dietary salt reduction programs
   i. applying a common set of principles
   ii. committed to information sharing
   iii. independent of food and salt industries
   iv. demonstrating the link between action and disease outcomes

4. 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
   i. how to most effectively optimize salt and iodine intake
   ii. the most effective and feasible collaborative surveillance of salt and iodine intake and of the sources of salt and iodine in the diet

5. Shared forums with relevant sectors of the food industry to deal with iodine and sodium additives and promote
a. universal salt iodization
b. Improve 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 in processed and pre-prepared foods while at the same time reducing their salt content
   ii. joint technical assistance and knowledge sharing between sectors
   iii. compatible positions on issues held in common e.g. international trade agreements and regulatory or voluntary frameworks governing the sec-

tors such that both salt iodization and dietary salt reduction programs can achieve their goals in the established timeframes

j. **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.

Next Steps

- PAHO approaches the main stakeholders (ICCIDD, UNICEF, Iodine Network, GAIN, MI, Inter American Heart Foundation, Latin American Societies for Nephrology and Hypertension) to endorse the Position Document.
- PAHO and the main stakeholders approach countries in Central and South America with active and successful IDD control programs and active dietary salt reduction initiatives to pilot the coordination of the two.

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. 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.

* For the purpose of this document, the word salt is used to refer to sodium and sodium chloride.

Appendix 2:
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Targets setting and voluntary industry engagement

A Guide For Setting Targets And Timelines To Reduce The Salt Content Of Food

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

Sub-group on industry liaison

Key Messages

Setting targets and timelines for reducing the salt content of foods begins with a secure national commitment to dietary salt reduction.

A number of countries in the Pan American region have already developed targets and timelines for several food categories – evidence that reformulations are feasible and that progress is being made. Countries that intend to set their own targets for reduced salt content in foods should examine first what has already been achieved. See Table 1 – Food Category Targets and Timelines in the PAHO Region (as of January 2013) in Appendix 1 in this document.

An alternative initiative or a complement to target setting is requiring warning labels on food products that surpass an upper limit of safe salt content as determined by the national health authority.

It is important that progress relative to national targets and timelines, whether voluntary or regulated, be monitored.

As of January 2013, there are targets and timelines for reduced salt in food in five countries in the Americas: Argentina, Brazil, Chile, Canada and the National Salt Reduction Initiative in the United States. The food categories for which salt reductions are intended, common in all or most of these countries, are: bread and bakery products, biscuits and cookies, cakes, meats, dairy, snacks, soups and pasta.

Introduction

Typical modern diets provide excessive amounts of salt, from early childhood through adulthood. In high income countries processed foods account for most dietary salt intake and in lower and middle income countries their consumption is rapidly increasing as nutrition transition evolves. While people can control the salt added at the table and in cooking, it is the food industry that determines how much salt is added during food processing.

A core component of any program to reduce dietary salt consumption at the population level is government working with the food industry to lower the amount of salt added during food processing. Governments are justified in intervening directly with the food industry because salt is such a common food additive. The food companies that participate in such a health promoting initiative, demonstrating corporate social responsibility, stand to benefit from a positive public image and also increase the potential for the whole food market to shift towards improving the nutrition profile of processed foods.

While a number of food companies have ongoing initiatives to reduce the salt content in their products, and while their product development schedules should be taken into consideration when setting national targets and timelines for salt reductions, experience to date has shown that when governments and the food industry coordinate their efforts in a national strategy to reduce the overconsumption of salt, there have been larger and more timely reformulations of food products.

Purpose of the guide

Audience

This is a step-wise Guide intended to assist governments and public health authorities with initiating and maintaining interactions with food companies to set and then monitor targets and timelines for gradually lowering the salt content of processed foods. It has been developed by representatives of public health authorities in countries in the PAHO region that have committed to reducing dietary salt intake and have involved the food industry to encourage product reformulations.

Primary aims

- give advice and recommendations on how to initiate and maintain the involvement of food industries and other relevant agencies and entities in a transparent and open process of developing and monitoring a schedule of targets and timelines intended to reduce the amounts of salt added to specific food categories.
- disseminate the Food Category Targets and Timelines in the PAHO Region (Table 1 in Appendix 1) current as of January 2013, as reported for five countries – Argentina, Brazil, Canada, Chile and the US National Salt Reduction Initiative (NSRI) – to inform countries that intend to reduce the overconsumption of salt of what can be achieved. Table 1 has a compilation of
  1. the food categories for which the food industry has agreed to reduce salt content common to all or most of the five countries
  2. for each food category above, the targets and timelines negotiated to date in each country
- An on-line version of Table 1 is to be updated as progress is made.

Secondary aims

- foster the harmonization of targets for common food categories
- provide links to the national salt reduction program details in the five countries with targets and timelines as of January 2103, presented in Appendix 2.

Step 1 – Secure the national strategy to reduce dietary salt

Establish the national importance of dietary salt reduction

Salt intake exceeding physiologically adequate levels has a causal and linear relationship with greater-than-optimum levels of blood pressure – the science is incontrovertible. Useful references and resources for securing the case for a national dietary salt reduction initiative include:

- the US Institutes of Medicine report Strategies to Reduce Sodium Intake in the United States (2010) at http://www.iom.edu/Reports/2010/Strategies-to-Reduce-Sodium-Intake-in-the-United-States.aspx
- the Political Declaration of the High-level Meeting of the [UN] General Assembly on the Prevention and Control of Non-communicable Diseases (2011) at http://www.un.org/ga/search/view_doc.asp?symbol=A/66/L.1
- the PAHO initiative on Cardiovascular Disease Prevention through Dietary Salt Reduction at http://new.paho.org/hq/index.php?option=com_content&view=article&id=2015&Itemid=4024&lang=en
  - o core scientific and policy references at http://new.paho.org/hq/index.php?option=com_content&view=article&id=3043&Itemid=2375
- WHO Guideline: Sodium intake for adults and children at http://www.who.int/nutrition/publications/guidelines/sodium_intake_printversion.pdf
- WHO guidelines for sodium and potassium intake at http://www.who.int/nutrition/publications/guidelines/sodium_intake/en/index.html

  http://www.who.int/nutrition/publications/guidelines/potassium_intake/en/index.html

Prepare the arguments, supported by epidemiologic data, as to the national importance of dietary salt reduction. Collect data on mortality and morbidity due to high salt diets, and if available, also the economic burden related to them. Consider also determining the health economic benefits of reduced salt intake. Examples of methodologies are the
Ensure high level political commitment and operational support for the national initiative and publicize it. As timelines for reformulations typically span a number of years, the government initiative must be able to sustain ongoing negotiations and performance monitoring for the period.

Develop a comprehensvie strategy with a clear goal; indicate whether it will take a voluntary or regulatory approach

Referring to international experiences and achievements, define a comprehensive strategy for dietary salt reduction. It can begin by setting a national goal for salt intake, as a number of countries in the Americas have done, or in its absence, adopting:

- the target recommended by the PAHO Expert Group – less than 5g salt intake/day/person by 2020
- OR the WHO global target – a 30% relative reduction in mean population intake of salt, aiming to achieve the recommended level of less than 5g salt per adult per day

Governments can follow several different approaches regarding targets. They can focus on the whole food supply (the food processing industry, restaurants, the informal food sector), on all food categories, or on specific components of the food supply or key food categories. Regardless of which component of the food supply or which food categories are being addressed, the approach must include a monitoring framework that assesses industry performance against commitments made to targets and brings feedback to the next stages of reduction. See Section 6 Monitoring Performance.
Strategies can be voluntary with close government oversight or regulated with corresponding enforcement, both of which have been successfully implemented.
Least successful have been initiatives that have relied solely on the food industry to self-monitor. Reformulations in these cases were found to be minimal and slow.
The voluntary approach is based on negotiations with food industries to establish reduction targets to which they voluntarily commit. Usually the agreements are for gradual reductions of salt content per food category. Success depends on:

- genuine commitment by the food industries to reach targets
- the strong position of the government to set and hold to the lowest targets possible and
- government commitment to monitor progress.

A legal approach is typically based on regulating the upper limits of salt in foods and depends on enforcement. It has been most commonly used for widely consumed products such as breads. An advantage of the voluntary approach over the legal is that it can be initiated relatively rapidly in most countries that have basic national data on salt intake and on the main food sources of salt. On the other hand, a legal approach creates

a level playing field for all food processing industries.
It is also possible for voluntary approaches to be followed by legal measures. This enforces reductions across the food market in cases where voluntary targets are not being fully achieved by industries or when small but cumulatively significant segments of the food market are not directly involved with voluntary targets.

Leverage and coordinate with supporting initiatives, agencies and resources

Position dietary salt reduction within the larger national public health agenda
Look for a convergence of interests, where concerted dietary salt reduction can strengthen other national policies, instruments and processes already in place that refer directly to salt eg national nutrition guidelines or the prevention of non-communicable diseases in particular cardiovascular and renal diseases, and wherever possible, also link to other national efforts to improve diet that offer an opportunity to add or raise the profile of the health risks of high salt eg obesity, trans fatty acid elimination.

Coordinate with the national salt iodization program
It is crucial for national dietary salt reduction initiatives to be coordinated with national programs to prevent iodine deficiency disorders that rely on iodized salt. See http://new.paho.org/hq/index.php?option=com_content&view=article&id=2015&Itemid=1757 for the White Paper on Improving Public Health by Optimizing Salt and Iodine Intakes, 2011 and the Final Report on Improving Public Health in the Americas by Optimizing Sodium and Iodine Intakes – A Meeting Summary.

Secure food labelling
Food labels are a central tool for directing consumers to healthier choices and at the same time are a key data source for salt content to inform the salt reduction strategy. Where official food composition tables are not updated quickly enough to correspond to product reformulations, the data on food labels can be considered for establishing baseline salt parameters which can then be monitored over time.
The regulatory framework governing food labels may need to be adapted to allow changes in food labels to be linked to reduction targets. Examining the framework may open the opportunity to address other issues eg warning labels, additional nutritional information, health claims and health seals.

Consult food technology experts
The food technology sector and food research centres are a particularly important resource for governments to learn about opportunities and constraints regarding food product reformulations eg typical reformulation schedules, technology issues related to the role of salt in specific food products that have an impact on reformulating, schedules for new product development, and how these relate to targets and timelines.

Examine/promote healthy food procurement policies
Determine where reformulated products can represent a new market opportunity for food companies. Public entities may have food procurement policies for their cafeterias for which they are responsible or may be in a position to adjust their policies to take into account reduced levels of salt in the food products being offered. Key examples are the procurement policies for schools, hospitals, prisons.

Involve other government ministries and agencies
A cross-government approach must be considered as there may be ministries other than health that have roles and responsibilities affecting the food supply. For example, the agriculture ministry may control meat and dairy processing and food regulatory agencies will be needed to monitor food labels, test food products or have a role in harmonizing salt content across food categories in cases where food products are the responsibility of multiple ministries. There may also be resources at regional or state levels that can be mobilized eg local government laboratories for analyzing salt content.

Use international references
International references such as the Codex Alimentarius have standards for labelling of salt that are parallel to the efforts to reformulate food.
Where relevant, understand the trade patterns and agreements regarding the processed foods imported from within a common market or from elsewhere, and the extent to which your country has control over these products eg nutrition labelling requirements.
Examine also the salt reduction approaches taken in other countries with which there is some relevant relationship eg neighbouring country, country with similar food culture, similar economic status (see Appendix 2).

Control advertising to children
It is especially important for all stakeholders in a healthy food supply to be consistent in supporting the public to make healthy food choices. This includes how and what foods are advertised and especially the nature of advertising to children as they are a vulnerable population. As some products intended for children have high salt content, the World Health Organization recommendations for marketing of foods and non-alcoholic beverages to children are relevant to dietary salt reduction. See http://www.who.int/dietphysicalactivity/marketing-food-to-children/en/index.html

Consider warning labels with or in the absence of targets

Requiring warning labels on food products with high salt content is an alternative as well as complementary approach to encourage the food industry to reduce its use of salt. In this case the public health authority sets an upper limit per standarized unit or serving of food product beyond which salt content is especially excessive and warrants a warning to consumers. See Appendix 2 for the Chile experience.

Step 2 – Prepare data

There are a number of sets of data necessary to initiate engagement with the food industry. A government must prepare some, and depending on its capacity and resources, can prepare the rest or request them from the food industry. In cases where the food industry supplies data, government must be in a position to verify them prior to negotiations and during monitoring of progress. As the objective for data preparation is a set of priority food products with proposed targets and timelines for salt content reductions, the criteria for selection of the categories and targets must be transparent to all stakeholders and grounded in evidence that the proposed reductions in salt content are technically feasible.

Select the food categories and determine baseline salt content

National food consumption data are essential as they identify the foods and eating habits that account for salt intake levels. The consumption data coupled with data on the salt content of the food products (from national or international databases) point out the relative contributions of various foods to total salt intake, hence the products on which reformulations should be focussed and the sectors of the food industry to approach.
Overall, it is necessary to identify:

- foods that people eat and the amounts and frequency of consumption
- salt content of the most commonly consumed foods
- the amount of salt added at the table and in cooking
- intake of high salt foods that are culturally or regionally specific

Select food categories based on national data on the sources of salt in the diet.

- The proportion of total salt intake attributed to a food category is derived by collecting food intake data (estimated through various instruments eg 24 hour food recalls or household budget surveys) which is then matched with appropriate food composition data that include the salt content for the products identified. Food composition data can be either nationally specific or databases with foods with some regional specificity can be used eg LATINFOODS (Tabla de Composición de Alimentos de América Latina at http://www.into.cl/latinfoods/)
- It is critical that any sources used to determine the salt content of foods be current. (Alternatives to food composition data that include salt content are food labels, food analysis or values provided by the food industry.)
- National food intake data can also be derived from FAO food balance sheets or purchased as product market share data. The latter, while providing precise and comprehensive information as to all the brands in each food category and their relative share of market, is proprietary information and costly.

The PAHO document A Review of Methods to Determine the Main Sources of Salt in the Diet, available at http://new.paho.org/hq/index.php?option=com_docman&task=doc_download&gid=11559&Itemid=) is a comprehensive guide to identify key food categories and salt content of foods. The FAO/INFOODS food composition databases is one international source for food categories and provides salt content data, available at http://www.fao.org/infoods/infoods/tables-and-databases/faoinfoods-databases/en/
Knowing the salt levels in locally available food products also allows comparing the levels in same or similar foods in other parts of the world, identifying in particular the global brand products for which lower salt versions are available elsewhere. This is a lever for encouraging multinational companies to replicate product improvements in your country. Refer to the work on global brand products by the Global Food Monitoring Group at http://www.georgeinstitute.org/global-health-landscape/food-policy/food-monitoring-group and http://www.georgeinstitute.org/global-health-landscape/food-policy/food-monitoring-group/resources
High income countries in the region have chosen to set targets and timelines for all food categories which contribute salt to the diet. In these cases, food recall surveys have shown that processed foods account for approximately 75% of total salt intake and public health authorities have been able to allocate resources sufficient to address the full range of these products.
Other countries in the region are taking a step wise approach, beginning with salt reductions in priority food categories, selecting those that:

- account for a large proportion of total salt intake
  - o a food category with a high volume of consump-

tion eg bread or a product within a category that holds a large percentage of market share, even though not high in salt, may account for a large proportion of total salt intake, while other foods, with relatively low volumes of consumption, may also contribute large amounts of salt to the diet because of their very high salt content (eg cured meats, soya sauce).

- have been shown to be highly consumed by vulnerable groups especially children
- have high baseline salt levels
- affect the supply chain beyond the individual consumer eg pre-mixes such as used by bakeries for bread and other baked goods and soup bases supplied to restaurants

Selection of priority food categories can also be influenced by what other countries have already selected, particularly countries in a common market or countries from which products are imported.
Other considerations in category selection are whether the sector associated with a food category has capacity to reformulate (can be related to size) and whether there is an existing relationship with a sector, established through previous public health interventions, where there is willingness to participate.

Propose a schedule of targets and timelines for discussion

Negotiations with the food industry begin with draft targets and timelines for priority food categories, developed by government or the food industry at the request of government, ideally modelled to demonstrate that they lead to the achievement of the national salt intake goal or otherwise based on criteria that ensure that proposed reductions will have a meaningful impact on salt intake at a population level.
There are several ways to set targets for reductions. The criteria selected to guide the process must be clear and transparent to the food industries as well as civil society. Experience has shown that It is helpful to establish short, medium and long term targets as food companies are especially concerned about certain issues that require time for resolution such as the need for new technologies, the acceptability of reformulated foods by consumers, reductions already underway and food safety. Taking these factors into consideration during negotiations will better ensure that reductions agreed to are sustainable and meaningful.

Review first Table 1 Food Category Targets and Timelines in the PAHO Region (Appendix 1). If baseline salt content for a particular food category or product is the same or similar to that found in another country, consider adopting the schedule of reduction targets and the timelines already negotiated.

The draft targets are the basis for initiating discussions with the food industry, there being a clear understanding that they are to be finalized in a timely manner.

Set targets as averages/ means, maxima or both

Targets are usually set in terms of the percentage reductions from a baseline salt content in the products in a food category (as when working with single companies and their brands). Consider first if targets are to be set as an average/mean or as a maximum level of salt. Averages, either simple or sales weighted, allow flexibility in the levels of salt in different products within a category and are helpful in considering the natural variation in salt levels of some foods (as cheeses and cured meats). On the other hand, averages are more difficult for consumers to understand and for national authorities to compare and monitor across individual products.
Maximum or upper levels of salt are straightforward and transparent, easier to both administer and monitor, and easier for companies and consumers to compare salt in products. They do not however indicate whether the salt range in foods is changing, making it difficult to predict the impact of targets on average intakes. In the long run maxima may even suggest that once the target is achieved, no further reductions are needed.
Ideally, set both average and maximum values per category, that is, use averages for salt in each food category and set an upper limit. Adding the upper limit for the food category ensures that meaningful salt reductions occur in a larger proportion of the products in the category (especially those with higher salt content), implicating all companies whose products are in the category and also protecting all segments of the population no matter which products people consume from within a category. Where resources permit, create sub-categories to better address the differences within a food category. Refer to Appendix 3 for a thorough discussion of averages, sales weighted averages and maxima.

For averages/means

- check existing average/mean targets for salt content in other countries (Appendix 1)
- determine the average/mean salt content per standard unit of measure for a food category and the salt content distribution
- if necessary remove outliers in a consistent fashion

For maxima

- check existing maxima for salt content in other countries (Appendix 1)
- set maxima as between the 50th and 75th percentile of the salt content distribution

Consider sales weighted averages/means (SWA/SWM) where available

- check existing SWA/SWM for salt content of food products for Canada and the US NSRI (Appendix 1)
- SWA/SWM are calculated using the salt levels of products within a category weighted by their volume of market share in kilograms
- requires purchasing expensive market share data from the private sector
- for monitoring whether targets are being met, requires ongoing purchase of the market data

Note that there may be food categories for which salt substitutes might be necessary in order to meet targets or where lowering salt levels beyond a certain target creates a food safety risk. Seek the objective and independent advice of food technology experts on such issues and if needed, consider supporting or encouraging research on the roles of salt and salt in these cases. Alternatively, consider the WHO global target of a 30% relative reduction in mean population intake of salt as an overall guide to reductions. This still requires knowing the sources of salt in the diet and the impact of various reductions in salt by source. If for example 50% of salt intake is attributed to discretionary use at home and 50% comes from processed foods, then if all the reduction were to be achieved by lowering the salt content of only processed foods, these foods would have to have salt content lowered by 60%.

Standardize the presentation of salt content

To facilitate the reduction efforts by industries and for consumers to know how much salt they get from a food product, it is important to standardize how salt content is presented.

- It is recommended that targets be expressed as salt per 100g of product.
- If salt content is expressed per serving size or portion, there should be standard reference amounts indicated.
- For products that require reconstitution before consumption (eg soup cubes), indicate whether the target refers to the product "as sold" or "as consumed" (once it has been prepared per the manufacturer's instructions).

Propose timelines

The timeline should be such that the national salt intake goal or the internationally recommended goal can be reached within six to 10 years. Consider the initial targets to span four years at two year intervals.
Ensure that proposed timelines are grounded in experiences proven successful elsewhere and/or are based on evidence of achievability provided by the food technology sector.

Step 3 – Identify the key stakeholders

Effective dietary salt reduction at the population level requires a multi-sector approach. The greatest impact will be achieved when governments, the food industry, civil society and non-governmental organizations (NGOs) coordinate and align their efforts. Critical is that all agencies involved in the dietary salt reduction initiative accept the approach of targets and timelines and where relevant, coordinate themselves to deliver consistent messages and education to the public.

Outline the process and principles of engagement with the food industry

There must be a clear understanding and agreement that the selection of food categories, targets and timelines are to make a meaningful impact on salt intake.
Each agreement with the food industry must be documented and made transparent as commitments are official. Consider setting terms for technical cooperation. It must be understood that commitments include acceptance of a transparent monitoring framework.
There also needs to be agreement that industry commitments and performance are to be made public, the details of which can be negotiated. Broadcasting the agreements, new targets and industry progress through for example press releases are opportunities to publically reinforce information and education messages and also reinforce the salt reduction policies within the government and to food companies. This can also be positively linked to building the market for low/no salt products, to the industry's advantage.

Select stakeholders in the food industry

Data on the main sources of salt in food categories will direct the selection of food industries to engage in product reformulations. Give priority to representatives of food categories that account for the highest market coverage and highest potential effect on population intake of salt.
Umbrella food industry organizations or single large companies can be approached. If for example food markets are highly concentrated, negotiating with in-

dividual companies may be fast and effective but caution needs to be exercised to avoid government association with any particular company or brand to appear as endorsement. In more fragmented markets, dealing with a food industry association, if it represents the majority of the sector, will reach more companies simultaneously although it may take more time for all companies to agree on targets. If there is less than optimal coverage of a sector by an association, consider approaching sub-associations or undertake outreach that can connect outliers to the initiative.

Take advantage of existing contacts and relationships with food industry and of any relevant initiatives that are currently involving or have involved the food industry eg trans fatty acid elimination, fortification of bread. Engage both retailers and manufacturers per food category where relevant.

Include other government ministries and agencies. Refer to Section 3 regarding leveraging and coordinating with other government entities. Engage NGOs

NGOs can both legitimize and support the national goal and the target setting processes. They play a key role in balancing the public discourse regarding what consumers can do to reduce salt intake and what the food industry can do, possibly even countering industry efforts to weaken targets. They can also extend the reach of eg consumer awareness and education campaigns through their local and national networks and can offer champions to reinforce them.

Consumer organizations can be particularly helpful if not integral in monitoring whether food companies meet the commitments they make and can strengthen the government position to maintain the momentum to set and reach targets. Where resources permit, governments can assist NGOs with the production and dissemination of consumer information.

Societies of health professionals can also assist with raising awareness, disseminating information and encouraging and keeping track of industry commitments.

Step 4 – Plan the meetings

The design and formats of meeting between governments and food industries will vary from country to country. Much depends on whether there are pre-existing relationships with the food industry, their nature and the extent of communications. Regardless of the differences between countries, a number of points should be taken into consideration when launching the negotiations on targets and timelines.

Agree on a way of working

- State a clear purpose for all meetings
- Circulate an agenda in advance of each meeting with objectives specified and invite food companies to send in advance specific questions they want addressed during the meeting
- At initial meetings, discuss what activities are already underway
- If applicable, invite leaders in industry to present current contributions or progress already made
- Meet separately with companies whose products are a concern related to high salt content and/or slow progress in reformulation. One-on-one meetings generally provide more detailed information about progress and future plans as well as successes and challenges. The information from one company may be useful in understanding the market for a particular food category.
- Consider sector-specific meetings, with groups of companies that produce similar products, with the objective of sharing problem solving and addressing common questions on the salt reduction program. Such meetings can result in partnership of industry groups to jointly work on technical solutions and reporting mechanisms.
- Trade associations can be useful in presenting generic barriers and technical issues and solutions (but often present the greatest challenges faced by the industry rather than the greatest opportunities for change).
- In preparation for meetings, be aware of the range of salt content of company products as well as the range of salt content of competitors' products and in global brand products in the same food categories. For the latter, see the Global Food Monitoring Group at http://www.georgeinstitute.org/global-health-landscape/food-policy/food-monitoring-group and http://www.georgeinstitute.org/global-health-landscape/food-policy/food-monitoring-group/resources
- Foster as open and honest sharing of information as possible without violating trade secrets
- Keep brief notes of all key points covered in meetings for future meetings and document challenges and solutions. Circulate to all participants.
- Where companies have changes in staff or resources, or there are company mergers or acquisitions, monitor progress and follow-up as needed with meetings
- Welcome meetings at company offices as there may be opportunities to tour food processing plants that can provide greater understanding of challenges and solutions
- Negotiations with food companies are most likely to

take place by individual food category because the function of sodium salts, food safety issues, the processing technologies and consumer thresholds for acceptability may be specific to a category. Expect discussions with food industry representatives to take varying amounts of time according to the food category.

Require reformulation schedules

Ask for company-specific reformulation schedules that include the products to be reformulated, by how much and by when. Ensure that there is a focus on products with a larger market share. [link to industry questionnaire]

Step 5 – Monitor performance

Strong oversight and monitoring are essential for the success of a national program for dietary salt reduction. A monitoring framework underpins both voluntary reductions of salt content in food products and regulated limits by stipulating what will be monitored, how, at what frequency, how performance results will be disseminated and the consequences in cases where targets are not met. Industry accountability in either voluntary or regulated contexts must be clarified in these terms and be part of the agreements made when industry engagements are initiated.

Consider the different sources of data for monitoring

Data required for monitoring can come from various sources. Choose what is most likely available on an ongoing basis such that monitoring comparable data can be most readily sustained. Examples of data sources are food labels, food analysis, consumer organizations and research institutions. This applies equally to countries that require warning labels to ensure that very high salt content products are consistently labelled as such. Consider requiring companies to regularly (annually or biennially) report the nutrient profiles of their foods per 100g of product (salt and other nutrients) in a standardized database format.
Develop a publically accessible database of the salt content of the products by company.

Establish and maintain public attention to the targets

Launch the dietary salt initiative in a public forum where companies will state their commitments and indicate their plans. Plan subsequent events where company progress and achievement of targets can be applauded with media coverage.
Maintain a database of company challenges and successes. The NSRI provides an example of food company commitments at http://www.nyc.gov/html/doh/html/diseases/salt.shtml
Meet separately with companies whose progress is slower than expected.

Engage consumer organizations, scientific societies, health related NGOs

Invite and support other organizations to monitor progress against the targets. Supply the data required for monitoring as needed.

Dealing with technical issues, controversies, barriers

Food companies are especially concerned about certain issues when negotiating salt reduction such as the need for new technologies, the acceptability of reformulated foods by consumers, reductions underway and food safety. Governments must make themselves aware of these issues and consider them in the targets and timelines to be set. It is very important though to stress that for most food categories it is possible to initiate salt reduction through simple salt removal since the baseline levels of salt are normally very high and the first targets can be achieved within taste thresholds for salt that are acceptable to consumers. In later stages of reformulation, further lowering salt content poses greater challenges as there may be need for salt substitutes and/or large and costly changes to food processing methods and equipment. For these reasons stepwise approaches have been adopted, to allow reductions to parallel the taste adaptation of consumers and also permit development of new technologies and production processes. Discussions with food technologists in advance of meetings with industry, to understand reformulation opportunities and challenges per food category, are recommended.

Use the science and the evidence

- Indicate that the science base on the health advantages of reduced salt intake is solid and frequently updated by internationally recognized scientific and public health organization eg American Heart Association (http://my.americanheart.org/professional/General/Cutting-Sodium-to-Prevent-CVD-and-Stroke_UCM_424966_Article.jsp); the Canadian Hypertension Education Program (http://www.hypertension.ca/chep-recommendations)

- Do not immediately respond to challenges raised by a single company; first carefully consider information from other companies and other countries.
- Should the issue of micronutrient fortification arise, particularly the use of iodized salt to prevent iodine deficiency disorders, see http://new.paho.org/hq/index.php?option=com_content&view=article&id=2015&Itemid=1757 for the White Paper on Improving Public Health by Optimizing Salt and Iodine Intakes, 2011 and the Final Report on Improving Public Health in the Americas by Optimizing Sodium and Iodine Intakes – A Meeting Summary

Refer to existing reformulations and targets

- If industry reformulation costs are cited as a barrier, refer to the established targets and timelines in the table of Food Category Targets and Timelines in the PAHO Region. The existing experiences have proven that there is room for meaningful reductions, particularly in the first stages of reformulation when the adjusted levels of salt remain within the acceptable range for taste.
- Reformulation is an ongoing part of the food processing industry; a substantial proportion of the reformulation costs are part of ongoing business expenses.
- Be prepared for companies being reluctant to reduce salt content of all brands especially those with global recognition. For the latter, refer to the Global Food Monitoring Group at http://www.georgeinstitute.org/global-health-landscape/food-policy/food-monitoring-group and http://www.georgeinstitute.org/global-health-landscape/food-policy/food-monitoring-group/resources for data on the salt content in best in class and best in world global brand products.

Encourage technology transfer

- Encourage and create fora for industry, especially small and medium enterprises (SME), to discuss and share technical solutions for reformulations
- if feasible contribute funds for technical research, especially to SME, as a partial solution to reducing industry costs
- Seek public commitments from the food industry for technology transfer

Invoke corporate social responsibility

- Give examples of industry leaders and be willing to highlight the success stories
- Set mechanisms whereby industry leaders can report on progress

Appendix 1

Table 1 - Food Category Targets and Timelines in the PAHO Region (as of January 2013)

		Baselines			Targets mg sodium/100g									% reduction from baseline average to last target
					Average/mean			SWA/SWM			Upper limit			
Food Category	Country and products	average/ mean (year)	SWA 2009/ 2010	upper limit (year)	2012	2014	2016	2012	2014	2016	2012	2014	2016	
Bread and bakery products	**Argentina**													
	Artisanal bread	920 (2011)		1100 (2011)	805	690								
	Bakery products	1300 (2011)		1600 (2011)	1200	1000								
	Brazil													
	Industrially produced bread and buns													
	Loaf bread	431		796							645	522		
	Buns	524		656							531	430		
	Artisanal bakery (French) bread	648									616	586		
	Canada													
	Pantry bread, rolls, bagels, croissants, flatbread		469					430	300	260			400	
	Hearth bread		531					520	490	470			600	
	Chile													
	Artisanal bakery bread	780 (2010)				450								
	Private label supermarket bread					450								
	NSRI													
	Savory breads and rolls		485					440	360					
Biscuits and Cookies	**Argentina**													
	Crackers without bran	601 (2011)		907 (2011)	570.95									
	Crackers with bran	781 (2011)		890 (2011)	741.95									
	Sweet without filling	367 (2011)		539 (2011)	348.65									
	Sweet with filling	234 (2011)		451 (2011)	222.3									
	Snack cookies	1190 (2011)		3000 (2011)	1130.5									

		Baselines			Targets mg sodium/100g									% reduction from baseline average to last target
					Average/mean			SWA/SWM			Upper limit			
Food Category	Country and products	average/ mean (year)	SWA 2009/ 2010	upper limit (year)	2012	2014	2016	2012	2014	2016	2012	2014	2016	
Biscuits and Cookies	**Brazil**													
	Salted biscuits	700		1220							923	699		
	Sweet Biscuits	360		490							419	359		
	Filled cookies	254		600							398	265		
	Canada													
	Cookies		363					320	280	240			390	
	Crackers		859					770	690	600			930	
	NSRI													
	Filled and unfilled cookies, sandwich cookies and tea biscuits		367					310	260					
	Crackers		918					780	640					
Cakes	**Brazil**													
	Cakes without filling	336		463							392	332		
	Filled cakes	250		330							282	242		
	Roulade	205		240							221	204		
	Mixes for aerated cakes	336		568							476	398	334	
	Mixes for creamy cakes	268		412							349	295	250	
	Canada													
	Baked desserts (cakes, doughnuts, muffins, pastries etc)		349					310	270	230			400	
	NSRI													
	Cakes, snack cakes, muffins and toaster pastries		359					310	250					
Meats	**Argentina**													
	Sausages, ham, morcilla	1218 (2011)		1370 (2011)	1120.56									
	Salami	1680 (2011)		2000 (2011)	1596									
	Chorizos	1750 (2011)		1950 (2011)	1662.5									
	Hamburgers	766 (2011)		1100 (2011)	651.1									
	Chicken	680 (2011)		980 (2011)	625.6									

		Baselines			Targets mg sodium/100g									% reduction from baseline average to last target
					Average/mean			SWA/SWM			Upper limit			
Food Category	Country and products	average/ mean (year)	SWA 2009/ 2010	upper limit (year)	2012	2014	2016	2012	2014	2016	2012	2014	2016	
Meats	**Canada**													
	Uncooked bacon		619					610	590	580			610	
	Cooked bacon		961					940	930	910			960	
	Uncooked fresh sausage		789					750	700	660			690	
	Cooked sausage		990					940	880	830			870	
	Cooked deli meats		1028					970	910	850			890	
	Dry cured, fermented deli meats		1592					1510	1420	1330			1400	
	Canned chicken or turkey		554					520	480	450			470	
	Canned meat		865					840	820	790			830	
	NSRI													
	Cold cuts		1085					980	810					
	Pepperoni and dry salami		1834					1740	1560					
	Cooked sausage		898					810	720					
	Uncooked sausage		838					750	670					
	Hot dogs		1059					950	850					
	Bacon		1792					1610	1470					
	Uncooked whole muscle meat and poultry		NA								450	400		
	Canned meat and sausage		987					940	840					
	Canned chicken and turkey		403					380	340					
Dairy	**Argentina**													
	Cream cheese	583 (2011)		650 (2011)	553.85	524.7								
	Danbo cheese	600 (2011)		700 (2011)	570	540								
	Cuartirolo cheese	583 (2011)		700 (2011)	553.85	524.7								
	Tybo cheese	633 (2011)		705 (2011)	601.35	569.7								
	Porsalut cheese	600 (2011)		720 (2011)	570	540								
	Mozzarella	666 (2011)		725 (2011)	632.7	599.4								

		Baselines			Targets mg sodium/100g									% reduction from baseline average to last target
					Average/mean			SWA/SWM			Upper limit			
Food Category	Country and products	average/ mean (year)	SWA 2009/ 2010	upper limit (year)	2012	2014	2016	2012	2014	2016	2012	2014	2016	
Dairy	**Canada**													
	Cottage cheese		375					350	330	280			410	
	0		472					440	410	350			600	
	Brie, camambert, cheddar, swiss, monterey, jack, brick, colby, gouda, mozzarella		720					710	700	670			770	
	Feta and feta-style		1323					1270	1210	1100			1530	
	Hard grated and ungrated													
	Processed cheese and other cheese products		1610					1520	1420	1240			1670	
	NSRI													
	Grated hard cheese		1530					1450	1300					
	Cheddar, colby, jack, mozzarella, muenster, provolone, swiss		668					630	600					
	Cream cheese		408					390	350					
	Cottage cheese		347					330	290					
	Processed cheese		1393					1250	1040					
Snacks	**Argentina**													
	Snacks	1500 (2011)		2000 (2011)	1275									
	Brazil													
	Extruded corn snacks	832		1288							1090	852	747	
	Potato chips	548		720							650	586	529	
	Canada													
	Chips, popcorn, extruded corn snacks		676					580	490	400			800	
	NSRI													
	Flavoured chips		711					570	430					
	Unflavoured chips		524					470	420					
	Puffed corn snacks		969					820	680					

		Baselines			Targets mg sodium/100g									% reduction from baseline average to last target
					Average/mean			SWA/SWM			Upper limit			
Food Category	Country and products	average/ mean (year)	SWA 2009/ 2010	upper limit (year)	2012	2014	2016	2012	2014	2016	2012	2014	2016	
Mayonnaise	**Brazil**	1269		1567							1283	1051		
	Canada		760					680	610	530			840	
	NSRI		713					640	570					
Soups	**Argentina**													
	Soups in cubes	432 (2011)		449 (2011)	410.4	388.8								
	Instant soups	255 (2011)		286 (2011)	242.25	229.5								
	Ready to consume	331 (2011)		358 (2011)	314.45	297.9								
	Cream soups	337 (2011)		355 (2011)	320.15	303.3								
	Canada													
	Bouillon and broth		296					280	260	240			360	
	Condensed wet		302					280	260	240			360	
	Ready to serve		280					280	260	240			360	
	Fresh and instant oriental noodles		309					280	260	240			360	
	Dry		388					280	260	240			360	
	NSRI													
	Canned		326					280	230					
	Broth and stock		352					320	260					
	Dry soup		820					700	570					
Pasta	**Brazil**													
	Instant pasta	2036		4718							1920.7			
	Canada													
	Shelf stable pasta, noodles and rice or other grains with sauce or seasoned		368					330	300	270			440	
	NSRI													
	Shelf stable dry seasoned pasta and stuffing mix		700 mg/ cup					630 mg/ cup	560 mg/ cup					

Appendix 2

Links to national strategies including industry commitments made public

NSRI Packaged Food Categories and Targets at http://www.nyc.gov/html/doh/downloads/pdf/cardio/packaged-food-targets.pdf

NSRI Restaurant Food Categories and Targets at
http://www.nyc.gov/html/doh/downloads/pdf/cardio/cardio-salt-nsri-restaurant.pdf

Health Canada Data Table at http://www.hc-sc.gc.ca/fn-an/legislation/guide-ld/2012-sodium-reduction-indust_data_table-eng.php

Argentina dietary salt reduction initiative at http://www.msal.gov.ar/ent/index.php/informacion-para-ciudadanos/menos-sal--vida

Brazil dietary salt reduction initiative: Nilson EAF, Jaime PC, de Oliveira Resende D. "Iniciativas desenvolvidas no Brasil para a redução do teor de sódio em alimentos processados" [Initiatives developed in Brazil to reduce sodium content of processed foods] at http://new.paho.org/journal/index.php?option=com_content&task=view&id=116&Itemid=215

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