LESS SALT LESS RISK

OF HEART DISEASE AND STROKE

REDUCING SALT INTAKE IN POPULATIONS

Report of a WHO Forum and Technical Meeting

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EXECUTIVE SUMMARY

As part of the implementation of the World Health Organization (WHO) Global Strategy on Diet, Physical Activity and Health (DPAS), WHO organized a Forum and Technical Meeting entitled "Reducing salt intake in populations". The overall objective was to develop recommendations for Member States and other stakeholders on interventions to reduce population-wide salt intake with the long term goal of preventing chronic diseases. The French Ministry of Health and the French Food Safety Agency kindly supported both the Forum and the Technical Meeting.

The main objectives of the Forum were to review and discuss:

- the current state of knowledge regarding the link between excessive salt consumption and health;
- initiatives, policies and programmes aiming at reducing population-wide salt intake;
- the effectiveness and costs of population interventions to reduce salt intake, and how to evaluate and monitor dietary salt intake;
- the main contributors to salt consumption and the role of fortified salt in iodine deficiency prevention.

Forum participants included academics, technical staff from ministries of health and representatives from food manufacturers, the catering industry, professional associations and nongovernmental organizations (NGOs) (Annex II). The presentations and the conclusions of the forum are outlined in the third part of this report.

The participants at the Technical Meeting included academics, technical staff from ministries of health and WHO staff. Having considered the information presented during the Forum, the Technical Meeting participants discussed the current rationale to be considered in the formulation of recommendations to different stakeholders; guiding principles for the development of policies aiming at salt-intake reduction; and specific issues to consider at national and international levels when implementing these policies. Based on the outcome of these discussions, the participants drafted a series of recommendations to several groups of stakeholders on possible measures which, when implemented, would facilitate the reduction of population-wide salt intake.

The participants of the Technical Meeting agreed that:

- There is strong evidence of the link between excessive salt consumption and several chronic diseases.
- Interventions to reduce population-wide salt intake have been shown repeatedly to be highly cost-effective, hence the urgency to implement strategies/policies/programmes tackling the reduction of dietary salt intake.
- Alternative vehicles to salt for micronutrient fortification should be explored and the current recommended levels of salt iodization need to be revised.
- The interaction with food manufacturers is fundamental to the success of salt reduction strategies. Multinational food industries should be encouraged to harmonize the salt content of their products according to the lowest threshold possible to avoid unnecessary variations in salt content of the same food product commercialized in different countries.

The working group discussions and the recommendations from the Technical Meeting are detailed in part four of this report.
This report will constitute a tool to be used by WHO, Member States and other stakeholders when developing and implementing policies aimed at the population-wide reduction of salt intake.

INTRODUCTION

Burden of disease

In 2005, 35 million people died from chronic diseases; this represents 60% the total number of deaths (58 million) in that year. Of all deaths from chro diseases, 30% were due to cardiovascular disease (CVD). Approximately 8 of chronic disease deaths occurred in low- and middle-income countri Additionally, it is known that 80% of heart disease, stroke, and type 2 diabet and 40% of cancer can be prevented through inexpensive and cost-effec interventions (WHO, 2005).

In the WHO World Health Report 2002 (WHO, 2002) it is estimated that globally 62% of cerebrovascular disease and 49% of ischaemic heart disease were attributable to elevated blood pressure (systolic > 115 mmHg). Heart diseases are the leading cause of death for persons over 60 years of age and the second cause of death for persons aged 15–59 years. The report reviews strategies to reduce the risks associated with CVD and states that in all settings population-wide salt reduction strategies were the most cost-effective.

Expert consultation

A technical report produced by WHO and the Food and Agriculture Organization of the United Nations (FAO) recommended the consumption of less than 5 g sodium chloride (or 2 g sodium) per day as a population nutrient intake goal, while ensuring that the salt is iodized (WHO, 2003). This expert consultation stressed that dietary intake of sodium from all sources influences blood pressure levels in the population and should be limited so as to reduce the risk of coronary heart disease and stroke.

WHO's action

In response to the disease burden of chronic diseases, which is growing at an alarming rate, the Fifty-fifth World Health Assembly in May 2002 called on WHO to develop a global strategy on diet, physical activity and health (WHA55.23). The development of this strategy involved consultations with Member States in all WHO regions, other United Nations organizations, other intergovernmental bodies, and representatives of civil society and the private sector. Advice was also provided by a reference group of independent international experts.

Global Strategy on Diet, Physical Activity and Health (DPAS)

The Global Strategy on Diet, Physical Activity and Health (DPAS), together with the resolution by which it was endorsed (WHA57.17), was formally adopted by the Fifty-seventh World Health Assembly in May 2004 (WHO, 2004). The strategy recognizes the high and growing burden of chronic diseases and addresses two of their main risk factors – diet and physical activity.

The overall goal of the strategy is to promote and protect health by guiding the development of an enabling environment for sustainable actions at individual, community, national and global levels which, when taken together, will lead to reduced disease and death rates related to unhealthy dietary patterns and physical inactivity.

DPAS calls upon WHO to provide guidance to Member States on the formulation of guidelines, norms, standards and other policy-related measures that are consistent with DPAS objectives; and to identify and disseminate information on evidence-based interventions, policies and structures that are effective in promoting, among other aspects, healthy diets in countries and communities. Guidance on reduction in salt consumption by the population and individuals is an example.

Forum and Technical Meeting

As part of the implementation of DPAS, WHO organized a Forum and Technical Meeting entitled "Reducing salt intake in populations". The overall objective was to develop recommendations for Member States and other stakeholders on interventions to reduce population-wide salt intake. The French Ministry of Health and the French Food Safety Agency kindly supported both the Forum and the Technical Meeting.

This is the combined report of the WHO Forum and Technical Meeting. It outlines the purpose of the meetings, summarizes the evidence presented and discussed at the Forum, and details the conclusions and recommendations from the Technical Meeting that followed. The structure of this report follows the structure of the meetings. (For the programme see Annex III).

This report will constitute a tool to be used by WHO, Member States and other stakeholders when developing and implementing policies aimed at the population-wide reduction of salt intake.

Definition

Publications refer to sodium intake as either mass or millimolar amounts of sodium, or mass of sodium chloride (salt). (1g sodium chloride = 17.1 millimolar amounts of sodium or 393.4 mg of sodium).

For the purpose of the meeting discussions and of this report, it should be noted that the word **salt** was used to refer to **sodium** and **sodium chloride intake**.

The term **limitation of dietary salt intake** implies the reduction of total sodium intake from all dietary sources including, for example, additives such as monosodium glutamate and preservatives.

OPENING SESSION

Dr Michel Chauliac,
on behalf on the French Minister of Health

The meeting was opened by Dr Michel Chauliac, Coordinator of the French Nutrition and Health Plan at the Ministry of Health, who presented the opening speech on behalf of the Minister of Health of France.

Dr Chauliac welcomed all the experts to Paris and explained that the Forum and Technical Meeting had been jointly organized by the French Ministry of Health, L'Agence Française de Sécurité Sanitaire des Aliments (French Food Safety Agency; AFSSA) and WHO. He noted that, among other topics, the purpose of the meeting was to take stock of the scientific data on the effects on health of excessive sodium consumption, and in particular its effects on cardiovascular health. He informed participants that the meeting coincided with the publication by the Ministry of Health of a new guide for health professionals, which focuses on the risk factors of high blood pressure, and in which excessive salt consumption is included.

Dr Chauliac mentioned that in 2004 the French parliament adopted a Public Health Act setting forth approximately one hundred targets to be achieved by the year 2008; one of them was the reduction of salt intake to less than 8 g per person per day. The French Food Safety Agency, hosting institution of the Forum and Technical Meeting, has been heavily engaged in the implementation of this Act. A working group was constituted in 2001, and brought together scientists, physicians, consumers and various sectors of the food industry, to enable a dialogue between the health sector and industry. He reinforced his belief that health policy in this area must stand on two pillars: the first, the prevention of risk, information for the general public and health education; and the second, action to improve the quality of the food supply.

Dr Chauliac noted that in France only 10% of total dietary salt intake comes from salt added during cooking or at the table. This makes it essential for processed food products to be labelled. In the near future, food labelling is also due to be amended as a result of a European directive developed at the request of France, in order to clarify the nutritional composition of food products. Beyond this, it is the addition of salt during industrial food processing that needs to be reduced, taking into account the need to add salt for reasons of food safety, preservation, processing requirements, and taste. Each branch of the food industry works under different constraints which must be taken into account to ensure that reduction of salt content is achieved by agreement and consensus.

On 6 September 2006, at the presentation of the National Nutrition and Health Programme (2006–2010), all the relevant stakeholders were mobilized to put their signatures to commitments concerning the nutritional composition of food, its presentation and marketing. By the end of 2006, the Ministry of Health expects to have signed the first charters in this respect, which will include specific commitments to reduce salt content.

The contribution of France to the adoption of DPAS by the World Health Assembly in 2004 was highlighted, and Dr Chauliac reiterated that France wishes to remain in the forefront of food policy with respect to health. He ended his speech by mentioning that the debate that would take place in the following days was a valuable opportunity to exchange good practices, to broaden minds, and to put forward solutions that are applicable in economic and social situations that are very different from one country or continent to another.

Dr Pascale Briand
Director General of French Food Safety Agency (AFSSA)

Dr Briand welcomed all participants to AFSSA and highlighted the joint collaboration of the French Ministry of Health, AFSSA and WHO in the organization of this meeting.

Dr Briand recognized the high burden that the rising prevalence of chronic diseases imposes on many health systems, and emphasized the high prevalence of cardiovascular disease and its risk factors, particularly high blood pressure, in France.

Dr Briand noted that efforts should be made to reduce the prevalence of high blood pressure as this would contribute directly to the reduction of cardiovascular diseases rates. She mentioned that one of the most cost-effective means to the reduction of high blood pressure in both developing and developed countries was population-wide reduction in salt intake. Finland was given as a successful example of prevention of cardiovascular mortality. Through health promotion campaigns and sustained policy implementation a 30% reduction in population hypertension levels had been accomplished.

AFSSA is committed to achieve population-wide reduction in salt intake. In 2000, AFSSA recommended a reduction in salt consumption by the population of France and an evaluation of the achievability of a gradual decrease in the salt content of processed foods. In the following years, a working group with representatives from diverse areas was created and three main objectives were set: (1) to estimate salt intake in adults in France, (2) to identify the major sources of salt consumption, and (3) to propose measures to reduce the intake. A survey showed that the mean intake of salt was around 9 g/day.

Several recommendations and goals were then defined by the working group:

- reduce salt intake in the population by 20%
- reduce salt content in those products found to be the most important vehicles of salt
- launch public information campaigns on overall nutrition.

In 2004, the Public Health Act was adopted. One of its objectives is to reduce salt content in foods and it defines the consumption of less than 8 g of salt per day in French population as the national goal for salt consumption. Since then progress in salt-intake reduction has been made and will be presented in more detail during this Forum.

Dr Briand ended by emphasizing that much work still needed to be done to achieve the goal of 8 g salt/day, and she hoped that this meeting could also contribute to the common goal of reducing worldwide dietary salt intake.

Dr Robert Beaglehole
Director, Chronic Diseases and Health Promotion Department World Health Organization

Dr Robert Beaglehole, gratefully acknowledged the support from the French Ministry of Health and the French Food Safety Agency and welcomed all the participants to the meeting on behalf of WHO.

He pointed out the importance of taking further steps in the implementation of DPAS based on the growing epidemic of chronic diseases worldwide. He described the objectives of the meeting and explained that the procedure of dividing this meeting in two parts – Forum and Technical Meeting – had already been used successfully by WHO to discuss other topics. This structure endeavoured to favour the development and drafting of recommendations that were virtually unbiased from any interest group.

Prof Joel Ménard and Dr Sania Nishtar were appointed chair and vice-chair persons of the Forum, and Ms Jacqui Webster, Dr Suzanne Soares-Wynter and Ms Vanessa Candeias as the rapporteurs.

Objectives of the Forum

The objectives of the Forum were to review and discuss the current state of knowledge regarding:

- the link between excessive salt consumption and health;
- initiatives, policies and programmes aiming at reducing population-wide salt intake;
- the effectiveness and costs of population interventions to reduce salt intake,
- how to evaluate and monitor dietary salt intake;
- the main contributors to salt consumption worldwide;
- the role of fortified salt in iodine deficiency prevention.

Forum participants included representatives of ministries of health, the food and catering industry, professional associations, NGOs, academics and WHO (Annex II).

Objectives of the Technical meeting

The objectives of the Technical Meeting were to:

- consolidate the evidence and the current state of knowledge discussed during the Forum;
- formulate recommendations to different stakeholders on how to intervene to promote the reduction of population-wide dietary salt intake;
- discuss guiding principles to be considered by ministries of health when developing and implementing policies aimed at salt intake reduction;
- discuss specific issues to consider at both national and international levels, when implementing salt reduction policies.

Technical Meeting participants included a member of the virtual network of experts for the implementation of DPAS, and representatives of ministries of health, academics and WHO (Annex II).

WHO FORUM

All the presentations given during the Forum were summarized, supplemented by comments provided by the speakers, and are presented in this section.

The scientific evidence for the role of salt in cardiovascular health

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Many lines of investigation, including genetic studies, epidemiological studies and interventional studies, have provided evidence for a causal relationship between salt intake and cardiovascular disease. Several prospective studies have investigated the association between dietary sodium and risk of cardiovascular disease. A significantly positive association between sodium intake and stroke has been reported in at least two of these studies; one in overweight adults in the United States of America (He J et al., 1999) and the other in a Japanese cohort (Nagata et al., 2004). In a study of Finnish men and women, urinary sodium excretion was significantly positively associated with mortality from cardiovascular disease but not with mortality from stroke (relative risk = 1.3 in men) (Tuomilehto et al., 2001). In the National Health and Nutrition Examination Survey which examined the relationship of dietary sodium to cardiovascular disease as a whole, dietary sodium intake was significantly inversely associated with mortality from cardiovascular disease (Cohen et al., 2006). However, this finding has been questioned because of methodological limitations in the study.

Many epidemiological studies have demonstrated that high salt intake is associated with an increased risk of high blood pressure. In the InterSalt Study, the association between blood pressure and salt intake was studied in 52 communities with a wide range of salt intake (INTERSALT Cooperative Group, 1988). Four communities studied had a low salt intake (≤ 3 g/day) and the rest had an intake of 6–12 g/day of salt. The study showed there was a positive relationship between salt intake and blood pressure. There was also a positive and highly significant relationship between the increase in blood pressure with age and salt intake.

The efficacy of reduced sodium intake in lowering blood pressure is well established. In a Cochrane systematic review (including 17 trials in individuals with elevated blood pressure and 11 trials in individuals with normal blood pressure) a modest reduction in salt intake for a duration of 4 weeks or more was found to have a significant and, from a population viewpoint, important effect on blood pressure (He & MacGregor, 2004). In those with elevated blood pressure the median reduction in 24-h urinary sodium excretion was 78 mmol (4.6 g/day of salt), the mean reduction in blood pressure was 4.97 mmHg (systolic) and 2.74 mmHg (diastolic). In individuals with normal blood pressure the median reduction in 24-h urinary sodium excretion was 74 mmol (4.4 g/day of salt), the mean reduction in blood pressure was 2.03 mmHg (systolic) and 0.99 mmHg (diastolic). This meta-analysis also demonstrated a correlation between the magnitude of salt reduction and the magnitude of blood pressure reduction, within the daily intake range of 3 to 12 g/day of salt.

However these findings may exaggerate the possible benefits achievable in routine clinical practice. An individual's blood pressure response to changes in sodium intake (salt sensitivity) is determined by genetic factors, age, body mass, associated diseases and ethnic factors. Furthermore, people find it possible to reduce their dietary sodium intake through individual effort in the short term, but a more plausible estimate of effect is obtained when long-term trials are assessed.

Another meta-analysis (Hooper et al., 2004) reviewed the results of all

unconfounded randomized trials aiming to reduce sodium intake in healthy adults over at least 6 months. Three trials in normotensive people, five trials in those with untreated hypertension, and three trials in people being treated for hypertension were included, with follow-up from six months to seven years. The large high quality studies used intensive behavioural interventions. Deaths and cardiovascular events were inconsistently defined and reported. There were 17 deaths, equally distributed between intervention and control groups. Systolic and diastolic blood pressures were reduced (systolic by 1.1 mmHg and diastolic by 0.6 mmHg) at 13–60 months, as was urinary 24-h sodium excretion. Degree of reduction in sodium intake and change in blood pressure were not related.

It is clear that intensive interventions, as demonstrated in the Dietary Approaches to Stop Hypertension (DASH) study (Sacks et al., 2001), are capable of reducing salt intake and lowering blood pressure. Such interventions however would not be practicable to implement on a wide scale in primary care on a long-term basis. Advice to reduce sodium intake has been also shown to help people on antihypertensive drugs to stop their medication while maintaining good blood pressure control.

Although our understanding of long-term effects of reducing dietary salt intake on cardiovascular morbidity and mortality can be improved by further studies, the currently available scientific evidence is strong enough to justify reducing sodium intake in the whole population through cost-effective public health approaches.

A conceptual framework for the relationship between salt consumption and mortality

Prof Joël Ménard
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When performing any kind of epidemiological study, several methodological issues arise, related to the level of evidence provided by the type of study, quality assessment (internal/external validity, magnitude of the effects) and the understanding of causality. In terms of recommendations, all expert groups in all countries have concluded that salt consumption should be reduced as excessive intake of salt is linked to increased risk of several chronic diseases.

A conceptual framework for analysing the link between daily sodium intake and morbidity or mortality is shown in Figure 1. This figure also summarizes the main difficulties encountered in this risk analysis, i.e: methods for assessing salt intake; methods for measuring blood pressure; lag time between exposure and the onset of disease and the multifactorial nature of disease.

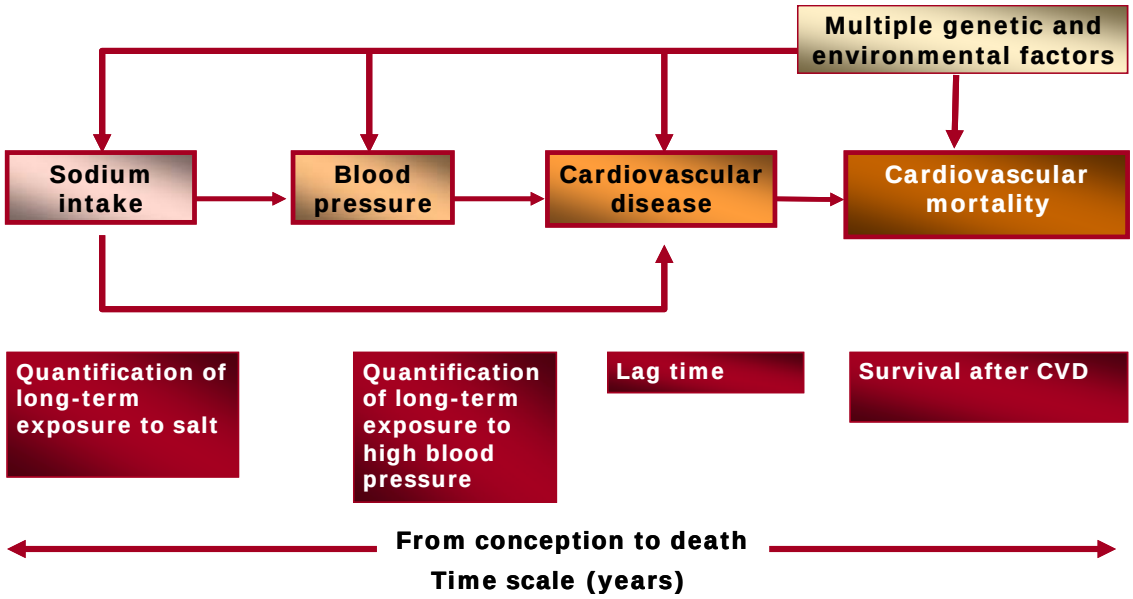

Figure 1 - Conceptual framework for analysing the link between daily sodium intake and morbidity or mortality

Three factors should be considered when evaluating the contribution of a scientific study to risk analysis of the relationship between salt intake and health:

1) What level of evidence would generally be expected from the type of study carried out? All observational studies (ecological, transverse and longitudinal) have their own strengths and limitations.
2) What is the internal validity of each study, according to methodological quality criteria?
3) What is the external validity of each study – the extent to which the conclusions of the study can be generalized to other groups or populations?

Considering salt as the exposure under study, problems begin in expressing this exposure: in some cases, sodium chloride (g) is used, and in other cases only sodium, expressed either in mmol, mEq or mg. There are also different methods to assess salt intake and different ways to express the results, rendering some difficulties in establishing comparisons.

To assess the consequence, in this case blood pressure, questions such as materials, conditions, and observer must not be disregarded. The quality in measuring the outcome, i.e. mortality, depends on the accuracy of death certificates (completeness of information, quality and verification). It should be remembered that rates of incidence and survival may influence mortality data.

As for the statistical analysis, several points must be considered in order to use the best methods possible and available to analyse the data collected: number of events, selection of cut-off points or continuous distribution, appropriate model, number of co-variables, sensitivity analysis and expression of the results.

This critical assessment highlights the benefits of a permanent and direct exchange of data between investigators, with the support of external experts not directly involved in salt research, under the coordination and sponsorship of an official body and in the absence of financial and intellectual conflicts of interest. Instead of a race to publish "original" results in high-ranking medical journals, automatically followed by aggressive comments from other scientists, a repository of data could be created, with authorized access for methodologists more interested in data analysis than in political debates. The quality criteria of the STROBE initiative could be retrospectively applied to previously-published epidemiological studies on salt and diseases (STROBE statement; von Elm & Egger, 2004).

Salt intake around the world: how to measure and what are the key contributors?

Prof Paul Elliott,
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United Kingdom

Sodium is the principal cation in the extracellular fluid and its main functions are related to volume maintenance, water balance and membrane potential of cells. The physiological need is around 8–10 mmol (184–230 mg) sodium/day and most of the ingested sodium is excreted via kidneys.

Several methods can be used to estimate sodium intake: duplicate diets, dietary surveys and urinary collection. A 24-h urine collection is considered to be the "gold standard" to measure sodium intake as it can capture 85–90% of the ingested sodium. This method presents the advantage of being unaffected by subjective reporting of dietary intakes, but shows some other limitations:

- high participant burden
- problems of completeness
- collection must be accurately timed to avoid over- and under-collection.

The INTERSALT study (1988) collected data on 24-h urinary sodium excretion for 52 population samples in 32 different countries. Results showed that more than 50% of males had an average consumption of sodium ranging from 150–199 mmol/day and about 50% of females consumed 100–149 mmol/day.

In a subsequent study, INTERMAP (Stamler et al., 2003), information on sodium intakes and 24-h urinary sodium excretion data were collected in four different countries: China, Japan, the United Kingdom of Great Britain and Northern Ireland, and the USA. The consumption of sodium was found to be highest in China.

In order to estimate sodium intake with a 95% confidence interval about the mean of consumption of +/- 12 mmol/d, a single 24-h urine collection from a sample population of 100–200 people would be required. Much larger samples would be necessary to ensure greater precision. Even though a large fall in sodium intake from high levels has been noted in some countries like Japan, for most countries the mean sodium intakes have not changed markedly over the past 20 years. Sodium intakes tend to be higher in men than women, reflecting their higher food and energy intakes. In children, the same pattern is suggested; however, several methodological problems exist and data are limited or absent in many countries.

In industrialized countries, about 75% sodium consumed comes from processed foods and food eaten away from home. In Asian countries, as well as in many African countries, the salt added in cooking and present in sauces and seasonings represent the major sources of sodium in the diet.

The effectiveness and costs of population interventions to reduce salt consumption

Prof Bruce Neal
The George Institute for International Health,
University of Sydney,
Australia

Dietary sodium consumption is a clear determinant of individual and population levels of blood pressure. Reducing dietary sodium consumption reduces blood pressure and would be anticipated to substantially decrease vascular risk. Furthermore, there are clear epidemiological data to define the likely magnitude of the blood pressure reductions and vascular risk reductions that could be achieved. Cost–effectiveness analysis should be a powerful tool in the argument for cardiovascular disease control strategies based upon reductions in dietary sodium consumption.

A search of the medical literature was carried out to find relevant studies reporting the cost–effectiveness of interventions to reduce population salt consumption. Two substantive reports were identified. The first estimates the cost and health consequences of interventions to reduce salt intake in the Norwegian population (Selmer et al., 2000). The second published describes the cost-effectiveness of reducing population salt intake in comparison to and in conjunction with a range of interventions for the lowering of blood pressure and/or cholesterol levels (Murray et al., 2003). Two further reports were also identified but each was of only limited relevance. One is a brief report prepared for the Disease Control Priorities in Developing Countries Project (Willet et al., 2006). The other (Chang et al., 2006) is a trial of the effects of salt substitution

and includes a report on the impact of the intervention on health-care expenditure during the trial.

In a study by Selmer and colleagues (2000) the interventions consisted of :

- population-wide targeted information campaigns
- decreases in salt content of processed foods
- labelling changes
- enforced taxation/subsidization of foods with high/low salt content.

The baseline hypothesis was that the intervention would produce a 50% reduction in the daily salt consumption. The Markov model was used in the analysis and the effects on health outcomes and economic parameters were modelled for 25 years. The results showed an overall mortality reduction of 1–2%, an increase in the average life expectancy and a 5% reduction in the number of people requiring treatment for raised blood pressure. Modelling of the economic outcomes, suggested that the intervention would result in a net saving of US$ 270 million over 25 years. However, savings would not occur if the fall in systolic blood pressure was only 1 mmHg.

In the study by Murray et al. (2003) the population health effects and costs of selected interventions to reduce the risks associated with high cholesterol concentrations and blood pressure were estimated. The analysis included 17 interventions and those targeting salt reduction comprised legislation or voluntary agreements to ensure appropriate labelling changes and stepwise decreases in the salt content of processed foods. The WHO-CHOICE project (CHOosing Interventions that are Cost Effective) (WHO, 1998) was used to provide separate estimates of cost–effectiveness in 14 sub-regions defined by geographic proximity and basic epidemiology. Health benefits were estimated employing a multistage modelling tool (four health states) that allows a trace of what would happen in a given population over 100 years, with and without each intervention. The results indicate that measures to decrease salt intake, such as labelling changes and strategies to change manufactured products, are potentially very cost effective, with legislation being more cost effective than voluntary agreements.

In conclusion, the cost–effectiveness findings for population-wide reductions in dietary sodium consumption argue very strongly for the more widespread introduction of national programmes to reduce dietary salt consumption. The findings of the cost-effectiveness analyses are consistent and very favourable, and are robust to variation in key model parameters providing substantial reassurance of their validity. The currently limited impact of the cost–effectiveness data can be addressed by the development of national estimates, the presentation of the results in formats more easily comprehensible to policy-makers, and the incorporation of cost–effectiveness data into coherent national programmes seeking to change policy related to dietary salt. The WHO-CHOICE programme has great potential to support the preparation of nationally contextualized cost–effectiveness data for groups seeking to advocate the implementation of a highly-effective cardiovascular disease control strategy.

The role of fortified salt in disease prevention: iodized salt

Dr Bruno de Benoist
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Iodine deficiency is a public health problem in 54 countries and about 1.9 million people worldwide are at risk because of their insufficient iodine intake. The most vulnerable groups comprise pregnant women and children. The consequences of iodine deficiency on brain development during fetal life was the driving force that led the international public health community with the support of UN agencies, in particular WHO and UNICEF, to adopt as a goal the sustained elimination of iodine deficiency.

Iodine is an essential element that cannot be synthesized by the body and therefore food products, such as seafood, are the only available source. The iodine content of food depends on the quantity of iodine available in soils; their degradation due to erosion associated with overgrazing by livestock and tree-cutting result in iodine losses and consequently foods growing in those soils are poor in iodine.

Iodine deficiency disorders (IDD) are the consequences of hypothyroidism and this term is used to encompass all the adverse effects of iodine deficiency including not only goitre but also brain damage, poor pregnancy outcomes and impaired cognitive and physical development. The recommended indicator of iodine status is urinary iodine (UI) excretion which reflects recent iodine intake. Iodine deficiency is categorized into different levels of severity ranging from insufficient (UI median < 20 µg/l) to excessive (UI median > 300 µg/l).

In an analysis of data collected in 2003, WHO estimated that the WHO Regions of the Americas and the Western Pacific had the lowest proportion of population with insufficient iodine intake (9.8 % and 24.0%, respectively). In the other WHO regions, the figures were 56.9% (Europe), 54.1% (Eastern Mediterranean), 42.6% (Africa) and 39.8% (South-East Asia) (WHO, 2004).

Two different approaches are currently used to control IDD: iodine supplementation using a slow-release preparation such as iodized oil administered orally once a year (1 dose of iodized oil given once a year to a specific group at risk – children and pregnant women); and iodine fortification of foods, usually salt. The strategy recommended by WHO to eliminate iodine deficiency is universal salt iodization. Supplementation is currently restricted to populations living in areas of severe deficiency or who are difficult to reach, and for specific groups such as pregnant women and young children where iodized salt coverage is not sufficient. Salt was recommended as the preferred vehicle for iodine fortification because it is widely consumed in a constant amount, its production is generally centralized and therefore easy to monitor, its sensorial characteristics are not affected by iodization, and the intervention can be implemented at a reasonable cost (WHO, 2004).

In order to be effective and sustainable, the main components of a national IDD control programme should include political commitment, an operational monitoring of iodized salt quality and iodine status, and mechanisms to promote partnership.

Between 1990 and 2003, the proportion of households consuming iodized salt increased from 10–66%. As a result, WHO estimated that in 2003, the number of countries with IDD as a public health problem decreased from 110 to 54. Furthermore, in 2006, 15 countries have reached the goal of sustainable elimination of IDD.

When attempting to reduce the salt intake by populations, the issue of salt iodization must be taken into consideration. A comprehensive strategy that effectively encompasses both public health problems must be developed.

Overview and evaluation of national policies, dietary recommendations and programmes around the world aiming at reducing salt intake in the population

Prof FP Cappuccio
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United Kingdom

The WHO technical report on primary prevention of essential hypertension (WHO; 1983) and the joint WHO/FAO report on diet, nutrition and the prevention of chronic diseases (WHO, 2003) state that the population nutrient intake goal for salt should be < 5 g/day. Some countries have developed their own dietary and/or nutritional goals to address salt intake while others do not currently have any national recommendation on salt.

In most European countries, there is a wide variety of quantitative and/or qualitative recommendations on salt intake. For example, in the Netherlands the recommendation is < 9 g/day and in Portugal it is < 5g/day of salt. In Greece and Hungary, only general dietary recommendations are available (e.g. "avoid salt and foods rich in salt").

In Asia, nutritional recommendations were found for four countries and they ranged from < 5 g/day in Singapore to < 10 g/day of salt in Japan. In the African continent, only two countries, Nigeria and South Africa, have developed dietary guidelines regarding salt intake. Australia and New Zealand share the target of < 6 g/day of salt.

In North America, the target intake in Canada and USA is < 6 g/day of salt, and in the USA a specific recommendation (< 4 g/day) exists for special groups. In South America, a few countries have developed general advice ("reduce salt intake", "moderation in salt intake") and Brazil is the only country with a nutritional recommendation (< 5 g/day of salt).

Iodine deficiency is another worldwide public health problem and the main strategy to control IDD is universal salt iodization. Consequently, many countries include in their national dietary guidelines the recommendation to ensure the use of iodized salt. Potentially conflicting public health messages might result in confusion and there is an urgent need to re-visit this policy.

In some countries, specific measures to reduce population-wide salt intake have been implemented as part of an established national nutritional policy and /or cardiovascular diseases prevention policies.

These measures include, among others:

- salt labelling regulation
- consumers' awareness campaigns
- development of symbols to identify low salt products
- agreements with the food industry to lower the salt content of a wide range of products
- monitoring sodium content of food.

Efforts and commitments to reduce salt intake are still not a reality in many countries and recommendations must result in action, which should be tailored to the national context. Voluntary, as well as statutory initiatives are thus necessary. The lack of policies and/or recommendations to reduce salt intake in African and Latin American countries demonstrates regional differences in the work achieved to date to tackle this risk factor for cardiovascular diseases.

Reducing salt intake in populations: example of the French experience

Mr Lionel LAFAY
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In 2000, AFSSA recommended a reduction in salt consumption by the French population and an evaluation of the achievability of a gradual decrease in the salt content of processed foods. In the following years, a working group with representatives from different areas was created and three central objectives were set:

1) to estimate salt intake in French adults,
2) to identify the major sources of salt consumption, and
3) to propose measures to reduce salt intake.

The first National Individual Food Consumption (INCA1) Survey was carried

out using a sample of 1985 subjects ≥15 years of age, and food consumption was assessed with 7-day foods records. The mean intake of salt was around 9 g/day. Men consumed more salt than women and among men, there was a high large proportion of heavy consumers (22.8% of males consumed > 12 g/day). Bread, meat products, soups and cheese were the main contributors to salt intake in the population and, in heavy consumers, ready-to-eat meals were also important.

Several recommendations and goals were then defined by the working group:

- reduce salt intake in the population by 20%
- reduce salt content in those products found to be the most important vehicles of salt
- launch public information campaigns on overall nutrition.

In 2004, a Public Health Law was approved, stating the objectives of reducing salt content in foods and achieving an average salt intake of < 8 g/day in French population. However the application of sanctions for non-compliance is not yet established.

Some progress has been made: 33% of bakers reported having reduced salt content of their products since 2002 and, among these, 82% state that they had no complaints concerning taste; moreover 13% of them reported having planned a further reduction over the next 3 years; a 7% reduction in salt content of soups was achieved and new recipes containing less salt were formulated; new meat products with lower salt content were developed and a Code of Good Practice on the use of salt was adopted by the cheese industry.

In 2003 AFSSA, together with a consumers association, initiated a surveillance programme of salt content in food products, and re-analysed the same products in 2005. Findings were that some food groups tended to have lower salt content (breakfast cereals, some soups and some cheeses) but others had similar or higher levels (bread, ready-to-eat meals) and variability across the same range of products was very high. With regard to the evolution in salt purchases, a decrease of 3% per year was observed between 1997 and 2003.

To achieve the goal of 8 g/day salt much work still needs to be done, and the focus is directed to re-evaluating salt intake, labelling and surveillance.

Food Standards Agency and salt reduction

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The UK Food Standards Agency (FSA) Strategic Plan sets a specific target for the British population to reduce their salt consumption to 6 g/day by 2010. In order to achieve this specific goal with the wider objective of improving the dietary habits and health status of the United Kingdom's population, a consultative and partnership approach has been implemented since 2001. This strategy involves government, businesses, and consumer and health groups, based on the premise that action must address people, environment and products.

To reach the goal of 6 g/day salt consumption, the first step was to assess which foods contributed to the sodium consumption of the population. In children, white bread, breakfast cereals, crisps and savoury snacks were the top contributors and in adults the situation was the same, except for crisps and savoury snacks which were replaced by bacon and ham.

After this assessment, several meetings and consultations with the food industry took place between 2004 and 2005. In August 2005 the final Salt Targets were published, stating the agreed commitments for each product category. During the discussion period, the main obstacles discussed concerned food safety, technological limitations and proportionality (cost of change), but given the high level of support and the fact that health was part of the political agenda's priorities, these obstacles were overcome. Currently, 70 organizations, including retailers, manufacturers, trade associations and

caterers are committed to the action plan.

In addition to the partnership with the food industry, other measures needed to be considered and put into practice to reach the established goal. Therefore, people and environment were also addressed. FSA launched several campaigns to raise consumers' awareness of the deleterious effects of excessive salt consumption, and began working with NGOs at a community level to speak to the most vulnerable groups. Multinational food companies were encouraged to adopt best practices for the production of less salty foods. Improved nutritional labelling systems, health claims and signpost labelling have fostered the consumers' empowerment to make healthier food choices. The labelling options used were validated and considered effective for the consumers in the United Kingdom.

As a result of this set of actions, 20 million more people say they are cutting down on salt, half of all consumers say they now check food labels for salt and a 10-fold increase in awareness of the message "no more than 6 g/day" has been observed.

The process is to be continued and the next steps include a review to be performed in 2008 of the targets agreed with the food industry in 2005, and the monitoring of progress through assessment of salt levels in products, data on dietary intake and impact evaluation of the consumers' awareness campaigns.

Reducing salt intake in populations: the Ghana example

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Africa is undergoing an epidemiological transition resulting in a double burden of disease: infectious diseases are still highly prevalent and the prevalence of noncommunicable diseases, namely cardiovascular diseases, is increasing swiftly.

Hypertension is the most important risk factor for cardiovascular disease in sub-Saharan Africa and affects 30% of the population > 40 years of age. In Ghana 25–30% of deaths are due to cardiovascular diseases, and hypertension and its complications are responsible for the great majority of these (Cappuccio et al., 2006).

In the Ghanaian food culture, the use of salt in cooking and at table is very common. Consumption of salted fish and meat is regular, especially in rural communities, and high salt-containing "seasonings" are frequently used in cooking (Kerry et al., 2005).

A community-based cluster randomized trial was carried out to reduce salt intake in the Ejisu-Juabeng and Kumasi districts of the Ashanti region (Cappuccio et al., 2006). The sample was composed of 12 villages, randomly stratified into rural and semi-urban. Stratified random sampling within villages was performed to match population structure according to age and sex. Six villages were in the control arm and six were in the intervention arm. The intervention consisted of nutritional education and health promotion to reduce dietary intake of salt. Data collection consisted of anthropometry, blood pressure, two collections of 24-h urine, and blood sampling performed at baseline, 3 months and 6 months.

After 6 months of intervention, a mean decrease of 2.54 mmHg (range, 1.45–6.54) in systolic blood pressure and a mean decrease of 3.95 mmHg (range, 0.78–7.11) in diastolic blood pressure was seen in the intervention group when compared to the control. However, no significant changes in urinary sodium excretion were observed possibly due to a reduction in sodium intake also in the control arm. When the results from the 12 villages were analysed altogether, a change of 50 mmol in 24-h urinary sodium excretion was associated with a lowering of systolic blood pressure of 2.12 mmHg (1.03–3.21) at 3 months and 1.34 mmHg (0.08–2.60) at 6 months.

These changes in blood pressure for given changes in salt intake were comparable to those achieved in the DASH trial (Sacks et al., 2001) for comparable differences in salt intake.

This is the first community intervention study of salt reduction performed in sub-Saharan Africa and shows that further community-based strategies of health promotion to address chronic diseases (particularly cardiovascular disease) should be considered. In West Africa, the lower the salt intake, the lower the blood pressure; it would appear that a reduction in the average salt intake in the whole community may lead to a small but significant reduction in systolic blood pressure in the population. This has the potential of translating into large reductions in the incidence of cardiovascular diseases in the community.

Salt: the need for action now!

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Cardiovascular disease is the leading cause of death worldwide – 80% of these deaths are due to raised blood pressure, cigarette smoking and raised cholesterol. Of these factors, raised blood pressure is the most important direct cause of death worldwide, and this is true both in developed and developing countries.

Blood pressure throughout its range, i.e. down to a systolic pressure of 115 mmHg, is directly related to the risk of stroke, coronary heart disease and heart failure. Both high blood pressure, and the rise in blood pressure with age that occurs in nearly all societies, are directly due to our high salt intake, low consumption of potassium (particularly related to lack of fruit and vegetable intake), being overweight and a lack of exercise.

Of all dietary factors causing cardiovascular disease, by far the best evidence is for salt and its relationship to blood pressure. Epidemiological and intervention studies, studies on migrant populations, genetic studies in man, animal studies (including chimpanzees) and treatment trials all clearly demonstrate the importance of salt in elevating blood pressure. A meta-analysis of trials of modest salt reduction throughout the world has shown that a 6 g/day reduction, i.e. reducing salt intake by approximately half, would lead to an average reduction in systolic pressure in the adult population of 5 mmHg. This is turn would cause a 24% reduction in strokes and an 18% reduction in coronary heart disease. Worldwide this would lead to an approximate reduction of 2.5 million deaths due to strokes and heart attacks each year (He & MacGregor, 2003).

In most developed societies, the majority of salt comes courtesy of the food industry and is not under the control of the consumer. Indeed, in western Europe and the USA approximately 80% of all salt is hidden in these foods. Any reduction of salt intake in these countries requires the cooperation of the food industry to slowly reduce the salt content of all foods to which it has been added without the knowledge of the consumer. Some sections of the food industry are reluctant to cooperate as salt is a cheap ingredient which can make completely inedible food palatable at virtually no cost. Salt also (particularly in meat products) acts with polyphosphanates as a water-binding agent forming a gel so the product weight can be increased at no cost. It is a major drive to thirst and therefore any reduction in salt intake would cause large reductions in soft drink, mineral water and beer consumption. In highly-salted products, particularly those now sold to children, a salt taste habituation develops and children start to demand these very highly salted foods, from which the food industry makes large profits.

In the United Kingdom, a group of medical and scientific experts created Consensus Action on Salt and Health (CASH) in 1996. CASH was determined to change the national policy of health in relation to salt and to make consumers more aware of the importance of salt and thereby pressurize the food industry to reduce the salt content of all foods. CASH worked alone initially, but persuaded both the Department of Health and the Food Standards Agency to follow a similar campaign. As a result, the United

Kingdom is the first country in the world to have a coherent, systematic, ongoing reduction of the salt content of nearly all foods to which salt has been added by the food industry. Major reductions in the salt content of many processed foods have already been made, i.e. over 30% in some foods, without any consumer rejection as this process has introduced slowly over the course of a few years. Clear labelling of the salt content of foods is also vital for greater public understanding and a "traffic light" system has been adopted and will become the agreed system for all processed foods sold in the United Kingdom.

From a public health point of view, salt is an ideal target as reductions in salt content of foods can be made without the consumer being aware and therefore it requires no change in the eating habits of the population. Thus if the food industry cooperates it is a target that will be very easily achieved.

Given the example of the United Kingdom, it is now time to spread this message worldwide and get all countries to adopt a salt reduction policy. For those countries where most of the salt is hidden in food, the policy could be the same as that in the United Kingdom. However, in those countries (mainly developing countries) where most of the salt is added by the consumer, a different strategy needs to be adopted. This should include a public health campaign to highlight for the public the dangers of consuming too much salt and to encourage them to reduce the amount of salt they add to food, and particularly to reduce other sources of salt – such as soya sauce and other sauces or salted fish products. In order to try and encourage this, a new NGO has been set up – World Action on Salt and Health (WASH). WASH will target the food industry, governments and the public by setting up individual organizations as far as possible in each country. If this proves possible, it will result in the biggest improvement in public health since the introduction of clean water and drains in the late nineteenth century.

CSPI and salt reduction

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The Center for Science in the Public Interest (CSPI) has focused on issues of nutrition and food safety since 1971. CSPI is supported largely by the 900 000 subscribers to the Nutrition Action Health letter, probably the largest-circulation nutrition newsletter in the world.

Salt is by far the biggest source of sodium in the American diet and has long been known to increase blood pressure. The *Dietary Guidelines for Americans* (2005) recommend that middle-aged and older adults, as well as African Americans and people with high blood pressure, limit themselves to 1.5 g/day of sodium (i.e. approximately 3,85g of salt). Other people could consume a bit more; 2.3 g/day of sodium (i.e. approximately 5,90g of salt) . Thousands of foods contain one-fourth to one-half of a person's recommended daily limit of sodium, and many foods contain much more. The sodium situation at restaurants is even grimmer than at grocery stores. CSPI has analysed hundreds of restaurant meals and found that while fat contents vary widely, sodium levels are almost universally high, as can be seen in the reports "*Salt: the forgotten killer*" (Jacobson, 2005) and "*Salt assault: brand name comparisons of processed foods*" (Jacobson, Emami & Grasmick, 2005).

Americans are consuming more sodium than they did 20 or 30 years ago. According to national dietary studies conducted by the Department of Health and Human Services, consumption jumped from about 2.3 g/day per person in the early 1970s to about 3.3 g/day in 1999–2000. Currently, the average American consumes about 4 g/day of sodium.

In 1978, CSPI first petitioned the Food and Drug Administration (FDA) to tackle the sodium issue. One of the things CSPI asked the agency to do was to change the legal classification of salt from being a "generally recognized as safe ingredient" (GRAS) to being a "food additive". Such a change would make it easier for the FDA to limit salt to safe levels. This petition was

buttressed in 1979 when a FDA advisory committee reported that there was no basis for considering salt to be GRAS. The FDA ignored that committee's advice and rejected our petitions, but did require sodium labelling on certain foods. However, in 1983, CSPI sued the agency for continuing to consider salt to be GRAS. The FDA told the court that it wanted to see if labelling led to lower sodium levels and that if this approach failed the agency would consider taking stronger actions. The court accepted the FDA's strategy, but said that FDA would still have to determine whether or not salt was GRAS.

CSPI then turned its attention to getting food labels to list not just sodium, but also calories, saturated fat, cholesterol, and other nutrients. That culminated in the 1990 Nutrition Labelling and Education Act. Before doing anything more on sodium, it seemed appropriate to see what effect the new Nutrition Facts labels would have on salt levels in foods and in the American diet.

The current situation in the USA is as follows:

- Sodium consumption has increased, not decreased.
- The number of new low-sodium foods introduced annually has dropped by half.
- According to industry surveys, consumer concern about sodium has declined steadily.
- The FDA does not have a single employee focused on reducing salt consumption.

In November 2005 CSPI filed a petition requesting that the FDA set upper limits for salt in various categories of processed foods and to lower the Daily Value (DV) of sodium for individuals from 2.4 g to 1.5 g/day. CSPI noted in its petition that several government bodies have urged Americans to reduce their salt consumption because of salt's promotion of cardiovascular disease.

After almost 25 years of inaction from the food authorities in the USA, CSPI considers that it is time to enforce a regulatory approach to protect the consumer from the effects of excessive salt consumption, and that cutting in half the sodium levels in packaged and restaurant foods could save roughly 150 000 lives per year. The key to lowering sodium consumption is not so much admonishing consumers as requiring manufacturers and restaurants to use less salt.

Confederation of the Food & Drink Industries of the EU: the Nestlé example

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Nestlé is one the major global food companies and distributes to virtually every country. Across the food industry, questions of safety, technological feasibility, health, taste and profit are considered when developing new products or reformulating existing ones. Nestlé has led some efforts to reduce the salt content of its products, as shown by the examples in France and in the United Kingdom.

In 1998, Nestlé France assessed the nutritional composition of each range of products and developed nutritional guidelines with specific criteria for product innovation and reformulation. Examples of products that underwent a salt reduction approach are meat products, soups and baby food.
Regarding the reformulation of charcuterie products, three major issues are relevant: taste, safety and clear labels. Attempting to maintain a balance between the aforementioned factors and still reduce the salt content in this category of products, resulted in reductions in ham (11%); lardoons (25%), bacon (15%) and poitrine. Between 2000 and 2006, a 22% reduction in the salt content was achieved in soups, and almost all soups contain less than 800 mg sodium per portion. In baby foods, a significant reduction in the salt content has occurred since 2004 across a wide range of products.

In the United Kingdom, some progress has been made in relation to salt reduction. Specific achievements in the reduction of sodium content have occurred in bread (around 30%), breakfast cereals (33%), cakes, buns and

biscuits (20% in some products), crisps and savoury snacks (25% in potato crisps), meal sauces (25%) and soups (15%).

More efforts and a strong commitment are needed to reduce salt in processed food. All the factors, including safety, technological barriers, consumers' opinions and requirements, taste, health and nutrition, must be taken into consideration in order to achieve the most positive balance.

Contribution of the contract catering sector to salt reduction

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The EU Federation of Contract Catering Organizations (FERCO) represents the work and interests of catering associations from 12 Member States and aims to provide EU decision-makers with a better understanding of the sector. In 2005, FERCO reached 67 million consumers a day, distributed 5.5 billion meals with a total revenue of 22 billion euros.

Since 2005, FERCO has been a member of the EU Platform for Action on Diet, Physical Activity and Health and in 2006 endorsed a "5 Commitments Policy", in which recommendations for generally improved healthy nutrition are described. These include, among others, serving a wider variety of foods and promoting the use of less fat, sugar and salt, promoting the consumption of at least 5 portions of fruit and vegetables a day.

As an integral part of an overall nutrition strategy to achieve a reduction in the salt content of the meals served, it is necessary, for example, to reformulate some recipes, implement consumer information and awareness campaigns, cooperate with suppliers and introduce the use of iodized salt.

In 2004, the British Hospitality Association (BHA) integrated the United Kingdom Government's campaign to encourage a reduction in salt intake. As a result, recipes were revised, salt was removed from tables, and a gradual reduction in salt content of meals was undertaken.

Another example from the United Kingdom comes from the Compass group that worked with Baxter's soups and together achieved a 25–50% reduction in the salt content of soups. The same group has reduced the salt content of meals in primary schools by 38% since 2002.

In the Netherlands, VENECA has developed a manual of procedures in which one of the stated recommendations is "use very small amounts of salt" and the Sodexho group has promoted healthy eating campaigns in staff restaurants and made available, through its Intranet, a Food Manual containing nutritional information. The Albron group has adopted a price policy, raising the price of unhealthy snacks whilst lowering the price of healthier options.

In France, Sodexho launched web sites with nutritional information and a call centre for consumers.

The contract catering sector has demonstrated efforts to improve the nutritional quality of meals that are distributed, to raise consumers' awareness and to offer useful information services.

SUMMARY AND CONCLUSIONS

A summary and some initial conclusions from the forum were presented. This was followed by a discussion. The points presented below represent the views of the forum participants:

- There is conclusive scientific evidence of the adverse effect of excessive dietary salt consumption on health, particularly on blood pressure, leading to cardiovascular disease, gastric cancer, osteoporosis, cataracts, kidney stones and diabetes (Cappuccio & MacGregor, 1997; Cappuccio et al., 2000).

- Current recommendations indicate that in order to prevent chronic diseases, the population average consumption of salt should be < 5 g/day (< 2 g/day of sodium) (WHO 1983, WHO 2003).

- Population-wide reductions in dietary sodium consumption are highly cost-effective. Hence the need to give priority to the implementation of national strategies/policies/programmes aiming at the reduction of dietary salt consumption.

- Policies to reduce dietary salt intake need to be implemented through work in three main areas: **food production** through the development of products and/or meals with no added salt or the lowest content of sodium possible; **changes in the environment** ensuring that the healthier food items are the easiest choice for the consumer (e.g. through a clear labelling system of all processed foods and meals) and through wide and active **health promotion and consumer education** (in all population groups).

- There is a significant variation in the levels of salt consumption between countries, and also significantly different patterns of consumption. In European and North American countries the main sources of dietary salt are processed foods, restaurant services, and catering, while in Asian and African countries the main sources are the salt used in cooking and sauces.

- Urbanization has a large influence on dietary habits, and therefore its effects on dietary salt intake should not be disregarded when developing salt reduction policies.

- Governments should consider statutory regulation to lower salt in food products if alternatives to legislation, such as self-regulation or voluntary guidelines, do not result in adequate change after a specified amount of time.

- Assessment and monitoring of policy implementation and variation in salt intakes is fundamental. More data on the sources of dietary salt and the impact of dietary habits on consumption would support the development of more effective policies and interventions.

- Monitoring and evaluation mechanisms need to be integrated into planning from the outset of policy development and taken into account in budgeting. Systematic monitoring and evaluation of the policies implemented will permit the identification of any constraints and allow early corrective action, and will facilitate the measurement of the effectiveness and efficiency of the desired outcome of the programme.

- Measuring 24-h urine sodium excretion in representative sub-samples, stratified by sex and age provides absolute estimates of baseline salt intakes for comparison across different population groups and different regions. Additionally, urine spot analyses should be considered as a valid method to monitor dietary salt intake over time if integrated into national intervention surveys.

- Consumption data for children are scarce, and very few countries have recommendations on salt intake for children and adolescents. This age group should not be neglected in terms of salt consumption recommendations when nutrition policies are being developed.

- Health professionals (nutritionists, dieticians, physicians, nurses, etc) should be trained to counsel patients about the risks of excessive salt intake, about the major sources of sodium in their diets, and how to reduce sodium intake. This topic should also be included in academic curricula in schools and universities.

- Associations of health professionals (nutritionists, dieticians, physicians, nurses, etc) should exert their influence within each country to raise awareness amongst relevant stakeholders of the adverse effects of excessive salt consumption. They should advocate for the implementation of dietary salt reduction strategies by governments, the food industry and also at the individual level by their patients.

- Alternatives to the use of salt fortified with micronutrients such as iodine or fluoride need to be urgently explored.

- The progress made in terms of product reformulation in some countries (generally high-income countries) needs to be reflected when the same food products are sold in markets in low- and middle-income countries.

- Individuals in whom changes in salt intake or excretion cause large changes in blood pressure are often referred to as "salt sensitive". Whilst salt sensitivity may exist in some individuals or groups, this issue should not prevent nor influence the development of population-wide salt reduction policies as only a small proportion of the population may fail to respond, and for these people the implementation of policies aimed at the reduction of dietary salt intake will not have a harmful effect.

Conclusion

There was consensus throughout the discussions that the current scientific evidence was conclusive about the adverse effects of excessive salt consumption on health. Interventions to reduce population-wide salt consumption are highly cost-effective and should therefore be given priority. Forum participants highlighted the need to translate the evidence and available data into effective advocacy messages to approach decision- and policy-makers and raise awareness of the urgency to reduce population-wide salt consumption.

It was also agreed that population-wide salt reduction can be achieved most effectively through a multisectoral and interdisciplinary approach where all relevant stakeholders are actively engaged. Before the implementation of any salt reduction policy, it is important to take into account ongoing initiatives and programmes, existing structures and institutions (including NGOs and private sector), as well as existing barriers including actual legislation and budgetary priorities. Additionally it was reinforced that in order to succeed, all strategies and interventions should be tailored to the characteristics of the country and populations within it.

TECHNICAL MEETING

Introduction

The Technical Meeting was attended by academics, technical staff from ministries of health, a member of the virtual network of experts for the implementation of DPAS and WHO technical staff (Annex II). Dr Robert Beaglehole led a short plenary session with all participants, explaining the objectives of the Technical Meeting and the organization of the working groups. The participants were divided into three working groups, Prof Paul Elliot, Dr Sania Nishtar and Ms Jacqui Webster were appointed as chairpersons, and Prof Bruce Neal, Dr Darwin Labarthe and Dr Suzanne Soares-Wynter were appointed as rapporteurs for each working group respectively.

Having considered the information presented during the Forum, the Technical Meeting participants discussed the rationale to be considered when formulating the recommendations for different stakeholders; guiding principles for the development of policies aimed at reducing salt intake; and specific issues to consider at national and international levels when implementing these policies. Based on the outcome of these discussions, the participants drafted a series of recommendations addressed to several stakeholders on possible measures which, when implemented, would facilitate the reduction of population-wide salt intake. Brief summaries of the discussions and conclusions of the working groups are reported below. These conclusions form the basis for the recommendations that follow.

The conclusions and recommendations reflect the work of the participants of the Technical Meeting and have not been endorsed by WHO governing bodies.

Working Groups

Rationale for recommendations

Working Group 1 discussed the current scientific evidence available for the development of recommendations. The main topics considered were: the effects of sodium consumption on chronic diseases; the burden of cardiovascular disease; international recommendations for daily sodium consumption; monitoring and evaluation of dietary salt intake; the cost-effectiveness of reducing population-wide salt consumption; and the use of salt as a vehicle for fortification.

Guiding principles for policy development and implementation

Working Group 2 discussed general principles for the development and implementation of policies aimed at reducing dietary salt intake. The main topics considered were: the establishment of goals, main stakeholders and settings to be considered; possible partnerships between relevant stakeholders; monitoring and evaluation of the interventions considered; and legislation versus self-regulatory approaches to reduce the salt content of processed foods and meals.

Main areas for intervention

Working Group 3 discussed specific points regarding the implementation of national/ international actions on salt intake reduction. The main topics considered were: areas of intervention to reduce population-wide dietary salt intake; consumer awareness and social marketing; labelling; and product reformulation.

RATIONALE FOR RECOMMENDATIONS

Effects of sodium on blood pressure

Conclusive evidence for the effects of dietary sodium on blood pressure comes from a broad range of different studies performed in animals and humans and including anthropological projects, observational studies and clinical trials. In rural societies in developing countries sodium excretion is very low (1–10 mmol/day), potassium excretion is high (80–200 mmol/day), blood pressure does not rise with age and there is a very low incidence of high blood pressure and cardiovascular disease. When populations migrate from such an environment to a more industrialized urbanized environment, there is an increase in blood pressure over a period of months that appears to be attributable primarily to an increase in dietary sodium consumption. (Denton, 1982; WHO, 1982; INTERSALT Cooperative Group, 1988; Elliott, 1989; MacGregor et al., 1989; National Research Council, 1989; Cutler et al., 1991; Elliott, 1991; Law, Frost & Wald, 1991; Denton et al., 1995; Elliott et al., 1996; Midgley et al., 1996; Cutler, Follmann, & Allender, 1997; Graudal, Galloe & Garred, 1998; Sacks et al., 2001; Scientific Advisory Committee on Nutrition, 2003; Institute of Medicine, 2004).

Large-scale observational studies have been key to understanding the association of sodium with blood pressure and vascular disease and the most widely cited of these is INTERSALT. First reported in 1988 (INTERSALT, 1988) this study identified significant positive associations of 24-h urinary sodium excretion with systolic and diastolic blood pressure. This was found in two sets of investigations: in cross-population analyses for the 52 population samples; and at the individual level for the 10 079 participants aged 20–59 years. More recently, overviews of observational studies comparing sodium consumption and blood pressure between populations and overviews of studies comparing sodium and blood pressure between individuals within the same population have confirmed these findings.

The effects of sodium on blood pressure were observed amongst both hypertensive and non-hypertensive individuals. Effects were found to be greater amongst older individuals and were greater amongst people with higher baseline blood pressure levels (Law, Frost & Wald, 1991). However, while the response to sodium reduction does vary between individuals, the concept of salt sensitivity is not particularly valid, with the vast majority of most populations likely to achieve blood pressure reductions and health benefits from a reduction in dietary salt consumption.

There have been many high quality randomized trials of sodium restriction that confirm the findings of the observational epidemiology. Systematic overviews and meta-analyses of the results of these trials clearly demonstrate that reducing dietary sodium decreases blood pressure with greater effects in the elderly and amongst individuals with higher starting blood pressures (Cutler et al., 1991; Law, Frost & Wald, 1991; Cutler, Follmann & Allender, 1997)

It is of note that blood pressure lowering effects with sodium reduction were observed amongst individuals with normal blood pressure as well as amongst people with high blood pressure and that in both cases the reductions achieved would be anticipated to translate into significant health benefits.

Effects of sodium on vascular disease and other serious outcomes

Multiple observational studies show clear associations of sodium consumption with vascular disease as well as a range of other conditions including gastric cancer, osteoporosis, cataracts, kidney stones and diabetes (Cappuccio & MacGregor, 1997; Cappuccio et al., 2000).

While direct evidence of the beneficial effects of sodium reduction on major vascular events is absent, the rationale for expecting benefit from sodium restriction is very strong. Lower sodium consumption results in lower blood pressure and lowering blood pressure is a profoundly effective means of reducing vascular risk (Prospective Studies Collaboration, 1995; Asia Pacific Cohort Studies Collaboration, 2003; Blood Pressure Lowering Treatment Trialists' Collaboration, 2003). While there are some observational studies reporting neutral or even inverse associations between sodium consumption and vascular disease (Alderman, Cohen & Madhavan, 1998) the methodological flaws leading to serious bias in these studies are such that their findings do not seriously impact upon conclusions about the benefits to be gained from reduced sodium consumption.

The absence of evidence from randomized trials of the effects of sodium reduction on vascular events reflects the fact that such studies need to be very large, carried out over long periods of time, are very expensive, and thus are to all intents and purposes impractical for these reasons. Thus policy needs to be made in the absence of such data. Most of the trials conducted have been small and short-term and recorded few vascular events. The few larger community trials that have been completed have achieved reductions in sodium consumption that are too modest to produce detectable effects on major vascular outcomes.

Burden of cardiovascular disease

Cardiovascular diseases are a large and growing cause of death and disability in high-, medium- and low-income countries (Murray & Lopez, 1997 a, b, c, d).

Cardiovascular diseases (mainly heart disease and stroke) are the leading cause of death, responsible for 30% of all deaths globally. According to the "*Preventing chronic diseases report*" (WHO, 2005) cardiovascular diseases are the leading contributors, among the chronic diseases, to the global burden of disease, as they account for 10% of all disability adjusted life years (DALYs) worldwide.

In the *World Health Report 2002 – Reducing risks, promoting healthy life* (WHO, 2002), it was estimated that cardiovascular diseases accounted for about 20% of all DALYs in high-income countries and 8% of DALYs in low- and middle-income countries. Furthermore, while the proportion of DALYs caused by cardiovascular diseases is projected to remain approximately constant in high-income countries, it is anticipated to increase sharply in low- and middle-income countries. Blood pressure was identified as the risk factor making the largest contribution to cardiovascular disease burden. Excess sodium consumption is the leading cause of sub-optimal blood pressure levels in most populations (WHO, 2002).

Worldwide, 7.1 million (13%) of deaths were estimated to be attributable to blood pressure levels above the optimum of 115 mmHg (systolic pressure). About one third of DALYs attributable to blood pressure occur in developed countries, one third in developing countries with high mortality and one third in developing countries with low mortality. Thus strategies for blood pressure control are a public health priority around the globe and not just in developed countries (WHO, 2002).

International recommendations for sodium consumption

Several national and international agencies recommend individual dietary sodium intakes of no more than 100 mmol/day (6 g salt/day) and in some cases no more than 65 mmol/day (4 g salt/day). Two WHO expert consultations recommended that the population average for salt consumption should be < 5 g/day (WHO, 1983; WHO/FAO, 2003).

While well below the average salt consumption in most countries, this recommendation reflects a pragmatic compromise since well-conducted trials clearly indicate that even greater sodium reductions (to 50–60 mmol/day) would achieve greater health benefits. (Denton, 1982; WHO – International Society of Hypertension, 1999; Sacks et al, 2001; He & MacGregor, 2004)

Additionally, numerous countries worldwide have set adequate intake levels for sodium. In Australia and New Zealand the adequate intake for adults for sodium was set at 460–920 mg/day (20–40 mmol/day) to ensure that basic nutritional requirements are met and to allow for adequate intakes of other nutrients (Nutrient Reference Values for Australia and New Zealand, 2005).

How to assess salt intake

Sodium intake can be estimated either indirectly from questionnaires or food consumption data, or directly by the measurement of urinary excretion.

Dietary survey methods require that data on intakes of various foods are converted into nutrient intakes using standardized food tables. Such methods are prone to numerous errors including reporting errors, inaccurate or incomplete food composition tables, coding errors, and sampling bias (Bingham, 1987). Specific sources of error with regard to sodium intake include difficulties in estimating the amount of sodium chloride added during cooking (including in restaurants) and at the table, variation in the proportion of salt added during cooking that is retained by the food, plate losses (i.e. salt left behind on the plate), and variation in the sodium content of processed foods and in sodium concentration of local water supplies (Bingham 1987; James, Ralph & Sanchez-Castillo, 1987).

The sodium content of processed and restaurant foods is especially important, as these contribute three-quarters or more of the sodium intake of a typical industrialized country diet (James, Ralph & Sanchez-Castillo, 1987; Mattes & Donnelly, 1991). As a consequence of these sources of error, estimates based on the food diary, weighed records, food–frequency questionnaire or 24-h recall approach tend to underestimate sodium intakes as compared with intakes estimated from duplicate diets or 24-h urine collections.

The measurement of 24-hour urinary sodium excretion is considered the “gold standard” method of obtaining data on sodium intakes in population surveys (Bingham, 1987; Bates, 1991; Hunter, 1998). This method has the advantage of being unaffected by subjective reporting of dietary intakes but takes no account of electrolyte loss other than via the kidney, so it will tend to underestimate true intake by 10% or 15%.

Both overnight and spot (casual) urine collections have been suggested as alternatives to 24-h urine collections as there is less participant burden and there is the added advantage that a timed collection is not required. With regard to spot (casual) urine samples, some studies have suggested that these may be representative of the sodium intake of the group despite the fluctuations in values for individuals over the course of a day. As spot urines are readily and cheaply obtained they may prove to be of value in monitoring sodium intakes, particularly in resource-poor settings or where 24-h urine collections are not deemed feasible. However, spot urines have not been extensively tested in epidemiological surveys and further validation is required. Regarding overnight urine collections, there is evidence to suggest that their use may result in biased estimates of sodium excretion, for example among people with hypertension a greater proportion of sodium is excreted

overnight compared with people with lower blood pressures.Assuming a standard deviation of 24-h urinary sodium excretion of about 60 mmol/day (1.38 g/day), as few as 100 men and 100 women from a representative sample, with each participant carrying out a single 24-h urine collection, would be sufficient to provide an estimate of sodium intake of a population by sex, with 95% CI around the mean of about +/- 12 mmol/day (276 mg/day). Much larger samples may be required for more precise estimates. Because of the large day-to-day variability in urinary sodium excretion (Liu et al., 1979) precision would also be improved to some extent by obtaining more than one 24-h urine collection from each individual.

There are no established biochemical techniques to monitor completeness of urine collections in large-scale population surveys, although the *p*-aminobenzoic acid technique has proven value in smaller-scale validation surveys. Therefore good survey methodology, preferably with timed start and end of the urine collection under supervision, is essential to minimize problems of over- and under-collection.

Salt intake around the world

The INTERSALT study has provided by far the largest set of standardized data on 24-h urinary sodium excretion patterns around the world, from 10 079 men and women aged 20–59 years from 52 population samples in 32 countries (INTERSALT, 1988; Elliott et al., 1996). Results showed that more than 50% of males had an average consumption of sodium ranging from 150–199 mmol/day (approximately 8.8 - 11.7 g of salt/day) and about 50% of females consumed 100–149 mmol/day (approximately 5.9 - 8.8 g of salt/day). Values over 200 mmol/day (approximately 11.7 g salt/day) in men were found in Canada, Colombia, Hungary, Ladakh (India), Bassiano (Italy), Poland, Portugal, and the Republic of Korea.

In a subsequent study – INTERMAP – information on sodium intakes and 24-h urinary sodium excretion data were collected for four different countries: China, Japan, the United Kingdom, and the USA (Stamler et al., 2003). The vast majority of people in each of the countries had urinary sodium excretion values in excess of 100 mmol/day (2.30 g/day), and few had values below 70 mmol/day (1.61 g/day). The consumption of sodium was highest in China.

A number of other studies have been published since 1988 giving data on sodium intakes or urinary excretion from different countries around the world. Most populations appear to have mean sodium intakes well in excess of 100 mmol/day (2.30 g/day), and in many (especially Asian countries) in excess of 200 mmol/day (4.60 g/day). Sodium intakes in men are greater than those in women, most likely reflecting the higher food consumption (energy intake) among men. Sodium intake in adults appears to be slightly lower after the age of 50 years than at younger ages.

A sodium intake of 65 mmol/day (1.5 g/day) has been recommended as Adequate Intake (AI) in the USA – to ensure that the diet provides adequate intakes of other nutrients, and to cover sodium sweat losses in individuals who are exposed to high temperatures, or who become physically active (Institute of Medicine, 2004). The current data suggest that the vast majority of individuals around the world have sodium intakes well in excess of this level.

Fewer data are available on sodium intake in children and young people than in adults, and these are mainly limited to the high-income nations of Europe and North America. Two recent reviews have summarized the available data on sodium intakes in children in different countries (Simons-Morton & Obarzanek, 1997; Lambert et al., 2004). The highest mean dietary sodium intake and urinary sodium excretion values were reported in China for boys and girls aged 12–16 years. High salt intakes were also found in boys in Belgium, Denmark, Hungary, the Netherlands and USA, and black boys and girls from Tennessee, USA. The lowest mean intake was observed in the youngest group comprising boys and girls aged 1.5–4.5 years from the

United Kingdom (Cooper et al., 1980; Faust, 1982; Staessen et al., 1983; Knuiman et al., 1988; Geleijnse, Grobbee & Hofman, 1990; Harshfield et al. 1991; Wu et al., 1991; Gregory et al., 1995; Lyhne, 1998; Hamulka & Gronowska-Senger 2000; Hassipidou & Fotiadou, 2001).

Main sources of dietary salt

In industrialized countries, a large proportion of the sodium ingested is added (as sodium chloride) in food production and foods eaten away from the home. James, Ralph & Sanchez-Castillo, (1987) and Mattes & Donnelly (1991) estimated that in the United Kingdom and the USA, about 75% of sodium intake was from processed or restaurant foods, 10–12% was naturally occurring in foods, and the remaining 10–15% was from the discretionary use of salt in home-cooking or at the table.

In the United Kingdom, based on National Food Survey data for 2000, the main contributors to dietary salt intake were: cereals and cereal products including bread, breakfast cereals, biscuits and cakes, meat and meat products, soups, pickles, sauces and baked beans.

Similar data are available for the USA (Cotton et al., 2004). Bread, ready-to-eat cereal and cakes, cookies, quick-breads, doughnuts, ham, beef, poultry, sausage, cold cuts, milk, cheese, condiments, salad dressing, mayonnaise, potato chips, popcorn, crackers, pretzels, margarine, hot dogs, pickles and bacon are the main contributors to dietary salt intake. With regard to restaurant foods, various dishes *on their own* contain over 2.3 g (100 mmol) sodium, i.e. equivalent to the recommended daily Tolerable Upper Intake Level (UL) for the USA (Institute of Medicine, 2004); some foods contain twice the recommended UL. For example the estimated salt content of one large slice of pizza or two thin fried pork sausages is around 1 g (391 mg or 17 mmol sodium).

In the United Kingdom, cereals contribute 38–40% of sodium present in the diets of children and young people aged 4–18 years; meats 20–24%; vegetables 14–17%, and dairy products 7–9%. In the USA, girls reporting that they ate fast foods at least four times per week had higher sodium intakes than girls eating fast foods less than once up to three times per week (Schmidt et al., 2005). Some children's foods are extremely high in sodium.

A different picture with regard to dietary sources of sodium is apparent in some Asian countries. In China and Japan, a large proportion of sodium in the diet comes from sodium added in the cooking and from various sauces, including soy sauce and (in Japan) miso. In China about 75% of dietary sodium comes from sodium added as salt in cooking, and a further 8% from soy sauce. (Mean intake of total sodium, sodium from cooking salt, and sodium from soy sauce by area, for the participants of China Health and Nutrition Survey, 2002. Source: Zhao L, personal communication.)

Looking at the main sources of sodium in the diets of INTERMAP participants from China and Japan, again the predominant source in China was salt added during cooking (78%). In Japan, the main sources were soy sauce, fish and other seafood, soups and vegetables (66% in total) with a further 10% being contributed by salt added during cooking. Some foods commonly consumed in Malaysia are also very high in sodium; for example a bowl of Mee curry and a bowl of Mee soup available from 'Hawker' markets contain about 2.5 g (109 mmol) and 1.7 g (74 mmol) sodium respectively (Campbell et al., 2006).

Finally, in many sub-Saharan African countries, particularly in less urbanized settings, the main source of dietary sodium is predominantly from salt added to food for preservation, for taste and added in the cooking process (Kerry et al., 2005).

Cost–effectiveness of interventions to reduce dietary salt intake

There is clear evidence of the cost–effectiveness of strategies seeking to achieve population-wide reductions in dietary sodium consumption (Murray, 2003). Multiple analyses have demonstrated that both statutory and voluntary agreements for sodium restriction would be either cost-saving or very cost–effective.

Furthermore, population-wide strategies for sodium restriction are estimated to be more cost effective than traditional hypertension control programmes in almost all settings. Both cost–effectiveness ratios and costs per capita for sodium reduction strategies compare very favourably with other treatment and prevention programmes already in place in developed and developing countries alike. Additionally, the estimates of cost–effectiveness made for population salt reduction strategies are robust to extensive sensitivity analyses. It is of note, however, that in the short to medium-term at least, strategies for population-wide sodium reduction will address only a part of all blood pressure-related disease. As such, population salt reduction strategies should be viewed as one highly cost-effective component of a comprehensive blood pressure control programme.

Increased efforts to provide contextualized national estimates are a priority and could be achieved easily by local advocates working with the WHO-CHOICE programme (WHO, 1998). Since the cost–effectiveness data are so strong, more widespread implementation of strategies for population-wide sodium reduction might be achieved if high quality national data about cost–effectiveness were available.

Salt iodization

Iodine is an essential element that cannot be synthesized by the body and therefore food products, such as seafood, are the only available source.

Iodine deficiency produces a spectrum of disorders: endemic goitre, hypothyroidism, brain damage, cretinism, congenital abnormalities, poor pregnancy outcomes and impaired cognitive and physical development (WHO, 1995).

Recommended daily iodine intakes in people over 2 years of age are 100–200 µg per day and urinary iodine is considered the best indicator of iodine intake (Hollowell et al., 1998; Hess et al., 1999; Andersen et al., 2001).

Two different approaches are currently used to control IDD: iodine supplementation using a slow-release preparation such as iodized oil administered orally once a year (1 dose of iodized oil given once a year to a specific group at risk, e.g. children and pregnant women) and salt fortified with iodine. Of the various methods used to supplement the diet with iodine, ‘universal salt iodization’ has been recommended and implemented worldwide (WHO, 1995; WHO, 1997).

Current WHO recommendations indicate the need to reduce iodine deficiency worldwide by using iodized salt. Moreover, in Latin America fluoride supplementation is also delivered through salt. At the same time there is a recommendation for population-wide reductions in salt intake to lower population blood pressure and associated cardiovascular outcomes worldwide (WHO, 2002).

The promotion of salt consumption overall to prevent iodine deficiencies is unnecessary. Therefore, the implementation of a universal salt iodization programme should not induce individuals to perceive that increased salt consumption is needed to prevent iodine deficiencies.

Alternatives to salt iodization

In view of the evidence linking high salt intake to high blood pressure and increased cardiovascular disease, and the recommendations for reduction in population salt intake worldwide, it is clear that alternative vehicles for iodine delivery need to be investigated. For instance, delivery of iodine through oils, though more expensive, could be considered for groups at high risk (women of childbearing age, infants and young children). The yearly supply of iodine could be given in a single administration and this would be feasible in most circumstances. Where logistics prove difficult, alternative vehicles to deliver iodine should be explored.

With a reduction in population salt intake there will probably be a need to increase the amount of iodine (from the current 20–40 ppm) particularly for the vulnerable groups (pregnant women and young children), therefore the current recommendations for salt fortification need to be revised. The increase in the concentration of iodine in salt will require careful monitoring through the existing infrastructure for monitoring the global iodization programme. There is a clear opportunity to include the monitoring of urinary sodium, potassium, and creatinine in this programme.

Research gaps

The current knowledge could be improved if further research was conducted in the following areas:

- Effects of salt reduction and/or salt substitution on mortality rates in populations with high sodium intakes such as in China.
- The use of spot urine collections as an alternative to 24-h urine collections to monitor and evaluate sodium consumption.
- Information from national surveys on country-specific dietary habits, including the main sources of dietary salt intake.
- Successful strategies to effectively reduce population-wide salt intake.
- Most adequate duration of interventions to successfully reduce dietary salt intake.
- Potential effects of the promotion of the use of iodized salt on the overall salt consumption.
- Alternative vehicles to salt for iodine fortification.

Conclusion

Several national and international agencies recommend individual dietary sodium intakes of ≤ 100 mmol (6 g salt) per day and in some cases ≤ 65 mmol (4 g salt) per day. WHO and WHO/FAO expert consultations recommended that the population average for salt consumption should be < 5 g/day. According to the current data, salt consumption levels in populations in most countries are significantly higher than these recommendations.

Sodium intake can be estimated either indirectly from questionnaire or food consumption data or directly by the measurement of 24-h urinary sodium excretion. The latter is considered to be the “gold standard” method of obtaining data on sodium intakes in population surveys.

Alternative vehicles to salt fortification need to be explored. When implementing a universal salt iodization programme, ministries of health should ensure that health promotion messages do not suggest that increased salt consumption is necessary to prevent iodine deficiency.

There is conclusive evidence on the adverse effects of excessive dietary sodium consumption on blood pressure. Multiple observational studies show clear associations of sodium consumption with cardiovascular disease as well as a range of other conditions including gastric cancer, osteoporosis, cataracts, kidney stones and diabetes. There is also clear evidence of the cost–effectiveness of strategies seeking to achieve population-wide reductions in dietary sodium consumption. Additionally, population-wide strategies for sodium restriction are estimated to be more cost effective than traditional hypertension control programmes in almost all settings.

In conclusion, although there are still some research gaps that need to be addressed, current scientific evidence strongly urges WHO Member States to develop policies and implement interventions aimed at the population-wide reduction of salt intake.

GUIDING PRINCIPLES FOR POLICY DEVELOPMENT AND IMPLEMENTATION

Guiding principles for salt reduction policies

The development and implementation of a national policy to reduce population-wide salt intake may be shaped by the following general principles:

- The policy development and implementation should take into consideration cultural background (including traditional dietary habits and the main sources of salt in the diet), existing gender issues, ethnic minorities, jurisdictional and legal structure of the country.
- A salt reduction policy should be coherent with, and complementary to, existing national policies and action plans such as food and nutrition, health promotion and chronic disease prevention.
- The overall outcome of a salt reduction policy should be the population-wide reduction in dietary salt intake.
- A coordinated and sustainable salt reduction policy should be developed with a specific budget allocated for its implementation.
- A strategy aiming at salt intake reduction should, whenever possible, attempt to mobilize and utilize existing resources (technical staff, civil society, information, ongoing initiatives, policies, etc).
- An interdisciplinary, integrated, holistic approach should be followed throughout the policy development and implementation.
- A policy aiming at salt reduction should be socially inclusive and participatory. All social classes need to be specifically targeted, particularly the most vulnerable and poor.
- Messages need to be consistent across policies and programmes, ensuring that there is no conflict between the goal of reducing dietary salt intake and other public health goals. Every policy and/or intervention should promote the reduction of salt consumption (e.g. school meal or worksite programmes should provide menus for students/workers with the lowest content in salt possible).
- Evaluation and monitoring should be done throughout the whole process of policy development and implementation.
- Best practices should prevail.

Policy development and implementation

The model below (Figure 2), adapted from the Framework to monitor and evaluate DPAS Implementation (WHO, 2006), provides some examples on how salt reduction policies, their development and implementation may influence behaviour changes and longer-term social, health and economic benefits.

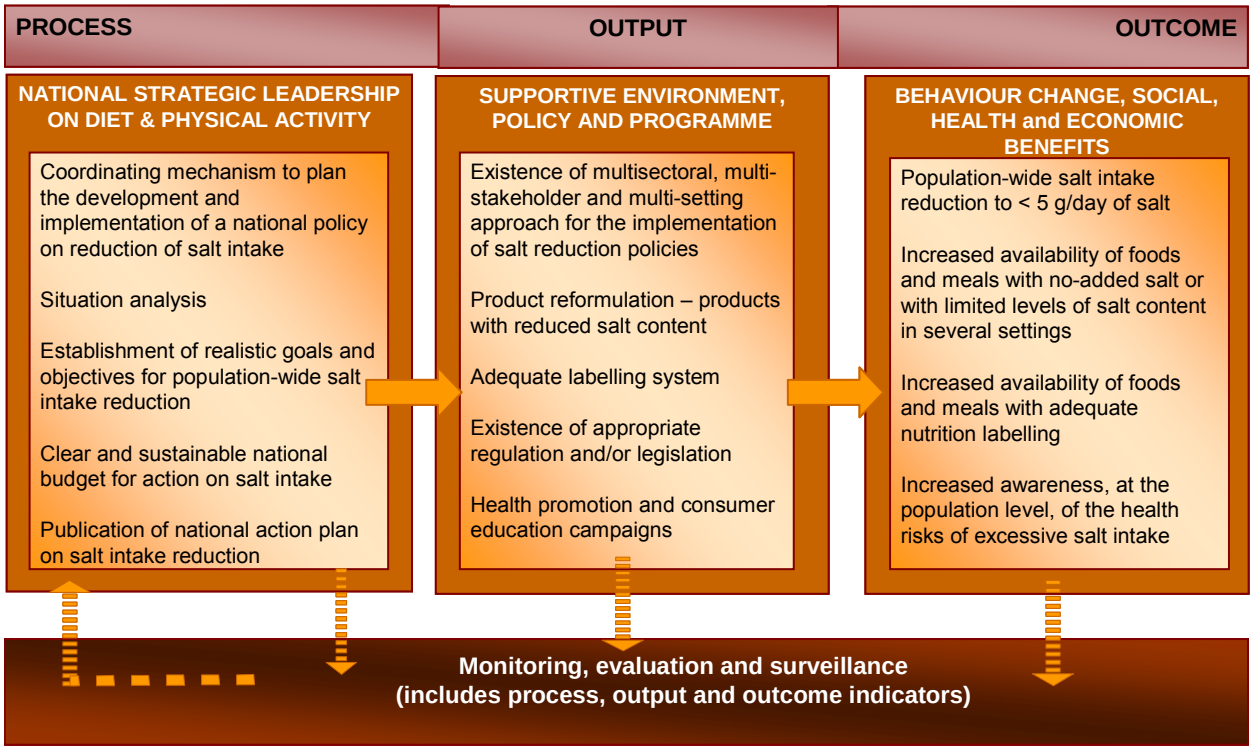

Figure 2 – Schematic model for policy development and implementation

According to this schematic model, ministries of health should provide national strategic leadership on diet and physical activity, and in this specific case on population-wide reduction of salt intake, through the development and implementation of supportive policies, programmes and environments. During this process all interested stakeholders (e.g. other ministries and other interested governmental agencies, NGOs, private sector organizations, etc.) should be involved.

The analysis and use of this model, should always consider the above-mentioned guiding principles. Additionally it should be noted that a policy on population-wide reduction in salt intake might be published individually or as part of a wider policy on diet and nutrition, health promotion, or prevention of chronic diseases.

The adopted policies will foster and enable the processes of change leading to the desired salt intake at the population level. Research, monitoring, evaluation and surveillance should continue throughout the whole process to provide the institutions involved with feedback on the population's modifications in behaviour.

Establishment of goals

Goals may differ from country to country, particularly according to the salt consumption level of the population at the moment of developing and implementing the salt intake reduction policies. National policies should seek to establish realistic and culturally-relevant goals, as well as reasonable and feasible timeframes to accomplish these goals.

The average consumption of < 5 g/day of sodium chloride should be the immediate goal for the general adult population for every country except where lower levels are appropriate and have already been set (WHO, 1983; WHO, 2003; Dietary Guidelines for Americans, 2005). Countries should aim to achieve the nationally-agreed goal in the shortest time possible. Although the consumption goal should be the same for men and women, timelines for

the achievement of this overall goal may differ between these two groups, as the initial dietary salt intake may differ significantly between men and women. For children, a lower consumption goal should be established.

When outlining objectives at the national level to reach the agreed goal, distinguishing between short-, medium- and long-term objectives may be useful, as well as a differentiation between generic and specific objectives.

Stakeholders

The possible stakeholders to be involved in the development and implementation of a policy on salt intake reduction are listed below. At the national level, each country should make an assessment of its relevant stakeholders to be involved, but ministries of health are encouraged to play the leading role in initiating and developing policies, strategies and actions aiming at reduction in salt intake. They should play a key role in convening interaction with other ministries, government-mandated food and health agencies and other stakeholders, assuming the responsibility for coordinating the inputs and integrating the interventions in the most appropriate time frame of the policy development and implementation process.

Public Sector

- ministry of health - public health
- national food safety agencies / public health institutes
- ministry of education - interventions in schools and universities, research (universities and scientific leadership), academia
- ministry of science and technology
- ministry of information/ communication
- regional and local governments, municipalities
- schools, hospitals and prisons administrations
- legislators
- public food and nutrition research institutes.

Private sector

- food and non-alcoholic beverage producers
- spices, condiments, sauces and food preservatives producers
- catering industry
- restaurants and bars
- special interest groups (industry groups, business, trade organizations)
- apex organizations of commercial groups, commercial sector organizations
- commercial sector
- salt producers and miners
- retailers
- advertising industry
- other vendors
- private schools and hospitals administrations
- media and press.

NGOs/ civil society

- community groups (including women, cultural and religious groups)
- consumer groups
- health promotion organizations
- food safety organizations
- health professional societies/ associations
- education organizations
- parent–teacher associations
- micronutrient interest groups.

International bodies

- WHO
- FAO
- UNICEF
- Codex Alimentarius
- European Comission
- regional economic groupings
- international research institutes.

Settings

Action in multiple settings is required for effective policy implementation, the following entry points should be considered for interventions:

- Food production – reducing the salt content of foods and meals produced; adequate labelling system.
- Marketing, advertising and distribution of foods.
- Food purchasing points – foods containing the lowest salt level should be the easiest option to identify and acquire; appropriate labelling system; available information for the consumer on the salt content of the food items and served meals.
- Food consumption:
- households
- schools and worksites
- public institutions (hospitals, prisons, military service etc)
- restaurants
- other food vendors (for example street vendors).
- Points of health promotion and education (academia, educational institutions, media).
- Salt production – through the production of iodized salt until an alternative vehicle for the delivery of iodine is found.

Partnerships

It is useful to differentiate between the phase of policy development and that of policy implementation as distinct alignments of stakeholders and settings may be involved in these different phases.

In policy development, interaction between stakeholders rather than partnership may better characterize the relationship. All stakeholders may be consulted in this type of interaction, under the leadership and supervision of the ministry of health,

In contrast in policy implementation, governments may enter into partnerships with industry, NGOs and other relevant stakeholders listed above, to ensure that the agreed policy is successfully implemented.

Monitoring and evaluation

In addition to the monitoring of dietary salt intake, measures to assess progress in policy development and implementation are needed. Monitoring and evaluation are systematic processes to assess the progress of ongoing activities, to identify the constraints for early corrective action, and to measure effectiveness and efficiency of the desired outcome of the programme. Planning for implementation should take monitoring and evaluation into account from the beginning and also budget for it.

When developing a monitoring and evaluation system, the following principles should be considered:

- No policy or intervention should be contemplated without including a mechanism for regular evaluation.
- Incorporate monitoring and evaluation into the planning, design and implementation processes, and include a specific budget allocation for monitoring and evaluation activities.
- Define the monitoring and evaluation strategy during programme design, ensuring the availability of baseline data and planning of the initial

surveys/assessments such that they can be used for monitoring in the future.

- Use experts in the evaluation team (e.g. statisticians, economists for cost–benefit and cost–effectiveness analysis, programme manager to determine what should be evaluated, etc).
- Ensure the wide dissemination of the evaluation results.
- All policies and interventions should include process evaluation to assess whether the programme is being implemented as planned, to identify constraints to implementation and to use the collected information to improve the implementation of policies by identifying, testing and implementing corrective measures as needed.
- Outcome evaluation should be undertaken to assess whether the intended outcomes have been achieved as a result of the policy implementation. Careful, rigorous evaluation needs to be conducted to test impact and cost–effectiveness of the interventions implemented in different contexts. The output evaluation should focus on assessing whether the policy has reached its stated goals, and also assessing success factors. The results from the outcome evaluation should be used as a tool for advocacy and raising awareness, particularly of key decision- and policy-makers.
- When planning the monitoring and evaluation system it is important to take into account and try to harmonize with ongoing initiatives and programmes, existing institutions, previous data and available indicators.

Indicators

Indicators are identified as variables which help to measure changes and that facilitate the understanding of where we are, where we are going, and how far we are from the underlying goal. They are measurements used to answer questions in the process of monitoring and evaluating a health-promoting intervention activity. The selection of indicators should be guided according to the purpose for which they were established.

Listed below are some of the indicators suggested in the framework to monitor and evaluate the implementation of DPAS that may be used for the monitoring and evaluation of policies and interventions to reduce dietary salt intake (WHO, 2006).

Process and output indicators:

- number of food manufacturers providing full nutrition labelling;
- number of products with limited levels of salt content;
- percentage of workplaces serving meals consistent with national dietary guidelines (limit salt intake);
- percentage of workplaces offering healthy snack options;
- number of awareness-raising activities for consumers;
- existence of networks and action groups formed by NGOs to promote the availability of healthy foods (reduced salt content);
- percentage of schools restricting the availability of high-salt foods (canteens, vending machines, bars).

Outcome indicators:

- percentage of the population aware of the health risks of high intakes of total fat, saturated fats, salt and sugars;
- percentage of the population recalling messages from communications campaigns or strategies on healthy diets and physical activity;
- percentage of the population with dietary sodium chloride (salt) intake < 5 g/day.

Regulation and legislation

Legislation should be seen as a helpful tool to facilitate the population-wide reduction in salt intake. Each country is encouraged to assess their national situation and determine the most appropriate type of legislation to be implemented. There are potential advantages to voluntary or self-regulatory approaches as well as to legislation, all of which should be investigated. The most suitable approach should be implemented with the hope of effective action, and with a specific time frame and monitoring system in place for evaluation of impact.

When a country chooses to adopt a self-regulatory approach to reduce the salt content of processed foods and meals, but these voluntary measures prove ineffective or insufficient, preparations to initiate legislative approaches should be taken. Voluntary approaches need strong monitoring mechanisms; independent, transparent and carried out on a regular basis.

Clear time lines should be defined for the self-regulatory approach to take action on salt content reduction. If the agreed goals are not reached, a legislative approach should be defined. In countries where there have been recommended goals but little or no progress, it may now be time for legislative action to be enforced with an adequate monitoring system.

With respect to international approaches, these are needed in the framework of economic zones or among trading partners. In addition, evidence shows that there are sometimes wide variations in sodium content of foods marketed by a single multinational company in different countries. Through interaction with these organizations, efforts should be undertaken to ensure that the lowest attained sodium content for a given food product becomes uniformly available in all countries.

Clear guidelines on the development and implementation of regulation/legislation to reduce population dietary salt intake need to be developed. WHO should consider the development of a guidance tool for Member States addressing among other topics: principles, advantages and disadvantages of self-regulatory and legislative approaches, including model legislative and regulatory provisions when implementing strategies to promote healthy diets, including the reduction in salt content of foods; labelling; advertising; public education.

Conclusion

When developing policies to address the reduction of dietary salt intake it is fundamental that policy-makers establish realistic and culturally-relevant goals, as well as reasonable and feasible time frames to accomplish these goals.

An interdisciplinary, integrated, multi-stakeholder, holistic approach should be followed throughout the policy development and implementation. Policies aiming at salt reduction should be socially inclusive and participatory. All social classes need to be specifically targeted, particularly the most vulnerable and poor. Interventions in several settings, targeting different population groups, and partnerships between different stakeholders should be considered by policy-makers in order to develop and implement effective interventions.

Measures to assess progress in policy development and implementation are fundamental to assess the progress of ongoing activities, identify the constraints for early corrective action, and to measure effectiveness and efficiency of the desired outcome of the policies and interventions. Planning for implementation should take monitoring and evaluation into account from the beginning and budget for it.

INTERVENTIONS AT NATIONAL AND INTERNATIONAL LEVELS

Pillars for interventions

Interventions at the national level should be based on three main pillars: **product reformulation**, **consumers** and **the environment**.

Regarding product reformulation, the main focus should be put on the highest reduction possible in the salt content of commercialized foods and meals.

The work with consumers should include improving nutritional education, raising awareness of the adverse effects of excessive salt consumption on health, and improving knowledge on how to read the labels and choose healthier foods.

Changes in the environment should aim to build an environment where choosing the healthiest foods is the easiest and most affordable option. Among other actions this includes the use of an adequate and easy-to-understand labelling system and the availability of foods and meals with no added salt or with the lowest salt content possible, at affordable prices to all the consumers.

National interventions to reduce population-wide salt intake

In countries where action to reduce population-wide salt intake has been taken, significant reductions in the urinary sodium excretion have occurred.

In Belgium, where the amount of sodium in bread was reduced from the mid-1960s to the early 1980s (Joossens, Sasaki & Kesteloot, 1994), 24-h urinary sodium excretion declined over the same period. In Finland which has been subject to a comprehensive public health campaign to reduce cardiovascular disease, marked reductions in salt intake (as estimated from 24-h urine collections in repeated surveys) were documented over a 23-year period (Laatikainen et al., 2006). The very high mean sodium intakes that were recorded in northern Japan in the 1950s and early 1960s are no longer found following public health campaigns to lower sodium intake in the population (Sasaki, 1980).

Also, recent interventions to reduce population-wide dietary salt intake in the United Kingdom have started to show significant results not only in the awareness of the consumers about the need to reduce salt consumption, but also in work with the industry to improve the labelling system and significantly reduce the salt content of several processed foods.

From the interventions that have already been implemented in different countries, examples of successful measures to reduce dietary salt intake, included:

- Development of a national dietary guideline on salt.
- Consumer awareness campaigns – informing and alerting consumers about the adverse effects of excessive salt consumption.
- The use of labelling highlighting the salt content of foods.
- Development of symbols/logos to identify low salt products.

- Agreements with the food industry to lower the salt content of a wide range of products.
- Monitoring the sodium content of food.
- Agreements with the catering industry and restaurants to serve meals with no added salt or with very low salt content.

Consumer awareness and social marketing

Approaches directed towards consumers to increase their awareness of sodium in foods and the impact on health vary across countries. Therefore the strategy to communicate the messages must be adapted to national reality, taking into account: culture, religion, dietary habits, literacy level of the population, gender issues, the food production chain, etc. The establishment of the appropriate avenues of communication should also take into account the level of influence that different media may have in countries, communities, groups.

It is necessary to identify key groups and individuals responsible for increasing awareness. Their roles and responsibilities must be clearly defined. The most vulnerable groups of the population should be targeted, especially children, pregnant women and elderly. Action groups should pay particular attention to food marketing directed at children which promotes the consumption of poor-quality high-salt foods.

The following suggestions may be taken into account when planning consumer-awareness initiatives:

- Employ appropriate strategies for message dissemination, including the media in those countries where the media is perceived to have a major influence.
- Produce a training manual for health professionals to ensure appropriately guided and standardized messages are given, whether at an individual or group level.
- Identify and employ consumer lobby groups to develop, monitor, and deliver consistent, simple, clear and coherent messages promoting the reduction of salt consumption.
- Test the messages developed for their adequacy and impact on consumers' awareness, before using them in campaigns.

Product reformulation

Product reformulation seems to be particularly effective in countries where the major part of dietary salt consumed by the population comes from processed foods. In these countries, government-mandated health agencies need to ensure that food producers are actively engaged in the reduction of sodium content of their products.

The following suggestions may be taken into account when planning and implementing product reformulation actions:

- Identify and monitor the main foods in each country for targeting salt reduction.
- Increase government awareness of sodium levels in available foods.
- Increase awareness among food producers of the high salt content of their products.
- Encourage food producers to contribute in a meaningful way to the implementation of the national goal for the reduction of dietary salt intake.
- Target major food producers or trade organizations to standardize the sodium content of foods that are distributed locally and internationally. This may involve countries of influence to push for international legislation or codes of conduct regarding food composition and distribution.
- Enforce clear mechanisms to monitor the food producers activities' related to the salt composition of food products (this monitoring system

should cover not only processed foods, but also catering industry, restaurants and meal deliveries in general).

- Allocate a clear budget and employ qualified staff to proceed with the monitoring of the activities of food manufacturers to reduce salt content of foods and meals.
- Assist smaller food businesses (e.g. local bakeries, traditional cheese producers, small restaurants) in their aim to provide low sodium products. This should be done with national coordination through regional and local action. Where appropriate, the production of a "tool kit" on how to reduce the salt content of locally-produced foods could be developed specifically to assist small food producers. The dissemination and implementation of such a tool kit should be done via the regional and local authorities through free information sessions for food producers and through the collaboration and supervision of qualified technical staff from national, regional and local authorities.
- Encourage the public declaration of the sodium content of foods via labels on all processed foods and meals. The labels must be clear, simple, coherent and consistent with the communication messages developed to raise consumers' awareness.

Labelling

Labelling should provide clear information on the sodium content of food products and all countries are encouraged to aim for compulsory nutritional labelling on foods.

The *Codex Alimentarius* system is considering proposals to include mandatory nutritional labelling on packaged foods in support of DPAS. This would constitute useful guidance for Member States when implementing national labelling standards. Any health claim made in the label or package of the food should respect the Codex Alimentarius recommendations (*Guidelines for the Use of Nutrition and Health Claims*, 2004). False advertising/labelling claims must be firmly avoided.

Any health claim made in the label or package of the food should respect the Codex Alimentarius recommendations (*Guidelines for the Use of Nutrition and Health Claims*, 2004). False advertising/labelling claims must be firmly avoided.

National authorities should ensure that any nutritional labelling system implemented is clear, simple, culturally-acceptable and easily understandable by the population, independently of their literacy or socioeconomic level.

The labels must also be coherent and consistent with the communication messages developed to raise consumers' awareness. Before adopting a labelling system, governments should ensure that the labels have been tested for adequacy and impact on consumer awareness and understanding.

Standards need to be developed specifically for restaurant or meal providers to ensure compliance with nutritional information requirements. This is particularly critical for food providers for school and worksite canteens.

Generally, food providers should be encouraged to offer meals with no salt added or very low salt content. Permission to utilize identification signs on healthy menu options should be explored by national authorities as a means to encourage the production and adoption of healthier meals. Meal producers should also consider employing an easily identifiable health warning label on containers of table salt bringing to the notice of consumers the deleterious effects on health of excessive salt consumption.

It should also be ensured that consumer education campaigns include information on how to read, understand and use the labelling information.

Conclusion

Recognizing differences in available resources and existing legislation within and between countries, both developed and developing countries need to commit to take measurable actions to reduce population-wide salt intake.

Interventions at the national level should be based on three main pillars: **product reformulation** (the main focus should be put on the highest reduction possible in the salt content of commercialized foods and meals), **consumer** (including improving nutritional education, raising awareness about the deleterious effects of excessive salt consumption on health, and improving the knowledge on how to read the labels and choose healthier foods), and the **environment** (by building an environment where choosing the healthiest foods is the easiest and most affordable option to population groups at all socioeconomic levels).

OVERALL RECOMMENDATIONS

Introduction

The participants of the Technical Meeting (see Annex II), having considered current scientific evidence and stakeholder experiences from different countries, agreed on the statements and recommendations given below. (Note: the conclusions and recommendations presented in this section, reflect the work of the participants and have not been endorsed by WHO governing bodies).

Nutrient intake goal

- The technical report on primary prevention of essential hypertension (WHO, 1983) and the joint WHO/FAO expert consultation report on diet, nutrition and the prevention of chronic diseases (WHO/FAO, 2003) recommended an average consumption of < 5 g/day of salt (< 2 g of sodium) to prevent chronic diseases.
- Countries should commit to reducing the average salt consumption of the adult population to < 5 g per day, except where lower levels have already been set (Dietary Guidelines for Americans, 2005).
- Countries should develop a clear strategy to achieve this goal. This should include measurable objectives, targets, indicators (including for population subgroups), and a time frame for their accomplishment in the shortest possible time.

Monitoring salt intake assessment

- Salt intake should be estimated initially by measuring sodium excretion in 24-h urine collections in representative sub-samples of the population stratified by sex and age. This will give absolute estimates of baseline salt intakes for comparison across different population groups and different regions.
- Changes in population salt intakes need to be assessed over time via monitoring of urinary sodium excretion and, where appropriate, in conjunction with the established WHO programme for monitoring urinary iodine levels.
- Use of spot urine collections to monitor changes in salt intake over time should be considered as a possible alternative to repeated 24-h urine collections to increase the feasibility of monitoring, despite expected requirements for substantially greater sample sizes with this approach.
- National knowledge, supplemented as necessary by regional and local periodic surveys on dietary sources of salt will be required to:
  - inform context-specific approaches to reducing mean salt intake in the population, and
  - monitor changes in the salt content of processed foods and other major sources of salt in the diet.

Monitoring and evaluation of policies/ programmes/ initiatives

- In addition to the assessment and surveillance of dietary salt intake, it is essential to undertake monitoring and evaluation of the policies, programmes and initiatives developed and implemented. Systems and specific indicators adapted to the country context are needed (WHO, 2006).
- Surveillance and monitoring activities should be integrated into existing systems for monitoring and evaluation in countries. Where relevant, such activities should be consistent with existing WHO initiatives (e.g. WHO STEPS programme).
- There is substantial evidence from different countries and from research modelling work that programmes to reduce population-wide salt consumption are highly cost-effective. National estimates of the cost–effectiveness of the planned strategies should be developed and used to increase the national uptake of these programmes. WHO-CHOICE (WHO, 1998) might be a useful tool for the performance of these analyses.

Stakeholders

- Ministries of health are encouraged to play the leading role in initiating and coordinating the development of policies, strategies and actions aimed at reduction of salt intake. An intersectoral and multidisciplinary approach should be fostered and pursued through the ministries of health to facilitate the development, implementation and monitoring of policies.
- National food authorities or other appropriate government-mandated public health agencies should be responsible for monitoring the actions of the food sector to ensure they comply with the existing national goals and recommendations for salt reduction.
- Ministries of health should ensure that health promotion messages do not inadvertently promote overall salt consumption. This is of particular concern in view of the potential conflict between two major public health goals – reducing average population salt intakes, and tackling iodine deficiency. The current recommended strategy for IDD control is based on correcting this nutritional deficiency by increasing iodine intake through food fortification. Salt is the most commonly-used vehicle for this purpose. In order to meet the iodine requirements of a population it is recommended to add 20–40 ppm iodine to salt, assuming an average salt intake of 10 g per capita per day (WHO, 1996).This recommendation needs to be adjusted in view of the goal to reduce average population salt intakes to < 5 g per day.
- When developing national policies, policy-makers need to consider the potential adverse effects of urbanization and other factors which might impact on dietary patterns in general and on salt consumption specifically, in order to target the most vulnerable groups effectively.
- Food producers and food distributors (catering companies, restaurants, schools and worksite canteens, etc) are strongly encouraged to take initiatives to reduce the salt content of their food products and/or meals to the lowest salt content possible, knowing that consumers progressively adapt their taste to the offered salt intake.
- Multinational food industries are strongly encouraged to harmonize the salt content of their products according to the lowest threshold possible in order to avoid adverse variability in the salt content of the same product when traded or marketed globally.

- Civil society and nongovernmental organizations are strongly encouraged to:

  - advocate for food items with no added salt or the lowest salt content possible to be easily available to all consumers;

  - organize campaigns and events to stimulate action towards the goal of achieving population-wide reduction in salt consumption, and

  - support the dissemination of relevant information, including that on the adverse effects of excessive salt consumption on health.

- Media and press are strongly encouraged to disseminate simple, coherent and clear public messages that are consistent with existing national dietary recommendations aimed towards the reduction of dietary salt intake to < 5 g/day and micronutrient deficiency prevention policies.

Settings

- Multiple settings and entry points for interventions should be considered for effective policy implementation.

- Schools/workplaces should protect and promote the health of the students/workers by ensuring that healthy food options (including meals and food snacks with reduced levels of salt and/or no added salt) are widely available, affordable and easy to identify.

- The foods served by restaurants and institutions' canteens (hospitals, prisons, military institutions, schools, workplaces, etc) should ensure that all the meals supplied contain the lowest amount of salt possible. Wherever possible, "no added salt" options should be available.

Self-regulation and legislation on the salt content of the processed foods and meals

- There is a range of measures to drive change by the private food sector. These include self-regulatory, voluntary government guidelines and legislative measures. Countries should adopt the measures that fit best in the national context and monitor their implementation.

- There are potential advantages to voluntary government guidelines or self-regulatory approaches, including flexibility and speed of implementation. Such approaches should be pursued, but only if independent and transparent mechanisms for evaluating the impact of agreed actions within a specific time frame are also established.

- Clear time lines should be defined for the implementation of a self-regulatory approach and if the agreed goals are not met in a timely way, regulatory approaches should be initiated and enforced. This point may have already been reached in countries where for years voluntary approaches have proved ineffective.

Labelling

- All countries should aim to develop and implement compulsory nutritional labelling on manufactured foods including information on the salt/sodium content. The nutrition label format and its placement on the product (front pack versus back pack) should be culturally adapted and determined according to the format proven to be most helpful and easy to read by the majority of the consumers. For example, the "traffic light" labelling system has been shown to be effective in the United Kingdom and offers much potential for other countries.

- Legislation should ensure that the use of nutrition or health claims targeting the salt content of food should comply with *Guidelines for the Use of Nutrition and Health Claims* (Codex Alimentarius, 2004) for use of nutrition and health claims.
- Countries should aim to adopt simplified and culturally-appropriate labels to educate consumers and ensure that the healthier food options are easily identified by the majority of the population, regardless of educational or socioeconomic status.
- Restaurants, caterers and other meal producers/distributors should provide nutritional information about the meals, including information on salt content. This is particularly critical for those companies/caterers/food providers for school and worksite canteens.

Product reformulation

- For countries where the main contributors to dietary salt intake are processed foods and meals, the focus of the interventions should be on the reduction/removal of salt from processed foods and meals. In these countries, food producers are encouraged to reduce or remove completely, when possible and appropriate, the salt content of their foods.
- Food producers and food distributors (catering companies, restaurants, schools and worksite canteens, etc) should voluntarily take the initiative to reduce the salt content of their food products/meals to the lowest salt content possible. Their action should be in line with the national goals and monitored by the appropriate governmental health agencies.
- National standards need to be developed specifically for restaurant or meal producers/distributors to ensure compliance of served meals with national dietary recommendations. This is particularly critical for those companies/caterers/food providers for school and worksite canteens.

Specific recommendations to WHO

- WHO should raise the awareness of Member States on the adverse effects on health of excessive salt consumption and facilitate and encourage their commitment to take strong and sustained actions to reduce population-wide dietary salt intakes.
- WHO is encouraged to explore alternative vehicles to salt for micronutrient fortification which will accommodate both the micronutrient needs of the populations at risk of deficiencies and overall public health goal of reducing population-wide salt intake to < 5 g/day.
- Current recommendations for iodine concentration in salt are based on the assumption that the average salt intake per capita is 10 g/day (WHO, 1996). WHO should review the recommended levels of salt iodization and adjust them to the overall goal of reducing total dietary salt consumption to < 5 g/day until an alternative vehicle for salt fortification is found.
- WHO should convene a technical meeting including experts on iodine deficiency and hypertension in order to review the most appropriate ways to strengthen the implementation of the strategies aimed at the prevention of iodine deficiency, while reducing salt consumption in order to prevent hypertension and other chronic diseases.

- WHO should consider the development of guidance for Member States addressing principles, advantages and disadvantages of different approaches, including self-regulatory, voluntary government guidelines and legislative approaches. This could provide examples of model legislative and regulatory provisions that could be used to implement strategies to promote healthy diets, including the reduction of the salt content of foods.

Conclusion

Strategies aimed at population-wide reductions in salt consumption are highly cost effective and will improve the general health status of the population. Salt intakes are excessive in almost all populations. Given the adverse impact of excessive salt consumption on health and particularly on blood pressure levels and cardiovascular diseases, policies to reduce population-wide dietary salt intake should be urgently implemented by all countries.

The average salt consumption of < 5 g/day should be the immediate goal for the general adult population for every country, except where lower levels have already been set. Salt intakes should be evaluated and monitored over time to assess the variations in dietary salt consumption and also the impact of the implemented policies and programmes.

Ministries of health or the appropriate national mandated agencies should lead the development and implementation of policies aimed at reducing population-wide salt consumption. The policies developed should be intersectoral, multidisciplinary and include the participation of all the relevant stakeholders; they should act in all the appropriate settings and make use of all the available tools (labelling, legislation, product reformulation, etc) to ensure their effective implementation.

ANNEX I
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Dr Bruno de Benoist	Coordinator NHD/MNM, Reduction of Micronutrient malnutrition WHO Headquarters, Switzerland
Ms Vanessa Candeias	Technical Officer; Surveillance and Population-Based Prevention Unit, Department of Chronic Diseases and Health Promotion, WHO Headquarters, Switzerland
Dr Shanthi PB Mendis	Senior Adviser, Cardiovascular Diseases, Chronic Diseases Prevention and Management, WHO Headquarters, Switzerland
Mr Christophe Roy	Technical Officer, Surveillance and Population-Based Prevention Unit, Department of Chronic Diseases and Health Promotion, WHO Headquarters, Switzerland
Ms Lurdes Santos	Intern, Surveillance and Population-Based Prevention Unit, Department of Chronic Diseases and Health Promotion, WHO Headquarters, Switzerland
Ms Ursula Truebswasser	Technical Officer, Programme for nutrition and food security, World Health Organization Regional Office for Europe, Denmark

ANNEX III PROGRAMME

5 October 2006 Forum	
8:00 – 8:30	Registration
8:30 – 9:00	**Opening ceremony** Dr Michel Chauliac, on behalf of the French Minister of Health Dr Pascale Briand, Director General of AFSSA Dr Robert Beaglehole, Director, Department of Chronic Diseases and Health Promotion, WHO Headquarters, Switzerland
9:00 – 9:15	**Goal and objectives of the meeting and election of the meeting chair, vice-chair and rapporteurs** Dr Robert Beaglehole
9:15 – 9:45	**The scientific evidence for the role of salt in cardiovascular health** Dr Shanthi Mendis
9:45 - 10:15	**A conceptual framework for the relationship between salt consumption and mortality** Prof Joël Ménard
10:15 – 11:00	Discussion
11:00 – 11:30	Coffee break
11:30 – 12:00	**Salt intake around the world: how to measure and what are the key contributors?** Prof Paul Elliott
12:00 – 12:30	**The effectiveness and costs of population interventions to reduce salt consumption** Prof Bruce Neal
12:30 – 13:00	Discussion
13:00 – 14:30	Lunch
14:30 – 15:00	**The role of fortified salt in disease prevention: iodized salt** Dr Bruno de Benoist
15:00 – 15:30	Discussion
15:30 – 16:00	**Overview and evaluation of national policies, dietary recommendations and programmes around the world aiming at reducing salt intake in the population** Prof FP Cappuccio
16:00 - 16:30*	Discussion
16:00 - 16:30	Coffee break
16:30 - 18:00	**Conclusions about the science reviewed** Prof Joël Ménard; Dr Sania Nishtar

6 October 2006 – Morning Forum	
8:30 – 9:00	**Reducing salt intake in populations: example of the French experience** Mr Lionel LAFAY
9:00 – 9:30	**Food Standards Agency and Salt reduction** Dr Rosemary Hignett

9:30 – 10:00	**Reducing salt intake in populations: the Ghana example** Prof J Plange-Rhule
10:00 – 10:30	Discussion Chair
10:30 – 11:00	Coffee break
11:00 – 12:30	**Roundtable: Activities of consumer organizations and the food industry to reduce salt**
	Salt: the need for action now! Prof Graham MacGregor
	CSPI and salt reduction Dr Michael F Jacobson
	Confederation of the Food & Drink Industries of the EU: the Nestlé example Ms. Simone Prigent
	Contribution of the contract catering sector to the salt reduction Ms Marie-Christine Lefebvre
12.30 – 13.00	**Forum Conclusions** Dr Sania Nishtar **Closure of the Forum** Dr Beaglehole
13:00 – 14:30	Lunch

6 October 2006 – Afternoon Technical Meeting	
14:30 – 14:45	Introduction to the working groups and division into the working groups Dr Robert Beaglehole
14:45 – 16:00	Working groups (3 groups)
16:00 – 16:30	Coffee break
16:30 – 18:00	Working groups
18:00	Closure of the day

7 October 2006 – Morning Technical Meeting	
8:30 – 9:00	Presentation working group 1
9:00 – 9:30	Presentation working group 2
9:30 – 10:00	Presentation working group 3
10:00 – 10:30	Discussion
10:30 – 11:00	Coffee break
11:00 – 12:30	Agreement on recommendations and conclusions of the workshop
12:30	Closure of the Technical MeetingDr. Robert Beaglehole