Final Report

Development of Five Years Multi-sectorial National Action Plan for Salt Intake Reduction

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ABSTRACT

Hypertension is one of the most important causes of mortality all over the world. The prevalence of hypertension in Iran was about 18% in 2007, while the amount of daily salt intake based on 24-hour urine collection was 10.6 g in Isfahan. Also, nutritionists have estimated that daily salt intake based on family food consumption survey is 10-15 g in the country. Accordingly, salt intake is more than twice as much as the amount recommended by the World Health Organization (WHO) which is 5 g per day. Therefore, it is quite necessary to implement a comprehensive and widespread interventional plan for decreasing salt intake in the society. Based on the literature review, countries like England, Finland, Australia, New Zealand and Canada, are the most successful ones in decreasing salt intake. Their success origins in taking some measures in health systems and advocating policymakers' support and cooperation with food industries in this regard. Advocating industries in England, policy making in Australia and, bread improvement in some other countries have been mentioned as reasons for their success. Thus, this study will be conducted to develop a five years multi-sectorial national action plan for salt intake reduction in Iran.

The program was performed in 10 strategies for which an objective (or objectives) will be determined, then the action plan to achieve their objectives will be defined. The 10 strategies consist of program leadership and governance, establishment of national and international advisory boards, mobilizing and sensitization the stakeholders, assessment of current salt intake in the society, measuring and reviewing the salt content of different foods in Iran, determining the target levels of salt intake reduction by the end of the 5-year plan, sourcing the information required for program development, developing educational strategies for reducing salt intake in the society,developing strategies for legislation, policymaking and intersectoral collaboration for reducing salt intake in the community and providing the resources for implementing the salt reduction program. In this plan, we present different

multi-sectorial actions in target groups to achieve the goal of salt reduction program. Target groups consist of six sub-groups including legislator and policy makers, influential people, high risk groups, health professionals, food industries and non-governmental organizations and the general population.

CHAPTER 1: BACKGROUND

Current status of non-communacable diseases

- **Non-communicable diseases in the world**

It has been estimated that in 2008, non-communicable diseases (NCDs) accounted for 36 million death worldwide, contributing to 63 percent of all-cause global mortalities (1). Amongst NCDs, cardiovascular diseases (CVDs) is the leading cause of mortality worldwide, which is one third of mortality fr^{om} NCDs. CVDs is the 1st cause of mortality in popu^{la}tion aged ≥ 30 and 2nd one in 15-58 years old (2). Without any serious action, the NCD epidemic is projected to kill 52 million people annually by 2030 (3, 4).

- **Non-communicable diseases in developing countries**

Nearly 80 percent of current deaths due to non-communicable diseases occur in low- and middle-income countries, disproving the myth that NCDs are mostly affecting affluent societies (5). According to estimation in developing countries, NCDs will be the cause of 7 deaths of 10 in 2020. This increasing trend may be demographic and nutrition transition in these societies (6).

- **Non-communicable diseases in Iran**

Iran is undergoing epidemiological transition and is facing a rapid increase in the burden of NCDs (7). Based on a WHO report, NCDs are estimated to account for 72 percent of all deaths in Iran, 24 percent of which happens under age 60 (8). The estimated age standardized prevalence of hypertension was 34 percent in the adult population (36 percent in men and 32 percent in women). It has been estimated that the circulatory system diseases contributed to about 1,500,000 Disability DALYs in Iran in 2003 (7). CVDs were responsible for 45 percent of total national mortality, while communicable diseases, maternal, perinatal, and nutritional conditions together contributed to 13 percent of total mortality in Iran in 2008 (8). So far,

compared to infectious diseases, chronic diseases have received less attention in the Iranian health care system (9). However, recently the Iranian ministry of health has acknowledged tackling NCDs as one of its priorities (10).

NCDs and salt intake

According to evidences, high intake of salt is harmful for human health and is related to several diseases including, hypertension, CVDs, different types of cancers, osteoporosis, chronic kidney diseases (CKD), respiratory diseases such as asthma. Hypertension is the most important diseases that have strong associations with high salt consumption.

- **Osteoporosis and salt intake**

With increasing life expectancy, osteoporosis is emerging as a serious health problem worldwide, especially in developing countries. Several genetic and environmental factors may influence the development of osteoporosis, which the high salt consumption is one of the most important factors. Excessive salt consumption extracts the calcium from the bones and the excretes it through the urine. Therefore it causes osteoporosis (11). Of 2598 retrieved studies, 31 studies comprising 34,814 people was used for meta-analysis. The overall prevalence of osteoporosis in lumbar spine was 0.17 (95% CI: 0.13, 0.20) and that of osteopenia was 0.35 (95% CI: 0.30, 0.39). The prevalence was higher in older age groups, in women, and in the northern regions of the country, with an increasing trend in recent years (12).

- **Cancers and salt intake**

Globocan 2012 determined that approximately 84,829 new cases and 53,350 cancer deaths occur annually in Iran (13). The most common cancers are: stomach, bladder, prostate and colorectal cancers among Iranian men, and breast, colorectal, stomach and esophageal cancers among Iranian women (14). According to Globocan 2008, stomach cancer is the most common cancer in Iran (15, 16). While high incidence rates of stomach cancer have been reported from different geographic areas in Iran (17, 18), Ardabil Province in northwestern Iran has the highest rates of stomach cancer for both males [age-standardized incidence rate (ASR) = 50 per 100,000] and females (ASR = 24 per 100,000) (19).

Stomach cancer is the second highest cause of cancer mortality worldwide (15). Although the incidence rate of stomach cancer has decreased in the Western world, its incidence and mortality have increased or remained stable in middle and low income countries (20). Stomach cancer is usually diagnosed in very advanced stages and its prognosis is poor. Efforts to improve the treatment outcome of stomach cancer have been discouraging. Therefore, stomach cancer prevention is prioritized, particularly in high-risk areas (21). High salt is one of the important external factors for the occurrence of gastric cancer (22). In almost all clinical studies, the reduction of daily salt intake by preserving meat and food without the use of salt as a conserving compound has decreased the progression of gastric mucosa towards precancerous conditions and gastric cancer. The varying mortality rates of gastric cancer in many countries are closely associated with the consumption of salt and urine salt concentration (23). In a meta-analysis in 2012 (total population: n = 2076498; events: n = 12039), the combined odds ratio showed a significant positive association between high salt intake and gastric cancer compared with low salt intake (OR = 2.05, 95% CI: 1.60 – 2.62) (24). In another meta-analysis with seven studies and inclusion of 268 718 participants, 1474 gastric cancer cases were identified over a follow-up of 6-15 years. In the pooled analysis,

"high" vs. "low" salt intake was associated with a corresponding risk of gastric cancer with RR = 1.68 (95% CI: 1.17 – 2.41) and "moderately high" vs. "low" salt intake with RR = 1.41 (95 % CI: 1.03 – 1.93) (25).

- **CKD and salt intake**

CKD is a worldwide public health problem, associated with a considerable increase in morbidity and mortality. Of importance is its global increase in incidence and prevalence (26, 27). Outcomes of CKD include not only progression to kidney failure but also complications of reduced kidney function and increased risk of cardiovascular disease and all-cause mortality overall, although patients with CKD are far more likely to die, principally from cardiovascular disease, than to develop kidney failure (28-30). In the United States, cross-sectional analysis of the most recent National Health and Nutrition Examination Surveys (NHANES) showed that the prevalence of CKD increased from 10.0% in 1988–1994 to 13.1% in 1999–2004 (27). Studies from Europe, Australia, and Asia, also, confirm the high prevalence of CKD. The prevalence of reduced GFR in Australia was 11.2 percent (31). Singapore, a south-east Asian country, reported a CKD prevalence of 10.1 percent, while the prevalence of CKD in Japanese general population was reported to be 18.7% (32, 33). However, much less information is available on prevalence rates elsewhere, from the developing regions of the Middle East in particular. In Iran overall prevalence of CKD with the abbreviated MDRD equation was 18.9% (95% confidence interval (CI) 18.2, 20.6). Age adjusted prevalence of CKD was 14.9% (95%CI 14.2, 15.6) in Iranian population. (34) However CKD is often undiagnosed and its complications are often untreated (35-37). There is convincing evidence that CKD can be prevented or its progression delayed, if effective management is initiated in time. Hence, identifying patients with CKD and providing prompt intervention play an important role in appropriate management of CKD (38-40. Overlooked

is whether there is a relationship between dietary electrolyte ingestion (both sodium and potassium) and risk for progression of kidney disease, particularly in patients who manifest early evidence of CKD. Patients with CKD often are salt sensitive and respond to increased ingestion of sodium chloride with increased BP. Of concern is the clinical evidence that salt-sensitive patients respond to increased salt intake, in the physiological range, with increased glomerular filtration fraction and proteinuria. Thus, these salt-induced changes in both systemic BP and the renal microcirculation create a favorable theoretical scenario for progressive renal injury. Increased salt intake also attenuates the antihypertensive effects of most antihypertensive drugs (41). Concomitant restriction of the intake of dietary salt and use of a loop diuretic are often required to control BP. A high salt intake blunts the effect of antihypertensive medications and the antiproteinuric effects of ACE inhibitors (42). Consequently, salt intake must be considered a potential modifiable risk factor for the progression of kidney disease.

- **Asthma and salt intake**

Asthma is a chronic inflammatory airway disease (43) caused or worsened by environmental factors in genetically vulnerable people (44). According to previous reports, 5% of the world's total population suffer from asthma (45, 46). Chronic respiratory diseases account for about 4.7% of global DALYs. Among the chronic respiratory diseases, chronic obstructive pulmonary disease (COPD) causes two thirds of the total burden of respiratory disease in terms of DALYs (47). There are 300 million asthmatics worldwide (48). About 1% to 18% of populations in different countries are asthmatics (49). Asthma is the sixth major cause of hospitalization in the United States (50). It is also the cause of more than 27% of referrals to physicians and 6 million days of absenteeism from work annually. About18% of families' income is spent on asthma (51). The WHO estimates that asthmatics experience

15 million DALYs annually, which encompasses 1% of the total burden of diseases. The mortality of asthma worldwide was estimated to be 250,000 people per year (52, 53). According to the latest report of the Global Initiative for Asthma (GINA) in 2004, the prevalence of asthma in Iran was between 5.1% and 7.5% (54). Dietary sodium has been linked to the prevalence and severity of asthma in several epidemiological studies (55-58). In general, the higher the salt intake within a population, the greater prevalence of asthma and the greater the severity of the asthma (55-58). Additionally, most (59-61), but not all (62-64), interventional studies have indicated that increased salt worsens bronchiolar smooth muscle reactivity.

- **Hypertension and salt intake**

High blood pressure (BP) has been reported as the leading underlying cause of as many as 7.6 million premature global deaths and 92 million disability adjusted life years (DALYs) in 2001. Globally, 51 percent of deaths due to stroke (cerebrovascular disease) and 45 percent of deaths due to ischemic heart disease are attributable to high systolic BP (SBP) (65). At any given age, the risk of dying from high BP in low- and middle-income countries is more than double that in high-income countries. In the high-income countries, only 7 percent of deaths caused by high BP occur under age 60; in the African Region, this figure increases to 25% (66).

Across income groups of countries, the prevalence of raised BP was consistently high, with low, lower-middle- and upper- middle-income countries all having rates of around 40% for both sexes. The prevalence in high-income countries was lower, at 35% for both sexes. On average, global trends in population show that mean SBP over the past three decades have barely declined, but trends vary significantly across regions and countries (67).

Isfahan Cohort Study (ICS) showed hypertension is the most important contributor to CVD events in Iranian population (68). According to Isfahan Healthy heart Program (IHHP) that was performed in adults population aged ≥ 19 years old in central part of Iran in 2000-2007, and the data from the 2006 National Surveillance of Risk Factors for Noncommunicable Diseases of Iran with a population-based sample of almost 30,000 people aged 15-64 years, the hypertension prevalence was 17.3% among Iranian adults (69, 70). While nationwide cross-sectional survey was conducted on 35 048 men and 34 674 women aged 25-65 years from December 2004 to February 2005 in Iran reported that the prevalence of hypertension were 19.8% of men and 26.9% of women (71) and it was 20.4 in Tehran, Iran population in 2001 (72).

Amongst the nutritional factors, salt seems to have a major role in BP homeostasis, there is a strong evidence for the role of salt intake in hypertension (73). The overuse of salt is a phenomenon of the modern world. Early humans used 0.1 g of salt per day, which was in fact the salt content of natural foods. However, nowadays people use 10-12 g of salt per day. Salt is an additive for improving the taste of foods and is added to food products in chemical processes and freezing techniques. In the UK, only 15% of people add salt to their food, and about 80% of the UK resident's salt intake is received through restaurant foods and fast foods.

Salt reduction as one of global targets

There is some evidences that shows salt intake reduction may have some health outcomes (75).

. A meta-analysis of these large studies showed that a decrease in daily salt intake by 6 g reduces the risk of strokes by 24%, the risk of coronary artery diseases by 18% and mortality rates by 2.5 million (74). Trails on Hypertension Prevention (TOHP) also revealed similar

results (75), as a 25% decrease in salt intake reduced the risk of cardiovascular diseases by 25%.

A meta-analysis showed that a decrease in salt intake for 4 weeks or over was associated with a decrease in hypertension. A 6 g decrease in daily salt intake reduced BP by about 5 mm Hg (7 mm Hg in people with hypertension and 4 mm Hg in normotensive population) (76). The meta-analysis of randomized clinical trials indicates that a 100 mmol decrease in urine sodium over 24 hours, which occurred following a decrease in salt intake within a median period of 5 weeks (from 4 weeks to 3 years), led to a reduction in systolic BP by 3.99 mm Hg (2.93-5.05) and in diastolic BP (DBP) by 1.92 mm Hg (1.26-2.59); (77). A meta-analysis conducted on 19 independent samples in 13 cohort studies on 177025 participants and over a median period of 3 years (5-19 years) and with over 11,000 vascular events showed that increased salt intake is associated with a higher risk of stroke (RR: 1.23; 95%CI: 1.06-1.43; P= 0.007) and a higher risk of cardiovascular diseases (RR: 1.14; 95%CI: 0.99-1.32; P= 0.07) (78).

- **Global recommendation on salt intake: UN/WHO**

In the 2011 United Nations' summit, governments were urged to take immediate preventive action to deal with the rapid progress of noncommunicable diseases (NCDs) (79) so as to decrease NCD mortalities by 25% by 2025 using cost-effective strategies. Reduced salt intake is the most cost-effective strategy that can decrease the burden of such diseases, especially CVDs, to a good extent (80-82). According to a WHO report, a 30% decrease in salt intake by 2025 is one of the 9 goals determined as an effective strategy for the prevention of NCDs in all countries and regions (83). The decrease in salt intake reduces mortality rates by 1-2% and increases life expectancy by 1.6 months in the society (84). Another study showed that a 15% reduction of salt intake in the society achieved through holding public

campaigns and reformulation of food products decreases mortalities by 8.5 million in 23 countries overly burdened with NCDs (85).

- **Global recommendation on salt intake: WHO/ FAO**

The joint WHO/FAO workgroup on diet, nutrition and chronic disease prevention recommends a decrease of salt intake to less than 5 g per day (86). The WHO recommended reducing salt intake to less than 5 g (2 g of sodium) per day for reducing BP in adults aged 16 and over (87). According to the strong recommendations made by the WHO, the salt reduction in children aged 2-15 should be adjusted according to the energy requirements of this age group. The recommendation of salt reduction is consistent with the consumption of iodized salt. Governments are responsible for monitoring iodine intake and adherence to the recommended reduction in salt intake (87).

In the UK, decreasing daily salt intake to less than 6 g per day has been recommended for adults (88). However, the Public Health England (PHE) and the National Institute for Health Research (NIHR) have recently recommended a 3 g per day decrease in salt intake by 2025 (88).

According to the recent dietary guidelines published in the United States in 2010 and the current recommendation of the Food and Drug Administration (FDA) of the United States, salt intake should be reduced to less than 6 g per day (2300 mg of sodium) in adults while high-risk individuals, such as Native Americans, people with hypertension, diabetes or chronic kidney diseases and people aged 51 and over, should reduce their salt intake to less than 4 g per day (1500 mg of sodium) (89). This government administration is not responsible for preparing dietary guidelines, but it supports the dietary guidelines published every 5 years by the US Department of Agriculture and the US Department of Health and Human Services. The US FDA seeks to convince food industries to use less salt in their

products. According to the 2010 US dietary guidelines, the recommended upper limit of sodium intake is 3400 mg per day, and any excessive amount increases BP. Based on these guidelines, the adequate intake of sodium for different age groups is presented in table 1(90).

Table 1- Adequate amount and upper limit of sodium based on American Guideline, 2010 (90)

Age	Adequate amount (mg/ day)	Upper limit (mg/ day)
Infant 0-6 months	120	Not available
Infant 7-12 months	370	Not available
Child 1-3 years	1000	1500
Child 4-8 years	1200	1900
Child 9-13 years	1500	2200
Adults 14-50 years		
Adults 51-78 years	1300	2300
Adults≥ 79 years	1200	
Pregnant women	1500	

Some state advisory committees in the UK, including the Committee on Medical Aspects of Foods (the COMA), the Scientific Advisory Committee on Nutrition (SACN) and the National Institute for Health and Clinical Excellence (NICE), have recommended a decrease in salt intake. The Food Standards Agency (FSA) of the UK has also begun to focus on nutrition priorities since 2001. The following table presents the recommendations on salt intake in the UK (91) and SACN:

Table 2- Recommended salt consumption in the UK (91)

Age	**Recommended amount (gram/ day)**
0-6 months	Less than 1
7-12 months	1
1-3 years	2
4-6 years	3
7-10 years	5
≥ 11 years	6

CHAPTER 2: CURRENT STATUS OF SALT INTAKE

Salt intake in the world

Salt intake in the world was estimated based on data from 245 surveys, including 142 reporting 24 h urinary sodium data and 103 reporting dietary sodium data, with 26 of each forming urine/diet survey pairs. Owing to known larger measurement errors in diet based methods, 24 h urinary excretion was chosen as our primary metric, and dietary estimates as our secondary metric. The quantitative relationship between urine and dietary measurements was estimated using 79 datapoints from 26 surveys having data on the same individuals in both metrics, and used these results to estimate urinary excretions corresponding to the dietary values in the remaining dietary surveys. These surveys were conducted in 66 countries comprising 74% of the global adult population. Sixty-one percent (149) of the surveys were conducted in high-income countries (LMIC) and 40% (89) in low-income and mid-income regions. East Asia (23 surveys) was the only low-income or mid-income region with more than 10 surveys. Counting as a data point each estimate for an age–sex stratum, the identified surveys provided 1346 data points, of which 651 were urine based and 695 were diet based. More than half (376/ 651) of the urine-based data points came from the Intersalt study, a major international study with standardized protocols conducted between 1985 and 1987 (92). Fifty data points, all in European regions, were from collections biochemically validated for completeness using para-amino benzoic acid (93). Ten countries had at least 20 urine-based datapoints, including the USA (86), the UK (86), Japan (48), China (41), Italy (33), Belgium (24), Finland (24), Germany (24), New Zealand (22) and the Netherlands (20). Urine-based data were relatively scarce in the highest age groups, with only two urine based data points for age groups 70+ years; in contrast, 97 diet-based datapoints were available for these older age groups. Global and regional sodium intakes In 2010 global, mean (95% CI) sodium intake in adults was 3.95 (3.89–4.01) g/day, equivalent to salt intakes of 10.06 (9.88–10.21) g/day (based on the assumption, conventional in this context, that all the sodium

comes from salt). Globally, mean intake in men was, as expected, higher than that in women: 4.14 (4.04–4.23) vs 3.77 (3.69–3.85) g/day, respectively. In every region, sodium intake was lower in women than men, ranging from 8.9% lower in South Asia to 10.7% lower in Western Europe. Given these consistent, modest differences, additional findings are presented for both sexes combined (94).

Interestingly, It was also identified a relatively little variation in sodium intakes by age. Globally, mean intakes rose by ~6% from age 25–29 (3.78 g/day) to 40–44 (4.04 g/day), and then remained relatively constant thereafter. This pattern was broadly consistent across each of the 21 GBD Study regions. In contrast to small within-region differences by age or sex, marked differences in intake were identified across regions. Asian regions had the highest intakes including East Asia (mean, 95% uncertainty interval) 4.80 (4.59–5.02) g/day, Asia Pacific High Income (mainly Japan and South Korea) 5.00 (4.85–5.16) g/day, and Central Asia 5.51 (5.11–5.95) g/daycorresponding to daily salt intakes of 12.21, 12.71 and 14.01 g, respectively.

Very high intakes were also seen in Eastern Europe (4.18 (3.95–4.41) g/day, Central Europe (3.92 (3.73– 4.12) g/day and the Middle East and North Africa (3.92 (3.74–4.12) g/day. Among high-income Western regions, sodium consumption was 3.44 (3.32–3.55) g/day in Australia/New Zealand, 3.62 (3.52–3.72) g/day in the USA/Canada and 3.81 (3.72–3.91) g/day in Western Europe equivalent to salt intakes of 8.75, 9.21 and 9.69 g/day, respectively (94). So Australian has the lowest figure.

Sub-Saharan Africa, Latin America and the Caribbean and Oceania tended to have lower estimated intakes, but also were based on fewest data sources among all the regions, with resulting larger uncertainties. For example, estimated intakes in sub-Saharan Africa ranged from 2.18 (2.05–2.32) g/day in Eastern sub-Saharan Africa to 2.76 (2.58–2.95) g/day in Western sub-Saharan Africa and estimated intake in Oceania was 2.48 (2.18–2.80) g/day.

Mean intakes were similar or higher in Latin America and the Caribbean, including 2.61 (2.40–2.83) g/day in the Caribbean, and 3.19 (3.03–3.34) g/day in Central Latin America. Intake in Tropical Latin America (mainly Brazil) was higher than in other Latin American regions and, at 4.11 (4.01–4.22) g/day, exceeded that for the USA/Canada (94).

- **National sodium intakes**

It was identified substantial variation in estimated sodium intakes across nations. The statistical uncertainty around the estimated intakes for individual countries was larger than that for world regions, especially for countries with no primary data. Thus, relative rankings across different nations should be interpreted in the light of their relative uncertainty levels (94).

In Western Europe, a region with relatively low uncertainty, estimated mean intakes ranged from 3.28 (2.99– 3.59) g/day (Denmark) to 4.43 (4.23–4.62) g/day (Italy). Estimated intakes in the Netherlands, Belgium, Germany and Iceland ranged from 3.33 to 3.59 g/day; in another 12 Western European countries, from 3.62 (3.41–3.86) g/day (Switzerland) to 4.03 (3.78–4.27) g/day (Spain); and in Cyprus, Luxemburg, Malta, Portugal and Italy, from 4.06 to 4.43 g/day (94).

Estimated intakes within North Africa/Middle East were also diverse, ranging from3.13 (2.77–5.54) g/day in Lebanon to5.37 (4.85–5.92) g/day in Bahrain. In Eastern sub-Saharan Africa, estimated consumption was higher in Mauritius 5.45(4.57–6.50) g/day than in other neighboring countries (mean intakes ranging from 1.47 to 4.32 g/day). In other regions, less variation in sodium intake was identified. For example, sodium consumption was very similar in the USA 3.61 (3.51–3.71) g/day versus Canada 3.72 (3.59–3.84) g/day. In addition, relatively small within-region differences were observed in Australia/New Zealand, Eastern Europe, South Asia and each of the regions of Latin America. Overall in 2010, estimated

mean intakes in 181 of 187 countries, whose total adult population accounted for 99.2% of the world adult population, exceeded the WHO recommendation of 2.00 g/day sodium (~5 g/day salt) (86).

In 119 countries (with 88.3% of the world's adult population), estimated mean intakes exceeded this recommended amount by at least 1 g/day; and in 51 countries (44.8% of the world's adult population), estimated mean intakes were more than double this recommended amount (94).

- **Changes over time**

Globally, between 1990 and 2010, modest, statistically nonsignificant global increases were seen, from 4.02 (3.93– 4.11) to 4.14 (4.04–4.23) g/day in men and from 3.63 (3.55–3.71) to 3.77 (3.69–3.85) g/day in women. By region, estimated increases were larger for East Asia, from 4.37 (4.18–4.58) to 4.80 (4.59–5.02) g/day, and Eastern Europe, from 3.76 (3.55–3.97) to 4.18 (3.95–4.41) g/day (for both sexes combined) (94).

Situation analysis in Iran

- **Salt intake in Iran**

There have been no study that measured 24- hour urinary sodium excretion in a nationally representative Iranian sample. However, there were three 24-hour urinary sodium excretion studies performed in representative adult population samples in the city of Isfahan. Equivalent daily salt intak levels based on 24-hour urinary sodium excretions, in the years 1999, 2002, and 2007, were 8.2, 12.5, and 10.6 g/d, respectively (95, 96). These values are in line with most of the countries around the world, in which the intakes are higher than recommended daily intake. Figure 1 provides further details of the 24-hour urinary sodium excretion studies in the city of Isfahan.

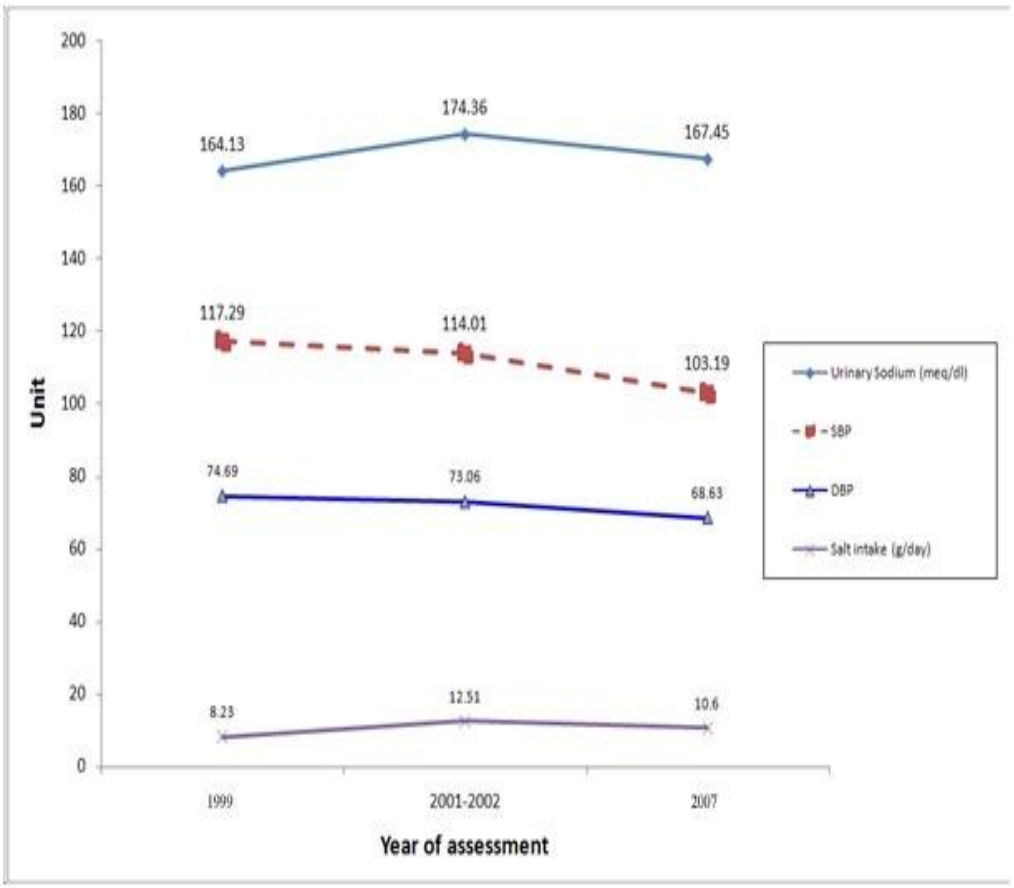

Figure1- Trend of blood pressure and salt intake among Iranian adults population, 1998-2007

Another study in 219 volunteer participants aged 20-74 years old in Yazd, Iran in 2004-2005 reported the salt intake was 9.1 g/d based on 24- hour urine collection (97). There have also been dietary sodium studies that used food frequency questionnaire to estimate the salt intake in the cities of Rasht and Sari and those residing in “Ilam province” according to which the average intake by the population aged 2 – 79 were 7.2, 7.7, and 10.3 g/d, respectively (98, 99). During the meals, 51% of people tend to always use the salt shaker while 26% use it from time to time.

There is a general consensus that the dietary estimation of salt intake considerably under-reports the true salt intake; data from these studies support the notion that the salt intake of Iranians is high.

In order to see how the trend of salt intake change, the fourth phase of salt intake measurement using the 24-hour urine collection method was conducted by the Isfahan Cardiovascular Research Institute (ICRI) in 2012-2013 on 1200 adults aged >18 years living in Isfahan city and its findings will be reported after the completion of the data management and processing. The level of salt intake was estimated around 13 g per day in 300 of the adult participants. Moreover, a sample of the first morning urine was collected to determine its validity against the golden standard (the 24-hour urine). In addition, the fourth phase examined 800 children and adolescents living in Isfahan city using one sample of their first morning urine.

- **Salt sensitivity in Iran**

A study conducted to examine salt sensitivity in Iran showed that salt sensitivity is around to be 30% in healthy individuals and 34% in those with a positive family history of hypertension (100).

- **The salt content of food items in Iran**

As there is no Iranian food composition table of salt or sodium, salt content of food items in Iran has been calculated based on Western food composition tables. As nutrients content of food are different in various societies, therefore recently a study was conducted in ICRI to measure the salt and sodium content of more than 200 food items including traditional and industrial breads, all types of cheese, butter and cream, yogurt, curd, vegetables and canned legumes, canned tuna, prepared packaged foods, tomato paste, ketchup, mayonnaise,

sausages and cold cuts, biscuits, cakes, French fries, snacks, noodles and salty snacks (cheese puffs, potato chips, crunchy corn snacks, etc.), all types of nuts and seeds and pickles, in the reference laboratory approved by the Food and Drug Deputy of Isfahan University of Medical Sciences (101, 102). Table 3 shows the salt content of the discussed items. As it shows, the mean salt content of all types of traditional bread was 1.75 g per 100 g of bread. In addition according to the national nutrition survey, daily bread consumption was about 300 g among Iranian adults in 2012 (103). **Thus, our estimation is that the daily salt intake derived from traditional bread in Iranian adult was more than 5 g.**

Table 3- Salt and sodium content of some food per 100 gram (101, 102)

Food	Salt (g/ 100)	mg/ 100g
Whole bread	1.53	946.5
Dried bread	2	823.6
Bread baguettes	1.04	529
Cheese	2.3	1269
Tomato paste	1.8	827
Canned fish	1.1	515
Canned beans	0.9	450
Canned vegetables	1	343
Pickles	2.1	1024
Canned and ready foods	1	525
Tomato sauce	1.6	619
Biscuits	0.4	315
Potato chips	1.3	877
Junk foods	1.2	692
Mayonnaise	1.7	782

Types of salt across the world

There are 14 edible types of salt across the world with the following names and specifications (104):

1. Black salt:

This type of salt is unrefined and contains minerals. It is grayish pink rather than black, has a sulfur taste and is often used in Indian recipes.

2. Celtic salt:

Also it is known by the name French gray sea salt. It is extracted from the water off the Brittany coast of France along the Pacific Ocean and contains micro minerals. This salt is hand-harvested through drying sea water on wooden trays and without any contact with metals.

3. Coarse salt:

This type of salt has larger grains. Professional chefs prefer to use this type of salt more than the other types as they can add it more easily to their dishes with their fingers only. It contains less moisture and is therefore longer-lasting. This salt is used to flavor different types of food, especially meat, fish, soups and stews.

4. Flake salt:

This salt resembles snowflakes and is made naturally under the wind and the sun. Saltwater is first poured into wide trays, and then heated once concentrated so that it forms flakes.

5. Flower of salt:

This type of salt is one of the oldest condiments. This spontaneously-formed salt is composed of crystals formed naturally on water holes evaporating under certain climatic conditions and is removed from the surface of the water using a tray. It is harvested in the Guerande region of France and is prepared with different flavors and aromas in different regions. This salt is good for flavoring salads, steamed vegetables and grilled meats.

6. French sea salt:

This type of salt is harvested from the pristine water of the Pacific Ocean. Unlike the ordinary salts available in the United States, this salt is usually unrefined. It thus contains most sea water micro minerals. It is good for flavoring salads, steamed vegetables and grilled meats and is available as ground and unground.

7. Gray salt:

Also known as Celtic sea salt, this salt is a unrefined wet salt found on the coasts of France. It is light gray with the occasional purple streaks. It is hand-harvested. This salt has become highly popular in the world of cooking in recent years, and is considered by some people as the best type of salt. It is available in coarse grains or as a powder.

8. Ground salt:

This salt is often available in the form of large dry crystals suitable for grinding. The white crystals of this salt are easily ground to a fine powder due to their low moisture. It is a table salt used for flavoring dishes. An important point to bear in mind is that this salt should be ground with a ceramic or plastic grinder as it corrodes metal, including stainless steel, and thus changes in flavor.

9. Hawaiian sea salt:

Another name for this salt is Alaea or Hawaiian red salt. Hawaiians use this salt as a table salt. A local red lava clay containing iron oxide is infused into the salt to make it ripe in taste. This salt is used to flavor traditional Hawaiian foods such as kebabs and shish kebabs.

10. Italian sea salt: Also known as Sicilian sea salt, it is extracted from the shallow waters off the Sicilian coasts of the Mediterranean Sea. It is a natural salt rich in various elements such as iodine, fluoride, magnesium and potassium, and has a very lower sodium chloride content compared to regular table salt. Its salinity is therefore also lower than regular table salt. Salt-collecting trays are filled with sea water in the spring, and the Sicilian sun and the

strong winds blowing from Africa evaporate the water, and the residual salt is pulverized and used without refining. This salt has a pleasant taste and is not irritating. It is used in salads, dressings and fried foods.

11. Natural salt:

Although salt is not a herbal or cultured substance that can be categorized as organic or non-organic, there are at least three factories that produce this type of salt. The water used to produce salt should be 100% safe and pure, and instructions for hygiene should be carefully observed during all the stages of preparing and packaging the salt. The three factories producing this salt are located in France, New Zealand and Italy.

12. Sea salt:

It generally refers to salts that are extracted directly from the sea or the ocean. Water is transmitted to clay salt-collecting trays directly through channels, and the sun and the wind then work to naturally evaporate the water and produce salt. For its mass production, this salt is not refined as much as other types of salt and contains minerals such as iron, magnesium, calcium, potassium, manganese, zinc and iodine. The advocates of this type of salt argue for its pure flavor and healthy minerals. The best locations for producing this salt include the Mediterranean Sea, the North Sea and the Atlantic Ocean (especially off the Brittany coast of France). This salt is healthier and more flavored than table salt and is available in the form of large grains, pulverized powder and fine powder.

13. Smoked sea salt:

This type of salt is new and is more popular in the United States. It is smoked naturally over wood fire so that the salt crystals get a 100% natural smoky flavor. Smoked salt gives a very special flavor to dishes and is very good for flavoring grilled and roasted dishes. It is essential for cooking salmon. It also gives a smoky flavor to soups, salads, doughs and sandwiches and exists as both large grains and pulverized powder.

14. Table salt:

This salt is the most easily available and common salt found in all kitchens. It is usually extracted from salt mines and refined after extraction so as to yield pure sodium chloride. Table salt is available in both iodized and non-iodized forms. Salt production factories in the United States began to produce iodized salt in 1920 with the cooperation of the government, as residents of some areas suffered from iodine deficiency and thyroid enlargement, which could be easily resolved through adding iodine to their table salt.

Types of salts in Iran (105)

1. Refined salt:

It is the same as regular table salt that is transparent white in color and is widely sold in the market. This type of salt is extracted from rock salt mines and has a sodium chloride content that has increased to 99% through the removal of impurities during the refining process –i.e. the recrystallization. Impurities in salt reduce its salinity and encourage its overuse. However, anticaking agents, which are toxic in large amounts, are added to the salt to prevent the adhesion of salt particles. Any table salt sold in the market should have a hygiene license issued by the Ministry of Health and Medical Education and its production and expiry date should also be clearly marked on the product. This refined iodized salt does not contain heavy metals such as lead and arsenic (carcinogenic substances) or soluble impurities such as plaster, which cannot be isolated due its white color.

2. Fortified salt:

Today, the majority of countries, including Iran, enrich their refined salt with essential micronutrients, most importantly, iodine. It is also possible to enrich salt with iron and folate to improve anemia conditions. The Ministry of Health and Medical Education in Iran has enforced a salt iodization policy for more than 20 years since 1992 in order to reduce the risk

of goiter and other iodine deficiency disorders, such as miscarriage and stillbirth, cretinism, retardation, psychomotor impairments and hypothyroidism. All salt producers are now obliged to add iodine to their table salt, as the use of refined iodized salt is the only way for providing iodine to the body for its performance of vital functions that require this micronutrient. Through the enforcement of the iodization policy, Iran became known in 1996 as a country without iodine deficiency disorders. It is necessary to follow some points when using iodized salt:

- When cooking, make sure to add salt only at the end.
- Iodized salt should not be overexposed to sun or humidity. A major part of its iodine content is lost when kept for over a year. It is best to be kept in sealable non-transparent containers with the lid closed. Be mindful of the products's date of expiry, production license from the Ministry of Health and a “refined” or “recrystallized” label on the product. Avoid using any type of salt marked as “industrial for export”, which is not edible, and also sea salt, which does not contain enough iodine. Bear in mind that not only does salt provide the main flavoring to dishes, but it is also an essential substance for the body. The use of salt in any amount lower or higher than the recommended level disrupts the normal functioning of the body.

3. Sea salt:

Sea salt is produced through the evaporation of water from the sea, the ocean and lakes and through minimal refining processes. Its source water therefore contains various minerals that affect its color and taste. However, the use of this type of salt is not recommended due to problems such as potential contamination with heavy metals, including mercury, and the availability of numerous sea salt knock-offs in the market. It should be noted when using sea salt that the salt extracted from drying sea water, such as Urmia Lake in Iran, contains toxic bromides not suitable for use. Sea salt is never transparent white, but found in various colors

due to its impurities. It contains a variety of impurities, including insoluble substances such as sand, gravel, soil plaster and contaminants, and hard-soluble substances such as calcium and magnesium and heavy metals such as lead, mercury, arsenic and cadmium, which may have negative effects on the gastrointestinal tract, liver, kidneys and lungs and might even bring toxicity and different cancers. Furthermore, it may disrupts the absorption of micronutrients such as iron and zinc and does not contain the standard amount of iodine for the prevention of goiter and iodine deficiency disorders. It cannot supply other minerals such as magnesium and calcium either. Sea salt can be consumed only when it has a production license from the Ministry of Health showing its conformity to the standards of the industry. It should be noted, however, that the Ministry of Health has never issued such license for the production and packaging of sea salt to date as, based on the laboratory tests conducted, sea salt contains soluble and insoluble impurities such as lead, mercury, sand, gravel and plaster and lacks components that are essential for the body.

Salt standards in Iran

The following tables provide the existing standards based on a report gathered by the Institute of Standards and Industrial Research of Iran (106):

Table 4- Physicochemical properties of edible salt

	Properties *	**Acceptable limits**
1	Appearance	Transparent to opaque white
2	Taste and aroma	Salty and without any external aromas
3	External substances	Without any external substances
4	Purity	Minimum: 99.2%
5	Water-insoluble substances	Maximum: 0.16%
6	Sulfate (SO^{24-})	Maximum: 0.46%
7	Moisture	Maximum: 0.1%
8	Calcium (Ca^{2+})	Maximum: 0.15%
9	Magnesium (Mg^{2+})	Maximum: 0.03%
10	Alkalinity (Na_2Ca_3)	Maximum: 0.03%

*Chemical properties, except for moisture, to be measured based on dry matter.

Table 5- Contaminants

	(ppm) Contaminant	**Maximum (ppm)**
1	Arsenic	0.5
2	Copper	2
3	Lead	1
4	Cadmium	0.2
5	Mercury	0.05
6	Ferric	10

- **Permitted additives**

Potassium or sodium ferrocyanide can be added to salt. This additive should be of an adequate quality for use in food products; the maximum permitted amount of ferrocyanide ion is 10 mg/kg.

Note: Adding any other additives requires a separate license from the relevant authorities.

- **Packaging**

Food products should be packaged in suitable packages that are resistant to humidity, such as high-density polyethylene, polypropylene, multi-layer papers with one humidity-resistant layer and bottles with proper capping that are permitted to be in contact with food items. The weight of each package should not exceed 40 kg.

CHAPTER 3: BEST PRACTICES OF SALT INTAKE REDUCTION IN THE WORLD

According to Webster et al' s review, 32 country salt reduction initiatives were identified. The majority of activities were in Europe (19countries). Most countries (27) had maximum population salt intake targets, ranging from 5 to 8 g/person per day. Twenty-six of the 32 initiatives were led by governments, five by non-government organizations (NGO) and one by industry (107).

In addition to their leadership role in five countries, NGO or advocacy organizations were active in salt reduction in another 15. There are also more organizations committed to salt reduction in countries that do not have coordinated national programs. The World Action On Salt and Health (WASH) was established by Professor Graham MacGregor 2005 and is a global group with the mission to improve the health of populations throughout the world by achieving a gradual reduction in salt intake. WASH will encourage multi-national food companies to reduce salt in their products and will work with Governments in different countries highlighting the need for a population salt reduction strategy. The overall aim is to bring about a reduction in salt intake throughout the world by reducing the amount of salt in processed foods as well as salt added to cooking, and at the table (108). So far WASH has 527 members from 95 countries and has been instrumental in promoting and supporting NGOs to take action around the world. The establishment of World Salt Awareness Week has provided a focus for media activities engaging national advocacy groups such as Heart Foundations, Hypertension Societies and a range of different consumer organizations around the world (107).

- **Baseline assessment and monitoring**

Seven countries have estimates of average daily population salt intake based on analysis of 24-h urine samples, 21 indirect estimates obtained through modeling of dietary data (109).

Eighteen countries currently have data on salt levels in foods but only four countries have measures of consumer knowledge and/or behavior in regard to salt (107).

- **Implementation strategies**

According to Webster□s study, implementation strategies vary between countries. The great majority (26 countries) have a voluntary program of food reformulation in place and two (Argentina and Portugal) have plans for mandatory reformulation programs. The strategies used to encourage the industry to reformulate foods vary but targets are a common feature. For example, the European Union (EU) Framework has suggested a target 16% reduction in the salt levels of processed foods over 4 years and many member states have signed up to this approach. The UK has set individual targets for approximately 85 different food categories as has New York City which is coordinating the US national approach. Canada has established draft targets with timelines for some foods and is working on the rest. Most programs (28 countries) also have planned or existing initiatives to raise consumer awareness about the issue of salt and health with some led by government and others by NGOs. Nine countries have implemented initiatives on labeling directly related to salt reduction. These include traffic lights (UK), warnings (Finland), percentage daily intake (%DI) or guideline daily amount (GDA) (several EU countries, Australia and New Zealand) and logos (the Nordic countries, Australia, New Zealand and Canada). Schemes provide information to consumers about healthier choices but also potentially encourage food companies to reformulate products (107).

Finland attributes much of the success of its national salt reduction program to the use of mandatory warnings on high salt foods, which in conjunction with labeling to identify lower salt products, provided consumers with very clear direction about optimal food choices (107).

In 1996, Consensus Action Salt and Health (CASH) group was set up by Professor Graham MacGregor with similar expert group of WASH in the UK called, intending to inform consumers of the importance of reducing their salt intake, to change the policies on salt intake and to enforce food industries to reduce their products' salt content. They held a campaign with the cooperation of health and standardization organizations to reduce salt intake. Thus the UK has been the first country that took a major organized step toward reducing the salt content of its food products. Reduced salt content was achieved for 30% of the food products in the UK and food labels marking the detailed salt content of food products became compulsory and food products without labels were gradually eliminated. A major objective of this group was to reduce the daily salt intake without informing the consumers, which required an extensive cooperation from the producers (110).

The similar actions which were conducted in the UK is necessary to carry out in all countries, especially in developing countries where people tend to add salt to their daily meals. Holding campaigns for improving society awareness is an important step. The WASH targeted the food industries and government agencies to reduce salt intake in different countries (108).

According to a 1983 WHO report on the primary prevention of hypertension and another WHO report on diet, nutrition and the prevention of chronic diseases in 2003, the daily salt intake should not exceed 5 g; some countries have done some actions to reach this amount, while some others have still made no appropriate decisions in this regard. Many European countries have their own national recommended values of salt intake. For instance, the Netherlands has recommended a daily salt intake less than 9 g and Portugal less than 5 g; meanwhile, in Greece, the only recommendation has been to generally avoid excessive salt intake and the consumption of salty food (107). In Asia, only four countries have given their own recommended levels of salt intake, the lowest has been recommended in Singapore (less

than 5 g) and the highest in Japan (less than 10 g). In Africa, only Nigeria and South Africa have emphasized salt intake reduction in their diets. The recommended level of salt intake in Australia and New Zealand is less than 6 g (107).

The recommended level of salt intake is less than 6 g in North America (Canada and the US) and less than 4 g for high risk groups in the US. In South America, Brazil is the only country with a recommended amount of salt intake, which is less than 5 g, and other countries in South America have sufficed to reduce salt intake (107). Some countries have used special methods for reducing salt intake such as:

- Labeling products with their precise salt content;
- Holding public campaigns on salt intake reduction;
- Advertising low-salt products;
- Advocate the food industries for producing low-salt products;
- Monitoring the salt content of food products.

In 2004, France legislate some laws to reduce salt intake to less than 8 g per day; however, no actions have yet been performed for persuading people who do not accept the recommended amount (107).

In the UK, the target amount of salt was to reduce salt intake to less than 6 g per day by 2010, and the first step to achieving this level was to measure the salt content of food products. The measurements showed that white bread, breakfast cereals and snacks provided the highest percentage of the daily salt intake in children and adults (111).The most successful experiences took place in the UK, which managed to reduce salt intake by 10% from 9.5 g per day in 2000 to 8.6 g per day in 2008 through interventions (112). Thus it saves salt accounted to about 26,000 tons per year, and finally 6000 mortalities caused by strokes and heart attacks were also prevented. In 2011, the salt content of processed foods was reduced by 20-50% with no changes to their taste or any problems in their production. Salt packages

were reduced by 40-50% and the goal was to reduce salt intake to less than 6 g per day by 2014 (113). The salt reduction campaigns were estimated to cost 5 million pounds per year; however, 1.5 billion pounds were saved annually in the health sector instead (114).

The meta-analyses showed that the WHO activities in 2006 for reducing salt intake were not only cost-effective but also reduced the complications of salt overuse and mortality rates (75). The objectives and components of these actions, which were presented in WHO seminar, Paris in 2006, were as follows (82):

- Changing food products' formulations through advocacy of health system policymakers about the concern of acceptable salt content of food products, notifying food industries and unions including bakeries and restaurants about their products' salt content and encouraging them to reduce it to the desirable levels, encouraging industries to label their products for the salt content and improving awareness of food importers and distributors about salt and advising them to import food products with low salt content (113).
- Holding campaigns for sensitizing the general populations was done to implement these activities, the message should be simple, clear, tangible and in accordance with the culture, beliefs, dietary habits, race and common recipes of the society (108); determining target groups and their level of influence; improving awareness in special groups such as children, pregnant women and the elderly, particularly children who should aware of high salt content foods; and educating public about using food labels through the campaigns.
- Healthy food products with simple and clear labels for all people with any socioeconomic status and defining specific standards for restaurants and food industries with high salt food products such as processed meat.

Salt reduction strategies across the world

- **European countries**

The UK, Ireland and Finland performed pertinent measure the salt reduction activities through the following 8 steps:

1. Supporters of the salt reduction programs:

The CASH and WASH groups were formed in the UK in 1996 for reducing salt intake in the society. The target salt intake reduction in the UK was determined as 6 g per day in 2003. Interventions were held for policymaking agencies, food industries, food consumers and health professional (108, 110). Based on studies, in 2008-2009, cereals, breakfast cereals, biscuits, cakes, meats and meat products, soups and dressings provided the most daily salt intake in the UK (115, 116). Training seminars were also held in 2004 for food unions and distributers, such as bakeries and restaurants. Fewer activities were also initiated in 2005 in Ireland to provide strategies and recommendations on salt reduction and adherence to the programs by supporting of the Irish Department of Health (117). Recommendations on salt reduction in Finland begun in 1978, and a salt reduction program was implemented in 1979-1982 within the framework of the North Karelia Project on both national and regional levels with the WHO support (118).

2. Assessment of the current status:

Various studies have been performed for assessment of salt intake in these countries using the 24-hour urine collection method; the studies estimated the level of salt intake to be about 10 g per day (109).

3. Determining the target level of salt intake:

The target level of daily salt intake was determined as 6 g in the UK and Ireland and 5 g in Finland by 2010 (114, 118).

4. Planning campaigns and advocacy of stakeholders in salt reduction implementation:

This step was performed based on the situation analysis of environmental status. If processed foods were the main source of the consumed salt, the plans would be made with the cooperation of food industries, and if imported products were the main source of the consumed salt, their import and sale would be avoided.

5. Holding campaigns for improving public awareness

6. Labeling salt content in food products by using signs, symbols and logos

7. Negotiating with food industries, unions and restaurants for reducing the salt content of their food products

8. Monitoring and evaluation of the program and making necessary changes:

The implementation of these activities in the UK, which is one of the most successful countries with respect to salt reduction programs, resulted in the reduction of salt intake by 1 g per day by 2008 (82, 119). The salt content of about 1000 food products was also reduced. Compared to in 2004 and 2005, about 32% of the population reduced their salt intake and their attention to food labels increased by 31%. Ireland and Finland also obtained more or less similar results.

- **Spain and France were also two other countries that implemented combination methods consisting of the aforementioned 8 steps:**

Salt reduction programs were performed in these two countries as part of broader programs on nutrition and lifestyle modification.

In France, some actions were done to reduce the salt content of foods in 2000. Salt intake was estimated around 9 g per day in 1998-1999 and the most of men consumed more than 12 g of salt per day. Therefore the target of salt intake was defined 8 g per day by 2010. In this regard some activities were performed to reduce salt content in food industries. Public education was

performed to reduce salt usage in preparing food and not using salt at table in salt reduction campaign. Labeling food products in salt content became obligatory. Some of those labels even denoted that the product did not need additional salt. Bakeries also did some activities to reduce the salt content of the bread. Comparing the salt content of food products between 2003 and 2005, it was reported that no significant differences were observed in the salt content of food products in France, except for in bread (82, 108, 120).

- **Other European countries (108, 121):**

Other European countries including Belgium, Bulgaria, Greece, the Czech Republic, Denmark, Estonia, Hungary, Italy, Lithuania, Luxembourg, Malta, Switzerland, Norway, Austria, Portugal, Romania, Slovenia and Sweden performed various limited actions, including joint meetings of the government and food industries, dietary recommendations, designing dietary guidelines, executing programs in the worksite and focusing on certain food items such as bread or some places such as schools. Each activity included one of the 8 steps implemented in the European countries previously discussed in details. These countries were able to achieve a certain level of success through performing these activities, too.

- **Pacific countries (122-124)**

The Australian branch of WASH called the Australian World Action on Salt and Health (AWASH) began its activity in Pacific countries in 2007 and, in cooperation with the George Institute for Global Health, it seeks to promote health through advertising programs on salt intake reduction and advocacy, especially in Australia and New Zealand. These programs aim to reduce population's salt intake to less than 6 g per day and to reduce the salt content of processed foods by 25%. Those programs are currently running and have been successful so far, owing to the countries' good policymaking.

Despite the many recommendations to Australian consumers for reducing their salt intake, there have been no coordinated strategies for salt reduction (82).

An advocacy program was run on organizations and groups working on health matters. The AWASH was established in 2005-2006 aiming to reduce the country's salt intake to less than 6 g per day by 2012, to reduce the salt content of fast foods and products of food industries by 25%, to increase public awareness about the advantages of consuming less salt and to gain support for labeling foods with their precise salt content. The core members of the AWASH include the George Institute for Global Health and the Australian Health Directory. The objective of the AWASH was to communicate ideas and focus on food industry owners (124). The target groups of the AWASH mainly include:

1. Food producers in Australia;
2. Policymakers: The Australian government showed little interest in salt reduction at first, but policymakers were gradually motivated to take part and contribute to the programs;
3. The AWASH used every possible means of informing people and raising their awareness. For instance, in the World Salt Awareness week 2008, sandwiches and sauces were introduced as foods with very high-salt content and as the favorite foods of the Australian nation;
4. Academics
5. NGO
6. The public

- **To achieve the objectives of salt reduction program in Australia:**

1. Many meetings were held in 2007 about reducing salt intake by 2012 (5 years into the program).

2. The establishment of the AWASH for integrating activities targeting salt intake in Australia. Focusing on food industries and their owners and the Australian government's support of the program.

3. The establishment of an influential organization for aligning industries and the health sector and any sector with the same interests as the AWASH.

One of the useful activities performed for reducing salt intake was the cooperation made with food industries and policymakers for the reduction of the salt content of processed foods. Supervision and follow-up are difficult but necessary, and policymakers should also become involved and draft laws within the next 2 years for the health and nutrition sector (123).

In Brief, the Australian approach was very similar to the UK approach and included cooperation between the health sector, industries and policymakers. Many other actions are planned to be taken over the coming years (124).

- **North and South American countries (125-133)**

Many countries in this region have held campaigns for salt reduction advocacy. In the United States, efforts began in 1980 to reduce salt intake to less than 5-6 g per day and different strategies have been performed, including the advocacy in public with the cooperation of the National Heart, Lung and Blood Institute (NHLBI) and legislator organizations of the country.

In addition, some similar actions were conducted in other North and South American countries, including Argentina, Brazil, Bolivia, Canada, Chile, Costa Rica, Ecuador, Guatemala, Panama, Paraguay and Uruguay; these actions have been more successful in some countries, such as in Canada.

The Center for Science in the Public Interest (CSPI) began holding campaigns and advocacy in 2000 in the US and had a cooperation with the United States Food and Drug

Administration (FDA). As they did not achieve favorable results, the American Medical Association (AMA) began to design a salt reduction program in 2006 with the aim of reducing salt intake in the US by 50% with the cooperation of the FDA and the NHLIBI and held large advocacy campaigns (132). The WASH group started other comprehensive programs in the US and some other countries including Cuba, Jamaica, Mexico and Venezuela.

In Canada, the program was focused on three groups: health organizations, food industries and policymakers (133):

- **The Health system:**

1. The Canadian Institute of Health Research (CIHR) was the first organization working on the prevention and control of BP, and one of the initial steps was to design strategies for the reduction of salt intake, which was performed with the cooperation of relevant organizations.
2. BPC was a large organization working on BP and its related issues:
3. Encouraging policymakers to legislate laws and make decisions for reducing salt intake and seeking to reach the recommended level of salt intake; encouraging food industries to use less salt in their products and encouraging the health system to raise consumers' awareness. These measures were successfully implemented with the cooperation of 18 organizations.
4. Establishing a workgroup for training the public and communicating messages
5. Sending the necessary warnings to policymakers for the control and prevention of BP, including warnings given to the Canadian Food Guides to pay special attention to salt intake, and also sending a warning to Campbell Soup Company to encourage the owners of industries to reduce the salt content of their products.
6. An education program was designed for the PHAC and the Canadian Hypertension Society in 2007 on BP and its relation to sodium intake as an important health problem.

7. Holding seminars on BP and presenting studies on the topic and publishing them in different journals.

8. Canadian health organizations were sensitized to salt intake on the World Hypertension Day in 2007, and salt intake became the major topic discussed on the World Hypertension Day in 2009.

The Canadian Stroke Network further analyzed the matter of salt intake and established a website (www.sodium101.ca) to train the public and provide them with more news and information. Organizations working on cardiac and cerebral events presented a common program and emphasized the subject of salt intake and its relationship with cardiac and cerebral events (133).

- **Food industries:**

The Food and Consumer Products of Canada (FCPC) is an organization consisting of 60-70% of the food producers in Canada. The organization promised to cooperate with policymakers and established a group supervising production techniques and other procedures for adherence to the salt reduction program (133).

The Campbell Soup Company aired promotional TV shows about low-salt products.

Many food industries tried to reduce the salt content of their products.

- **Policymakers:**

- The Institute for Nutritional Sciences began working on salt reduction in 2004.
- The Canadian Food Guides announced its recommended healthy level of salt intake.
- A national study was conducted in 2004 for bringing public awareness on the subject.
- The PHAC published materials on this subject.
- The Ministry of Agriculture founded a heath committee for evaluating salt.
- The necessity of salt reduction was incorporated into the state cardiovascular strategy form.

- Measures were taken for reducing the salt content of foods sold and provided at schools and generally to children.

- **African countries (107, 134)**

The major source of salt intake in African countries is the added salt in preparing food as a preservative and in cooking (134). According to a WHO seminar held in 2006, only Cameroon and South Africa had dietary guidelines for salt intake. However, 17 African countries, including Angola, Botswana, Cameroon, the Democratic Republic of Congo, Egypt, Ethiopia, Gabon, Ghana, Kenya, Malloy, Nigeria, Rwanda, Sierra Leone and South Africa are now members of WASH and implement salt reduction programs (107).

- **Asian countries (135-139)**

Asian countries, including Bangladesh, China, Iran, Japan, South Korea, Malaysia, Singapore, Nepal and Turkey, have performed some sporadic activities for salt reduction. For instance, in Bangladesh, the level of salt intake based on the data from salt production and sales, was estimated at 15 g per day in 2004(135). A more recent study using spot urine analysis found very high average sodium intake of 21 g/day (135). Therefore some meetings on salt reduction were held in 2007 in the country with the relevant organizations and with the cooperation of the WHO and programs were formulated for achieving salt reduction. Japan also implemented a widespread program for salt reduction advocacy. Before the program, the Japanese' level of salt intake was estimated at 11 g per day, and the objective of the advocacy program was to reduce salt intake to about 6 g per day. Thus, educational booklets has been prepared and a special emphasis was done on the labeling food products for their salt content, and the program is still running (138). According to the findings of an INTERMAP study, 78% of the consumed salt in China is added in cooking, and 66% of the

salt intake in Japan is derived from sauces, fish, sea foods, soups and vegetables, and 10% of the salt is added in cooking (136).

- **Leading countries in implementing salt reduction program and the key features:**

Five countries, Finland ([140), France, Ireland (141), Japan (142) and the UK (143) have demonstrated some impact of their salt reduction initiatives. In four cases (Finland, France, Japan and UK) this includes evidence of changes in population salt consumption, in another four (Finland, France, Ireland and UK) changes in the salt levels in foods and in two (Ireland and UK) changes in consumer awareness.

- **Finland:**

Finland commenced efforts to reduce salt in 1978 and by 2002 had demonstrated a 3 g reduction in average population salt intake (from 12 to 9 g/person per day). During the same period there was a corresponding 60% fall in coronary heart disease and stroke mortality (140, 144). Key characteristics include: strong leadership through the Finnish National Nutrition Council with clear population targets; regular monitoring of population salt consumption using 24-h urinary assessments and dietary survey data; mass media campaigns and education of healthcare personnel; extensive stakeholder and community involvement; voluntary cooperation with the food industry to reduce salt including the use of Pansalt (a reduced sodium salt substitute); and mandatory warning labels for foods high in salt which drove many high salt foods from the supermarket shelves (145).

- **United Kingdom:**

Key characteristics include strong leadership from the UK government through the Food Standards Agency (FSA) and the Department of Health. The UK FSA started working with the food industry in 2003 and launched its consumer education campaign in 2005. By 2008 the UK had achieved an average 0.9 g/person per day reduction in daily salt consumption

(146), which is predicted to be saving some 6000 lives a year. Salt levels have been reduced in key food products by between 25 and 45% (147) and there has been an increase in consumer awareness and parallel changes in consumer behavior relating to salt usage and purchasing of foods (148).

The UK program benefits from baseline data on salt intake, salt levels in foods and consumer awareness with clear and consistent mechanisms for monitoring each. In addition the program benefits from established targets for salt levels in all foods; engagement of stakeholders in the development and implementation of the strategy; and an integrated three-pronged approach based upon working with the food industry, a well funded advertising and social marketing campaign and the introduction of traffic light labels indicating whether foods The main strategy was the focus on reducing the major source of sodium in people's diet. Processed foods were the major source of salt, and the strategies adopted were heavily focused on food industries as they were the strongest competent against salt reduction, and their demands and problems with cooperation for achieving this goal had to be recognized. The following items were discussed:

1. With a lower salt content, snacks and prepared foods (fast foods) will be left bland without a taste and rather unpleasant, especially for children.

2. The addition of salt is a cheap method for increasing the weight of meat products by 20-30% as salt absorbs liquids.

When the UK government decided to legislate laws for industries, the CASH group was established. This group gained a lot of success and enacted new standards.

Operational procedures:

The three following modifications were made in the UK:

- The salt content of prepared foods was reduced from 9.5 g to 4.5 g.
- Using table salt was reduced by 50%.

- Of 0.6 g of the salt requirement was received through natural foods.

The objective of this program was to reduce the salt content of most food products, and people did not feel their 20-50% reduction of daily salt intake. Food products were divided into 80 categories, and the maximum permitted amount of salt was determined for each category. The ultimate goal was to reduce salt in 30-40% of the food products and to eventually reduce the population's salt intake to less than 6 g per day (149).

Factories should mark their products for their salt content according to three different categories: high-salt, medium-salt and low-salt. Based on this approach, the level of salt intake determined through urine collection decreased from 9.5 g to 8.6 g per day during 2003-2006, that is, by 10%, and 7000 lives were thus saved (149).

- Monitoring includes publishing the industries' commitments and achievements so that stakeholders can see the progress that is being made (149).

- **Ireland:**

Ireland published its scientific report on salt in 2005 and shortly thereafter the Irish Food Standards Agency (FSAI) initiated a salt reduction initiative. The initial goals for selected food products were achieved by 2008 including reducing the salt in breads by 10%, sauces by 15% and soups by 10%. More challenging reformulation targets have since been set. An evaluation of the consumer education campaign showed that more than half the people surveyed claimed to be changing their behaviors related to salt. The Irish strategy was modeled closely on the UK approach with leadership from the government through the Irish Food Safety Promotion Board supported by the Irish Heart Foundation. Mandatory limits for the salt content of foods have been established such that manufacturers can claim 'low salt', 'very low salt' or 'salt free' on packaging (107).

- **France:**

The French Food Safety Authority recommended a reduction in population salt consumption in 2000 and has since reported a decline in intake provided by foods from 8.1 to 7.7 g/day in the overall adult population. The French salt industry has also reported a 15% reduction in sales of salt to food manufacturers between 2001 and 2006 and a parallel 5% reduction in the sales of household salt. Key characteristics of the French approach have been a focus on bread (although bread is one of the few products in which salt levels have not declined) and salt messages disseminated as part of broader nutrition campaigns. There is regular monitoring of salt levels in foods and population salt intake level is estimated through dietary surveys and modeling (107).

- **Japan:**

The Japanese Government initiated a campaign to reduce salt intake in the 1960s through a sustained public education program. Prior to that deaths from stroke in Japan were among the highest in the world, and it became apparent that certain regions, particularly the north, were consuming as much as 18 g/day of salt. The stroke rates in Japanese prefectures were showed to be directly related to the amounts of salt consumed (142). Over the following decade average salt intake was reduced from 13.5 to 12.1 g/day with a parallel fall in BP in adults and children, and an 80% reduction in stroke mortality despite large adverse changes in a range of other cardiovascular risk factors. In the absence of any sustained government program there are indications that salt intakes are once again gradually rising in Japan (107).

Legal enforcement strategies have rarely been used for the implementation of the objectives or any other aspects of salt reduction programs, and many countries have relied on voluntary programs. Both voluntarily and compulsory programs have the potential to have clear mechanisms for monitoring progress and charging penalties for the failure to observe the laws set (107). Voluntary actions are implemented easier, respond faster and are more

flexible. However, if the regulations are properly established, they have a greater potential for execution. The UK is a good example of how voluntary programs respond. With the cooperation of the FSA, the UK has been seeking to accomplish the objectives of the program through comprehensively monitoring the process and involving all stakeholders in the monitoring of objectives and the progress of the program. Examples of the impact of law enforcement can be seen in the control of bread's salt content in Portugal and in warnings for high-salt foods in Finland. Non-Governmental Organizations (NGOs) can play an important role in the process of monitoring. It appears that no countries have managed to reduce their salt intake through instructing consumers alone. However, public education on choosing healthier food products and also modifying the other health behaviors may be time-consuming and tends to have little effectiveness. The costs of these programs might be barriers to their implementation even in the wealthiest countries of the world. As the most influential and cost-effective method for ensuring the public health, national efforts for salt reduction should be concentrated and accompanied by environmental changes as well as public education and supportive laws so as to facilitate the implementation of the salt reduction in the society. In many countries, salt reduction programs performed with the aim of gradually reducing the salt content of high-salt food products are focused on food industries and changing the formulation of products and turning them into lower-salt products. Providing low-salt substitutes is a better strategy than simply reducing the salt content of products, which may decrease their overall sales as it changes the taste and might ultimately discourage industries from keeping up with the program (107).

- **Eastern Mediterranean and the Middle East countries**

There are few reports and evidence on salt intake and salt reduction programs in the Eastern Mediterranean. Reports have shown that the daily salt intake is 14 g in Tunisia, Syria and

Palestine and 18 g in Turkey. The salt intake in these countries is very high –almost 3-4 times as the recommended amount. Salt reduction programs have therefore been implemented within the IMPACT model, which is the most common model for determining the reducing mortality following actions for the prevention and control of heart diseases (150).

Policies set in these four countries for the reduction of salt intake include:

1. Holding health promotion campaigns all over the country for awareness improvement and encouraging the public to use less salt
2. Impelling industries to provide clear food labels showing their products' salt content and thus helping consumers select low-salt and low-sodium products
3. Impelling Enforcing industries to modify food product formulations to accommodate for the mandatory reduction of the salt content

These policies can be executed on their own or in combination with other programs and are therefore more effective. The analysis of the cost-effectiveness of this program showed that intersectoral cooperation is one of the most cost-effective and influential methods for reducing salt and preventing cardiovascular diseases in the studied Eastern Mediterranean countries (180).

Some Arab countries in Middle East including Bahrain, Kuwait, United Arab Emirates (UAE), Qatar, Lebanon, Oman and Saudi Arabia have begun some activities to reduce salt intake (151).

In Bahrain a ministerial decree was formulated in 2014 to establish a multisectoral committee, which aims to reduce salt in bread products. The objective of this committee is to set up a strategy with an action plan that includes (151):

1. Reducing salt in the bakery products;
2. Enforcing food labeling to include salt content;
3. Developing a legislation and monitoring its implementation.

Two studies analyzing food consumption in Kuwait which found the average salt intake to be within 8-10 g per day. This range may be an underestimate as not all food items were included in the studies. Data from these studies provided information on the main food sources of salt in the Kuwaiti diet, indicating that salt was mainly added during food preparation at home. This was shown to be the main source of salt intake. They also showed that bread consumption was the second main source of salt . Further research is needed to ensure the accuracy of data for future actions. Kuwait is currently at the stage of designing a study to determine salt intake by using the gold standard of assessing 24-hour urinary sodium (151).

The Ministry of Health in partnership with the main bakery company decided to implement the WHO recommendations regarding reducing salt intake. A 10% reduction of salt in bread was achieved in March 2013. This was followed by another 10% reduction 6 months later, in August of the same year. By October, 2013 almost all types of bread produced by the company, with the exception of one traditional variety, had a 20% salt reduction. Kuwait imports more than 95% of consumed food. Processed foods such as breakfast cereals, cheese, chips and meat, account for a significant amount of salt in the Kuwaiti diet. Some of these food items are sometimes highly consumed, for example, chips by children. This was recognized as an opportunity to further engage the private sector. A plan to advocate partnership and engage food companies with health awareness activities was put together (151).

The Ministry of Health, Oman, is the main governmental body that oversees salt reduction activities. The National Nutrition Survey based on the 24-hour dietary recall suggested the average intake of salt between 11-12 g per day. In order to reduce the consumption of salt to the levels specified by WHO, initiatives are being planned, though are still in their initial stages. Currently, the Ministry of Health is working towards reducing salt levels in

commonly consumed foods; mainly focusing on highly salted foods such as bread, cheese, and processed meats.

In Qatar the main source of salt in the diet was from bread and other baked products. This country in collaboration with EMRO planned initiatives to reduce salt in bread by 30% (151).

Saudi Arabia reported that salt intake reduction efforts are in their preliminary stages. Similar to other Arab countries, reduction of the salt content in bread is being targeted. As a result, the Ministry of Health proposed to pass a decree aiming to reduce salt by 10% annually until a target of 30% reduction is achieved.

The Ministry of Health in UAE is in its initial stages of implementing its salt intake reduction strategy. Currently it is identifying the main producers of bread to review the current situation regarding bread production, distribution, and the use of standardized recipes. The aim is to set a plan of action for the gradual reduction of salt in bread.

Briefly, Arab countries in the Middle East region are at different stages of implementing salt reduction programs. The majority are targeting salt reduction in bread, which has been identified as one of the major sources of salt intake. The salt content of various types of bread (pita, markouk and others) and commonly consumed cheese products in the area is described in the Lebanese experience. In Kuwait, Qatar and Bahrain local authorities are collaborating with major bakeries to reduce salt in bread products by 10%. This goal has been achieved in Kuwait and ongoing efforts are underway to achieve lower salt levels (151).

Overall, non of Middle East countries have performed a comprehensive program with definite objectives and actions on salt intake reduction. Activities in Iran as one of EMRO countries will be discussed separately in the following section.

CHAPTER 4: SALT INTAKE REDUCTION ACTIVITIES IN IRAN

A review of the available literature and performing interviews with stakeholders showed that no comprehensive programs have yet been designed in Iran. The activities performed are limited to the following:

- Daily salt intake was measured in adults in 3 separate studies in 1999, 2002 and 2007 using 24-hour urine collection to determine the trend of salt and to help in designing and performing interventions aiming to reduce the level of salt intake. The first two phases of the intervention led by the Isfahan Healthy Heart Program (IHHP) showed an increase in the level of salt intake; however, a decrease of 2 g was noticed toward the end of the IHHP program compared to the second phase that may be related to dietary interventions in IHHP (95, 96).

- **The World Hypertension Day**

The World Hypertension Day was celebrated every year in May with the main message of reducing salt intake at population level and the salt content of processed foods by the ICRI with the cooperation of "Food, Industry, Health Society" and the "Heart Friends Society" of Isfahan across the society and particularly among the high-risk groups. A number of booths were set up across Isfahan to provide certain recommendations about salt reduction in addition to measuring people's BP, weight and height in some years the world hypertension day was celebrated as a week with multiple activities in different sectors. Educational brochures and pamphlets about the risks of salt and the necessity of its reduction were distributed among the people in stands, health centers and schools (152).

- **IHHP activities on salt reduction**

One of the IHHP interventional projects was "the Healthy Food for Healthy Community" project, which aimed to public education and special groups about healthy diets, including the

intake of less oil, salt and sugar and the consumption of more fruits and vegetables (153). Numerous activities were performed across the society in high-risk groups and among health professional as part of the project carried out in 2002-2006 (154-155).

Several ongoing correspondences began on reducing the use of salt and preservatives in food industries and also food labels showing the product's salt content from 2005 during the implementation of the IHHP and then on a provincial level or on a ministry level with authorities at the Ministry of Health, including the Nutrition Improvement Office and the Food and Drug Administration. The correspondences were based on the results of cross-sectional studies or the assessment of the activities performed in the nutrition team of the IHHP, including a qualitative study conducted on a small group of the population and stakeholders within the framework of the IHHP, which showed that only 7% of the people who read the labels understand them and 95% of the participants believed that the labels had to communicate information in a simple, brief and comprehensible manner (155). Moreover, some food industries produced low-salt products after interventions were held, however, some of these actions were not persistent due to the inconsistencies, economic problem, consumer taste and undefined marketing strategies. It should be noted that all the educations provided by the IHHP were focused on using less saturated and trans fats, sugar and salt (especially in bread and industrial food products and focused on removing salt shakers from restaurant tables and making sandwiches with less salty cucumber), using more fruit and vegetables, and were mainly conducted through the Islamic Republic of Iran Broadcasting (IRIB), schools, kindergartens, industries, offices, welfare centers and hospitals; these educational and non-educational interventions might have caused the decline in the level of salt intake in Isfahan from 2004 to 2007 (96). Some salt reduction activities in IHHP are as follow:

1. Holding continuous education courses on nutrition for all physicians in Isfahan province by the collaboration of the Continuous Medical Education (CME) Development Center of Isfahan University of Medical Sciences.
2. Prohibiting the consumption of unhealthy high-salt snacks and fast foods at schools.
3. Prohibiting the advertising and promotion of unhealthy snacks and fast foods on the IRIB.

- **Food, Industry, Health Society**

The establishment of the "Food, Industry, Health Society" that consist of food industry specialists from the Department of Food Industries at Isfahan University of Technology, nutritionists from the School of Nutrition at Isfahan University of Medical Sciences, experts at the Food and Drug Deputy and the Institute of Standards and Industrial Research of Iran, cardiologists, pediatricians and nutritionists at the ICRI and a group of food industry for designing strategies to reduce salt content of food products and gaining more support from the food industries. In the beginning this society had some members from Nutrition Improvement Office of Ministry of Health and National Nutrition and Food Technology Research Institute.

The society has been active as a network since 2002 and was officially registered on Aug. 22, 2010. The objectives of the society are:

1. Promoting a healthy food culture among raw material producer, food producers and food unions and facilitating the improvement of health food production.
2. Performing promotional activities across the society to increase its acceptance of health food products and consulting with managers and authorities of relevant organizations for providing the required infrastructure for this purpose.
3. Negotiating with the owners of food industries and food unions about producing healthier and more high-quality food products and presenting new scientific food formulations and also

supporting the process of the production of health foods in factories and small manufacturers in a scientific manner.

4. Proposing new formulations for healthy foods to the Food and Beverage Supervision and Evaluation Department to ultimately be presented to food industries.

5. Presenting Proposing new formulations for healthy foods to the Institute of Standards and Industrial Research of Iran and making the necessary arrangements with that institute to encourage producers for switching to the new formulations.

6. Holding social and scientific meeting like, workshops and seminars for food producers, medical authorities and the public.

7. The Society has held several seminars and congresses for food industries in order to gain advocacy of producing healthy foods and has also held exhibitions for the public awareness about healthy food products.

- **Salt reduction advocacy model**

A study entitled “designing a comprehensive model of advocacy strategies for reducing salt intake in Iran in general population and high-risk groups” initiated by the Nutrition Improvement Office and supported by the WHO Office in Iran was conducted in the ICRI. A team of specialists, including cardiologists, nutritionists, experts from the health deputy, the Food and Drug Administration and the Treatment Deputy of Isfahan University of Medical Sciences and experts of food industries was established. The viewpoints of the team members were discussed in several meetings. The collaborators were then divided into 4 groups: legislators and policymakers, beneficiaries, partners and opponents. To design the support model, the 4 groups were classified under 7 separate groups: the public, legislators and policymakers, influencers, high-risk groups, health professional, food unions and food industries, and NGOs. Interviews were conducted with these groups to determine their

awareness, beliefs, opportunities and barriers. Based on the findings obtained from the interviews and a review of literature, the viewpoints of each group and the suggestions of the specialist committee, key messages were defined in two categories: a main category and a secondary one. The messages were designed making sure they kept their simplicity, brevity and comprehensibility. The influencers, the content, the method of advocacy, the place, the time, the predisposing factors, the opportunities and the barriers to advocacy were determined in each group for the design of the model (103).

The main method of advocacy by children and adolescents is to use different role models, to hold competitions pertaining to their school material and to design research activities. The mass media, health professional and popular figures, such as artists, athletes and clergymen, are more influential for advocacy of adults, and health professional are more influential for advocacy of high-risk groups. The main method of advocacy of policymakers is to lobby with them and to sensitize them to the high costs of diseases caused by high-salt diets. The advocacy of food producers, including food unions and food industries, can be performed through inspiring discussions and debates. The interviews with food producers revealed that consumers' interests and taste preferences are important for them. Food producers are therefore forced into producing low-salt products when the public awareness increases and their attitudes and demands change. One of the major sources of the daily salt intake of Iranians is bread, which is because of the low quality wheat used in the preparation of its flour. It might be argued that the most influential method for reducing salt intake is to advocacy of policymakers for importing and producing high-quality wheat, training proper bread baking methods, using bread improving agents to replace salt and using incentives for bakers producing low-salt bread (103).

- Cooperation with WASH and CASH

ICRI joined WASH and CASH led by Professor Graham MacGregor since it started 8 years ago. ICRI members joined him in all the reports, newsletters, surveys and studies such as the announcement the measurement of the salt content of pizzas prepared in pizza shops. Representatives of this team took part in the salt reduction workshop held on Sep 27-29, 2011, in Isfahan concurrent with the "First International Congress on the Prevention, Diagnosis and Treatment of Hypertension". To further the cooperation with these two groups, the ICRI held the "World Salt Awareness Week" through designing posters, performing interviewing with specialists in news agencies and publishing educational material on salt in line with the specific theme of the year on websites in March 2013 and 2014 along with other countries of the world and sent the reports to the international organizations. The topics announced for these two years were:

- The Sixth Salt Awareness Week with the subject of "Less salt Please" on March 11-17, 2013
- The Seventh Salt Awareness Week with the subject "Stop… Look… Choose… The Lower Salt Option" on March 10-16, 2014.

- Public education on salt intake reduction

1. According to a protocol of the Undersecretary of Health in the Ministry of Health, health centers provided the public education about the prevention of high BP and the reduction of salt intake and also about the improvement of group feeding in public places providing food services, such as boarding schools, offices and dormitories, within the framework of lifestyle modification programs.
2. The periodical supervision of in food unions by the Department of Environmental Health.

3. Compulsory health education courses, including courses on environmental health, food hygiene, held periodically every 3 years by guidance schools for all food unions under the supervision of the provincial health center.

4. A national campaign was designed by the Nutrition Improvement Office of the Ministry of Health on salt intake reduction and held by all provincial health deputies of Iran on Dec. 27-Jan. 30, 2014-15. The campaign focused on the following subjects:

- Modifying children's taste
- Modifying school cafeterias
- The elderly
- Bakeries
- Noncommunicable diseases (hypertension, cancer and cardiovascular diseases)

5. Moreover, three conferences were held as part of the program; the first conference was held on Jan. 18, 2015, by the National Nutrition and Food Technology Research Institute (NNFTRI) with the presence of experts from different organizations, including the authorities of the Health Deputy of The Ministry of Health, the Nutrition Improvement Office, the Food and Drug Administration, the ICRI, the Cancer Research Center, the Institute of Standards and Industrial Research of Iran, the IRIB, the Office of Nonmetal Industries, the Association of Trade Unions, Salt Producers Guild, Refined Salt Producers' Association, and the Iranian Food Sciences and Technology Association. Three discussion panels were held in this conference discussing:

- The side effects of salt intake on health (the Health Deputy of The Ministry of Health, the National Nutrition and Food Technology Research Institute, Director of the Isfahan Cardiovascular research Institute, Director and the Research Deputy of the Cancer Research Center);

- Programs led by regulatory and administrative agencies for salt reduction (Director of the Nutrition Improvement Office of the Ministry of Health, the General Director of the Food and Beverage Supervision and Evaluation Department of the Food and Drug Administration, Advisor to the President of the National Organization for Standards in Food and Agriculture , Director of the National Institute of Standards of Human Resource Development, IRIB representative)
- The role of food unions and industries in the reduction of salt intake (Director of the Nutrition Improvement Office of the Ministry of health , Director of the National Nutrition and Food Technology Research Institute, Head of Iranian Food Industry Associations, Head of Cereal Research Center, Head of Salt Union)

6.According to a report from the Food and Organization, the law enforcing the labeling of food products for their salt or sodium content was legislated in 2011; however, due to administrative problems, not all food industries implement it.

CHAPTER 5: SALT REDUCTION ACTION PLAN

Vision

The adverse effects of noncommunicable diseases associated with salt intake should be reduced and all Iranians are subject to benefitting from low-salt diets by the end of the 5-year program.

Mission

All socio-economic classes of the Iranian society are subject to benefitting equitably from low-salt, balanced and cost-effective diets through the salt reduction program's inter-sectoral cooperation and policy making.

Objectives

The program aims to provide details of practical guides and their application in planning in order to modify the dietary patterns of the population and to reduce their salt intake.

General strategies

The program has 10 strategies for which an objective (or objectives) will be determined, and the action plan should address these or objectives, all have been presented in tables in the next chapter. The 10 strategies are:

1. **Program leadership and governance**

Government leadership at a senior level is an essential component for planning and performing successful salt reduction program. We designed this program with Ministry of Health leadership.

2. Establishment of national and international advisory boards

An advisory group can support the designing, development, implementation and evaluation the program. In addition they can help in engaging the expertise and stakeholders. International advisory board should be expert in salt reduction program is a useful addition to the advisory group or may be contacted for designing and reviewing of the proposed program. Our advisory boards are as follows:

Table 6- National advisory board

Name	Organization
Zahra Abdollahi	Nutrition Improvement Office, Undersecretary for Health, Ministry of Health and Medical Education
Gholam Hossein Sadri	Isfahan Provincial Health Center, Health Deputy, Isfahan University of Medical Sciences
Abas Jafarian	Deputy of Food and Drug, Isfahan University of Medical Sciences
Mansour Shiri	Health Education Department, Isfahan Provincial Health Center
Majid Hajifaraji	National Nutrition and Food Technology Research Institute
Hedayat Hosseini	Supervision and Evaluation of Food and Cosmetics and Hygiene Products , Food and Drug Administration, Ministry of Health and Medical Education
Ahmad Esmaillzadeh	School of Nutrition, Isfahan University of Medical Sciences

Table 7- International advisory board of the "Development of Five Years Multi-sectorial National Action Plan for Salt Intake Reduction"

Name	Position
Professor Norm R. C. Campbell	Department of Medicine, Community Health Sciences, and Pharmacology and Therapeutics, University of Calgary, Calgary; Libin Cardiovascular Institute of Alberta, University of Calgary; President of the Canadian Hypertension Society, the Canadian Coalition for High Blood Pressure Prevention and Control and the Canadian Society for Clinical Pharmacology, CANADA
Dr. Jacqui Webster	Centre Director, WHO CC Salt Reduction, Food Policy Division; Senior Lecturer, University of Sydney The George Institute for Global Health, AUSTRALIA
Professor Graham MacGregor	Professor of Cardiovascular Medicine; Chairman of Consensus Action on Salt and Health (CASH), World Action on Salt and Health (WASH), Blood Pressure UK and Action on Sugar Wolfson Institute of Preventive Medicine, Barts and The London School of Medicine and Dentistry, Queen Mary University of London; Chairs the Blood Pressure Association of the United Kingdom, Board Member of the World Hypertension League; President of the British Hypertension Society, ENGLAND

3. Mobilizing and sensitizing the stakeholders and policy makers

The stakeholders with potential interest in a salt reduction program are legislators, policy makers, government sectors, food industry and unions, health related NGOs, health professionals, academic and research institute and centers and the media. Of note, it is not just the Ministry of Health that is impacted upon but potentially also a broad range of other ministries, some positively and some adversely. A clear understanding of the powers and

interplay between different government ministries will be important to success. Identifying the right individuals and organizations is best done through a consultative process involving key contacts in each sector. The current and potential stakeholders that the program proposed on are presented in the following:

Table 8- Stakeholders with current or potential impacts on a national salt reduction plan

1.	**Legislative authorities and Policy makers**	Iranian Parliament's; High Council for Health and Food Safety; Minister of Health; Undersecretaries of Health and Treatment affairs of the Ministry of Health; Food and Drug Administration; Nutrition Improvement Office; Institute of Standard and Industrial Research; The Ministry of Agriculture; Ministry of Industry, Mining and Commerce; Governors of the provinces
2.	**Influencers**	The Ministry of Education; The Welfare Organization; National Iranian Broadcasting Corporation; Religious authorities; Celebrities (actors, sportsmen); The Flour and Bread Council in the provinces; The Health, Food and Drug and Treatment Deputies of the Universities of Medical Sciences ; The Medical Education Development Center of Universities of Medical Sciences; Institute of Standard and Industrial Research; The Ministry of Industries, Mining and Commerce; The Ministry of Agriculture; Food industries; The restaurant, bakeries sandwich, pizza shop and nuts unions
3.	**High risk groups**	Individuals aged more than 40 years; Those suffering from high BP, CVD, diabetes mellitus, renal disease, osteoporosis, or some types of cancer; First degree relatives of individuals with high BP or suffering from CVD; Individuals with overweight or obesity
4.	**Health professional**	Physicians, nurses, Health sector personnel, nutritionists
5.	**Food industries; The restaurant, bakeries sandwich, pizza shop and nuts unions**	Producers of processed foods with high salt content; Syndicate of restaurant owners; Syndicate of fast food shops; Syndicate of bakers
6.	**General population**	Children; adolescents; adults; the elderly; women

4. Assessment of current salt intake in the society

Determining the average level of salt intake in population based on age groups and genders is the essential information to plan salt reduction program. Although there are various methods for assessment of salt intake, we need a valid and reliable tool to estimate accurate amount.

The most precise and traditional method for assessment of salt intake is 24hour urine collection. The alternative methods are various dietary assessment questionnaires which have some limitations. Another approach which recently is used id spot urine sample which should be calibrated in the target population. Although 24hour urine samples usually underestimate salt intake by 10% because non-urinary losses of sodium are not captured, the errors resulting from estimates based upon dietary survey data have been greater and less predictable. In addition a validated food frequency questionnaire is necessary to estimate food contribution in salt and sodium intake.

5. Estimating the salt content of different foods

Identifying the food contribution in salt intake and the main sources of dietary salt is necessary to the development a successful salt reduction program. For example, if most salt is found to derive from processed foods then the most appropriate intervention will be one targeting food reformulation and the food industry; if the main source is bread we should focus on bakery and training them to use less salt and also availability of the high quality wheat; alternatively, if the main source of salt is discretionary salt added during food preparation at the home then the primary intervention may be based upon community education and the use of a salt substitute.

Information about the main sources of salt in the diet can be derived from a number of different places including both individual and summary data sources. Individual data was

collected by dietary assessment method. Although dietary assessment methods are suitable for examining the food contributions in dietary salt intake, they were less accurate for estimation of total salt intake.

In addition national food composition database for sodium is necessary for assessment of salt intake. Thus we need to do chemical analysis different foods and also collecting relevant documents from other societies that consume the same foods.

6. Determining the target level of salt intake reduction by the end of the 5-year plan

To achieve a 25 percent reduction in the mortality derived from NCDs by the year 2025, the WHO targeted the population salt intake reduction by 30 percent. Therefore an approximate 3 percent reduction in salt consumption every year is recommended. Although these are highly achievable reductions, it will require specific and focused activities led by a dedicated team.

Setting a national target will require baseline information about the current level of salt consumption. As salt intake was about 13 g per day in our society, the goal for the year 2025 is a decline in average consumption of 4 g/day to a new average consumption level of 9 g/day and it needs to reduce totally 2 g in our 5- year salt reduction program.

7. Collecting information required for program development

We require some other data including knowledge, attitude and practice of all target groups including general population and high-risk individuals, health professional legislators and policymakers, food industries and unions. In addition we need to collect the laws, circulars, legislations and rules pertaining to the reduction of the salt or sodium content of preservatives and use food labeling with salt or sodium content and the available plans and actions designed and performed to date in Iran for reducing salt intake and the harms of high salt intake and methods of reducing it and collecting information on all types of edible salts

available in Iran, including refined salt, sea salt, iodized salt or salts fortified with other minerals and potassium salts. In this regards we may need performing some studies in the target groups.

8. Delivering educational strategies for reducing salt intake in the society

One of our main strategies is **i**mproving awareness, attitudes and performance in people, including children, adolescents, adults, women and the elderly, on the harms of high salt intake and approaches for reducing it. In this regard we require performing some educational courses for health professional, providing some educational material and cooperating with mass media to prepare some educational program. Furthermore cooperation with Education Ministry can help us to educate our children in this regard.

9. Delivering strategies for legislation, policymaking and inter-sectoral collaboration for reducing salt intake in the community

Another main strategy is legislation, policymaking and inter-sectoral collaborations for reducing salt consumption. . We need ratifying some laws for food industries, unions including restaurants and fast food shops to prepare low salt foods, Islamic Republic of Iran Broadcasting Organization to prohibit advertisement of high salt foods, Industry, Mines and Commerce Ministry for prohibit the import of low-quality wheat and also enforcing some laws about the standard salt content of flour, prohibiting the distribution of salty snacks and food in schools, labeling the sodium content of food products, prohibiting the production and distribution of sea salt. Moreover ratifying some laws for educational courses for health professional are necessary to perform this program.

10. Providing resources for implementing the salt reduction program

Salt reduction programs have been identified as one of the most cost-effective, and likely cost saving, interventions for reducing the burden of NCDs. However, there are still costs involved with the implementation of a salt reduction program. The following potential cost elements need to be considered:

- Coordination - dedicated staff (at least one person) in the Ministry of Health to manage the program
- Baseline data collection - salt intake, sources of salt in the diet, knowledge, attitudes and behavior related to salt, stakeholder analysis, levels of salt in foods
- Developing the program– data synthesis, expert meetings, stakeholder consultation
- Implementing the program– engaging policy makers and stakeholders, working with the food industry, community education, health promotion
- Evaluation and program optimization – process and outcome indicator measurement, program review, iterative program re-development

In many cases it will be possible to minimize costs by utilizing existing resources and piggy-backing on other initiatives. For example, much of the data collection could be done within the WHO STEPwise framework and most countries have some existing nutrition program within which salt reduction work could be incorporated.

CHAPTER 6: MONITORING AND EVALUATION OF SALT REDUCTION PROGRAM

Monitoring and evaluation protocol

Proper monitoring and evaluation is a vital element of any successful intervention program. Therefore, various steps were considered in order to assess the “process” of the plan, its “impact” and “outcomes” in each of the target audiences; according to which the plan would be reviewed and revised. Multiple indicators were defined for each action and it' s target population were explained in the next chapter. Specific indicators evaluate specific type of intervention including process, impact or outcome.

Table 8 provides the details of the monitoring and evaluation plan for assessment of the success of the national salt reduction program in the general population.

Table 9- Monitoring elements in national salt reduction program

Elements to be assessed and monitored
Processes
1. Existence and quality of educational programs and trainings provided through/at the time of: • Families attending health clinics • Physicians and health professional attending mandatory continuing qualification courses or CME • "Parents and teacher associations" meetings • Mass media programs • Educational materials • Competitions • Emails • Text messages • Campaigns • High risk group attending health clinics
2. Existence, numbers and quality of actions related to policy making strategy • Meeting with legislators, policy makers and influencers • Meeting with stakeholders including food industries, unions and negotiation with them
Impacts
1. Reports and published documents • Current sources of information to perform action plan program • Validation of tools • Current status and trends of salt consumption • Current status and trends of food contributions in salt intake • Salt content of food • Current status and trend of knowledge, attitude and practice about salt among special population and health professional • Current status and trend of available salt

- Existing laws
- Legislated laws

Outcomes

- Prevalence and trend of hypertension
- Prevalence of controlled hypertension
- Average BP level
- Incidence of cardiovascular disease (e.g. hypertension, Ischemic heart disease and stroke)
- Incidence of relevant cancers especially gastric cancer
- Prevalence and trend of obesity
- Prevalence and trend of osteoporosis
- Prevalence and trend of kidney diseases relevant to salt
- All-cause mortality rate
- Cardiovascular mortality
- Cancer mortality

CHAPTER 7: COMPONENTS OF THE SALT REDUCTION ACTION PLAN

Table10- Component of salt reduction action plan

	Strategy	Objective	Action	Who	Indicators/ Evaluation	Timeframe
1	**Program leadership and governance**	Performing the salt reduction program led by the government	2	- The Nutrition Improvement Office	- Committee strusture - Number of committee meetings	2015
2	**Establishment of national and international advisory boards**	Consultation on the design and implementation of the salt reduction program and benefiting from expertise of experts	- Discussing with some advisors with previous expertise at the national level - Requesting their cooperation officially Requesting international advisors who are experienced in preparing and performing salt reduction programs for cooperation in the preparation of the action plan - Sending an official letter to them - Consultation done electronically with national and international advisors - Sending the action plan draft to them - Applying their suggestions and comments - Holding meetings with the national advisors if necessary - Holding virtual meetings (conference calls or web-based meetings) with the international advisors, if necessary	- The Nutrition Improvement Office - Cardiovascular Research Institute - The National Nutrition and Food Technology Research Institute, - Other research centers and academic departments, - The international advisory board	- Number of correspondences - Performing the suggestions - Number of face to face meetings - Number of virtual meetings	2015
3	**Mobilizing and sensitizing the**	Identifying stakeholders of the salt reduction program	Holding meetings with the steering committee and determining the stakeholders in 6 groups: **1. Legislative authorities and Policy**	- The Steering Committee	- The Steering Committee's number of meetings	2015-2016

	stakeholders and policy makers		**makers:** Iranian Parliament's; High Council for Health and Food Safety; Minister of Health; Undersecretaries of Health and Treatment affairs of the Ministry of Health; Food and Drug Administration; Nutrition Improvement Office; Institute of Standard and Industrial Research of Iran (ISIRI); The Ministry of Agriculture; Ministry of Industry, Mining and Commerce; Governors of the provinces 2. **Influencers**: The Ministry of Education; The Welfare Organization; National Islamic Republic of Iran Broadcasting (IRIB); Religious authorities; Celebrities (actors, sportsmen); The Flour and Bread Councils in the provinces; The Health, Food and Drug and Treatment Deputies of the Universities of Medical Sciences; The Medical Education Development Center of Universities of Medical Sciences; Institute of Standard and Industrial Research; The Ministry of Industries, Mining and Commerce; The Ministry of Agriculture; Food industries; The food unions (restaurants, bakeries sandwich shops, pizza shops and nuts) 3. **High risk groups:** Individuals aged more than 40 years; Those suffering from high BP, CVD (CVD), diabetes mellitus, renal		- Reviewing minutes to evaluate the discussed subjects	

			disease, osteoporosis, some types of cancer; First degree relatives of individuals with high BP or suffering from CVD; Individuals with overweight or obesity 4. **Health Professional:** Physicians, nurses, Health sector personnel, nutritionists 5. **Food industries and unions:** Producers of processed foods with high salt content; Syndicate of restaurant owners; Syndicate of fast food shops; Syndicate of bakers; 6. **General population**			
		Advocacy of the salt reduction program targeting legislators and policymakers for it's implementation	1. **Corresponding with the Ministry of Health related Undersecretaries** 2. **Corresponding with:** - ISIRI - IRIB - The Ministry of Agriculture - The Ministry of Industries, Mines, and Commerce - The Cabinet - The Iranian Parliament - The National Health and Food Safety Council and the Provincial Health and Food Safety Working Groups	- The Nutrition Improvement Office - The Ministry of Health	- Number of contact letters - Number of letters replied to - Number of relevant minutes - Number of issued circulars - Number of ratified laws	2015-2016
			- **Holding meetings in:** - ISIRI	- The Nutrition Improvement Office - The Ministry of	- Number of relevant minutes - Number of issued	2015-2016

			- IRIB - The Ministry of Agriculture - The Ministry of Industries, Mines, and Commerce - The Cabinet - The Iranian Parliament - The National Health and Food Safety Council and the Provincial Health - Food Safety Working Group	Health	circulars - Number of ratified laws	
		Advocacy of the salt reduction program targeting the influencers for it's implementation	1. Delivering lectures , talks	- The Minister of Health - The Undersecretary of Health of the Ministry of Health - The School Health Departments of Provincial Health Deputies - The Nutrition Improvement Office of Provincial Health Deputies - Provincial Treatment Deputies - Health related NGOs - Health professionals - Health charities	- Number of contact letters - Number of delivered lectures - Number of individuals attending the lectures	2015-2016

			2. Preparing educational materials on salt intake reduction for publication in newspapers', magazines' and organizations' periodic newsletters	- Health volunteers - The Nutrition Improvement Offices of Provincial Health Deputies -Related NGOs	- Number of contact letters - Number of provided educational material - Number of published periodic newsletters or newspapers - Number of people to whom the newspapers or newsletters were distributed'	2016-2020
			3. Preparation of educational materials - Booklet - Posters - Brochures	- Health volunteers - Nutrition Improvement Offices of Provincial Health Deputies -Health related NGOs	- Number of prepared topics - Number of printed copies -Number of circulated copies	2016-2020
			4. Taking care of correspondences with the authorities and presenting statistics	- The Minister of Health - The Head of Nutrition Improvement Office - The Head of Food and Drug Administration and the Food and Drug Undersecretary of the Ministry of	- Number of contact letters - Number of letters replied to - Number of relevant minutes - Number of circulars issued	2015-2016

				Health - The Undersecretary of Health of the Ministry of Health - The Undersecretary of Treatment of the Ministry of Health - The Head of IRISI - Health related NGOs		
			5. Holding meetings and discussions with the authorities to implement salt reduction program	- The Health Minister - The Head of Nutrition Improvement Office - The Head of Food and Drug Administration and the Undersecretary of Food and Drug of the Ministry of Health - The Undersecretary of Health of the Ministry of Health - The Undersecretary of Treatment of the Ministry of Health - The Head of IRISI	- Number of relevant minutes - Number of issued circulars - Number of physicians encouraged to support the cause	2015-2016

				- Health related NGOs		
			6. Sending chain emails	- Provincial Nutrition Improvement Offices - Health related NGOs - Provincial School Health Departments	- Number of contact emails - Number of each email's recipients - Number of chain email recipients	2016-2020
		Advocacy of the salt reduction program targeting the high-risk groups for it's implementation	1. Face-to-face education	- Health professional	- Number of contact letters to notify of the circulars - Number of contact letters notifying of the health professional training program - Number of held training courses and seminars - Number of trained health professional - Number of educated individuals (high risk)	2016-2020
			2. Preparing educational materials	- Provincial Nutrition Improvement Offices - Health related	- Number of prepared educational materials - Number of held	2016-2020

				NGOs - Provincial school Health Departments	training courses - Number of attendants in each course - Number of distributed educational materials - Number of delivered lectures - Number of individuals attending the lectures or relevant meetings	
			1. Running annual national campaigns on salt intake reduction	- Provincial Nutrition Improvement Offices - Provincial Food and Environmental Health Departments - Provincial School Health Departments - Provincial Health Education Departments - Provincial Food and Drug Administrations - Provincial Treatment Deputies - Provincial IRISI	- Number of performed campaigns - Number of involved governmental and NGOs and private sector - Number of participants	2015-2020

				- Municipalities - the Islamic City Councils - health related NGOs		
			2. Producing TV programs (panel discussions, cooking programs, subtitles and advertisement teasers, animations)	- Provincial Nutrition Improvement Offices - Provincial Food and Environmental Health Departments - Provincial School Health Departments - Provincial Health Education Departments - Provincial Food and Drug Administrations - Provincial Treatment Deputies - Provincial IRISI - health related NGOs	- Number of contact letters to IRIB - Number of issued letters by head of IRIB - Number of produced TV programs - Number of times each TV program was broadcasted - IRIB feedback - Audience feedback	2016-2020
			3. producing TV contests or game shows	- Provincial Nutrition Improvement Offices - Provincial Food and Environmental Health Departments - Provincial School	- Number of broadcasted game shows or contests - Number of contestants	2016-2020

				Health Departments - Provincial Health Education Departments - Provincial Food and Drug Administrations - Provincial Treatment Deputies - Provincial IRISI - health related NGOs		
		Advocacy of salt reduction program targeting the health professional for it' s implementation	1. Preparing educational material for publication in newspapers and offices' periodic newsletters	- Provincial Nutrition Improvement Offices - Provincial Health Education Departments	- Number of contact letters - Number of published articles - The publishing newspapers' circulation	2016-2020
			2. Sending frequent chain emails (chain messages)	- Provincial Nutrition Improvement Offices - Provincial Health Education Departments	- Number of contact emails - Number of chain email recipients - Number of each email recipients	2016-2020
			3. Sending educational text messages (SMS)	- Provincial Nutrition Improvement Offices - Provincial Health Education Departments	- Number of sent SMS - Number of chain SMS recipients - Number of each SMS recipients	2016-2020

			4. Preparing educational materials	- Provincial Nutrition Improvement Offices - Provincial Health Education Departments	- Number of educational topics - The books, brochures and posters' circulation - Number of distribution locations - Number of individuals who receive the educational material	2016-2020
			5. Corresponding with the Undersecretary of Logistics of the Ministry of Health and applying for training courses to train and advocate health professionals for salt intake reduction program	- Provincial Nutrition Improvement Offices	- Number of application letters for holding training workshops and seminars based on different groups - Number of programs written for the training courses and seminars according to audience groups - Number of programs approved for the training courses and seminars according to audience groups - Number of held training courses and	2016

					seminars according to audience groups - Number of attendees based on different groups	
			6. Holding training courses in order to train and advocate health professional for salt intake reduction program	- Provincial Nutrition Improvement Offices	- Number of application letters for holding training workshops and seminars based on different groups - Number of programs written for the training courses and seminars according to audience groups - Number of programs approved for the training courses and seminars according to audience groups - Number of held training courses and seminars according to audience groups - Number of attendees based on different groups	2016-2020

			7. Corresponding with the Undersecretary of Research and Education of the Ministry of Health to apply for holding and integrating training courses and seminars to train and advocate physicians and health professionals for salt intake reduction	- Provincial Nutrition Improvement Offices	- Number of application letters for holding training workshops and seminars based on different groups - Number of programs written for the training courses and seminars according to audience groups - Number of programs approved for the training courses and seminars according to audience groups - Number of held training courses and seminars according to audience groups - Number of attendees based on different groups	2016

			8. Holding training courses and seminars in order to train and advocate of health professional for salt intake reduction program	−Provincial Nutrition Improvement Offices	- Number of application letters for holding training workshops and seminars based on different groups - Number of programs written for the training courses and seminars according to audience groups - Number of programs approved for the training courses and seminars according to audience groups - Number of held training courses and seminars according to audience groups - Number of attendees based on different groups	2016-2020
			9. Sending frequent chain emails	- Provincial Nutrition Improvement Offices - Provincial Health Education Departments	- Number of contact emails - Number of recipients in chain emails - Number of recipients of each email	2016-2020

			10. Preparing educational pamphlets and CDs based on different target groups	- Provincial Nutrition Improvement Offices - Provincial Health Education Departments	- Number of educational topics - Educational materials' circulation - Number of recipients of the educational materials based on different groups - Number of CD topics - CDs' circulation - Number of recipients of CDs based on ,different groups	2016-2020
			11. Corresponding with the Undersecretary of Education of the Ministry of Health and applying for the dedication of educational courses held by the Medical Education Development Centers of Universities of Medical Sciences to perform continuous medical education (CME) programs on salt reduction for physicians	- Provincial Nutrition Improvement Offices	- Number of application letters - Number of written course curricula - Number of approved CME curricula - Number of participating physicians	2016
		Advocacy of salt reduction program targeting food industries and food syndicates and unions for it's implementation	1. Holding discussion meetings, debates and negotiations with the food industries, syndicates and unions	- The general population - Supervisory organizations like: • Provincial Food and Drug	- Number of contact letters - Number of industries and unions agreeing with holding the	2016-2017

				Administrations (sections related only to food industries) • Provincial Health Deputies • IRISI (only for food industries) • The Ministry of Agriculture (relevant departments) • The Ministry of Industries, Mines and Commerce (only for food industries) • The Government Trading Corporation of Grains • The Assembly of the Union (only for food unions) - Health professional - Health related NGOs	meetings - Number of relevant minutes - Number of circulars issued - Number of laws ratified - Monitoring and assessment of the products of food industries that have reduced their salt content	
			2. Preparing pamphlets, posters, brochures, booklets and CDs	- Provincial Nutrition Improvement Offices	- Number of educational materials topics - Pamphlets'	2016-2020

				- Provincial Health Education Departments - Health related NGOs	circulation - Number of recipients of educational materials based on group - Number of CD topics - CDs' circulation - Number of recipients of CDs	
		Advocacy of salt reduction program targeting the general population for it's implementation	- Holding annual national salt reduction campaigns - During in-service training - In Parent-Teacher associations' meetings - Through TV programs (panel, animations and scientific programs) - Through newspapers and offices' periodic newsletters - Through performing contests - Through chain emails - Through distributing educational materials among individuals visiting Health Clinics, especially obesity and diabetes clinics - Sending educational text messages (SMS)		- Number of circulars issued on the salt intake reduction - Number of letters announced by the Ministry of Health or it' s subsidiary units on the salt intake reduction - Number of held educational courses - Number of trained community health workers and experts - Number of referred people for family files - Number of educated people - Number of departments	2016-2020

					receiving the letters - Number of TV programs announced by the Ministry of Health or its subsidiary units - Number of held educational courses - Number of participants in each course - Number of SMS - Number of produced animations - Number of times broadcasting each TV program - Number of provided educational material - Number of published newspapers or newsletters - Number of people to whom the newsletters or newspapers were distributed - Number of	

					designed contests - Number of carried out contests - number of participants - number of contact emails - Number of recipients of each email - Number of recipients of chain emails - Number of people who read the emails - the books, brochures, and posters' circulation - Number of distribution locations - Number of referred individuals who receive the educational materials	
4	**Assessment of current salt intake in the society**	1. assessing the mean salt intake in Iranian general population	1. Validating simple instruments for assessing the amount of salt intake among the Iranian population: - Validation of the food frequency questionnaire for assessment of the amount of salt intake compared to the two gold standards: biomarker (the amount of	- The Steering Committee - The international advisory board - The Cardiovascular Research Institute - The Nutrition	- Number of published articles in national and international medical journals - Presented reports in national and	Ongoing

			sodium estimated based on a 24-hour urinary sodium) and a dietary assessment method as references (twelve 24-hour recalls) – Validation of the random spot urine samples (the second voided spot, an afternoon spot and an evening spot samples) compared to the gold standard, biomarker (the amount of sodium estimated based on a 24-hour urinary sodium)	Improvement Office Other related research centers and academic departments – National Nutrition and Food Technology Research Institute	international scientific meetings - Distributed reports/ documents on national and international notable websites	
			2. Assessment of salt intake using the validated food frequency questionnaire 3. Assessment of salt intake using the validated random spot urine sample	- The Nutrition Improvement Office - The Cardiovascular Research Institute - The National Nutrition and Food Technology Research Institute - Nutrition schools of Universities of Medical Sciences - Provincial Health Deputies	- Number of published articles in national and international medical journals - Relevant reports in national and international scientific associations - Distributed reports on national and international notable websites	2016-2017
		2. Determining different food groups' share in supplying Iranians' salt intake	1. Validating the food frequency questionnaire for assessment of food contribution in Iranians' salt intake and comparing it with the reference dietary assessment method (twelve 24-hour recalls)	- The Cardiovascular Research Institute - The Nutrition Improvement Office - The School of Nutrition and Food Science, Isfahan		Ongoing

				University of Medical Sciences		
			2. Assessment of food contribution in Iranians' salt intake using the validated food frequency questionnaire	- The Nutrition Improvement Office - The Cardiovascular Research Institute - The National Nutrition and Food Technology Research Institute - Nutrition schools of universities of medical sciences - Provincial Health Deputies		2016-2017
5	**Estimating the salt content of different food groups**	Determining the salt content per 100 g of food rich in sodium	1. Collecting information on the sodium and salt content per 100 g of food already measured in Iran	- The Cardiovascular Research Institute - The National Nutrition and Food Technology Research Institute - Other research centers and academic departments	- Number of published articles in national and international medical journals - Relevant reports in national and international scientific meetings - Distributed reports/ documents on national and international notable websites	2015-2016
			2. Collecting information on the sodium and salt content per100 g of food already measured in similar populations (with similar characteristics to Iranian societies)	- The Steering Committee - The international advisory boards	- Number of published articles in national and international	2015-2016

				- The National Nutrition and Food Technology Research Institute - Other research centers and academic departments	medical journals - Relevant reports in national and international scientific associations - Distributed reports on national and international notable websites	
			3. Measurement of the sodium and salt content of foods that are source of sodium in a standard laboratory approved by the Food and Drug Administration including: 7. Traditional and industrial bread varieties 8. Cheese brands 9. Sauce brands 10. Salty snack brands 11. Processed food brands 12. Fast food brands 13. Canned vegetable and legume brands 14. Salt-roasted nuts, seeds and 15. Biscuit brands 16. Curd varieties (Kashk) 17. Tomato paste varieties	- The Nutrition Improvement Office - The Cardiovascular Research Institute - The National Nutrition and Food Technology Research Institute - Other research centers and academic departments -The Food and Drug Administration	- Number of published articles in national and international medical journals - Relevant reports in national and international scientific associations - Distributed reports on national and international notable websites	2015-2017
6	**Determining**	The mean salt intake to	Salt intake should be reduced by 3% every year to	- The Steering	- Evaluating the	2015-2016

	the target rate of salt intake reduction by the end of the 5-year plan	achieve 9 g per day in Iran at the end of the 5-year plan	achieve the 2025 globally-defined target of 30% reduction, making the target reduction rate for the end of the 5-year plan 15% (each year 3% reduction).	Committee -The international advisory board	trend of salt intake and determining the annual rate of changes in salt intake in general population	
7	**Collecting information required for program development**	Determining the level of awareness, attitudes and performance in the general population and high-risk individuals in relation to salt and its reduced intake	1. Using the information available in Iran based on national surveillance studies and other studies conducted whether published or not 2. Using the published/unpublished information available in similar populations 3. Performing and conducting relevant studies if necessary	- The Steering committee -The international advisory board - The Nutrition Improvement Office - The Cardiovascular Research Institute - The National Nutrition and Food Technology Research Institute - Other research centers and academic departments -The Food and Drug Administration	- Relevant reports	2015-2016
		Determining the level of awareness, attitudes and performance in health professional in relation to salt and its reduced intake	1. Using the information available in Iran based on previous studies whether published or not 2. Using the published/unpublished information available in similar societies 3. Performing and conducting relevant studies if necessary	- The Steering committee -The international advisory board - The Nutrition Improvement Office - The Cardiovascular Research Institute - The National	- Relevant reports	2015-2016

				Nutrition and Food Technology Research Institute - Other research centers and academic departments -The Food and Drug Administration		
		Determining the level of awareness, attitudes and performance in legislators and policymakers in relation to salt and its reduced intake	1. Using the published/unpublished information available in Iran 2. Using the published/unpublished information available in similar societies 3. Performing and conducting qualitative studies if necessary through individual and focused group interviews if necessary	- The Steering Committee -The group of international advisors - The Nutrition Improvement Office - The Cardiovascular Research Institute - The National Nutrition and Food Technology Research Institute - Other research centers and academic departments -The Food and Drug Administration	- Relevant reports	2015-2016
		Determining the level of awareness, attitudes and performance in food manufacturers, including industries and	1. Using the published/unpublished information available in Iran 2. Using the published/unpublished information available in similar societies	- The Steering Committee -The group of international advisors	- Relevant reports	2015-2016

		unions in relation to salt and its reduced intake	3. Performing and conducting relevant studies through individual and focused group interviews if necessary	- The Nutrition Improvement Office - The Cardiovascular Research Institute - The National Nutrition and Food Technology Research Institute - Other research centers and academic departments -The Food and Drug Administration		
		- Collecting the laws, circulars, legislations and rules pertaining to the reduction of the salt or sodium content of preservatives - Collecting the laws, circulars, legislations and rules pertaining to use food labeling with salt or sodium content	1. Interviewing the relevant authorities at the Food and Beverage Supervision and Evaluation Department of the Food and Drug Administration about laws, circulars, legislations and rules in food industries for reduction of salt or preservatives containing sodium and labeling products for their sodium or salt content 2. Interviewing the relevant authorities at the Institute of Standards and Industrial Research of Iran about laws, circulars, legislations and rules in food industries for reduction of salt or preservatives containing sodium and labeling products for their sodium or salt content 3. Interviewing the head of the Nutrition Improvement Office of the Ministry of Health about laws, circulars, legislations and rules in	- The Steering Committee - The Nutrition Improvement Office - The Cardiovascular Research Institute - The National Nutrition and Food Technology Research Institute - Other research centers and academic departments -The Food and Drug Administration	- Relevant reports	2015-2016

			food industries for reduction of salt or preservatives containing sodium, labeling products for their sodium or salt content and salt and baking soda for bread 4. Interviewing the head of the Food and Environmental Health Department of the Ministry of Health about laws, circulars, legislations and rules in food unions for reduction of salt in food guilds and salt and baking soda in bread 5. Interviewing the head of the School Health Department of the Ministry of Health about laws, circulars, legislations and rules on the distribution of safe food in schools (school cafeterias) 6. Interviewing the relevant authorities of the Ministry of Agriculture about laws, circulars, legislations and rules on producing high-quality wheat and flour 7. Interviewing the relevant authorities of the Ministry of Industries, Mines and Commerce about laws, circulars, legislations and rules on importing high-quality wheat and flour			

		- Collecting the available plans and actions designed and performed to date in Iran for reducing salt intake	1. Interviewing the head of the Food and Beverage Supervision and Evaluation Department of the Food and Drug Administration about the actions taken in the food industry (reduction of salt, labeling products for their sodium or salt content) 2. Interviewing the relevant authorities at the Institute of Standards and Industrial Research of Iran about the actions taken in the food industry (reduction of salt, labeling products for their sodium or salt content)	- The Steering Committee -The Cardiovascular Research Institute - The National Nutrition and Food Technology Research Institute - Other research centers and academic departments -The Food and Drug Administration	- Relevant reports	2015-2016
		- Collecting the plans and actions designed and performed to inform people about the harms of high salt intake and methods of reducing it	1. Interviewing the head of the Nutrition Improvement Office of the Ministry of Health about informing people about the harms of high salt intake and methods of reducing it 2. Interviewing the relevant authority at the High Council for Health and Food Safety about the actions taken and facilities provided for informing people about the harms of high salt intake and methods of reducing it 3. Interviewing the Health Deputy and Director of the Provincial Health Center (due to the province's experience in implementing nutrition interventions among its community) 4. Interviewing NGOs working in health-related fields individually or in focused groups about informing people about the harms of high salt	- The Steering Committee -The Cardiovascular Research Institute - The National Nutrition and Food Technology Research Institute - Other research centers and academic departments -The Food and Drug Administration	- Relevant reports	2015-2016

			intake and methods of reducing it 5. Interviewing the relevant authorities in the Cereal Organization about actions taken to reduce the use of salt and baking soda in bread 6. Interviewing the relevant authorities of the Ministry of Agriculture about the actions taken to improve the quality of wheat and flour 7. Interviewing the relevant authorities at the Ministry of Industries, Mines and Commerce about the actions taken in relation to the quality of imported wheat 8. Interviewing the relevant authorities in the Department of Agriculture about the actions taken to improve the quality of wheat and flour 9. Interviewing the relevant authorities at the Government Trading Corporation of Iran about the actions taken to improve the quality of wheat and flour and reduce the use of salt and baking soda in bread 10. Conducting qualitative studies in the target salt reduction beneficiary population and holding discussions in focused groups			
		- Collecting information on all types of edible salts available in Iran, including refined salt, sea salt, iodized salt or salts fortified with other minerals and potassium salts	1. Interviewing the General Director of the Food and Beverage Supervision and Evaluation Department of the Food and Drug Administration about all the available types of salt and their relevant laws 2. Interviewing the relevant authorities of the Institute of Standards and Industrial Research	- The Steering Committee -The Cardiovascular Research Institute - The National Nutrition and Food Technology Research Institute	- Relevant reports	2015-2016

		- Laws, circulars, legislations and rules and also actions taken to forbidden produce and sale sea salt	of Iran about all the available types of salt and their relevant laws 3. Interviewing the Head of the Nutrition Improvement Office of the Ministry of Health about all available types of salt and their relevant laws 4. Interviewing the relevant authorities at the Ministry of Industries , Mines and Commerce about all the available types of salt and the relevant laws 5. Interviewing the head of Salt Producers Union 6. Conducting qualitative studies on the target salt reduction beneficiary population and holding discussions in focused groups	- Other research centers and academic departments -The Food and Drug Administration		
		- Collecting the existing laws, circulars and legislations on the advertisement of high-sodium products	1. Interviewing the relevant authority at the High Council for Health and Food Safety about the advertisement of high-sodium products 2. Conducting qualitative studies on the target salt reduction beneficiary populations and holding discussions in focused groups	- The Steering Committee -The Cardiovascular Research Institute - The National Nutrition and Food Technology Research Institute - Other research centers and academic departments -The Food and Drug Administration	- Relevant reports	2015-2016
8	**Delivering**	- Improving awareness,	1. Education of children and adolescents through:	- The Ministry of	- Number of	2016-2020

	educational strategies for reducing salt intake in the society	attitudes and performance in people, including children, adolescents, adults, women and the elderly, on the harms of high salt intake and approaches for reducing it	- Incorporating lessons into biology, science or writing courses and class material - School and research activities - Performing contests - The Iranian new year holidays (Norouz) homework - IRIB movies and animations - Roshd magazines, Norouz homework and other journals distributed in schools - Holding campaigns - School associations (healthcare assistants) - Computer games - Painting contests - TV subtitles - Brief messages in TV delivered by artists or athletes - Brief messages in sports magazines - The presence of artists or athletes in contests designed for children and adolescents	Education - Parents and teachers associations - Health instructors - Teachers - School healthcare assistants - Parents - Mass media - Artists - Athletes	circulars issued on the reduction of salt intake - Number of letters announced on the salt reduction intake by the Ministry of Health or its subsidiary units - Number of held courses - Number of community health workers and experts trained - Number of people referring for family files - Number of educated people - Number of departments receiving the letters - Number of TV programs announced by the Ministry of Health or its subsidiary units - Number of held courses for health professional	
			2. Educating adults, especially women and elderly, through: - Animations - TV programs (contests, panel discussions, cooking shows, subtitles and teaser ads)	- Health professional in healthcare centers, health clinics and obesity management clinics or diabetes centers		2016-2020

			- Newspapers and periodic newsletters of different organizations - Face-to-face training - Holding campaigns - Lectures - Frequent chain emails - Pamphlets - Posters - Brochures	- Pre-marriage training class - Clergymen in mosques, religious gathering and Islamic confraternities - Hajj training - Health volunteers in the workplace (organizations and factories) - Mass media (the IRIB, newspapers and magazines) - Artists - Athletes	- Number of participants in each course - Number of contact messages - Number of animations produced or designed - Number of times each TV program was broadcasted - Number of materials presented - Number of newspapers or newsletters published - Number of people among whom the newspapers or newsletters have been distributed - Number of performed contests - Number of carried out contests - Number of participants in the contest - number of contact emails - Number of	

					recipients of each email - Number of recipients of the chain emails - Number of people who have read the emails - the Books, brochures and posters' circulation - Number of distribution locations - Number of referred people who receive the educational material	
9	**Delivering strategies for legislation, policymaking and intersectoral collaboration for reducing salt intake in the community**	- Determining national goals for reducing the salt content of food products	- Corresponding and holding meetings with experts in salt intake and the food industry	- The Steering Committee -The international advisory board	- Number of application letters - Number of application emails - Number of held meetings	2016-2018
		- Ratifying vital laws for reducing salt intake - Setting policies on	1. Ratifying a salt reduction law (according to the above part food products which provide more than 100mg of sodium per 100 kcal of	- **Legislators:** The Iranian Parliament and the Health and	- Number of application letters - Number of held	2016-2018

		reducing salt intake - Intersectoral cooperation for reducing salt intake - Enforcing laws, circulars and legislations pertaining to salt	daily energy	Treatment Commission of Iranian Parliament - **Policymakers:** The Ministry of Health, the Food and Drug Administration - The High Council of Health and Food Safety -ISIRI	meetings - Ratified laws - Number of announced circulars - Percentage of changes in the salt or sodium content of high-sodium products	
			2. Ratifying a law to prohibit the import of low-quality wheat	- **Legislators:** The Iranian Parliament and the Health and Treatment Commission of Iranian Parliament - **Policymakers:** - The High Council of Health and Food Safety - The Ministry of Industries, Mines and Commerce - The Ministry of Agriculture The Ministry of Health, the Food and Drug Administration - The Grain Offices - The director of the Wheat, Flour and Bread Punishment	- Number of application letters - Number of meetings held - Laws ratified - Number of circulars announced - Reports on the quality of imported wheat	2016-2018

				Office - The Flour and Bread Parent Company		
			3. Ratifying a law for reduction of the salt content of dishes served in restaurants and fast foods by 10%	- **Policymakers:** The Ministry of Health, the Undersecretary of Health (the Food and Environmental Health Department and the Nutrition Improvement Office)	- Number of application letters - Number of held meetings - Ratified laws - Number of issued circulars - Percentage of changes in the salt content of dishes in restaurants and fast foods	2016-2018
			4. Ratifying a law or circulars for reducing the salt content of hospital food by 10%	- **Policymakers:** The Ministry of Health, The Undersecretary of Treatment - Provincial Nutrition Improvement Offices	- Number of application letters - Number of held meetings - Ratified laws - Number of issued circulars - Percentage of changes in the salt content of hospital food	2016-2018
			5. Reducing advertising costs for low-sodium products on IRIB by at least 20%	**- Policymakers:** The Ministry of Health - The High Council	- Number of application letters - Number of held meetings	2016-2018

				of Health and Food Safety	- Ratified laws - Number of issued circulars - Reports on changes in the advertising costs for low-sodium products	
			6. Producing and broadcasting educational TV program on IRIB about salt reduction by weekly or monthly	**- Policymakers:** The Ministry of Health - The High Council of Health and Food Safety - The IRIB	- Number of application letters - Number of held meetings - Ratified laws - Number of issued circulars - Reports on the number of broadcasted periodical educational TV program about salt reduction	2016-2020
			7. Enforcing the law for the standard salt content of flour, which is 1.5% (1% for bread)	- **Policymakers:** The Ministry of Health, the Health Deputy (the Food and Environmental Health Department and the Nutrition Improvement Office), the Food and Drug Administration	- Number of application letters - Number of held meetings - Ratified laws - Number of issued circulars - Reports on changes in the salt content of bread	2016-2018

				- Institute of Standards and Industrial Research of Iran - The Flour and Bread Council - The Governor's Office - The Chairman of the Wheat, Flour and Bread Punishment - The Flour and Bread Company		
			8. Holding salt campaigns in Iran at least once a year	- **Policymakers:** The Ministry of Health, the Undersecretary of Health (the Food and Environmental Health Department and the Nutrition Improvement Office), the Food and Drug Administration Provincial Health Deputies, the Food and Drug Administration in the provinces - IRIB - The Ministry of Interior (the	- Number of application letters - Number of held meetings - Ratified laws - Number of issued circulars - Number of annual campaigns in Iran	2015-2020

				Municipality, including the Deputy of Culture, the Citizenship Culture Committee, urban cultural centers, urban and rural Islamic councils and the Healthcare Committee) - Universities of Medical Sciences (schools of nutrition, healthcare, nursing, etc.) - ISIRI		
			9. Prohibiting the distribution of salty snacks and food, such as fast food, at school cafeterias	- The Ministry of Education - Teacher and Parent Associations - Health instructors - School healthcare assistants	- Number of application letters - Number of held meetings - Ratified laws - Number of issued circulars - Reports on selling these food items	2015-2016
			10. Enforcing the law on putting the food products label with a standard table of nutrition facts and specifying the sodium content of prepared food in the form of traffic lights (green for low and red for high sodium content)	- The Food and Drug Administration	- Number of application letters - Number of held meetings - Ratified laws - Number of issued circulars - Reports on proper	2016-2017

					food labeling	
			11. Adding high-sodium label on food products with a sodium content exceeding the recommended level of 30%	- ISIRI	- Number of application letters - Number of held meetings - Ratified laws - Number of issued circulars - Reports on proper sodium labeling	2017-2018
			12. Intensifying supervisory rules for the ban on the selling of bulk products with high salt content (e.g., cheese and pickles)	- The Health Deputy, the Food and Environmental Health Department	- Number of application letters - Number of held meetings - Ratified laws - Number of issued circulars - Reports on the selling of this type of cheese	2016-2018
			13. Enforcing the law for putting the Ministry of Health “health apple logo” on food products with low sodium and salt content	- The Food and Drug Administration - The Undersecretary of Health (the Food and Environmental Health Department)	- Number of application letters - Number of held meetings - Ratified laws - Number of issued circulars - Reports on putting the logo	2016-2018
			14. Enforcing the law for the ban on the production and distribution of sea salt and unsafe low-purity salts	- The Food and Drug Administration - The Undersecretary of	- Number of application letters - Number of application letters	2016-2018

				Health (Food and Environmental Health Department) - ISIRI	- Number of held meetings - Ratified laws - Number of issued circulars - Reports on changes in the production of sea salt - Reports on their sale rates	
			15. Ratifying a law facilitating the replacement of a portion of the salt content in food products with legally permitted potassium salt and noting it on these products that "for patients with kidney or other related diseases based on their physician's prescription"	- The Food and Drug Administration - ISIRI	- Number of application letters - Number of held meetings - Ratified laws - Number of issued circulars - Changes in the production of potassium salt - Potassium salt sale rates - Changes in the regular salt content of food products - Changes in the potassium salt content of food products	2016-2018
			16. Ratifying a law to consider salt reduction as an indicator for defining healthy food products	- The Food and Drug Administration - ISIRI	- Number of application letters - Number of held	2017-2018

					meetings - Ratified laws - Number of issued circulars - Calculating the score of the index in the evaluation of food products	
			17. Policy making banning the advertising of high-sodium products	- The High Council of Health and Food Safety - IRIB - The Health and Treatment Commission of Iranian Parliament	- The frequency of advertisements for high-sodium products - Changes pertaining to low-sodium products (decreasing their advertising expenses) - Increases in advertisements for low-sodium products	2016-2018
			18. Setting policies for reducing the TV advertising expenses of products with reduced salt or sodium content	- The High Council of Health and Food Safety - IRIB - The Health and Treatment Commission of Iranian Parliament	- The frequency of advertisements for high-sodium products - Changes pertaining to low-sodium products (decreasing their advertising expenses) - Increases in	2016-2018

					advertisements for low-sodium products	
			19. Policy making for holding CME courses for physicians on the strategies of salt reduction	- The Undersecretaries of Treatment and Education of the Ministry of Health	- Number and frequency of CME courses - Number of participants	2016-2018
			20. Policy making for holding training courses for health professionals on the strategies of salt reduction	- The Undersecretaries of Treatment and Health of the Ministry of Health - The Health professional Training Office	- Number and frequency of continuing education courses - Number of participants	2016-2018
			21. Policy making for holding compulsory training courses on proper baking methods of traditional bread for bakers	- The Flour and Bread Council - The Governor's Office - The Chairman of Wheat, Flour and Bread Punishment - The Flour and Bread Company - The Health Deputy of the Ministry of Health, Unions' Training Institutions - The Bakers' Union	- Number and frequency of continuing education courses - Number of participants	2016-2017
			22. Policy making for using permitted improving agents, such as gluten, vitamin C and glucose oxidase in baking traditional	- The Flour and Bread Council - The Governor's	- The frequency of bakeries that stopped using	2016-2017

			bread	Office - The Chairman of the Wheat, Flour and Bread Punishment - The Flour and Bread Company - The Health Deputy of the Ministry of Health, Unions' Training Institutions - The Bakers' Union	baking soda and reduced their salt use in bread and turned to using improving agents	
			23. Facilitating the existing laws for obtaining health and production licenses for food products with reduced salt or sodium content	- The Food and Drug Administration - The Institute of Standards and Industrial Research of Iran	-- Number of application letters - Number of held meetings - Number of ratified laws - Number of issued circulars - Trend of number of producing low salt products	2016-2017
10	**Providing the resources for implementing the salt reduction program**	Providing the human resources for implementing the salt reduction program	1. Establishing a team by the Nutrition Improvement Office, the Cardiovascular Research Institute and other related research centers, the National Nutrition and Food Technology Research Institute and health related NGOs for necessary follow-ups and making management	- The Steering Committee -The Nutrition Improvement Office -The Cardiovascular Research Institute -The National Nutrition and Food Technology Research Institute -Other related and	- The committee reports - Number of team meetings - Minutes for reviewing the discussed subjects during the meetings	2016-2017

				academic departments research centers -Health related NGOs		
			2. Training health professional for implementing the developed and approved strategies of advocacy and education of general public and high-risk groups	- Provincial Nutrition Improvement Offices - Provincial Health Education Departments - The Medical Education Development Center of Universities of Medical Sciences - The Personnel Training Office	- Number of application letters - Number of held meetings - Number of ratified laws - Number of issued circulars - Number and frequency of continuing education courses - Number of participants - Number and frequency of held personnel training courses - Number of participants	2016-2019
		Supplying the financial resources required for implementing the salt reduction action plan	1. Providing the costs of preparing educational materials	- The Undersecretary of Health of the Ministry of Health - Health related NGOs - Volunteer food	- Calculating the costs - Number of prepared educational materials	2016-2017

				industries (in return for advertising their low-sodium products)		
			2. Providing the costs of holding campaigns	- The Undersecretary of Health of the Ministry of Health - NGOs - Volunteer food industries (in return for advertising their low-sodium products)	- Calculating the costs	2015-2020
			3. Providing the costs of changes made in the formulation of food products	- Food industries	- Calculating the costs	2016-2020
			4. Providing the costs of modifying food labels	- Food industries	- Calculating the costs	2016-2020
			5. Providing the costs of using proper salt substitutes	- Food industries	- Calculating the costs	2016-2020
			6. Providing the costs of employing administrative personnel	- The Undersecretary of Health of the Ministry of Health -Health related NGOs - Volunteer food industries (in return for advertising their low-sodium	- Calculating the costs	2016-2020

				products)		
			7. Providing the costs of research, including the validation of instruments, assessing the salt intake status, the salt content of food products, evaluating the awareness, attitudes and practice of general population and analyzing the data	- The Undersecretary of Health of the Ministry of Health - Health related NGOs - Volunteer food industries (in return for advertising their low-sodium products)	- Calculating the costs	2015-2020

APPENDIX

REFERENCES

1. Alwan A, Maclean DR, Riley LM, et al. Monitoring and surveillance of chronic non-communicable diseases: progress and capacity in high-burden countries. Lancet 2010; 376: 1861 – 1868.
2. Daar AS, Singer PA, Persad DL, et al. Grand challenges in chronic non-communicable diseases. Nature. 2007; 450(7169): 494–6.
3. The global burden of Disease, 2004 update. Geneva: World Health Organization; 2008.
4. Lawes CM, Vander HS, Rodgers A. Global burden of blood-pressure related disease, 2001. Lancet 2008; 371: 1513– 8.
5. MacMahon S, Alderman MH, Lindholm LH, et al. Blood-pressure-related disease is a global health priority. J Hypertens 2008; 28(10): 2071–2.
6. Britton J, I. Pavord I, Richards K, et al. Dietary sodium intake and the risk of airway hyperreactivity in a random adult population. Thorax 1994; 49:875–80.
7. Naghavi M, Abolhassani F, Pourmalek F, et al. The burden of disease and injury in Iran 2003. Popul Health Metr 2009;7: 9.
8. World Health Organization. Non-communicable diseases country profiles 2011, WHO global report. 2012.
9. Sepanlou SG, Kamangar F, Poustchi H, et al. Reducing the burden of chronic diseases: a neglected agenda in Iranian health care system, requiring a plan for action. Arch Iran Med. 2010;13(4):340–50.
10. Iran stresses measures to prevent non-communicable diseases. Available from: URL: http://tehrantimes.com/index.php/health/2906-iranstresses-measures-to-prevent-non-communicable-diseases. 2011.

11. Johnell O, Hertzman P. Copenhagen: WHO. What evidence is there for the prevention and screening of osteoporosis?. 2006.

12. Irani AD, Poorolajal J, Khalilian A, et al. Prevalence of osteoporosis in Iran: A meta-analysis. J Res Med Sci 2013;18(9):759-66.

13. International Agency for Research on Cancer (IARC). G. GLOBOCAN 2008, IARC, Lyon. Available from: URL: http://www-dep.iarc.fr/.

14. Rouhollahi MR, Mohagheghi MA, Mohammadrezai N, et al. Situation analysis of the National Comprehensive Cancer Control Program (2013) in the I. R. of Iran; assessment and recommendations based on the IAEA imPACT mission. Arch Iran Med 2014;17(4):222-31.

15. Ferlay J, Shin H, Bray F, Forman D, et al. GLOBOCAN 2008, Cancer Incidence and Mortality Worldwide. Lyon, France: International Agency for Research on Cancer; 2010.

16. Sadjadi A, Nouraie M, Mohagheghi MA, et al. Cancer occurrence in Iran in 2002, an international perspective. Asian Pac J Cancer Prev 2005; 6: 359–63.

17. Mohagheghi MA, Mosavi-Jarrahi A, Malekzadeh R, et al. Cancer incidence in Tehran metropolis: The first report from Tehran Population-based Cancer Registry, 1998–2001. Arch Iran Med 2009; 12:1 –23.

18. Babaei M, Mousavi S, Malek M, et al. Cancer occurrence in Semnan Province, Iran: results of a population-based cancer registry. Asian Pac J Cancer Prev 2005; 6: 159-64.

19. Sadjadi A, Malekzadeh R, Derakhshan MH, et al. Cancer occurrence in Ardabil: results of a population-based cancer registry from Iran. Int J Cancer 2003; 107: 113–8.

20. Parkin DM, Bray F, Ferlay J, et al. Global cancer statistics, 2002. CA Cancer J Clin. 2005; 55: 74–08.

21. Fock KM, Talley N, Moayyedi P, et al. Asia- Pacific consensus guidelines on gastric cancer prevention. J Gastroenterol Hepatol 2008; 23:351–65. Massarrat S, Stolte M. Development of gastric cancer and its prevention. Arch Iran Med 2014; 17(7):514-20.

22. Joossen Jv, Hill MJ, Elliott P, et al. Intersalt cooperative research group. Gastroenterol Res Pract 2012; 2012:808120.

23. D'Elia L, Rossi G, Ippolito R, et al. Habitual salt intake and risk of gastric cancer: a meta-analysis of prospective studies. Clin Nutr 2012; 31: 489–98.

24. Ge S, Feng X, Shen L, et al. Association between habitual dietary salt intake and risk of gastric cancer: A systematic review of observational studies. Gastroenterol Res Pract. 2012; 2012: 808120.

25. Bethesda: Atlas of End-Stage Renal Disease in the United States.National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases; 2003.

26. Coresh J, Selvin E, Stevens LA, et al. Prevalence of Chronic Kidney Disease in the United States JAMA 2007; 298(17):2038–47.

27. Collins AJ, Li S, Gilbertson DT, et al. Chronic kidney disease and cardiovascular disease in the Medicare population. Kidney Int 2003; Suppl 87: S24–S31.

28. Astor BC, Schmid H, Miller ER et al. Glomerular filtration rate, albuminuria, and risk of cardiovascular and all-cause mortality in the US population. Am J Epidemiol 2008; 167(10):1226–34.

29. Keith DS, Nichols GA, Guillion C, et al. Longitudinal follow-up and outcomes among a population with chronic kidney disease in a large managed care organization. Arch Intern Med 2004; 164:659–63.

30. Chadban SJ, Briganti E, Kerr PG, et al. Prevalence of Kidney Damage in Australian Adults: The AusDiab Kidney Study. J Am Soc Nephrol 2003; 14:S131–S8.

31. Imai E, Horio M, Iseki K, et al. Prevalence of chronic kidney disease (CKD) in the Japanese general population predicted by the MDRD equation modified by a Japanese coefficient. Clin Exp Nephrol 2007; 11:156–63.

32. Ramirez SPB, Mcclellan W, Port FK et al. Risks factors for proteinuria in a large, multiracial southeast Asian population. J Am Soc Nephrol 2002; 13:1907–17.

33. Hosseinpanah F, Kasraei F, Nassiri AA, et al. High prevalence of chronic kidney disease in Iran: a large population-based study. BMC Public Health. 2009;9:44. doi: 10.1186/1471-2458-9-44.

34. Coresh J, Wei GL, McQuillan G, et al. Prevalence of high blood pressure and elevated serum creatinine level in the United States: Findings from the third National Health and Nutrition Examination Survey (1988 – 1994). Arch Intern Med 2001; 161:1207–16.

35. Kausz AT, Khan SS, Abichandani R, et al. Management of patients with chronic renal insufficiency in the Northeastern United States. J Am Soc Nephrol 2001; 12:1501–7.

36. McClellan WM, Knight DF, Karp H, et al. Early detection and treatment of renal disease in hospitalized diabetic and hypertensive patients: Important differences between practice and published guidelines. Am J Kidney Dis 1997; 29:368–75.

37. Barnett AH, Bain SC, Bouter P, et al. Angiotensin-receptor blockade versus convertingenzyme inhibition in type 2 diabetes and nephropathy. N Engl J Med 2004; 351:1952–61.

38. Kshirsagar AV, Joy MS, Hogan SL, et al. Effect of ACE inhibitors in diabetic and nondiabetic chronic renal disease: a systematic overview of randomized placebo controlled trials. AM J Kidney Dis 2000; 35:695–707.

39. Jafar TH, Schmid CH, Landa M, et al. Angiotensin-converting enzyme inhibitors and progression of nondiabetic renal disease. A meta-analysis of patient-level data. Ann Intern Med 2001; 135:73–87.

40. Weir MR, Fink JC. Salt intake and progression of chronic kidney disease: an overlooked modifiable exposure? A commentary. Am J Kidney Dis 2005; 45(1):176-88.

41. Esnault VLM, Ekhlas AMR, Delcroix C, et al. Diuretic and enhanced sodium restriction results in improved antiproteinuric response to RAS blocking agents. J Am Soc Nephrol 2005;16: 474-81.

42. Masoli M, Fabian D, Holt S, et al. The global burden of asthma: Executive summary of the GINA Dissemination Committee report. Allergy 2004; 59: 469–78.

43. Ministry of Health and Medical Education Undersecretary for Health Center for Non-communicable Disease Control National Committee on Asthma & Allergy Iran. National Asthma guidline; 2010.

44. Fauci AS, Braunwald E, Kasper DL, et al. Harrison's Principles of Internal Medicin e. 17nd ed. New York: MC GrawHill 2008; 1596 –607.

45. Lewis H. Textbook of Medical Surgical Assessment and Management of Clinical Problem . 5nd ed. St Louis: Mosby; 2000: 660.

46. Murray CJ, Vos T, Lozano R, et al. Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. Lancet 2013; 380(9859): 2197–223.

47. World Health Organization. Global surveillance, prevention and control of chronic respiratory disease: a comprehensive approach; 2007.

48. Kasper DL, Longo DL, Braunwald E, et al. Harrison's Principals of Internal Medicine . 16nd ed. New York: MC GrawHill; 2005: 1205.

49. Carroll P. How to intervene before asthma turns deadly. Available from: URL: http://www.modernmedicine.com/modern-medicine/content/how-intervene-asthma-turns-deadly (Access Date: 9 Sep 2014).

50. Hodgkin J. Pulmonary Rehabilitation Guidelines to Success. 2nd ed. Philadelphia: Lippincott Press; 1993: 4–5.

51. 47. Devereux G, Beach JR, Bromly C, et al. Effect of dietary sodium on airways responsiveness and its importance in the epidemiology of asthma: an evaluation in three areas of northern England. Thorax 50:941–947, 1995.

52. Beasely R. The Global Burden of Asthma report, Global initiative for asthma (GINA). Available from: URL: http:// www.ginasthma.org (Access Date:20 Sep 2014).

53. Masoli M, Fabian D, Holt S, et al. The Global Burden of Asthma. United Kingdom: University of Southampton; 2003.

54. Varmaghani M, Rashidian A, Kebriaeezadeh A, et al. National and sub-national prevalence, trend, and burden of asthma in Iran from 1990 to 2013; the study protocol. Arch Iran Med 2014;17(12):804-9.

55. Burney P. A diet rich in sodium may potentiate asthma: epidemiologic evidence for a new hypothesis. Chest 1987; 91:143–8.

56. Burney PG. The causes of asthma-does salt potentiate bronchial activity? J R Soc Med 1987; 80:364–7.

57. Burney PG. The origins of obstructive airways disease: a role for diet? Am J Respir Crit Care Med 1995; 151:1292–3.

58. Medici TC, Vetter TC. Bronchial asthma and kitchen salt. Schweiz Med Wochenschr 1991; 121:501–8.

59. Burney PG, Britton J, Chinn S, et al. Response to inhaled histamine and 24 hour sodium excretion. Br Med J 1986; 292:1483–6.

60. Burney PG, Neild JE, Twort CH, et al. Effect of changing dietary sodium on the airway response to histamine. Thorax 1989; 44: 36–41.

61. Sparrow D, O'connor GT, Rosner B, et al. Methacholine airway responsiveness and 24-hour urine excretion of sodium and potassium: The Normative Aging Study. Am RevRespir Dis 1991; 144:722–5.

62. Liebeman D, Heimer D. Effect of dietary sodium on the severity of bronchial asthma [see comments]. Thorax 1992;47:360–2.

63. Lawes CM, Vander HS, Rodgers A. Global burden of blood pressure related disease, 2001. Lancet 2008; 371: 1513–8.

64. Global health risks: mortality and burden of disease attributable to selected major risks. Geneva: WHO; 2009.

65. INTERSALT cooperative research group. Intersalt: an international study of electrolyte excretion and blood pressure. Results for 24 hour urinary sodium and potassium excretion. Intersalt Cooperative Research Group. BMJ 1988; 297: 319–28.

66. Talaei M, Sarrafzadegan N, Sadeghi M, et al. Incidence of cardiovascular diseases in an Iranian population: the Isfahan Cohort Study. Arch Iran Med 2013;16(3):138-44.

67. Shirani S, Kelishadi R, Sarrafzadegan N, et al. Awareness, treatment and control of hypertension, dyslipidaemia and diabetes mellitus in an Iranian population: the IHHP study. East Mediterr Health J 2009;15(6):1455-63.

68. Ebrahimi M, Mansournia MA, Haghdoost AA, et al. Social disparities in prevalence, treatment and control of hypertension in Iran: second National Surveillance of Risk Factors of Noncommunicable Diseases, 2006. J Hypertens 2010; 28(8):1620-9.

69. Janghorbani M, Amini M, Gouya MM, et al. Nationwide survey of prevalence and risk factors of prehypertension and hypertension in Iranian adults. J Hypertens 2008; 26(3):419-26.

70. Azizi F, Rahmani M, Emami H, et al. Cardiovascular risk factors in an Iranian urban population: Tehran lipid and glucose study (phase 1). Soz Praventivmed 2002; 47(6):408-26.

71. Mac Gregor GA. Report of WHO Forum and Technical Meeting. Reducing salt intake in population UK p 17-18.

72. He FJ, MacGregor GA. A comprehensive review on salt and health and current experience of worldwide salt reduction programmes. J Hum Hypertens 2009; 23(6):363-84.

73. Cook NR, Cutler JA, Obarzanek E, et al. Long term effects of dietary sodium reduction on cardiovascular disease outcomes: observational follow-up of the trials of hypertension prevention (TOHP). BMJ 2007;334(7599):885-8.

74. He F, MacGreogor GA. Effect of modest salt reduction on blood pressure .J Hum Hypertens 2002;16(11): 761-70.

75. He FJ, MacGregor GA. Effect of longer-term modest salt reduction on blood pressure. Cochrane Database Syst Rev 2004; 3: CD004937.

76. Strazzullo P, D'Elia L, Kandala NB, et al. Salt intake, stroke, and cardiovascular disease: meta-analysis of prospective studies. BMJ. 2009;339: b4567.

77. http://www.worldactiononsalt.com/salthealth/factsheets/stroke/ 75

78. UN High-Level Meeting puts NCDs on the map, falls short of setting goals or targets. Available from : URL: http://www.ncdalliance.org/ node/3517 . 2011.

79. Danaei G, Ding EL, Mozaffarian D, et al. The Preventable Causes of Death in the United States: Comparative risk assessment of dietary, lifestyle, and metabolic risk factors. PLoS Med 2009; 6 (4): 1000058.

80. Bibbins-Domingo K, Chertow GM, et al. Projected effect of dietary salt reductions on future cardiovascular disease. N Engl J Med 2010;362 (7): 590–9.

81. Asaria P, Chisholm D, Mathers C, et al. Chronic disease prevention: health effects and financial costs of strategies to reduce salt intake and control tobacco use. Lancet. 2007; 370:2044 –2053.

82. WHO forum and technical meeting on reducing salt intake in populations. Reducing salt intake in populations, report of a WHO forum and technical meeting, 5-7 October 2006, Paris, France. 2007.

83. Campbell NR, Lackland DT, Chockalingam A, et al; Executive Board of the World Hypertension League:; Executive Committee of the International Society of Hypertension:. The International Society of Hypertension and World Hypertension League call on governments, nongovernmental organizations and the food industry to work to reduce dietary sodium. J Hypertens. 2014;32(2):446-7.

84. Sodium intake for adults and children. Geneva, World Health Organization (WHO), 2012. http://www.who.int/nutrition/publications/guidelines/sodium_intake_printversion.pdf.

85. The World Health Organization. Joint WHO/FAO expert consultation on diet, nutrition and the prevention of chronic diseases. 2003. (Accessed Date: 19 Nov 2014).

86. World Health Organization. Healthy diet, updated May 2015. http://www.who.int/mediacentre/factsheets/fs394/en/

87. Diet, nutrition and the prevention of chronic diseases; Report of a joint WHO/FAO expert consultation group, Geneva. 2003.

88. Taylor RS, Ashton KE, Moxham T, et al. Reduced dietary salt for the prevention of cardiovascular disease Cochrane Database Syst Rev. Author manuscript; available in PMC 2014 September 11.Published in final edited form as: Cochrane Database Syst Rev. 2011; (7): CD009217. Published online 2011 July 6.

doi: 10.1002/14651858.CD009217Update in: Cochrane Database Syst Rev. 2013; 9: CD009217.

89. National Institute of Clinical Excellence. Guidance on the prevention of cardiovascular disease at the population level. 2011.

90. Dietary Guidelines for Americans, 2010. US Department of Agriculture 2010Available from: URL: http://www.cnpp.usda.gov/Dietary- Guidelines.htm

91. Scientific Advisory Committee on Nutrition (SACN) Report on salt and health (2003): FSAI(2005) salt and health :Review of the scientific Evidence and Recommendation for public policy.

92. INTERSALT Cooperative Research Group Intersalt: an international study of electrolyte excretion and blood pressure. Results for 24 hour urinary sodium and potassium excretion. Intersalt Cooperative Research Group. BMJ 1988;297:319–28.

93. Bingham SA, Cummings JH. The use of 4-aminobenzoic acid as a marker to validate the completeness of 24 h urine collections in man. Clin Sci 1983;64:629–35.

94. Powles J, Fahimi S, Micha R, et al. Global Burden of Diseases Nutrition and Chronic Diseases Expert Group (NutriCoDE). Global, regional and national sodium intakes in 1990 and 2010: a systematic analysis of 24 h urinary sodium excretion and dietary surveys worldwide. BMJ Open 2013;3(12):e003733. doi:10.1136/bmjopen-2013-003733.

95. Rafiei M, Boshtam M, Sarrafzadegan N, et al. The relation between salt intake and blood pressure among Iranians. Kuwait Med J 2008; 40 (3): 191-5.

96. Khosravi A, Kelishadi R, Sarrafzadegan N, et al. Impact of a community-based lifestyle intervention program on blood pressure and salt intake of normotensive adult population in a developing country. J Res Med Sci 2012;17(3):235-41.

97. Mirzaei M, Soltaniz M, Namayandeh M, et al. Sodium and potassium intake of urban dwellers: nothing changed in Yazd, Iran. J Health Popul Nutr. 2014 Mar;32(1):111-7.

98. Azizi F, Rahmani M, Allahverdian S, et al. Effects of salted food consumption on urinary iodine and thyroid function tests in two provinces in the Islamic Republic of Iran. Eastern Mediterranean Health Journal 2001;7: 115 – 20.

99. Rahmani M, Koohkan A, Allahverdian S, et al. Comparison of dietary iodine intake and Urinary excretion in urban and rural Households of Ilam in 2000 (in Persian). Iranian Journal of Endocrinology and Metabolism 2000; 2: 1

100. Haidary Sardabi E, Mahjoor Z, et al. Salt taste threshold and level of salt-sensitive blood pressure in young Iranian normotensive individuals. (Inpress)

101. Salt and sodium intake in Iranian traditional bread. Hakim J. (Inpress)

102. Salt and sodium intake in processed food in Iran. Hakim J. (Inpress)

103. Mohammadifard N, Fahimi S, Khosravi A, et al. Advocacy strategies and action plans for reducing salt intake in Iran. Arch Iran Med 2012;15(5):320-4.

104. http://www.foodna.ir

105. http://www.zibasho.com

106. http://ssu.ac.ir/cms/fileadmin/user_upload/Mtahghighat/tfood/file/aeen_nameh_meli/salt.pdf

107. Webster JL, Dunford EK, Hawkes C, Neal BC. Salt reduction initiatives around the World. J Hypertens 2011;29(6):1043-50.

108. http://www.worldactiononsalt.com/

109. Espeland MA, Kumanyika S, Wilson AC, et al. Statistical issues in analyzing 24-h dietary recall and 24-h urine collection data for sodium and potassium intakes. Am J Epidemiol 2001; 153:996–1006.

110. Consensus Action on Salt and Health, July 2009-10 Annual Report. 2010.

111. Webster J, Dunford E, Neal B. A systematic survey of the sodium contents of processed foods. Am J Clin Nutr 2010; 91:413–420.

112. Food Standards Agency. Processed Food Databank. 2006; http:// www.food.gov.uk/science/surveillance/fsisbranch2006/fsis1306. (Access Date: 12 November 2014).

113. BMRB Social Research. Comprehension and use of UK nutrition signpost labelling schemes. 2009; http://www.food.gov.uk/multimedia/pdfs/ pmpreport.pdf. (Access Date: 12 Nov 2014).

114. Mac Gregor GA. Report of WHO Forum and Technical Meeting. Reducing salt intake in population UK. 2007: p 17-18.

115. Ni Mhurchu C, Capelin C, Dunford EK, et al. Sodium content of processed foods in the United Kingdom: analysis of 44,000 foods purchased by 21,000 households. Am J Clin Nutr. 2011 Mar;93(3):594-600.

116. Except where otherwise stated, information on UK is taken from European Commission., Collated information on salt reduction in the EU. 2008: p. 14-17

117. Except where otherwise stated, information on Ireland is taken from European Commission. Collated information on salt reduction in the EU. 2008: p. 11-13

118. Except where otherwise stated, information on Finland is taken from European Commission. Collated information on salt reduction in the EU. 2008: p. 20-22

119. Survey on Members States' Implementation of the EU Salt Reduction Framework. http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_121941

120. Except where otherwise stated, information on France is taken from European Commission. Collated information on salt reduction in the EU. 2008: p. 14-17.

121. European Commission. Collated information on salt reduction in the EU. 2008: p. 28-39.

122. AWASH: Australian Division of World Action on Salt and Health. Strategic Review 2007, 2008.

123. http://www.awash.org.au/documents/AWASH/Strategic/Review/2007_08.pdf

124. http//www.awash.org.au/drop_thefoodindustry.html

125. Havas S, Dickinson BD, Wilson M. The urgent need to reduce sodium consumption. JAMA 2007; 298(12):1439-1441.

126. Appel LJ. Salt reduction in the United States. BMJ 2006; 333:562.

127. http://www.worldactiononsalt.com/action/america.htm

128. Health Canada website: www.hc-sc.gc.ca/index-eng.php

129. The "winner" was the "Chubby Junior" meal from A&W Restaurants. http://www.canadianstrokenetwork.ca/eng/news/downloads/releases/release.jan292008.e.pdf

130. Forrester T, Adeyemo A, Soarres-Wynter S, et al. A randomized trial on sodium reduction in two developing countries. J Hum Hypertens 2005; 19: 55–60.

131. http://www.cspinet.org/new/pdf/salt_lawsuit.pdf
http://www.ama.org/ama/pub/category/16413.html

132. Center for Science in the Public Interest. News Release, December 2008: Industry not lowering sodium in processed foods, despite public health concerns. http://www.cspinet.org/

133. Penney S. Dropping the salt: practical steps countries are taking to prevent chronic non-communicable diseases through population-wide dietary salt reduction. The Public Health Agency of Canada (PHAC). Revised version: February, 2009.

134. Cooper R, Rotimi C, Ataman S, et al. The prevalence of hypertension in seven populations of West African origin. Am J Public Health (1997; 87(2):160-8.

135. Salt consumption in hypertensive patients attending in a tertiary level cardiac hospital.http://www.worldactiononsalt.com/awareness/world_salt_awareness_week_2008/evaluation/bangladesh_paper.doc.

136. WASH (World Action on Salt and Health) (2008), China Salt Action Summary. http://www.worldactiononsalt.com/action/asia.htm.

137. Liu Z, Ho SC, Tang N, et al. Urinary sodium excretion and dietary sources of sodium intake in Chinese postmenopausal women with prehypertension. PLoS One. 2014; 9(8): e104018. Published online 2014 August 1. doi: 10.1371/journal.pone.0104018

138. Morgan T, Harrap S. Hypertension in the Asian-Pacific Region: The problem and the solution. (Report of a Joint International Society of Hypertension/Asian Pacific Society of Hypertension Workshop held in Beijing, 2007. http://www.ish-world.com/Documents/Report_of_the_Joint_APSH-ISH_workshop_Beijing_2007.pdf.

139. http://www.worldactiononsalt.com/action/asia.htm.

140. Laatikainen T, Pietinen P, Valsta L, et al. Sodium in the Finnish diet: 20-year trends in urinary sodium excretion among the adult population. Eur J lin Nutr 2006; 60:965–970.

141. Food Safety Authority of Ireland. Salt commitments and updates, August 2009–August 2010. http://www.fsai.ie/science_and_health/salt_commitments_and_updates.html (Access Date: 4 Feb 2015).

142. World Action on Salt and Health. Japan Salt Action Summary. 2008; http://www.worldactiononsalt.com/action/asia.htm. (Access Date: 12 Sep 2014).

143. UK Food Standards Agency. Salt. 2007; http://www.food.gov.uk/healthiereating/salt/. ccessed 12 July 2010.

144. Puska P, Vartiainen E, Tuomilehto J, et al. Changes in premature deaths in Finland: successful long-term prevention of cardiovascular diseases. Bull World Health Organization 1998; 76:419–425.

145. Pietinen P, Valsta LM, Hirvonen T, et al. Labelling the salt content in foods: a useful tool in reducing sodium intake in Finland. Public Health Nutr 2008; 11:335–340.

146. Food Standards Agency. Food industry activity. http://www.food.gov.uk/healthiereating/salt/industry. (Access Date: 4 Nov 2104).

147. European Commission. Collated information on salt reduction in the EU. Brussels; 2008.

148. He FJ, MacGregor GA. A comprehensive review on salt and health and current experience of worldwide salt reduction programmes. J Hum Hypertens 2009; 23:363–384.

149. Webster J. Signalling change: working with the private food sector to improve nutrition: a comparative analysis of national strategies in the UK and the Netherlands. 2006.

150. Mason H, Shoaibi A, Ghandour R, et al; MedCHAMPS project team. A cost effectiveness analysis of salt reduction policies to reduce coronary heart disease in four Eastern Mediterranean countries. PLoS One. 2014 Jan 7;9(1):e84445. doi: 10.1371/journal.pone.0084445. eCollection 2014.

151. Nawal Alhamad N, Almalt E, et al. An overview of salt intake reduction efforts in the Gulf Cooperation Council countries. Cardiovasc Diagn Ther 2015;5(3):172-177.

152. www.worldhypertensionleague.org

153. Mohammadifard N, Sarrafzadegan N, Nouri F, et al. Using factor analysis to identify dietary patterns in Iranian adults: Isfahan Healthy Heart Program. Int J Public Health. 2012;57(1):235-41.

154. Mohammadifard N, Kelishadi R, Safavi M, et al. Effect of a community-based intervention on nutritional behaviour in a developing country setting: the Isfahan Healthy Heart Programme. Public Health Nutr. 2009; 12(9):1422-30.

155. Alikhasi H, Rabiei K, Mohammadifard N, et al. Process evaluation in nutrition intervention of Isfahan Healthy Heart Program. J Medical School of Isfahan. Winter 2008; (Special issue Health Promotion): 549-59. (Persion)

RELATED LINKS

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3. http://www.theglobeandmail.com/special-reports/hard-to-shake/how-canada-is-losing-the-war-on-salt/article1194422/
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5. http://www.sciencebasedmedicine.org/index.php/the-war-on-salt/
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7. http://green.yahoo.com/blog/care2/260/the-truth-about-salt.html
8. http://manhattaninfidel.com/2010/04/08/new-york-declares-war-on-sodium/
9. http://www.cmaj.ca/content/178/2/256
10. http://seniorliving.about.com/od/nutritionforolderadults/a/sodium_risks.htm
11. http://www.cdc.gov/features/sodium/
12. http://www.hsph.harvard.edu/nutritionsource/files/1500mg-daily-sodium-budget.pdf
13. http://134.174.190.199/nutritionsource/files/1500mg-daily-sodium-budget.pdf
14. http://www.healthsachoice.com/food/the-state-of-new-york-proposes-a-law-against-using-salt-in-restaurants/
15. http://www.sowetanlive.co.za/news/2011/09/13/salty-bread-kills-thousands-in-sa
16. http://www.wivb.com/dpp/health/health_news/Study-questions-limiting-salt-intake
17. http://www.saltinstitute.org/Issues-in-focus
18. http://www.nhs.uk/Livewell/Goodfood/Pages/salt.aspx#adult
19. http://www.actiononsalt.org.uk/salthealth/children/index.html

20. http://www.insidermedicine.com/archives/INSIDERMEDICINE_VIDEO_Sodium_Intake_Has_Direct_and_Independent_Effect_on_Stroke_and_Cardiovascular_Disease_Risk_3920.aspx

21. http://news.sky.com/home/uk-news/article/15706948

22. http://www.betterhealth.vic.gov.au/bhcv2/bhcarticles.nsf/pages/salt?open

23. http://www.life123.com/question/Reducing-Salt-Intake

24. http://www.nhlbi.nih.gov/hbp/prevent/sodium/sodium.htm

25. http://new.paho.org/hq/index.php?option=com_content&task=view&id=2022&Itemid=1766

26. http://www.ncbi.nlm.nih.gov/books/NBK50957/

27. http://www.wikihow.com/Eat-Less-Salt

28. http://www.consumersinternational.org/our-work/food

29. http://blood-pressure.emedtv.com/high-blood-pressure/lower-blood-pressure.html

30. http://www.nyc.gov/html/doh/downloads/pdf/public/dohmhnews8-05.pdf

http://www.iom.edu/Reports/2010/Strategies-to-Reduce Sodium-Intake-in-the-United-States.aspx-

31. http://www.iom.edu/Activities/Disease/ReducingHypertension.aspx

http://circ.ahajournals.org/cgi/reprint/123/10/1138

32. www.xavier.edu/community-health/Blood-Pressure.cfm

33. http://www.nyc.gov/html/doh/html/cardio/cardio-salt-initiative.shtml

34. http://www.fisaltreduction.com/

35. http://www.nhs.uk/Livewell/Goodfood/Pages/salt.aspxفيلم

36. http://gibofiq.site88.net/foods-with-high-salt-levels.php

37. www.netmums.comاسلايد

38. http://www.netmums.com/family-food/healthy-eating/easy-ways-to-reduce-your-salt-intake

39. Cost-effectiveness of salt reduction interventions Darwin Labarthe , MD, MPH, PhD, DirectorGuijing Wang, PhD, Senior Health EconomistDivision for Heart Disease and Stroke PreventionCentersAtlanta, GA 30341, USAاسلايد

40. http://www.hc-sc.gc.ca/fn.an/nutrition/sodium/index-eng.php (Crafting sodium reduction messages for consumers octobr 2011)اسلايد

41. http://www.stroke.org.nz/stroke-blood-pressure-campaign

42. http://www.health.gov.au/internet/main/publishing.nsf/Content/66596E8FC68FD1A3CA2574D50027DB86/$File/childrens-nut-phys-survey.pdf

43. www.awash.org.au Media Release Serious Salt Scare for Australian Boys For release 9 October 2008

44. www.diabetes.org.nz/data/assets/pdffile/0015/2355/saltAug06.pdf

45. http://www.diabetes.org.nz/resources/docs/magazine_articles/spring_2006/salt

46. http://www.diabetes.org.nz/food_and_nutrition/questions__and__answers/answers/how_much_salt

47. http://www.diabetes.org.nz/food_and_nutrition/questions__and__answers/answers/low_sodium_diet

48. www.sanitarium.co.nz/article-information/salt and alcohol-intake.aspx

49. http://www.sanitarium.co.nz/health-and-wellbeing/sanitarium-nutrition-service

50. http://www.sanitarium.co.nz/health-and-wellbeing/shake-the-salt-from-your-diet

51. http://www.sanitarium.co.nz/health-and-wellbeing/salt-alcohol-blood-pressure

52. www.weightwatchers.com.au/util/art/index.art.aspa

53. www.nutrition-foundation.org.nz/nutritionfacts

54. www.arphs.govt.nz/nutrition/unileversalt reduction/default.aspa

55. www.consumer.org.nz/report/salt

56. www.healthyfoodguide.co.nz

57. www.eatwell.gov.uk/healthydiet/fss/salt

58. www.cspinet.org

59. www.sodium101.ca

60. www.sacn.gov.uk/pdfs/scan salt final.pdf

61. www.food.gov.uk/healthiereating/salt/saltmodel

62. www.bmpa.uk.com/attachments/resources/1507s4.pdf

63. www.food.gov.uk/consultations/ukwideconsults/2005/salt cosultation takes

64. www.food.gov.uk/multimedia/spreadsheets/salttargets20102.xls 201

65. ec.europa.eu/health/ph determinates/lifestyle/nutrition/documents/national salt eu.pdf

66. http://www.health.gov.au/internet/main/publishing.nsf/Content/Home

67. http://www.health.gov.au/internet/ministers/publishing.nsf/Content/mr-yr10-mb-mb022.htm?OpenDocument&yr=2010&mth=03

68. http://www.awash.org.au

69. http://www.menieres.org.au/treatment.php

70. http://hyper.ahajournals.org/content/47/2/296.full

71. http://hc-sc.gc.ca/fn-an/nutrition/sodium/strateg/index-eng.php

72. http://searchrecherche.gc.ca/s_r?t3mpl1t34d=1&s5t34d=cihr&l7c1l3=eng&S_08D4T.1ct57n=search&S_08D4T.s3rv5c3=basic&S_S20RCH.p1r1m3tr5cF53lds=diseasetype%2Caudienc

e%2Cinstitute%2Cdocumentkind%2Ccollection&S_S20RCH.l1ng91g3=eng&S_F8LLT2XT=salt++health