National High Blood Pressure Education Program

Implementing Recommendations for Dietary Salt Reduction

Where are we?

Where are we going?

How do we get there?

A Summary of an NHLBI Workshop

NATIONAL INSTITUTES OF HEALTH
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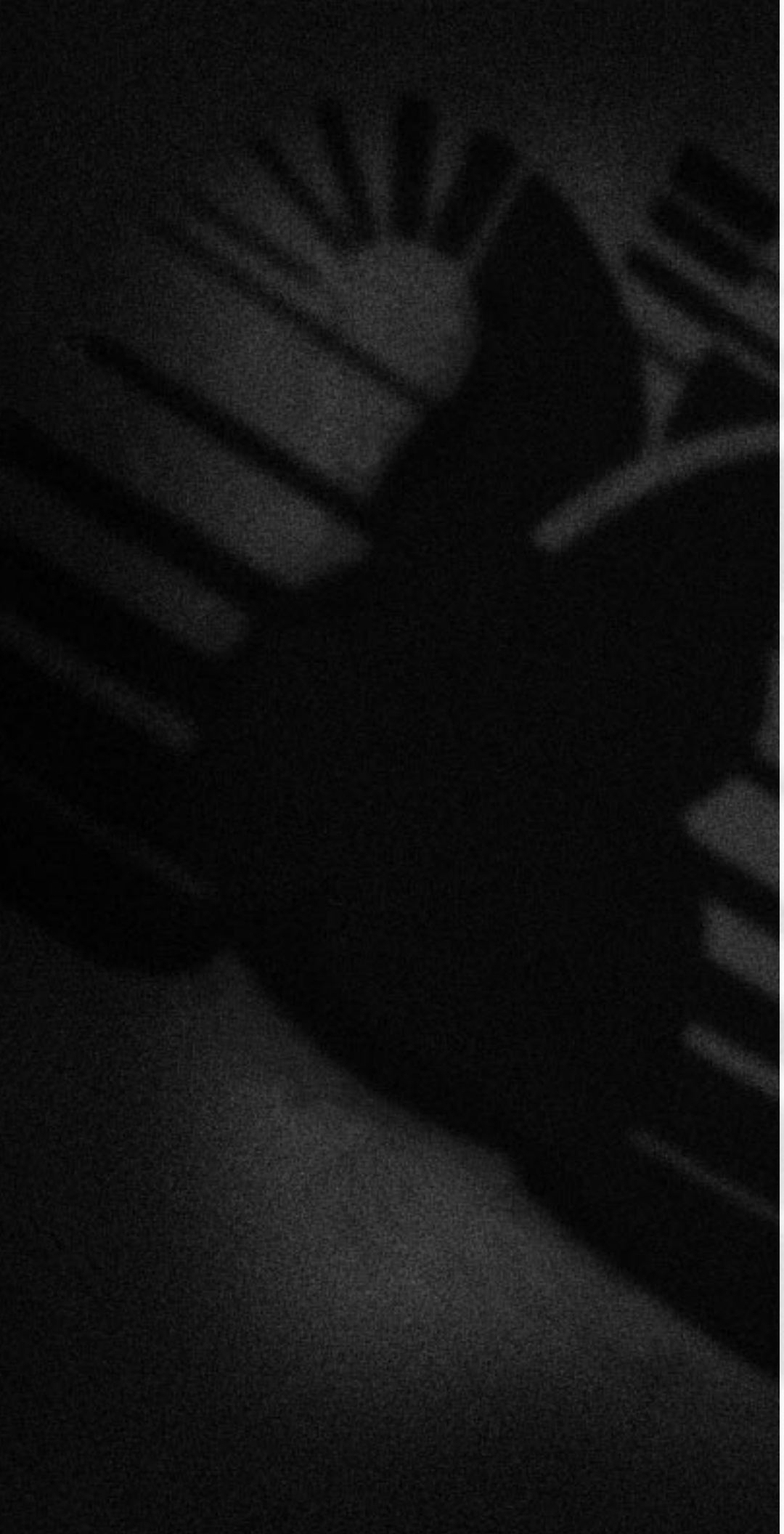

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Table of Contents

TABLES

Implementing Recommendations for Dietary Salt Reduction

Where are we? Where are we going? How do we get there?
A Summary of an NHLBI Workshop

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For the Planning Committee and Participants of the Workshop

ABSTRACT

In 1993, the National High Blood Pressure Education Program (NHBPEP) recommended that the time is appropriate for a national campaign, the specific goal of which is the primary prevention of high blood pressure. Various sets of data clearly show that mean dietary salt/sodium intake in our population is higher than optimal and is one of the important mass exposures that accounts for the generally unfavorable blood pressure distribution. In 1994, the National Heart, Lung, and Blood Institute assembled representatives from a variety of disciplines (including researchers active in dietary aspects of blood pressure reduction; representatives from the food and restaurant industries; Federal, State, and local public health professionals; and communications specialists) to discuss and recommend intervention strategies and materials, monitoring methods, and research directions for dietary salt/sodium reduction. The recommendations from this assembly, or workshop, are meant to contribute to the foundation on which the NHBPEP is developing a national campaign for salt/sodium reduction as one step toward the primary prevention of hypertension. This paper summarizes the workshop presentations, the working group recommendations, and the closing panel discussion. It uniquely compiles different current perspectives on implementing public health recommendations for dietary salt reduction.

INTRODUCTION

National dietary recommendations have consistently included qualitative recommendations for salt/sodium since the 1970s, even as scientific evidence has continued to accumulate. The workshop summarized in this paper, Implementing Recommendations for Dietary Salt Reduction, was predicated on a scientific perspective and proceeded with certain assumptions based on conclusions of the National Heart, Lung, and Blood Institute (NHLBI) Workshop on Salt and Blood Pressure.[1]

In August 1994, the NHLBI assembled representatives from a variety of disciplines (including researchers active in dietary aspects of blood pressure reduction; representatives from the food and restaurant industries; Federal, State, and local public health professionals; and communications specialists) to discuss and recommend intervention strategies and materials, monitoring methods, and research directions. The recommendations from this workshop are meant to contribute to the foundation on which the National High Blood Pressure Education Program (NHBPEP) is developing a national campaign for salt/sodium reduction as one step toward the primary prevention of hypertension. This paper summarizes the workshop presentations that provided the background on "where are we," the working group recommendations on "where are we going," and the closing panel discussion of "how do we get there." This paper compiles different current perspectives on implementing public health recommendations for dietary salt/sodium* reduction.

The initiation of the NHLBI's National High Blood Pressure Education Program in 1972 resulted in the development of a series of reports by the NHBPEP's Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure (JNC) that provided guidelines for screening, diagnosis, and management of hypertension. Over the past years, activities of the NHBPEP focused primarily on the pharmacologic treatment of high blood pressure and only relatively recently on nonpharmacologic treatment, including dietary salt/sodium reduction and its role in hypertension prevention. In parallel with these efforts, recent years have seen the introduction and promotion of sodium labeling on food products, national dietary guidelines, and the development of a variety of lower salt/sodium food products by the food manufacturing industry. Despite these accomplishments, sodium intake remains considerably higher than generally recommended.

In 1993, the NHBPEP recommended in its *Working Group Report on Primary Prevention of Hypertension*[2] that the time is appropriate for the NHBPEP to initiate a national campaign, the specific goal of which is the primary prevention of high blood pressure. "The campaign should inform the public and health care providers about the lifestyles and specific factors that increase the risk of developing high blood pressure and should foster the adoption of population-based and targeted intervention strategies aimed at the prevention of hypertension."

* The term "salt/sodium" is used in this paper when the statement is true for both salt and sodium. However, when the statement is true only for one, then only that one is stated. Terminology has been a source of confusion for the lay public.

The importance of a populationwide and primary prevention approach cannot be fully understood without knowledge of the nature of the blood pressure (BP) problem in the United States. Various sets of data clearly show that mean dietary salt/sodium intake in our population is higher than optimal and is one of the important mass exposures that accounts for the generally unfavorable blood pressure distribution. The goal of lowering habitual salt/sodium intake of the U.S. population is driven by this population-wide distribution of adverse BP levels and its causal relationship to high salt/sodium intake.

PRESENTATIONS — WHERE ARE WE?

RATIONALE FOR SODIUM/SALT REDUCTION

In the United States and most other countries (both industrialized and economically developing), BP rises with age for most people during the decades from youth through middle age. As a consequence, by middle age, population average systolic (SBP) and diastolic (DBP) blood pressures are above optimal levels (below 120/80 mmHg).[3] Only a small minority have optimal BP levels, and an absolute majority have high-normal and high BP levels (table A), with resultant increased risk of major cardiovascular diseases. These adverse BP patterns prevail in all geographic, ethnic, and socioeconomic strata (SES) of the U.S. middle-aged and older population and in particular among African Americans and lower SES groups.[3,4]

The basal sodium requirement for growing and adult humans is no greater than 8 to 10mmol/day (equivalent to about 500 mg of salt)[5-7] and may be lower.[6] Exposure to a high-sodium diet greater than the physiologic need is an exposure to which the human species has had no opportunity for evolutionary adaptation by natural selection.[8] To arrive at sound judgment on the role of salt/sodium as one of the key exposures causing elevated BP, consideration must be given — in accordance with established scientific practice — to all the evidence, from all research methods. This evidence is extensive[1] — from clinical therapeutics, animal experimentation, physiology and pathophysiology, cross-population and within-population epidemiologic research, anthropology, and randomized controlled trials.

From mid-century on, feeding experimental animals high-salt/sodium diets was repeatedly shown to raise BP[9] and data from observational studies in humans[10-12] indicated a relationship between population average sodium intake and average BP and/or prevalence of hypertension. Low sodium intake in isolated populations around the world was found to be associated with low-normal average BP, little or no rise in BP during adulthood, and low or zero prevalence rates of hypertension. In addition, the INTERSALT study, a cross-sectional epidemiologic study, showed a significant graded relation of 24-hour urinary sodium excretion to SBP independent of age, sex, alcohol intake, body mass, and urinary potassium, calcium, and magnesium. A difference in population median sodium intake of 100 mmol/day (e.g., 70 versus 170 mmol/day — 1,610 versus 3,910 mg/day) was associated with a gradient in SBP/DBP of 10/6 mmHg from age 22 to age 55.[13-16] This relationship, of almost equal magnitude, was also found for nonhypertensive INTERSALT participants, suggesting that BP response to changes in sodium intake is not confined to the hypertensive population. Consistent with results of observational epidemiologic studies, meta-analyses of recent randomized controlled trials indicated that a 65 mmol/day (1,500 mg/day) sodium reduction to about 104 mmol/day (2,300 mg/day) leads to a population average SBP reduction of about 3 mmHg and DBP reduction of about 2 mmHg. The BP reduction was about 5/3 mmHg in hypertensive subjects and about 2/1 mmHg in normotensive subjects.[17] The estimated preventive impact on cardiovascular disease risk and all-cause mortality of downward shifts in BP distribution resulting from habitual lower salt/sodium intake is substantial.[4]

Table A

PERCENTAGE DISTRIBUTION OF BLOOD PRESSURE LEVELS[a] IN U.S. ADULT POPULATION[3]

	Optimal	Normal	High Normal	Stage 1	Stage 2	Stage 3-4
SBP	<120	120-129	130-139	140-159	160-179	≥180
DBP	<80	80-84	85-89	90-99	100-109	≥110
Overall	47	21	13	14	4	1
Non-Hispanic Black	43	21	13	16	5	2
Men	30	27	17	18	5	2
18-49	41	30	14	11	3	1
50-69	10	22	23	33	8	4
70+	10	18	23	30	13	7
Women	54	15	10	13	5	3
18-49	71	14	7	5	2	1
50-69	21	19	16	27	12	4
70+	14	13	17	35	12	9
Non-Hispanic White	48	21	13	13	4	1
Men	36	27	17	16	4	1
18-49	45	30	14	10	1	<1
50-69	21	23	21	27	7	1
70+	13	16	22	33	13	4
Women	59	16	10	11	3	1
18-49	78	13	6	3	1	<1
50-69	28	24	19	23	5	1
70+	12	14	18	32	18	5
Mexican American	46	21	15	13	5	1
Men	37	24	20	13	5	2
18-49	49	29	15	7	1	<1
50-69	15	17	31	22	12	3
70+	9	12	29	25	16	8
Women	56	16	10	12	4	1
18-49	77	14	6	2	1	<1
50-69	19	24	20	27	7	3
70+	10	12	15	40	20	3

[a] Based on categories established in the *Fifth Report of the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure*, 1992.

Note: Rows may not total 100 percent due to rounding.

These research findings on salt/sodium intake and BP, as well as those on other lifestyle factors that contribute to observed adverse BP patterns in our population (excessive consumption of calories, physical inactivity, excessive alcohol consumption, and deficient intake of potassium), have led to a major national priority for addressing elevated BP as a public health problem. The results achieved with unifactorial interventions probably underestimate those that can be obtained under circumstances where an effective combined or multifactorial intervention is applied. From a practical point of view, many of the interventions are mutually supportive and reinforcing. Combination interventions (e.g., sodium reduction and weight reduction) have been applied in a number of trials.[18-22] Nevertheless, the research study results indicate a need for salt/sodium reduction for hypertension prevention independent of the need for other lifestyle changes.

Recommendations for Sodium Intake

Specific quantitative recommendations for salt/sodium intake for the public and for hypertensive patients have been available since the mid-1970s and have evolved over time. In 1977, the U.S. Senate Select Committee on Nutrition and Human Needs first addressed the issue of nutrition in the prevention of chronic disease and recommendations for dietary salt were quantified.[23] Since then, reduction of dietary salt/sodium for the prevention of hypertension has been advocated by a myriad of public agencies and health organizations.[24-31]

In 1993, the NHBPEP's *Fifth Report of the Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure* (JNC V)[32] recommended lifestyle modifications, including moderation of salt/sodium intake, as definitive or adjunctive therapy for hypertension. The NHBPEP's *Working Group Report on Primary Prevention of Hypertension*[2] recommends moderation of dietary sodium to a level of no more than 100 mmol (about 2,400 mg sodium or approximately 6,000 mg salt) per day as a method to prevent blood pressure from rising, in effect preventing hypertension.

Salt and Sodium Intake

Data on dietary sodium intake and discretionary salt usage are currently collected as part of the 1988-91 National Health and Nutrition Examination Survey (NHANES III).[33] Mean sodium intake (not including discretionary salt added to prepared foods at the table) was 143 mmol (3,289 mg) (or 70 mmol [1,598 mg] per 1,000 kcal) for all ages,[34] which greatly exceeds the estimated minimum requirements of healthy nonpregnant, nonlactating adults (about 500 mg sodium/day)[7] and the NHBPEP's recommended daily intake for adults of no more than 2,400 mg sodium/day.[2,32] Intake by adults reporting they were told by a physician or another health professional on two or more occasions that they ever had hypertension was not different from that of nonhypertensives. In these data, mean sodium intake of adults appears to be unrelated to income, poverty status, education, region, and race/ethnicity by univariate analyses.[34]

Quantification of discretionary salt, which has not been done consistently over the several national surveys, must be estimated by the survey respondent. The absence of adequate detail results in underestimation of sodium intake from dietary surveys and may render monitoring based on dietary data insensitive to changes in population sodium intake from discretionary sources.[35]

On the other hand, food industry representatives state that sodium has been silently lowered in food products over the past 20 years. It is possible that the sodium content of some products may not have been accurately captured in non-industry nutrient composition databases, resulting in overestimation of sodium intake in national surveys. However, efforts to compare estimated calculated sodium intake with laboratory analysis of the same foods provide little support for these claims.[36] Some efforts are being made to review and improve the level of sodium detail in prior U.S. Department of Agriculture (USDA) survey databases to permit retrospective trend evaluation. If nutrient data banks are kept current and if food manufacturers contribute to these efforts,

the level of detail on food product consumption that is now collected in national dietary surveys will permit improved estimates of intakes of sodium consumption from processed foods and detection of trends could be enhanced.

Given the aforementioned caveats, dietary trends are difficult to assess. Nevertheless, national survey (table B)[37-41] and clinical trial data (table C)[17,20-22,42-48] indicate little change compared to the median levels in the 1970s.

Sources of Sodium

Studies of the sources of sodium[49-52] indicate about 75 percent comes from food processing, 10 to 11 percent is inherent (naturally occurring), about 15 percent is discretionary (half of which is contributed by table salt and half by cooking), and less than 1 percent is from water.

A year 2000 Public Health Service objective is that 80 percent of the population not use salt at the table.[53] Overall, about 53 percent of persons under 20 years of age, and 41 percent over 20, report not using salt at the table.[54] Of the population that does report using salt at the table, about 33 percent of adults and 20 percent of children "frequently" use salt. The proportion of the adult population who report using sodium-reduced salt or a salt substitute is 4 to 5 percent and 1 to 2 percent, respectively.

A broad look at food groups contributing to sodium intake over the past decade is provided by comparing national survey data from the NHANES II (1976-80)[55] and the Continuing Survey of Food Intakes by Individuals (CSFII) (1989-91) (personal communication, 1994) (table D); both surveys used a 24-hour dietary recall, although methods and databases have changed over time. The top three groups combined (breads, rolls, crackers; hot dogs, ham, lunchmeats; soups) represented 31 percent and 25 percent of the totals for these two time periods, respectively. Other important food group sources of sodium are pasta dishes, rice, pizza, and cheese.

Conclusions regarding food contributions to sodium intake are very sensitive to the way foods are grouped and combined, but the Total Diet Study (TDS) conducted by the Food and Drug Administration's (FDA) — which covered 1982-89[40] and used 12 different major food groups — had similar results. The TDS, NHANES II, and CSFII surveys all indicate that grain products (in TDS grouped as grains; in NHANES and CSFII grouped as breads, rolls, crackers; donuts, cakes, cookies; pasta; rice; etc.) represented about a quarter of the total sodium intake in the diet. Other major contributors from the TDS were mixed dishes (e.g., pizza, soups in NHANES and CSFII), animal flesh (e.g., beef, hot dogs, ham, lunchmeats in NHANES and CSFII), and dairy products (e.g., cheese, milk, milk beverages in NHANES and CSFII), the relative contribution of which is about half of the total (table D). There has been little change in the relative rankings of these groups during the 1980s, and the relative contributions were very similar among the age groups in the TDS.

Nutrition Labeling

In 1990, Congress passed the Nutrition Labeling and Education Act (NLEA) to amend the Food, Drug, and Cosmetic Act and mandated sodium be included on nutrition labels.[56] In response, on January 6, 1993, the FDA promulgated new nutrition labeling regulations that require sodium content be declared in the absolute amount (milligrams) as well as a percent of the Daily Value (2,400 mg) in a serving.[57] For foods marketed for children under 4 years of age, for whom the FDA has not established Daily Reference Values, only the absolute amount is required. Actual sodium content is allowed to deviate upward from the label declaration by no more than 20 percent. Definitions for the optional sodium content claims — free, very low, low, less/reduced, lite/light, unsalted — have been established (table E). Claims for salt — salt free, no salt added, lightly salted — that are based on sodium content have also been defined (table E).

Table B

TRENDS IN MEAN 1-DAY DIETARY SODIUM INTAKE (MILLIGRAMS), BY SEX AND AGE, FROM SELECTED NATIONAL SURVEYS: 1971 THROUGH 1991[a]

Sex and Age (Years)	NHANES I 1971-74	NHANES II 1976-80	CSFII 1985-86	NHANES III 1988-91	CSFII 1989-91
Males and Females					
<1[b]	–	1,046	–	575	493
1-2	1,631	1,828	1,873	1,938	1,883
3-5	1,925	2,173	2,169	2,531	2,376
6-11	2,393	2,716	–	2,998	3,032
Males					
12-15	2,923	3,405	–	4,018	3,896
16-19	3,219	4,030	–	4,783	4,454
20-29	3,123	3,916	4,021	4,659	4,319
30-39	2,928	3,550	3,604	4,445	3,925
40-49	2,839	3,542	3,330	3,960	3,954
50-59	2,515	3,278	–	3,640	3,887
60-69	2,381	2,975	–	3,409	3,454
≥70[c]	2,114	2,804	–	3,072	3,228
Females					
12-15	2,094	2,567	–	2,927	3,063
16-19	1,812	2,336	–	3,097	2,728
20-29	1,928	2,404	2,593	3,002	2,639
30-39	1,822	2,354	2,491	2,977	2,615
40-49	1,793	2,327	2,486	2,919	2,439
50-59	1,713	2,186	–	2,575	2,375
60-69	1,548	2,108	–	2,578	2,437
≥70[c]	1,473	1,903	–	2,360	2,240

[a] Sources: National Center for Health Statistics (NCHS), First National Health and Nutrition Examination Survey, 1971-74; NCHS, Second National Health and Nutrition Examination Survey, 1976-80; USDA, Continuing Survey of Food Intakes by Individuals, 1985-86 (data for males for 1985 only); NCHS, Third National Health and Nutrition Examination Survey, 1988-91; USDA, Continuing Survey of Food Intakes by Individuals, 1989-91.

[b] NHANES II includes data for 6- to 11-month-olds only. NHANES III includes data for 2- to 11-month-olds only.

[c] NHANES I and NHANES II include data for 70- to 74-year-olds only.

Table C

REPORTS OF BASELINE URINE SODIUM EXCRETION IN CLINICAL TRIALS OF NORMOTENSIVE AND HYPERTENSIVE ADULTS

Trial	Baseline Years	Sample Size (% female)	Average Age (years)	Body Mass Index (kg/m^2)	Weight (kg)	Urine Sodium (mg/24 hrs)
NORMOTENSIVE						
PPH[a,18]	79-81	201 (13%)	38	NA	84	4,116
HPT[19,92]	82-83	841 (35%)	39	27 27M 26F	81 86M 71F	3,820[b]
HIP[c,42]	84-85	407 (13%) data on 169	39	27 28M 23F	NA	2,921
TOHP I[43]	87-88	2,182 (29.9%)	43	28 28M 27F	NA	3,644 3,919M 3,003F
TOHP II[44]	90-92	2,382 1,566M 816F (34%)	44T 43M 44F	31 31M 31F	NA	4,577M 3,535F
HYPERTENSIVE						
HCP[a,21]	80	189 (36%)	56	NA	77	3,702
TAIM[d,45]	85-87	878 (44%)	48 48M 49F	NA	86 92M 79F	3,036 3,381M 2,576F
TOMHS[22,46,93]	86-88	902 38%F	55 55M 55F	29 29M 29F	NA	4,685[b] 5,053M 4,089F
DISH[d,47]	80	496 (41%)	57	NA	80	3,346
HIT[48]	84-85	166	48	NA	NA	4,114

[a] Stamler R, personal communication, 1995.

[b] Extrapolated from 8-hour urine sodium by multiplying by 3.8.

[c] Caggiula A, personal communication, 1995.

[d] Davis B, personal communication, 1995.

Table D

PERCENT OF SODIUM CONTRIBUTED BY FOOD GROUPS IN ADULTS

NHANES II (55) (1976-80)		CSFII[a] (1989-91)	
Ages 19+ years		Ages 18+ years	
Food Group	%	Food Group	%
Breads, rolls, crackers	14	Breads, rolls, crackers	11
Hot dogs, ham, lunchmeats	10	Hot dogs, ham, lunchmeats	8
Soups	7	Soups	6
Cheese	6	Pasta	6
Potatoes	5	Beef (ground)	4
Milk, milk beverages	4	Potatoes	4
Donuts, cakes, cookies	4	Rice	4
Pasta	4	Pizza	4
Beef (ground)	3	Cheese	3
Pizza	2	Milk, milk beverages	3
Beef (solid)	2	Donuts, cakes, cookies	2
Cumulative %	61	Cumulative %	55

[a] Subar, personal communication, 1994.

The potential benefits of the new nutrition labeling are not only to provide information to the consumer at the time of purchase, a key time when making food selection decisions, but also to encourage food manufacturers to reformulate foods and make their sodium content lower.

SALT TASTE

Salt is known to increase food palatability in two conceptually distinct ways. First, it adds its own salty taste to foods. Second, and less widely appreciated, it appears to modify other tastes and flavors favorably and suppresses bitterness, without necessarily making the foods taste salty. Thus, when salt is reduced or removed from a food, not only is the saltiness of that food altered, but the balance of other flavors is changed. Also, sodium contributes to the safety and stability of many products and serves a function, which may be difficult to replace, in some leavening agents.

A technical barrier to sodium reduction is that there is presently no acceptable substitute for salt that provides similar taste satisfaction. Because the sodium-sensitive channels in human taste receptors are highly specific for sodium, it may be difficult to develop an acceptable substitute.[58] However, it is theoretically possible that a salt enhancer (e.g., a substance that creates more channels or keeps them open longer) could be developed. Some potential salt enhancers have been proposed.

Table E

DEFINITIONS OF SODIUM CONTENT CLAIMS ON FOOD LABELS[a]

CLAIM	DEFINITION[b]
Sodium free	less than 5 mg/reference amount[c] and per labeled serving (no ingredient that is sodium chloride or generally understood to contain sodium without asterisked statement)[d]
Very low sodium	not more than 35 mg/reference amount[c] and 50 mg for small reference serving[e]
Low sodium	not more than 140 mg/reference amount[c] and 50 mg for small reference amount[e]
Reduced or less sodium	at least 25 percent less sodium than reference food and reference food is not "low sodium"
Lite/light in sodium	at least 50 percent less sodium than reference food[f]
Salt free	meets criteria for sodium free
No salt added, unsalted	no salt added during processing; the food it resembles and for which it substitutes is normally processed with salt; if not sodium free, declare "not a sodium free food" on information panel
Lightly salted	at least 50 percent less sodium than normally added to reference food; if not low sodium, so state on information panel

[a] Office of the Federal Register. *Code of Federal Regulations*. Chapter 21, Parts 101.56 (nutrient content claims for "light" or "lite") and 101.61 (nutrient content claims for the sodium content of foods).

[b] These definitions apply to food products other than meal products and main dish products. The latter types of products have different requirements.

[c] Reference amount customarily consumed per eating occasion, as defined in the FDA regulation.

[d] Asterisked statement may say "adds a trivial amount of sodium," "adds a negligible amount of sodium," or "adds a dietarily insignificant amount of sodium."

[e] Small reference amount is defined as 300 g or less or 2 tablespoons or less.

[f] If the food is also "low calorie" and "low fat," can use a "light" or "lite" claim without reference to sodium.

Table F

PERCENT OF RESPONDENTS FOR WHOM VARIOUS FACTORS IN FOOD SELECTION ARE VERY IMPORTANT[64-68,74]

Factor/Year	1988	1990	1992	1994
Taste	88	88	89	90
Nutrition	72	75	77	76
Price	65	66	75	70
Product safety	83	71	71	69
Ease of preparation	39	33	36	34

The basis for the human preference for salted foods probably involves a combination of an innate preference and postnatal (and perhaps prenatal) experience.[59,60] The preference may be innate but may not be evident at birth. The emergence of this preference in infants may be linked to the postnatal maturation of the sodium-sensitive channels rather than to diet. However, there is evidence in adults that salt preference in a food is related to dietary exposure.[61,62]

Several studies of hypertensive and normotensive adults have demonstrated that after 2 to 4 months on a lower sodium diet, a person's level of salt preference in food declines.[61,63] A few studies have also demonstrated the corollary, that is, a higher sodium diet increases one's level of salt preference.[61] There is no experimental evidence in children, even though we assume they experience a similar effect. Thus, people can become adapted to a lower sodium diet, but such adaptation requires forgoing the experience of foods with clearly salty tastes and an acclimatization to changes in the complex of other flavors in common foods.

Food Industry

Taste is the key determinant of success for new food products — particularly for repeat usage. Several consumer surveys indicate that taste is a more important factor than nutrition or health in choosing foods in grocery stores (table F),[64-68] and at restaurants (table G).[69-72] Other major factors involved in food selection are convenience/ease of preparation, price/value, and product safety. Taste, as the driving market force, remains paramount over the years (table F) and in all age categories (table G). Another important market force is that consumers are aging. Older people tend to be more health-conscious and willing to make dietary changes. According to self-reported data, health supersedes cost and convenience as people age (table G). Health is a less important force in younger age groups. In addition, 92 percent of consumers are not in a traditional household — singles, single parents, two working adults, empty nests — which often leads to harried lifestyles.[73] There are more women in the workforce (46 percent of the workforce) than ever before.[73] Americans are working more hours than ever, and about 50 percent of meals are prepared outside the home.[73] Many of today's harried consumers believe that time and convenience are frequently more important than economic considerations.

Although nutrition is an important factor in choice, it is not a leading factor, and salt/sodium is currently not seen as important a message to the consumer as fat reduction (table H).[64-68,74,75] In the mid-1980s, surveys of consumer attitudes indicated that salt/sodium was the highest dietary concern among the population, but since then interest in salt/sodium has been on a downward slope relative to other concerns. Sixty-seven percent of respondents of a quick-service restaurant market survey said they were very interested in nutritious items on the menu.[72] When probed regarding what they are interested in, 86 percent of customers and 83 percent of noncustomers of quick services reported being extremely or very concerned about the freshness of foods, e.g., crisp lettuce. About 84 percent reported being concerned about fat and saturated fat; only 64 percent were concerned about salt/sodium, less than their concern for cholesterol, balanced diet, chemicals in food, and fiber.

This change in interest or concern for lower sodium foods is reflected by the proportion of consumers who have consciously changed their dietary behavior. Survey respondents changing dietary behavior currently do so more often by reducing high-fat foods than by reducing high-sodium foods.[75,76] For example, the proportion of restaurant patrons who say that they have consciously restricted foods higher in fat has increased slightly from 68 percent in 1986 to 71 percent in 1992, and foods higher in salt/sodium has decreased from 68 percent to 58 percent.[69,72,77] Food marketing surveys[64-68] show a similar pattern in dietary behaviors among food store patrons (table I). About 32 percent reported actively trying to restrict their fat intake,

Table G

PERCENT OF CONSUMERS, BY AGE, SELECTING FOODS IN QUICK-SERVICE RESTAURANTS BASED ON TASTE, CONVENIENCE, COST, OR HEALTH[64-68,74]

Issue/Age	18-24 Years	25-34 Years	35-44 Years	45+ Years
Taste	43	43	45	40
Convenience	22	18	15	13
Cost	18	11	8	6
Health	17	28	32	41

Table H

PERCENT OF RESPONDENTS WHO ARE VERY OR SOMEWHAT CONCERNED ABOUT SPECIFIED NUTRITION CONTENT OF FOOD[64-68,74]

Concern/Year	1986	1988	1990	1992	1994
Fat content, low fat	17	27	46	50	59
Salt content, less salt	20	26	30	21	18
Cholesterol levels	13	22	44	30	21

whereas only 7 percent reported actively trying to reduce their salt/sodium intake, even though almost 60 percent of respondents indicated they were seriously concerned about nutrition. Consumers may have to choose between lower fat versus lower sodium because many foods that meet lower fat criteria may not be lower in salt/sodium.

Restaurant market research identifies three consumer groups categorized by nutritional attitudes when eating away from home — unconcerned (32 percent), committed (37 percent), or vacillating (31 percent) patrons.[70,71,77] In 1992, the majority of respondents agreed that diet and nutrition are involved in disease prevention. As expected, when consumers were asked what foods they consciously restrict, a greater proportion in each category restricted foods high in fat rather than foods high in salt/sodium, and a greater proportion of committed and vacillating, than uncommitted, patrons restricted foods high in salt/sodium (table J). Those with unconcerned nutritional attitudes are generally men between the ages of 18 and 34 who frequent fast-food restaurants (utilizing carryout and delivery). Those committed to eating lower fat/sodium foods are generally women between the ages of 35 and 54 who live in metropolitan areas and when dining out behave consistently with their views on nutrition. The vacillating patrons are age 45 and older, are more likely to patronize quick-service restaurants and self-serve cafeterias, and place taste and occasion over nutrition and health when eating out. Consumers who frequently dine on the premises at quick-service restaurants are generally uncommitted patrons, whereas infrequent restaurant eaters are patrons more committed to health-promoting behaviors.

Successful companies identify what the consumer wants and supply it (accommodate consumer demands) better than their competitors. Consumer demand drives the marketplace; therefore, the increased use and broader availability of lower salt/sodium products depend, in part, on the ability to generate demand for them. The challenges to increasing this demand and use include educational and communication strategies, as well as product-related constraints.

Nielsen data[73] indicate that in virtually every product category there are low-salt/sodium alternatives available. A survey of new products[78] shows that more than 2,000 low- or reduced-salt/sodium products have been introduced, but total sales of reduced-salt/sodium items have been flat at about 3 to 4 percent in the last 5 years. There is low usage but consistent demand.

An examination of the factors that have contributed to the success of other nutritionally positioned products (particularly reduced-fat products) provides insight on how a demand for reduced-salt/sodium foods can be generated. Besides a high-quality product, there is a need for consumer messages that are engaging, compelling, and simple; advance realistic goals; clearly communicate tangible consumer benefits; and provide actionable recommendations that are easy to implement. Guidance that helps consumers integrate nutrient and health messages with food choices should help create healthful eating patterns.

Table I

PERCENT OF FOOD STORE PATRONS CHANGING DIETARY BEHAVIOR[77]

Changes	1989 n=1,031	1990 n=1,005	1991 n=1,004	1992 n=1,000	1993 n=1,006	1994 n=1,008
Reduce fat intake/eat low-fat foods	22	27	25	28	26	32
Eat more fruits and vegetables	59	57	57	60	62	63
Reduce cholesterol	12	15	12	8	6	3
Reduce salt/sodium	13	15	10	8	8	7
Reduce meat consumption	33	34	34	31	30	31
Eliminate fried foods	10	14	7	7	6	6
Increase grains and fiber	13	16	16	8	8	7

Table J

PERCENT OF RESTAURANT PATRONS CONSCIOUSLY RESTRICTING FOODS[64-68,74]

Dietary Concern / Patron Type	Percent of Sample 1992	Restrict Foods High in Fat	Restrict Foods High in Salt
Unconcerned	32	44	35
Committed	37	93	73
Vacillating	31	74	62

Behavior Change

Recent medical research and media attention on diet and health issues have created both increased public awareness and confusion about these issues. In today's environment, the salt/sodium and blood pressure messages compete with dietary recommendations about fat, fiber, calcium, and other nutrients and with prevention of heart disease, cancer, osteoporosis, obesity, and diabetes, for example. Consumers have difficulty translating diet and health information into food choices compatible with all diet recommendations.

This dilemma is only too apparent from results of the USDA's 1989 Diet, Health, and Knowledge Survey — CSFII.[79] More than 80 percent of respondents overall had heard of health problems related to salt/sodium; however, only about 60 percent had heard of hypertension related to salt/sodium. The majority (about 55 percent) of individuals report that avoidance of salt/sodium is personally of high importance. Yet, the mean sodium intake for the low, moderate, and high importance groups is comparable (about 70 mmol [1,600 mg] per 1,000 calories), suggesting that awareness of the importance of salt/sodium reduction is not translating to food selection. More than half the respondents indicated that their salt/sodium intake was about right, and only about a third indicated it should be lower. Again the actual sodium intakes of the two groups were comparable. It appears from surveys that the U.S. adult population has varied over time in its level of awareness and practices in salt/sodium reduction.

Blood pressure reduction trials[80-84] have provided practical tools and theories of behavior and dietary change for current educational efforts. Nevertheless, participants in these sodium reduction clinical trials have reported barriers to salt/sodium reduction that challenge efforts to promote lower salt/sodium diets. An often-perceived barrier derives from the observation that a population average BP reduction of about 3/2 mmHg[17] appears small to individuals and does not translate into useful motivation for clinicians. In addition, some will have more and some less of a response, but the majority of individuals will probably not notice this small an effect without many BP measurements. Understanding other potential barriers to a lower salt/sodium lifestyle, including issues of food sources, physiologic and behavioral idiosyncracies, as well as social, historical, cognitive, perceptual, and emotional factors (table K),[85] will contribute to more effective planning and implementation of a national campaign. Barriers must be dealt with in behavior change efforts. In order for people to be motivated, they have to understand what they gain from change and receive feedback and gratification to continue to be motivated.

A campaign focus, therefore, needs to be not only on the awareness but also on the specific behaviors that one needs to adopt to effect that change. It will take different kinds of influences to keep the individual motivated. Behavioral theories that provide a rationale for approaches to behavior change (Health Belief Model, Theory of Reasoned Action, Social Cognitive Theory) need to be considered.

Monitoring

Quantitative measurement needs to be obtained at the population level to monitor the effects of a national campaign. Information on salt and sodium in the American diet is available from several surveys and research activities in the Federal Government's National Nutrition Monitoring and Related Research Program.[35,86] In addition to sodium intake itself, factors to measure include those that contribute to the causal pathway of sodium intake — consumer awareness of the need to reduce salt/sodium, knowledge of how to reduce salt/sodium intake, and perceived and actual salt/sodium reduction behaviors, as well as producer awareness and behaviors that affect sodium in the food supply.

Total sodium intake may be adequate for some purposes, but for tracking sources — inherent, processing, table salt, cooking, and water — and

Table K

MODIFIABLE CHALLENGES TO SALT/SODIUM REDUCTION[85]

Structural/Food Source

- Emphasis on fat, not salt
- Poor product availability
- Have to buy off-brands
- Poor availability across stores
- Difficulty finding in store
- Increased time shopping
- Products remain on shelves for long periods
- Product rotation too great
- Few products low in sodium and fat

Social

- Poor awareness of benefits/behaviors
- Fat is fashionable, salt is not
- Perceived by public as "ill" or "odd"
- Few role models
- Low support from low awareness
- No public pressure to reduce
- Behaviors not evident; low support
- Little health care support

Behavioral Idiosyncracies

- Poor reinforcement source
- Feedback difficult/embarrassing
- Very focused, few behaviors, few options
- More difficult with available food supply

Cognitive/Perceptual

- No opportunity to add something back upon reaching goal
- Difficulty achieving low-sodium diet
- Misconceptions of methods to achieve low-sodium diet
- Frequent conflict with others:
  - restaurants
  - friends/family
  - food sources
- Frequent frustration for those not achieving lifestyle/cognitive change

Physiologic Idiosyncrasies

- No physiological feedback (except in taste extremes)
- Less adherent may not have taste changes

to plan interventions, estimation of sodium sources, e.g., by meal, by food group, or home versus away from home, may be needed. For research purposes, data on individuals to relate sodium intake to blood pressure may be required, and for surveillance, population data by relevant subgroupings, e.g., age, ethnicity, region of the country, food assistance program participation, lifestyle/health habits, income, and risk status, would be informative.

Total sodium intake can be estimated from urinary sodium because almost all consumed sodium is excreted through this route under normal circumstances.[50] At the individual level, measures have to be more representative of the usual intake than a measurement to reflect group intake. Twenty-four-hour urine collection is considered the gold standard for quantifying daily total sodium intake of groups. To characterize an individual, several 24-hour urine collections are needed.[87,88] Overnight urine excretion, which requires only a single collection upon arising, can be used to reflect group sodium intake, but it does not estimate 24-hour excretion and is, therefore, not an alternative for measuring total 24-hour excretion in the population.[89] Other methods of urine collection, e.g., casual (spot, untimed) specimens, sodium-creatinine ratios to control for variation in urine flow rate, and dipstick methods (chloride titrator strips), may not offer potential for measuring total sodium intake but may have other uses. Some dietary sodium methods are more feasible than urinary sodium measurements in field surveys.

Table L

MONITORING CHANGE IN SODIUM REDUCTION BEHAVIORS AND QUANTIFYING THE CHANGE IN SODIUM INTAKE[35,86]

Monitoring Need	Consumer Awareness	Consumer Behavior	Producer Awareness	Producer Behavior	Exposure	Sodium Intake
Data Source						
BLS					X	
BRFSS (CDC)	X	X				
CSFII (USDA)	X	X				X
FDA	X	X	X	X	X	
INDUSTRY	X	X	X	X	X	
NFCS (38) (USDA)						X
NHANES (NCHS)	X	X			X	X
NHIS (NCHS)	X	X				
USDA			X	X	X	

BLS (Bureau of Labor Statistics); Consumer Expenditure Survey; BRFSS (Behavioral Risk Factor Surveillance System); CDC (Centers for Disease Control and Prevention); CSFII (Continuing Survey of Food Intake by Individuals); FDA (Food and Drug Administration): Health and Diet Survey; Total Diet Study ("market baskets"); Industry (Consumer awareness/market surveys); NCHS (National Center for Health Statistics); NFCS (Nationwide Food Consumption Survey); NHANES (National Health and Nutrition Examination Survey); NHIS (National Health Interview Survey); USDA (U.S. Department of Agriculture): Other than CSFII and NFCS; for example, A.C. Nielsen Scantrak, National Nutrient Databank, Diet and Health Knowledge Survey

An approach to quantifying total sodium intake is to perform chemical analyses of diets that duplicate those consumed by a selected representative sample. Both this approach and 24-hour urine collection pose feasibility problems in field surveys. Moreover, neither approach provides sodium source data that are available from dietary intake data. Single measurements of sodium intake do not correlate well with single urinary sodium determinations,[42,90,91] so dietary methods should be validated, and if possible calibrated, against the more quantitative measures (several 24-hour urines) in order to draw conclusions about trends over time.

There are several options for collecting dietary and food supply data to provide quantitative estimates of sodium intake and to reflect attitude and behavior associated with salt/sodium intake (table L).[86] Retrospective trend analysis for knowledge, attitudes, behaviors, and intake from these data sources, however, will be complex because we are just reaching a desirable level of quantification, and we will lack temporal comparisons. The year in which a survey is initiated and the frequency of its repetition are critical factors in monitoring, as are the survey objectives and the questions they asked at the outset. Trends in dietary intake of sodium must be interpreted with caution because different assumptions about the salting of foods were used in different surveys. Moreover, over time, improvements have occurred in the nutrient composition databases (the reference data for translating any dietary intake data into nutrient values) and in interviewing techniques to facilitate recollection of detailed food intake.

Consideration of additional analyses of the yet unexplored, extensive, and, in some cases, detailed dietary and food purchasing data collected in existing surveys should be investigated. National surveys, however, exclude salt added at the table and in cooking, thus underestimating sodium intake. In addition, assessment of the salt/sodium content of the U.S. food supply is limited because such data are not currently available. To be current, nutrient databases require frequent modification, which necessitates food composition data based on adequate food sampling and chemical analysis, as well as public agency and private industry diligence and cooperation. The ability to interpret trends could be improved by methodological studies designed to assess the consequences of changes in survey procedures and databases on the sodium intake estimates. Thus, further attention to those aspects of nutrition monitoring described above is of high priority for optimal implementation and evaluation of the effectiveness of a nationwide dietary salt/sodium reduction campaign.

Working Group Recommendations — Where Are We Going?

Eight working groups discussed issues and made recommendations in four general areas: specific target populations, various settings for implementing changes, monitoring, and research needs. Each group was charged with addressing one or more of the five workshop objectives: (1) identify and document intervention strategies used in clinical trials and other intervention studies; (2) identify effective monitoring strategies (dietary and urinary sodium) at the individual, community, and national levels; (3) provide a forum for discussion of the issues of salt/sodium in the food supply; (4) identify research needs in implementing dietary salt/sodium reduction; and (5) synthesize the best approaches for salt/sodium reduction for the Primary Prevention of Hypertension initiative of the National High Blood Pressure Education Program. Six broad recommendations summarize the working group deliberations.

Recommendation 1: The NHBPEP should develop both public and professional education activities within its primary prevention campaign to convey the rationale for and benefits of lowering dietary salt/sodium for hypertension prevention to the appropriate target audiences.

Succinct communication of the scientific rationale for and benefits of reducing dietary sodium consumption to both the public and professionals is needed to promote the primary prevention of hypertension and to counter misleading and confusing messages that are pervasive among the public and health professionals. Many health care providers still do not recognize the impact of salt/sodium reduction on shifting the population blood pressure curve downward, with resultant decreased incidence and prevalence of heart disease, stroke, and other hypertensive complications.

Questions relating to the topic of dietary sodium reduction and prevention could be part of board or certification exams that are requirements for many health professionals in order to practice. Formal curricula and postgraduate education could be offered as part of the professional education campaign to increase awareness, knowledge, and skills of health care providers.

Because most of the U.S. adult population seek medical care at least once within 2 years, health professionals will play a critical role in creating awareness and providing the impetus to change. Once the motivation is there, restaurant, food service, and food production industries can supply lower salt/sodium alternatives as the demand for them increases. Therefore, the professional education component of a primary prevention campaign should be directed to health care providers, leaders in the food production industry (manufacturers, retailers, distributors, marketers), restaurant and food service personnel, and media members concerned with science, health, or food.

The public education campaign should emphasize the fact that the same lifestyle changes that help prevent high blood pressure (weight management, increased physical activity, and moderation of alcohol consumption) are also valuable in its treatment and have a favorable effect on general health. Furthermore, it should underscore the fact that prevention and control of high blood pressure represent only one of several important strategies for the prevention of coronary heart disease and stroke.

Although the campaign is recommended to be populationwide, a targeted campaign to the public to achieve awareness and facilitate change in high- risk groups — e.g., low socioeconomic groups, people who live in the Stroke Belt, and

African Americans — should be integrated without "labeling" these subgroups. Targeting both ends of the age spectrum — children and the elderly — should also be a high priority because prevention naturally starts in childhood and many elderly are already primed for change and many more could be primed with appropriate health promotion messages. In addition, the elderly suffer the highest rates of heart attack and stroke and may be more sodium-sensitive than younger people.

Recommendation 2: In addition to conveying the rationale and benefits for lowering dietary salt/sodium for hypertension prevention, the salt/sodium messages must be consistent with and often integrated into the overall healthful lifestyle/diet messages, such as those imparted by the DHHS/USDA Dietary Guidelines for Americans, the USDA Food Guide Pyramid, and FDA food label approaches.

Because the public is overwhelmed with a variety of competing health-related messages, over the past decade consumer interest in salt/sodium has been decreasing from being the highest to one of the lowest dietary concerns. Other factors that have led to the general confusion about the efficacy or importance of sodium reduction include the stigma of a salt/sodium-reduced lifestyle, which historically has been negatively associated with response to a medical diagnosis; inconsistent terminology (e.g., salt versus sodium versus sodium chloride, milligram versus milliequivalent or millimole); fewer tangible or perceived benefits of lower sodium than of lower fat (e.g., weight control); the perceived expense of a lower sodium lifestyle; and no identifiable goal (such as "know your number" for blood cholesterol reduction campaigns). It is now time that the salt/sodium message be linked with the fat message and integrated with messages on healthful lifestyles in general.

Multiple media (print, television, radio) have been major vehicles for dissemination of messages for the NHBPEP in the past, and the NHLBI has already aired public service announcements on radio and television and produced new print materials for the general public to prevent hypertension. The working groups noted that these types of materials when targeted to specific audiences need to be culturally and age-appropriate and written at appropriate literacy levels.

Public and private institutions (such as the workplace, schools, medical centers, churches, shopping malls, community centers, service clubs, military installations, prisons, health clubs, restaurants, and senior citizen centers) provide opportunities for salt/sodium reduction activities. Any prevention campaign or program fits more easily into the existing social structure of a community. For example, school is the major vehicle for targeting children and parents, and churches that serve as a community focus have, in the past, successfully hosted peer leader or lay opinion leaders in train-the-trainer programs.

Health care institutions appear to be natural channels for implementing salt/sodium reduction programs or disseminating educational materials. In these settings the opportunity exists for incorporation of salt/sodium reduction education into existing programs, frequent counseling, feedback through sodium monitoring, and use of technological aids such as videos and computers. Barriers to this strategy, however, exist and include lack of financial compensation to the provider, limited provider knowledge and skills in behavioral change, and the patient load. To minimize the burden and to encourage reimbursement, only those at high risk of hypertension — e.g., African Americans or individuals who are overweight, have excess sodium intake, are physically inactive, consume excess alcohol, have a high normal blood pressure, or have a family history of hypertension — could be targeted.

Recommendation 3: Experiences with intervention studies, to the extent possible, should be transferred to clinical and/or community settings after reviewing/evaluating and adapting, if necessary, strategies, methods, and materials.

There is a large body of research experience in making changes in sodium intake — results of research in adults with high-normal blood pressure and with hypertension indicate successful lowering of dietary sodium for up to several years. These studies offer a large body of methods, materials, strategies, etc., which have not been applied and tested in the field. However, because these intervention studies have consistently fallen short of targeted levels of sodium intake (60-80 mmol/day or 1,380-1,840 mg/day) for most of the participants, the "food environment" must also be addressed. Individuals will be more successful in making recommended changes when lower sodium foods are more widely available and when the broader educational environment encourages such change.

Recommendation 4: Gradual "silent" or "transparent" lowering of salt/sodium in the food supply will need to occur along with the opportunity for effective marketing strategies and the promotion of reduced-sodium, as well as low-sodium, low-salt, and no-salt food products. These recommendations are applicable to the food production industry, as well as restaurant, catering, and food service industries.

Because processed foods contribute about 75 percent of the sodium in the food supply, product reformulation and food preparation changes to reduce the sodium content in standard food products overall and increasing their availability in all communities, especially disadvantaged and rural communities, will help reduce the Nation's dietary sodium consumption. "Silent" lowering of the salt/sodium in the food supply is a passive, nonvisible, environmental change that has been shown to be effective in studies where the population consumes a substantial portion of its diet in an institutional setting. At some point this effort must become not so silent or transparent to the public. It could be counterproductive for the American public to not recognize the changes that have occurred or to not be provided the opportunity to support those brands that have made progress toward reducing sodium without compromising flavor. Obviously, nutrition education needs to go hand in hand with such an industry-based shift.

To develop and supply more low-salt/sodium or no-salt foods will necessitate a demand greater than what currently exists. Because these products represent only a very small portion of overall food sales, the bigger impact on sodium in the food supply will result from the silent lowering of sodium in the foods most commonly eaten. Continuing and generating this reduction will necessitate education of and continued dialogue with food industry leaders while concurrently educating the public.

Recommendation 5: Data from completed clinical trials should be analyzed for the adequacy of the simpler methods, e.g., casual urine collections and chloride titrator strips, as measures of sodium intake and for the validity of dietary recalls in order to consider the best feasible methods for individual and national level assessments of sodium intake.

The intent of these analyses would be to identify the most accurate and affordable method of assessing sodium intake — affordable to individuals in clinical settings and to investigators in large nutrition surveys. In addition, it may be feasible to apply these methods in large surveys to permit analysis by levels of socioeconomic status, ethnicity, State, or region of the country.

Although a number of methods have been used to monitor sodium intake in study participants, none is clearly known to be generally applicable or sufficiently accurate in an unselected population. There are simple methods that can be examined on a small scale, but their utility on large scales has not been applied. A secondary

analysis of existing data could be conducted so that the utility of simple urine collection methods can be correlated with more traditional detailed urinary sodium collection methods.

These clinical methods of assessing sodium intake should also be correlated with dietary recall methods that use varying degrees of probing for salt/sodium intake. The aim would be to identify where additional probing no longer contributes to the quality of the data. An additional aim would be to build a bridge or conversion factor that would allow for correction of biased estimates of sodium intake from dietary recall. Thus, dietary recall could be a more accurate tool to assess dietary salt/sodium consumption.

Analysis of dietary data can only be as good as the nutrient database from which it draws. Although databases are continually updated, nutrient data of brand-specific items in the past may have been proprietary information, although the Nutrition Labeling and Education Act now requires them to be publicly available. Coalitions between Government, industry, and other users of nutrient databases would promote more complete and current information in the databases.

Recommendation 6: In addition to investigating adequate monitoring methods, other research needs were identified in the areas of food technology, basic mechanisms of salt taste, and knowledge, attitudes, and skills of the public.

In light of the recommendation for "silent" reduction of salt/sodium in the food supply, a major unknown is the minimal level of salt needed to enhance flavors — that is, the dose response of salt versus flavor enhancement. A co-consideration is the safety of salt reduction in preservation of individual foods. Simultaneous research to develop salt enhancers and/or salt substitutes could be encouraged.

Other unknowns concern the basic mechanisms of salt taste. For example, is salt taste affected by age or ethnicity? Does salt taste interact with other nutrients or medications? A common recommendation made by health professionals is to limit salt/sodium intake in young children, but what is known about salt taste and preferences in children and the influence of early restriction on later demands is negligible because most salt taste studies have been conducted with adults. In addition, most salt taste studies have implemented abrupt sodium reduction whereas most behavioral interventions implement gradual sodium reduction. The benefit of slow versus rapid change is unknown as is the magnitude and duration of recidivism, although there are trial data to indicate less recidivism in regard to salt intake than, for example, caloric intake.

To date, few intervention studies have combined sodium reduction intervention with a more comprehensive or inclusive nutrition intervention other than weight reduction. Research needs to be conducted on the effect of sodium reduction intervention integrated with an overall nutrition message either concurrently or sequentially. As sodium reduction interventions have evolved, they have become more behaviorally oriented yet little is known about the readiness of individuals to change (that is, how they adopt, select, and maintain behavioral change) relative to sodium reduction, different population needs, and which incentives, cues, or feedback work.

Closing Panel — How Do We Get There?

Programs respond to new policy slowly and by changing priorities. The USDA-created school meal programs; Women, Infants, and Children Supplemental Food Program (WIC); food stamps; and commodity food distribution programs were originally based on nutrient deficiencies. Currently, excess and imbalances are major problems. Although hunger is still a problem in some population subgroups, policies to reduce salt/sodium along with other improvements in the American diet need to be addressed in the USDA programs.

Direct services, such as the USDA feeding and supplemental food programs, constitute only one part of new directions in lowering salt/sodium. To produce change in consumption patterns, a major nutrition education campaign accompanied by a specific series of public and private partnerships rounds out implementation of the new directions. Coordinated efforts building on the FDA's education efforts to implement the Nutrition Labeling and Education Act, the DHHS/USDA's *Dietary Guidelines for Americans*, and the USDA's Food Guide Pyramid will help maintain consistency of the salt/sodium message across public and private sectors.

To have a major impact on sodium consumption, it is critical that the food industry reduce (or continue to reduce, in some cases) the content of sodium in generally available processed foods, in addition to offering special low-salt products, e.g., gradually lower salt in bread by 10, 20, and 30 percent. However, patience and a realistic perspective are needed. Technologically, the food industry is at a standstill without a salt substitute on the horizon and with flavor enhancers still under development. In addition, reformulation of food to reduce sodium content takes research and development. Because industry's success depends on consumers' demands, incentives for industry to silently lower sodium content of foods will have to be created and demand for lower sodium and lower salt foods must precede their availability. Silent lowering could result in increased preference for lower salt/sodium foods. However, more skill at using salt substitutes could maintain the preference for high-salt/sodium foods and perpetuate the overall demand for a salty-tasting food supply.

The NHBPEP has initiated a national campaign, the specific goal of which is the primary prevention of high blood pressure. Primary prevention represents a natural extension of the NHBPEP's mission and would complement its initiatives to facilitate the detection, evaluation, and treatment of high blood pressure. To accomplish the goal of sodium reduction, the campaign at a minimum should include public education, programs to encourage food industry to provide the public with more healthful foods, education of food service institutions to prepare healthful alternatives, and education of health care professionals.

In conclusion, observational and experimental studies provide compelling evidence of the value of reducing sodium intake in the primary prevention of hypertension. It provides an attractive opportunity to interrupt and prevent the continuing cycle of managing hypertension and its complications. Changes in food manufacture, as well as public and professional education initiatives, provide a basis for achievement of substantial reductions in sodium consumption. The NHBPEP is well positioned to provide leadership for a national campaign for salt/sodium reduction as a major step toward the primary prevention of hypertension.

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