Ministry of Health

Health Behaviors

Healthful Nutrition

Healthy Israel 2020

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לעתיד בריא 2020 Healthy Israel

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Statement of the Director General

The purpose of the Ministry of Health is to promote the health and quality of life of the citizens of the state. The natural focus of activity is therapeutic care, although investing in the primary prevention of disease is the true strategic choice.. This is not solely a theoretical notion; it is a growing reality.In recent years, the obesity epidemic has been spreading throughout the population, striking children and adolescents as well as adults.If not stopped in its tracks, it threatens to reverse existing positive health trends and increase chronic disease-related morbidity and mortality rate in Israel.

Fully appreciating the importance of health promotion and disease prevention, already in 2006, the Ministry of Health started systematic planning of preventive activity, launching the Healthy Israel 2020 initiative. Twenty professional committees worked to evaluate the disease burden, define objectives and quantitative targets for 2020, and develop interventional strategies founded upon the best scientific evidence. The reports of three central subcommittees: promoting physical activity, the prevention and treatment of obesity, and healthful nutrition are currently being published. We hope they will help focus prevention efforts so we can ever more successfully cope with the main causes of obesity: poor nutrition and physical inactivity.

But theoretical guidelines are not enough; it is important to turn them into an operational plan.Therefore, within the “Pillar of Fire”, the work plan of the Ministry of Health for 2011, I established the promotion of public health as one of the five key goals of the ministry. To implement the plan, it was decided to form and lead a multi-ministerial national program for promoting an active and healthy lifestyle. Based on the scientific recommendations in these reports and the experience of many professionals and policymakers, a proposal for decision makers specifying legislative proposals and ancillary initiatives to allow citizens of all ages to live healthier, more complete lives, has been drafted.

I wish to thank Dr. Boaz Lev, who heads this initiative, Dr. Elliot Rosenberg and his team for coordinated its development, and all of the chairpersons and members of the committees who have devoted considerable time effort to promote this important initiative.

Well done, and may we all see it to fruition.

Prof. Ronni Gamzu,

Director General

Statement of the Assistant Director General

In the spirit of the present

The people want choice

The people want health

The people wish to muster around values of health and disease prevention

The people want healthcare justice

The Ministry of Health considers health promotion and disease prevention to be a key “lodestar” for policy and courses of action.

Shared responsibility for health between individuals, communities, local authorities, and the government has the potential to optimize the health of the nation.

Healthy Israel 2020 offers achievable health objectives and tools for reaching them.

We are well on the way.

I extend my hearty wishes and gratitude to all those who have worked to move this major project forward.

Dr. Boaz Lev.

Assistant Director General

Healthy Israel 2020: From Vision to Realization

The quest for good health has accompanying mankind since the dawn of history. The sages of the past gave useful advice regarding the means to maintain and improve one's health that would also be appropriate for a 21st century preventive medicine textbook as.The father of medicine, Hippocrates, stated back in the fifth century BCE that "walking is the best medicine known to man". Maimonides, who lived in the 12th century, cited in his famous book Mishneh Torah, a set of wise tips for a healthy, lifestyle. Here are several in the field of healthful nutrition "A person must be kept away from things that cause the body to deteriorate and he must direct himself towards those things that bring wellness and speed recovery. And they are as follows: a man should never eat unless he is hungry… a person is not to eat to his full".

But the sages of yesteryear lacked two vital elements for achieving the desired health objectives: substantiated scientific knowledge about **what** should be done, and proven methods showing how to effect change in the behaviors of the individual and society.

Significant change occured in the 1970s, when three key documents were published: in 1974, the report of the Canadian Minister of National Health, Marc Lalonde, was published, emphasizing the importance of the contribution of a healthy lifestyle and the physical and social environment to health; in 1976, the Canadian Task Force on Preventive Health Care was established, developing for the first time, scientific methodology for determining the level of evidence supporting preventive interventions; and in 1979 the Health People Report of the U.S. Department of Health was published, setting out preventive healthcare objectives at the national level.

These developments encouraged the World Health Organization to establish in1984, the Health for All initiative, following which, in 1989, the Israeli Ministry of Health undertook a process of crafting healthcare objectives for the year 2000. While that initiative did not advance beyond publication of objectives, it did prepare the ground for the current initiative, which was launched in 2006.

Twenty committees were created, many of which were divided into subcommittees. These were composed of subject experts from the Ministry of Health, other government ministries, healthcare organizations, the academia, and other organizations. The focus areas dealt with by the committees spanned a wide spectrum of preventive topics: some focused on health behaviors such as smoking, nutrition, physical activity, alcohol consumption or alertness. Others concentrated on the health states characteristic of a certain age group, such as neonatal anemia, occupational diseases, and hip joint fractures in the elderly.Yet other committees dealt with the prevention of diseases major body systems: e.g., infectious diseases, oral health or mental health. A final group explored methods and tools considered essential for the success: information, training and education, and health communication and marketing. The task of the committees was threefold: estimating the disease burden and economic burden resulting from risks and diseases in their domain, examining broad strategies and specific interventions to prevent or minimize this burden, and setting of objectives and targets to reach by 2020 for those issues that created a significant health burden and for which an effective and practicable interventions could be found. If baseline data was unavailable or it was decided that interventional research was required to explore the utility of a promising approach in Israel, a "developmental objective" was set, with the aim of directing future applied research to that issue.

Equality in the provision of healthcare services is a basic right of every citizen. To exercise this right, the committees were directed to reduce health disparities between the various population groups. Among the various efforts expended in this area was the strategy of choosing target values that fit the needs of each groups, with the expectation that the setting of an ambitious target would generate greater resources, define the need for persistence, and spark innovation to help “hit the mark” by 2020.

The current management of the Ministry of Health has decided to prioritize the issue of health promotion and disease prevention it its multi-annual work plan. The first topics to be addressed were tobacco control, obesity prevention and treatment, the promotion of physical activity, and healthful nutrition. The reasons are clear: these issues account for close to half of the chronic disease burden in developed countries. Tobacco control has been dealt with separately. The other three subjects constitute the core issues of a program that is currently being launched, the National Program for a Healthy and Active Lifestyle. The reports of the subcommittees dealing with these three subjects are contained in the current volume . During the next few months, the remaining reports will follow. We hope that over the upcoming years the Ministry of Health and other partners in the government ministries, healthcare organizations, and other participating organizations will develop implementation programs for the remaining issues as well.

I extent my wishes and gratitude to all of the participants in this tremendous effort: the Director General, Prof. Ronniy Gamzu, for his vision and support since assuming his office and the head of the initiative, the Assistant Director General, Dr. Boaz Lev, who has been leading and steering the initiative since its beginning. Many thanks to Dr. Tunie Dweck, who has been taking a key role in all of the activities of the initiative since 2007, Thanks to Dr. Laura Rosen, who helped initiate and promote the initiative, while she served as a national coordinator for the initiative in its formative years. And thanks to Miri Cohen, Prof. Gabi Bin-Nun and Dr. Tuvia Horev, members of the Healthy Israel 2020 directorate, for their continued support and good advice.

And last but not least, a hearty thank you to the members of the committees, consisting of more than 300 senior professionals from government ministries, healthcare organizations, the academia, and other organizations, and dozens of consultants from abroad. All of them have contributed greatly to the effort. .

It is our hope that the vision manifest in this first volume will translate into preventive action, thus bringing into greater focus the ancient biblical promise of wellness : “and I will remove sickness from your midst…and let you enjoy the full count of your days” (Exodus XXIII:25-26).

Dr. Elliot Rosenberg

National Coordinator

The Healthy Israel 2020 Initiative

Ministry of Health

Healthful Nutrition

A Subcommittee of the Health Behaviors Committee

Co-chairs: Theodore H. Tulchinsky, MD MPH, Ziva Stahl, PhD RD

Subcommittee members: Elliot Rosenberg, MD MPH , Judith Horwitz, MD, Rebecca Goldsmith, MSc RD, Josefa Kachal, MPH RD

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Contens

1. Executive Summary

1.1 Epidemiology

Israel faces challenges with respect to both under-and over-nutrition. Micronutrient deficiency conditions account for approximately 7.3% of the global burden of disease. Although much less prevalent in developed countries such as Israel, nutrient deficiency-related diseases contribute to the population burden of infectious and chronic disease. Excessive intake of certain nutrients poses even a greater health hazard. These include refined carbohydrates, saturated fats, trans fats, and salt; all independently increase the burden of chronic disease.

The Dietary Reference Intakes (DRI), the four nutritional reference measures and their respective values recommended by the Institute of Medicine of the U.S. National Academy of Sciences and adopted by the Ministry of Health (MOH), were used in this report. Of the four DRI measures, the measure selected for determining baseline and target values for the population in this report was the Estimated Average Requirement (EAR), i.e., the daily intake level deemed adequate for 50% of the healthy population of a specific gender and age group. A second DRI measure, the Adequate Intake (AI), was used in lieu of an EAR.

Nutrients for which less than 75% of the population meet the EAR are listed in the table. Baseline data stems from the MABAT national nutrition survey of 1999-2001. Year 2020 targets were set by defining ambitious but achievable targets as per international best practice.

1.2 Key objectives

Nutrient	Baseline Value (% meeting EAR*)	Year 2020 Target Value (%)
Fruits & Vegetables	Percent consuming 3 vegetables and 2 fruits per day is unknown	50
Calcium	5	50
Magnesium	46	97
Potassium**	6	50
Nutrient	**Baseline Value (% meeting EAR*)**	**Year 2020 Target Value (%)**
Zinc	52	97
Iron	70	97
A	65	97
B1	36	75
B2	74	97
B3	74	97
B6	60	97
Folic acid	24	97
B12	50	97
C	65	97
D	Current status unknown	-

*EAR = Estimated Average Requirement

**AI = Adequate Intake

1.3 Interventions

1.3.1 Overview

Food fortification is one of the more successful methods of intervention and has been adopted worldwide. Nutritional supplementation of micronutrients for targeted risk groups complements this strategy. Mandatory and voluntary efforts to reduce the content of saturated fats, trans fats, salt and sugar in manufactured foods to reduce the burden of chronic diseases is yet another broadly implemented strategy. In addition to the MOH, a wide range of stakeholders bear responsibility for implementation of these plans: the food processing industry, educators, and policy makers in dealing with social welfare and finance/economics.

1.3.2 Prioritized interventions

Prioritization of interventions incorporated the following factors: population reach (e.g., entire population > segment thereof), health impact, and practicability (including estimated cost and adherence). Rankings ranged from 1 (highest) to 3 (lowest) and were reached via committee consensus. They appear from left to right in the order listed above.

1. Mandatory fortification of basic foods with the vitamins and minerals listed below (**Ranking: 1, 1, 1**):
   a. All flour imported and/or produced in Israel should be fortified with iron (44mg/kg) and the full vitamin B complex (stated in mg/kg): B1 = 6, B2 = 4.5, B3 = 50, B6 = 2.5, B9 (folate) = 1.5, B12 = 0.01.
   b. All salt, imported and domestic, should be fortified with iodine (20 mg/kg). Future reductions of recommended salt intake and salt concentration in processed foods should be taken into account.
   c. All dairy products (including milks, yoghurts, soft cheese, and milk substitutes) should be fortified with vitamin D (400 IU/liter).
   d. Continued fluoridation of all community water supplies.

   Imported foods should be fortified to meet the requirements of Israeli legislation. The MOH should work with the food industry and the Standards Institution of Israel to achieve this.
2. Healthful food and drink should be assured through regulation, establishment of labeling standards for macro- and micronutrients, and provision of healthful menus in cafeterias of large organizations (**Ranking: 1, 1, 2**). Particular attention should be paid to the following:
   a. Banning of importing, production, and sale of trans fats-rich foods by the year 2013. These should not be replaced with saturated fats. Clearly label high trans or saturated fat foods.
   b. Reduce the sodium content of manufactured foods by 25% by the year 2015, and 35% by 2020, while clearly labeling the salt content of processed foods.
   c. educe the sugar content in processed foods by 15% by 2020. Clearly label sugars of all kinds on all products.

The MOH should work with the food industry, schools, institutional settings, communities, worksites, and the IDF to define minimum recommended intake levels of healthful nutrients, and upper levels of potentially harmful ones, while clearly labeling all the above.

3. Healthcare providers should counseling people with nutritionally-sensitive chronic diseases and/or risk factors for disease, in keeping with international best practice. This includes the prescription of the following supplements (which should be funded through the Health Basket):

   a. **Vitamin D:** Daily vitamin D supplements (400 IU/d for children and 1000 IU for those 71+) and/or measured daily exposure to the midday sun, considering individual dermal solar sensitivity (**Ranking: 1, 1, 2**).

   b. **Folic acid**: Women of childbearing age should be encouraged by all health and social agency providers to consume 400 mg/d. (**Ranking: 2, 1, 2**).

   c. **Iron:** Infants aged 4 to 12 months should receive 15 mg of iron per day. Assess iron-deficiency status at 9 -12 months, 18 months in all infants. Assess at 24 months in high risk toddlers (Arab/Bedouin, ultraorthodox, low SES, low birth weight, and premature birth) to determine need for continued supplementation.(**Ranking: 1, 1, 2**).

   d. Parenteral supplementation with Vitamin K at birth to all newborns. (**Ranking: 3, 1, 1**).

1.3.3 Implementation and Monitoring of Nutrition Status of the Population

Effective achievement and sustained success of these recommendations requires the following: funding continued research such as the decennial MABAT national nutritional surveys, anthropometric studies of child and adult growth patterns, and the establishment of a national Nutrition Advisory Committee to continuously monitor and evaluate important national and international nutritional scientific developments in conjunction with the Ministry of Health and other relevant national bodies.

2. Introduction

The Healthy Nutrition Committee of Healthy Israel 2020 was tasked with defining risk factor or disease burden-based objectives with measurable targets for the year 2020, and recommending evidence-based interventions to achieve them. This entailed defining adequacy of intake of micro- and macronutrients, thus addressing issues of under- and over-nutrition for the Israeli population as a whole, for different age and gender groups, and for groups at special risk for nutritional imbalance.

Over the past 10 years, Israel has conducted three national Health and Nutrition Surveys, covering distinct age groups. The first, MABAT 1, was for age group 25-64 in 1999-2001[1,2], the second, the MABAT Youth Survey (ages 11-19), in 2003-4, and the third, the MABAT Elderly Survey, in 2005-6. Survey results have been widely used in Israel to support policy decisions, assist in the planning and evaluating of intervention programs, assist in food fortification programs, as well as support research. The MABAT 2 survey commenced during 2009, incorporating modifications derived from the lessons learned from MABAT 1. The new survey will provide new data regarding nutritional profiles in Israel, extending the database for nutritional monitoring of the population in Israel and related policy development[3].

As other Healthy Israel 2020 committees have also dealt with nutrition-related topics, overlap was unavoidable. These include obesity control, oral health, maternal and child health, and geriatric health. They are dealt with briefly and cross-referenced to the appropriate reports.

3. Background

Nutrition is one of the most important factors in the health of individuals and communities. It has a direct effect on both physical and mental well-being at all stages of life, including growth, development, and reproduction, and plays an important role in the initiation and progression of many important chronic diseases. The nutritional status of the individual and that of the population have been important factors in the development of public health in the 20th Century[4]. The World Health Organization has over many decades promoted nutrition in public health and published important guidelines on the prevention of micronutrient deficiency by fortification of basic foods in 2006[5].

The nutritional status of an individual and of society is influenced by the supply, quality, access to, and cost of food. These, in turn, are impacted by national and local public health policies in the area of nutrition, as well as by the nutritional knowledge, attitudes, and behaviors/skills of the population and of its healthcare providers.

Improved nutrition has indeed made a major contribution to better health in recent decades. Yet significant challenges remain. Malnutrition remains widely prevalent throughout the world. Countries in the developing world are combating under-nutrition and protein-energy malnutrition, among many other deficiencies. Undiagnosed micronutrient deficiencies undermine the success of many other public health efforts, including efforts to combat widespread infectious and non-infectious diseases.

These deficiencies were estimated in 2004 to account for approximately 4% of the global burden of disease (GBD). Iron-deficiency anemia alone was responsible for the loss of 20 million disability-adjusted life years (DALYs) worldwide. Vitamin A deficiency led to a loss of 22 million DALYs, and 16 million DALYs were lost to zinc deficiency. With respect to the high-income European countries of which Israel is a member, only 0.5% of the GBD was attributed to the above deficiencies. On the other hand, inadequate fruit and vegetable intake was responsible for 1.1% of the GBD in the high income countries of Europe[6]. No Israel-specific nutrition-related DALY/mortality/morbidity data is as yet available.

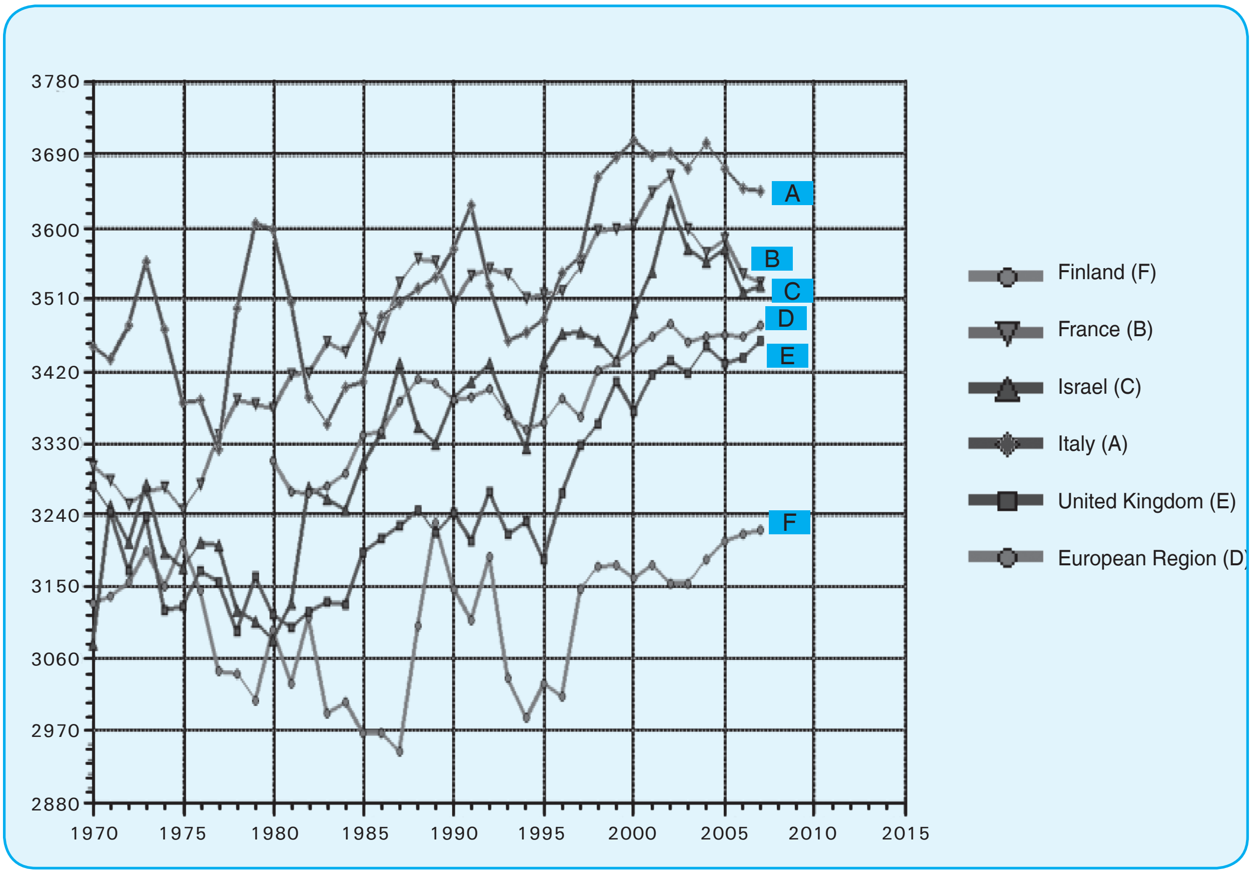
Both the developed and developing world now struggle with excess consumption of macronutrients[7].

For example, in the above WHO-sponsored study, overconsumption of cholesterol accounted for 3.8% of the GBD in the high income countries of Europe[6].

Total caloric intake available per person in Israel has increased rapidly since the 1970s, except for a period during 1988-1995, and as of 2007 was slightly above the European region average[8] (see Figure 1). Over the past decade it has slightly declined (-1%)[9].

According to the MABAT 1 survey[2], on average, adult Israelis consume 1856 ± 882 (Mean ± SD) kilocalories of energy each day. Men consume 2212 ± 951 (Mean ± SD) kilocalories, while women consume 1533 ± 668 (Mean ± SD) kilocalories. After adjustment for age, the mean energy intake of Jewish men is significantly higher than that of Arab men. Energy intake decreased considerably with increasing age in both population groups and in both sexes. A cautionary note is in order, as this data is approximately 10 years old and may not reflect current trends.

Figure 1: Average number of calories available per person per day (Kcal), Israel and selected European countries, 1970-2007



WHO/Europe, European HFA Database, July 2011[8]

However, average intakes hide important disparities, in particular, economic disparities secondary to increasing poverty and associated with food insecurity among large segments of the population. In 2009, approximately 25% of Israelis were living in poverty. Nearly 27% of families with children were impoverished; this includes 850,300 poor children. Families where the head of the household worked constituted almost 50% of the poor families. Approximately 20% of Israeli elderly were poor10. This situation has important nutritional implications; poverty leads to reduced purchasing power that, in turn, affects food availability and choices. Pregnant women are another vulnerable population at risk for significant malnutrition.

4. Terminology and Methodology

The **Dietary Reference Intakes** (DRI) adopted by the Ministry of Health are presented in Appendix 3 of this paper are those developed and revised by the Food and Nutrition Board of the Institute of Medicine of the United States Academy of Sciences[11]. They are periodically updated. These standards have been adopted by many countries.

The data reflecting Israeli intakes summarized in this report are drawn from the MABAT 1 Survey. As a basis for the recommendations, the Dietary Reference Intake (DRI) was used.

The DRI consist of 4 values for each nutrient:

1. **Estimated Average Requirement** (EAR) – The daily intake level estimated as adequate to provide the nutritional requirements of 50% of the healthy population of a specific gender and age group.
2. **Adequate Intake** (AI) – The recommended average daily intake level that are assumed to be adequate based on observed or experimentally determined approximations or estimates of nutrient intake for a group (or groups) of apparently healthy people. It is used when an EAR cannot be determined.
3. **Recommended Daily Allowance** (RDA) – The daily intake level estimated as adequate for the requirements of almost all (98%) of the healthy population of a specific gender and age group.
4. **Tolerable Upper Intake Level** (UL) – The maximum daily intake level which will not harm most of the population of a certain gender or age group.

When comparing Israeli intake levels with the recommendations, EAR levels were generally used; these are measures which are appropriate for comparison of populations. In cases when there no EAR has been determined, AIs have been used as a basis for comparison. To assure a high probability of nutrient adequacy, a target value of 97% reaching the EAR was chosen[12].

Rationale for level of target-setting: The following three principles guiding target-setting:

1. Ambitious but realistic targets: an absolute increase of 50% in the percentage of the population with an intake at the EAR level was considered achievable by the year 2020.
2. Reducing inequality: When 80% or more of the population met the EAR, it was assumed that the majority of the population had indeed met the EAR, but that pockets of undernutrition were likely responsible for most of the gap. In those cases, a developmental objective (rather than regular objective) was set to facilitate generation of population sector-specific data in the relatively near future.
3. Prioritization among regular objectives: Although population-wide objectives could theoretically also have been set even when the vast majority of the population (e.g., 80%) met the EAR, this was not done in order to better focus efforts on those nutrients where larger gaps existed.

Where Israeli intake and/or international standards were lacking, targets were typically not set, but instead, developmental objectives were formulated to focus future research to close existing data and/or interventional gaps.

5. Objectives

5.1 International: US Healthy People 2020

Key Healthy People 2020 objectives in the field of nutrition follow. The full US data (including data sources, target setting mechanism etc.) may be seen in Appendix-1.

Table 1: U.S. Healthy People 2020 Objectives that may be adopted for Israel[13]

NWS-14	Increase the contribution of fruits to the diets of the population aged 2 years and older
NWS-15	Increase the variety and contribution of vegetables to the diets of the population aged 2 years and older
NWS-15.1	Increase the contribution of total vegetables to the diets of the population aged 2 years and older
NWS-15.2	Increase the contribution of dark green vegetables, orange vegetables, and legumes to the diets of the population aged 2 years and older
NWS-16	Increase the contribution of whole grains to the diets of the population aged 2 years and older
NWS-17	Reduce consumption of calories from solid fats and added sugars in the population aged 2 years and older
NWS-17.1	Reduce consumption of calories from solid fats
NWS-17.2	Reduce consumption of calories from added sugars
NWS-17.3	Reduce consumption of calories from solid fats and added sugars
NWS-18	Reduce consumption of saturated fat in the population aged 2 years and older
NWS-19	Reduce consumption of sodium in the population aged 2 years and older
NWS-20	Increase consumption of calcium in the population aged 2 years and older

Data Source: http://www.healthypeople.gov/2020/topicsobjectives2020/objectiveslist.aspx?topicId=29

5.2 Israel

Nutrient-specific objectives and targets accompany the other data presented for each nutrient in the following section of the report.

6. Nutrient Groups: Epidemiology, DRI's, and Objectives

The six important nutrient groups that comprise a healthy and balanced diet are carbohydrates, fats, and proteins (the macronutrients), minerals and vitamins (the micronutrients) and water. The body requires input from each of these groups to function normally, and their availability is determined by the dietary intake of the individual. There is a range of intake that confers optimal physiological functioning. Below this range, deficiencies can cause disease or death. Excessive intake of some members of these nutrient groups can lead to toxicity and/or chronic disease.

The range varies for each nutrient and is affected by many factors, including age, body size, gender, activity level, pregnancy, disease, and injury. The AMDR (Acceptable Macronutrient Distribution Range) for each nutrient was determined for the US population by the Food and Nutrition Board of the Institute of Medicine of the US National Academy of Sciences[11-12]. The values for are as follows:

Macronutrient	AMDR (%)		
	1-3 years	4-18 years	19+ years
Carbohydrates	45-65		
Fats	30-40	25-35	20-35
Proteins	5-20	10-30	10-35

Israeli ranges have been recommended by the MOH and will appear in their respective sections.

Figure 6, the Israeli Food Pyramid (page 198), graphically represents the recommendations. Due to the detailed and specific nature of the science supporting each nutrient group, the health impact and average Israeli intake of each major nutrient group, as well as some specific nutrients themselves, are presented. These are followed by nutrient group-specific objectives and scientific recommendations to reach recommended levels. Population level public health recommendations that address multiple nutrients will be presented in the "Interventions" section.

6.1 Macronutrients

6.1.1 Carbohydrates

Health Impact: Carbohydrates are a major source of energy used for metabolic processes and for making cell membranes and enzymes. Carbohydrates are classified as monosaccharides, disaccharides or polysaccharides. Monosaccharides such as glucose and fructose are found in fruits and honey. They are simple sugars that can be absorbed in the gut without any digestion. Disaccharides comprise two monosaccharides and are found in fruits, vegetables and milk (e.g., sucrose and lactose)[14]. Polysaccharides are larger molecules consisting of monosaccharides linked together in a chain. They must be broken down into their component monosaccharides before being absorbed. This results in slower absorption. Low glycemic index foods such as vegetables, fruit and whole grains (with the exception of high GI "outliers" such as potatoes, carrots, beets or dates) provide good index foods for regulation of insulin and hunger levels[15]. No clear benefit has been shown of substituting unrefined, low glycemic index carbohydrates for saturated fatty acids in the diet to reduce risk of coronary heart disease, although further research is needed[16].

Local health impact: Limited information is available on the health impact of carbohydrates in healthy individuals in Israel.

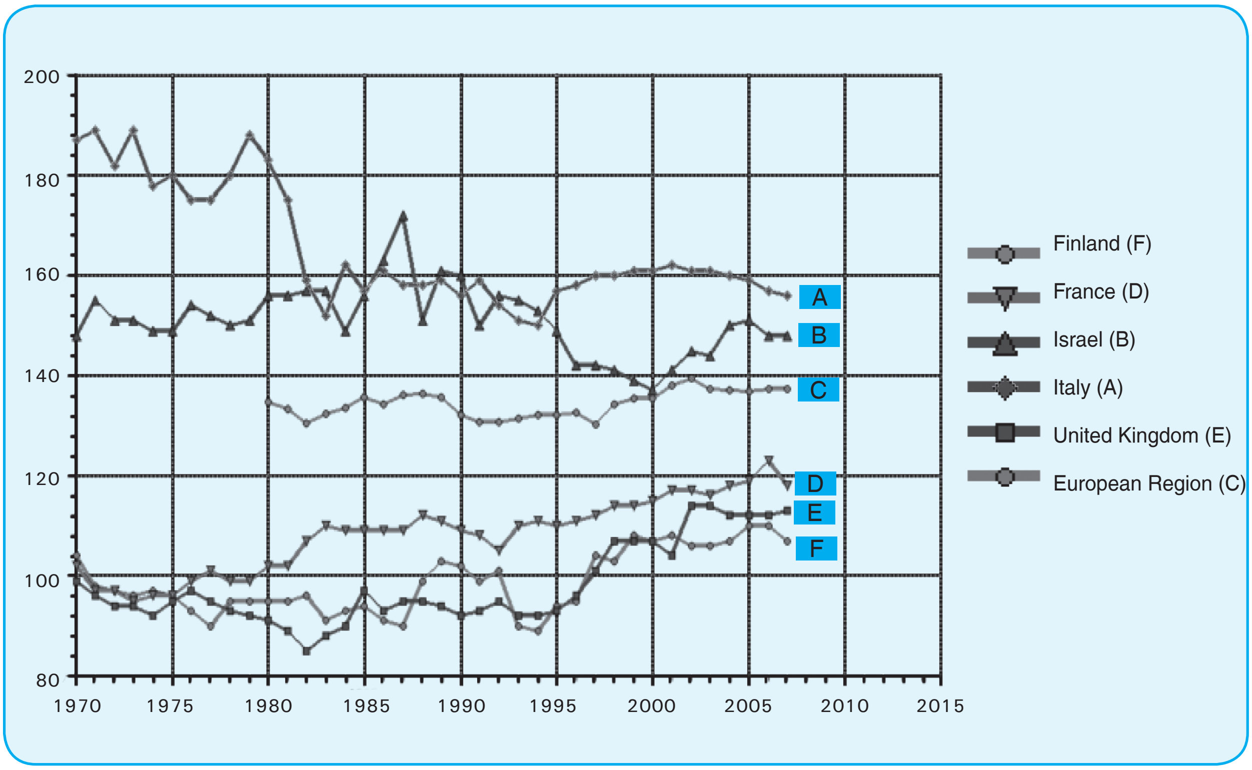
Recommended Daily Intake: The Ministry of Health recommends that all adult Israelis consume at least 130 grams of carbohydrates per day[11] to provide the recommended range of 55-65% of total caloric intake (see Appendix 3 for detailed Israeli DRI). This is in keeping with the Mediterranean-type diet consumed by many in the region.

Typical Israeli Intake: According to the MABAT 1[2], on average, adult Israelis consume 238 ± 113 (mean ± SD) grams of carbohydrates each day. Men consume 277 ± 123 (mean ± SD) grams per day, while women consume 203± 90 (mean ± SD) grams per day. Carbohydrates comprise 52±12% (mean ± SD) of their total daily caloric intake. The mean daily carbohydrate intake decreases with age, in both Jews and Arabs and in both sexes. After adjustment for age, the mean daily carbohydrate intake of Jewish men was significantly higher than that of Arab men. The mean daily percentage of calories from carbohydrates was lower than the recommended range of 55-65% in both genders and in all age groups, except among females aged 25-39, among whom consumption of carbohydrates was within the recommended range, although at the lower end. In all groups the intake was higher than the 130 grams per day minimal recommendation.

Baseline data: The percentage of Israelis meeting the EAR for total carbohydrates according to the MABAT 1[2] is 86%. The intake of refined sugar is currently unknown.

Israeli levels of cereal availability have remained fairly stable over the period 1970-2007, as has the European region average, but this is in contrast with Italy where it has declined, and conversely with France, the UK, and to a lesser degree, Finland, where it has increased (See Figure 2). It is reasonable to assume that patterns of refined sugar consumption are above desired levels in Israel as in other western countries. The MABAT 2 survey should provide more information on this by age, gender, and ethnic group.

Figure 2: Average amount of cereal available per person per year (in Kg), Israel and Selected Countries, 1970-2007



Source: WHO/Europe HFA Database, July 2011[8].

Objective: Reduce refined sugar intake by 15% by 2020.

Rationale: This objective is achievable as proven by ability of industry to reduce sugar content by 4% over 3 years17, extrapolated over a decade.

Developmental data objectives:

1. Assess the overall, gender, and age-specific percentage of Israelis meeting the EAR for refined sugar consumption.
2. Determine utility and methodology of assessing intake of simple vs. complex carbohydrates consumed by age and gender group[18].

6.1.2 Fats and Cholesterol

6.1.2.1 Fats

Health Impact: At 9 kcal per gram, fats provide a concentrated source of energy. Fatty acids are essential in the production of hormones, cell membranes, and bile acids and the for the absorption of certain vitamins. Fats stored in the body as fat tissue cushion and protect vital organs, insulate the body against heat loss, and provide energy during periods of reduced consumption or increased need, as well as during growth or illness[14].

Dietary fats are classified as saturated, monounsaturated, and polyunsaturated according to their chemical structure.

Saturated fatty acids are typically found in butter, cheese and beef. They are the major dietary factors that elevate the level of all fat fractions in the blood, especially low-density lipoprotein cholesterol (LDL-C) and are considered to be associated with increased risk for cardiovascular disease, particularly when compared with polyunsaturated fats[19]. As a recent rigorous systematic review of dietary factors and coronary heart disease has questioned the association between the consumption of saturated fat with coronary heart disease[20], further evaluation of dietary components and conduct of cohort studies are needed. These fats are also linked to increased rates of diabetes and certain forms of cancer.

Mono- and polyunsaturated fats are found in nuts, various seeds, and in vegetable oils. They do not raise blood cholesterol levels. Substituting unsaturated fatty acids for saturated fatty acids can help lower health risks[21]. The American Heart Association and the Israel Ministry of Health dietary recommendations include consuming fat free or low fat dairy products, lean meats, poultry and seafood, liquid vegetable oils and margarines, and a wide variety fruits, vegetables and nuts, mainly to reduce intake of saturated fats[22].

Omega-6 fatty acids are a family of polyunsaturated fatty acids that have in common a final carbon–carbon double bond in the n–6 position, that is, the sixth bond from the methyl end of the molecule. They are found in a wide variety of foods, including: vegetable oils, poultry, eggs, avocado, nuts and various grains. The biological effects of the omega–6 fatty acids are largely mediated by their conversion to n-6 eicosanoids. Chronic excessive production of n–6 eicosanoids is associated with heart attacks, thrombotic stroke, arrhythmia, arthritis, osteoporosis, inflammation, mood disorders, obesity, and cancer. Excess n–6 fats interfere with the health benefits of omega 3 (n-3) fats (for details see below), in part because they compete for the same rate-limiting enzymes. A high ratio of n–6 to n–3 fat in the diet shifts the physiological state in the tissues towards a prothrombotic, proinflammatory, and proconstrictive state, leading to disease.

Omega-3 fats are a family of polyunsaturated fatty acids that have in common a final carbon–carbon double bond in the n–3 position; that is, the third bond from the methyl end of the fatty acid. Nutritionally important n–3 fatty acids include α-linolenic acid (ALA), eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA). They are found in fish oils, especially from salmon and other cold-water fish, and in food supplements. The effects of fish oil supplements, EPA and DHA, in preventing cardiovascular diseases has been a subject of clinical and epidemiologic research in recent years. A systematic review of the literature published in 2008, indicated that fish oil supplements were associated with a significant reduction in deaths from cardiac causes, but had no effect on arrhythmias or on all cause mortality[23]. Consequently, there are those who favor supplementation with fish oil rich in omega-3 fatty acids to prevent and treat cardiovascular disease. The evidence for the optimal formulation or dose is unclear[24].

Trans fatty acids or TFA can be found in natural or artificial products. The latter are produced by hydrogenating unsaturated vegetable oils, thus creating more stable fat molecules with a longer shelf life. They may be mono- or polyunsaturated. Polyunsaturated fatty acids are partially converted to trans fats by prolonged heating. They are present in margarine, fried foods, cookies, donuts, muffins, crackers, icing, potato chips, and microwave popcorn. These kinds of fats contribute to obesity and atherosclerosis by raising LDL cholesterol, which, in turn, accelerates atherosclerosis, and by lowering protective HDL cholesterol[25]. TFA pose a higher risk of heart disease than do saturated fats, which raises levels of LDL, but does not depress levels of HDL. Labeling of food which contain more than 0.5 grams/serving of trans fats has been required by the US FDA, effective the beginning of 2008. The use of trans fats in processed foods has now been banned in the state of California (effective January 1, 2010), in several US counties, and in several small and large cities such as New York and Philadelphia. Denmark was the first country to do so in March 2003.

In June 2007, Health Canada called on the food industry to reduce the levels of trans fats in foods to the recommended levels within two years. Health Canada monitors the actions of the industry via the Trans Fat Monitoring Program with results published on Health Canada's Web site to keep consumers informed about progress[26]. Switzerland followed Denmark's lead, and so, as of April 2008, TFA have been banned in that country[27]. In Israel, the MOH is currently in the process of changing labeling requirements to include trans fat content, and specific fat content in all foods with fat content over 2%. A legislative proposal is currently being submitted to the government to ban the production, importation, and sale of foods rich in trans fat.

Local health impact: High saturated and trans fat diets increase deleterious serum LDL-cholesterol, while trans fats also lower protective HDL-cholesterol. According to the Quality Indicators for Community Health Care in Israel program approximately 78% of adult Israelis aged 35-54 had their LDL-cholesterol checked in 2007[28].A larger percentage (84.5%) of those in the age group 45-54 was checked than those aged 35-44 (72.2%). Sixty–seven percent met the target of LDL-cholesterol (LDL-C) < 130 milligrams per day. A greater proportion of the younger segment of this group met LDL-C goals than did the older segment. Among those aged 55-74 years old, 76.1% had their cholesterol checked in 2007. As in the younger age group, a greater percentage (82.7%) of the older segment (aged 65-74) were checked than those in the younger group (only 71.8% in those aged 55-64). Nearly 72% of adults in this age group met the target LDL-C level. In contrast with the 35-54 year-olds, a greater proportion of the older segment of this population met the LDL-C target. Women were screened more often than men and a greater proportion of women met LDL-C target levels in all age groups. There has been an increasing trend in those meeting the LDL-C targets in both the young and the old.

Dietary Sources: Foods of animal origin contain high amounts of saturated fat and cholesterol. Some saturated oil is from plant origin (coconut and palm oils). Nuts, avocadoes, olive oil, and canola oil are good sources of monounsaturated fatty acids. Polyunsaturated fatty acids can be found in vegetable oils such as soybean oil and corn oil, and in walnuts29. Omega-3 fatty acids are found in fish oils, especially from salmon and other cold-water fish, and in food supplements. Trans fats may derive from natural or artificial sources, but the majority in the diet are produced by hydrogenating unsaturated vegetable oils.

Recommended Daily Intake: The Ministry of Health recommends that Israelis get no more than 30% of their total daily calories from fat (AMDR is 20-35%). Saturated fat, monounsaturated fat, and polyunsaturated fat should each comprise one-third of total fat consumption, or 10% of the total daily caloric intake30. The percentage of saturated and monounsaturated fat consumption may each range up to 12%. Trans-fat consumption should be kept as low as possible[11]. RDA for ω-3 fatty acids and n-6 fatty acids have not yet been established (Appendix 3 presents the AI for each).

Typical Israeli Intake:

Total fat: According to the MABAT 1[2], Israelis consume an average of 70 ± 44 (mean ± SD) grams of fat per day; men consume 84± 49 grams (mean ± SD), while women consume 57 ± 34 grams (mean ± SD). Fat comprises 33 ± 9% (mean ± SD) of their total daily caloric intake. The median intake of energy from fat is 32% of the total daily caloric intake.

Saturated fats: Israelis consume an average of 19.7± 13.4 grams (mean ± SD) of saturated fat per day; men consume 23.3 ± 15.2 grams (mean ± SD), while women consume 16.4 ± 10.6 grams (mean ± SD). Saturated fats comprise 9% of Israelis' mean total daily caloric intake. After adjustment for age, the mean daily saturated fat intake was significantly higher among Jews than Arabs, in both sexes. In both genders and in all age groups, the median daily percentage of calories from saturated fat was within the recommended range[2].

Monounsaturated fat: Among Arab men, the mean daily monounsaturated fat intake decreased with increasing age, from age 30-39 onwards. After adjustment for age, the mean daily mono-unsaturated fat intake was significantly higher among Jews than Arabs, in both genders. In both sexes and in all age groups, the mean daily percentage of calories from monounsaturated fat, 11%, was within the recommended range. The median intake of energy from mono-unsaturated fat was also within the recommended range[2].

Polyunsaturated fat: After adjustment for age, the mean daily polyunsaturated fat intake was significantly higher among Jews than Arabs, in both genders. A general decrease in intake was noted with increasing age among Jewish men and among Arab men and all women up to age 50-59. The mean and median daily percentage of calories from poly-unsaturated fat (8%) was lower than the recommended intake range[2].

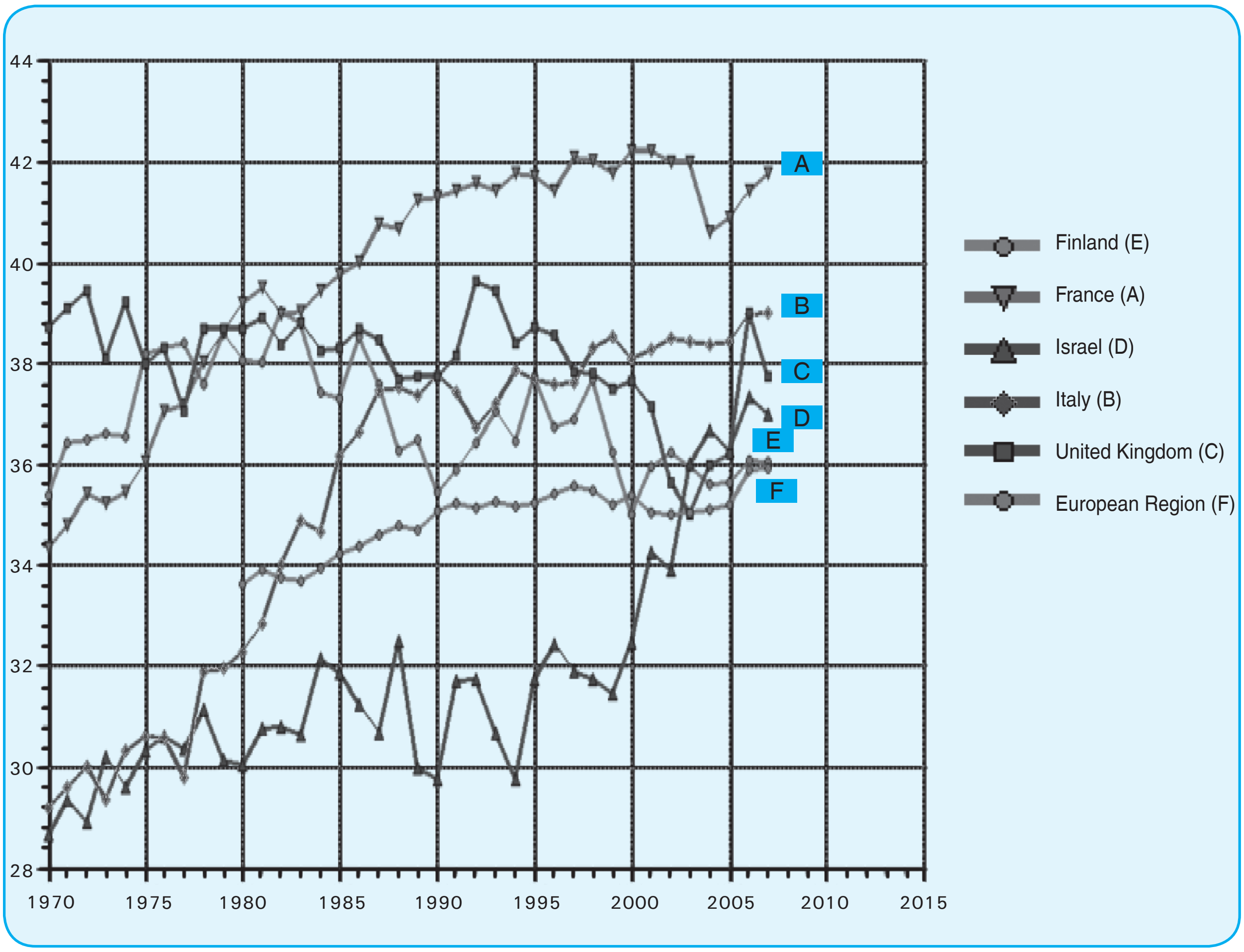
Omega-6 fatty acids: Among Jewish men and Arab women, the mean daily intake of omega 6 fatty acids decreased with age. After adjustment for age, the mean daily intake of omega 6 fatty acids was significantly higher among Arab men than Jewish men. Among women, the opposite was true: the mean daily intake of omega 6 fatty acids was significantly higher among Jewish women than Arab women. The median intake of omega 6 fatty acids was12.5 grams per day[2].

Omega-3 fatty acids: According to the MABAT 1 survey (based on fish consumption), Israelis consume an average of 1.8 ± 1.7 (mean ± SD) grams of omega-3 polyunsaturated fatty acids per day: men consume 2.2± 2 (mean ± SD) grams, and women consume 1.5 ± 1.4 (mean ± SD) grams. Jews consume significantly more omega-3 polyunsaturated fatty acids than Arabs. Among Arab men, the highest mean daily intake of omega 3 fatty acids was found in the 50-59 age group. Among Jewish men, the mean daily intake of omega 3 fatty acids decreased with age. After adjustment for age, the mean daily intake of omega 3 fatty acids was significantly higher among Jews than Arabs, in both genders[2].

Trans fatty acids: Daily consumption is unknown.

Figure 3 demonstrates the percent (%) of total energy available from fat in Israel and in selected European countries. In 2007, fat availability in Israel was approximately 37%. This was lower than its availability in France, Italy, or the UK, but it has been rising in recent years and exceeded the average of the European Region. The decline of this measure in Finland to the level existing in the 1970's is noteworthy.

Figure 3: Percent (%) of total energy available from fat, Israel and selected countries, 1970-2007



Source: WHO/Europe, European HFA Database, July 2011[8].

Baseline: The percentage exceeding recommended fat levels is currently unknown**.**

Objective: Ban the importation, manufacture, or preparation of trans-fat rich foods by the year 2013[31].

Rationale: Trans fats have a clear deleterious effect on the cardiovascular system. Consequently, a number of countries and cities throughout the world have banned the use of trans fats in foods, as there are safer and inexpensive alternatives.

Developmental objectives: Assess the overall, gender, and age-specific percentage of those meeting the DRI for each type of fat.

6.1.2.2 Cholesterol

Health Impact: Body cholesterol derives from 2 major sources- endogenous synthesis and absorption from the diet. The cholesterol present in the intestinal lumen is primarily derived from dietary cholesterol and the cholesterol excreted by the liver into the bile (about 800 to 1300 mg per day). Only about half is absorbed from the intestines, although there is a much individual variability in absorption rates. Population groups consuming relatively low cholesterol (less than 100 mg per day) and low-fat diets have low plasma and LDL-cholesterol levels and virtually no coronary artery disease[32]. Although it is clear that increases in dietary cholesterol increase serum LDL-cholesterol levels and that such increases are clearly correlated with increased risk of cardiovascular disease (CVD), the epidemiologic literature is less than convincing that dietary cholesterol increases CVD. Nevertheless, due to the discrete pathophysiologic data available, an upper limit of 300 milligrams per day has been set.

Dietary sources: Cholesterol is present in foods of animal origin. High amounts of cholesterol are present in liver (375 mg/3 oz. slice) and egg yolk (250 mg/yolk). Although generally low in total fat, some seafood, including shrimp, lobster, and certain fish contain moderately high amounts of cholesterol (60 to 100 g/half-cup serving)[33].

Recommended Daily Intake: The Ministry of Health recommends that Israelis limit their intake of cholesterol to 300 milligrams per day[34].

Note: This applies to those with normal levels of blood cholesterol.

Typical Israeli Intake: According to the MABAT 1 Survey, Israelis consume an average of 263± 257 milligrams (mean ± SD) of cholesterol per day: men consume 323± 287 milligrams (mean ± SD), while women consume 209 ± 212 milligrams (mean ± SD). Among Arab women, the mean daily cholesterol intake decreased with increasing age. After adjustment for age, the mean daily cholesterol intake of Jewish men was significantly higher than that of Arab men. The median intake of cholesterol was 185 milligrams per day[2].

Baseline: The percentage exceeding recommended cholesterol levels is currently unknown.

Developmental objectives: Assess the overall, gender, and age-specific percentage of those exceeding recommended levels of cholesterol.

Note: Recommendations for cholesterol screening and obesity control appear in the Healthy Israel 2020 reports on chronic disease prevention, and obesity control, respectively.

6.1.3 Protein

Health Impact: Proteins are large molecules that are broken down into their component amino acids by the digestive process. Children and adolescents need protein to support growth processes, while adults require them for tissue maintenance. Proteins function in the body as structural components of cells and tissues, and as enzymes that catalyze chemical reactions and hormones that act as chemical messengers. As such, they are integral to the daily functioning of all humans. Protein-energy malnutrition is secondary to a variety of disease states, for example, HIV/AIDS and liver disease.

Local health impact: The prevalence of nutritionally at risk older patients admitted to Israeli medical wards is 38.7%. Older patients may suffer from undernutrition of one or more types (e.g., protein, fiber, vitamin D, or vitamin B12). This may be due to a combination of the following factors: social isolation or abuse, dementia, inability or lack of energy and will to prepare balanced diet, oral health and chewing problems and other causes[35].

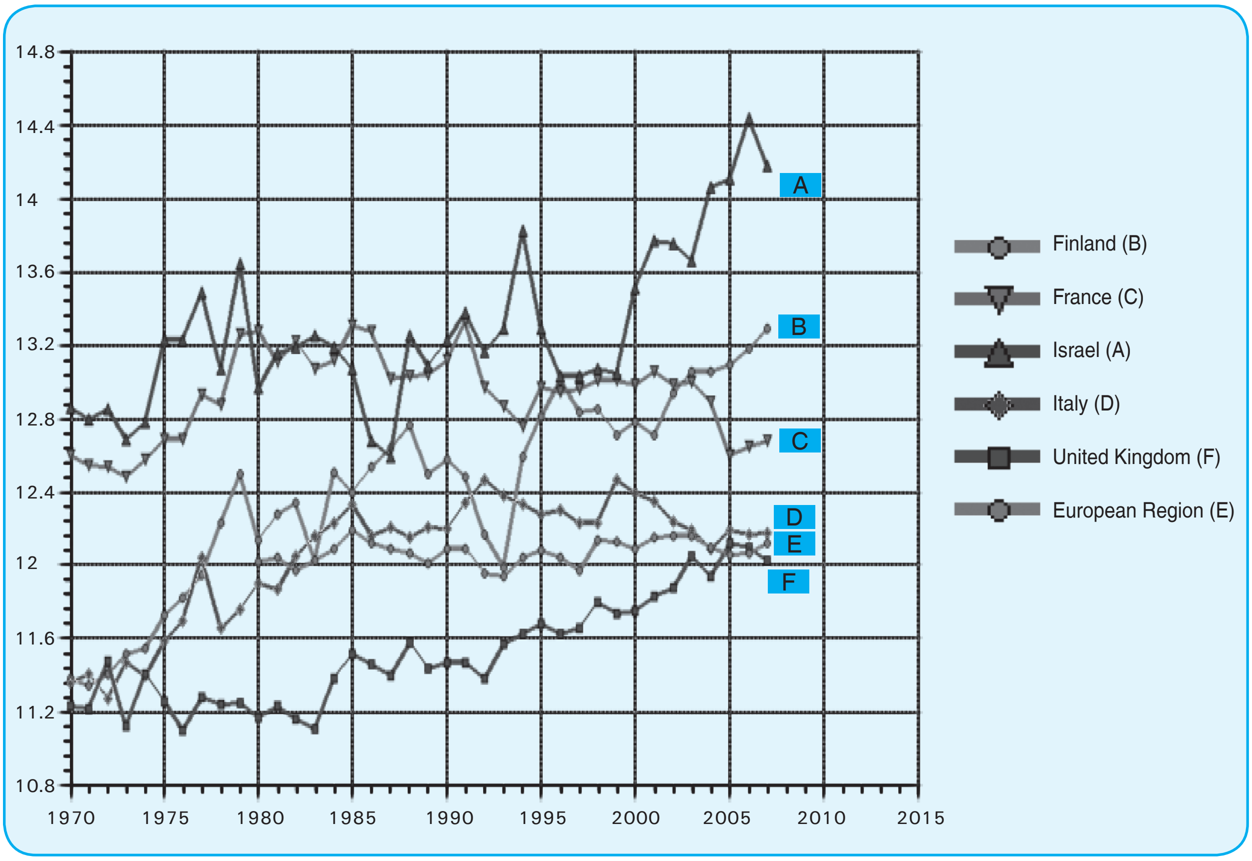
Dietary Sources: There are twenty common amino acids needed by the body. Humans cannot synthesize nine of these and therefore must obtain them in the diet, either from animal protein or from combinations of plant-based foods such as legumes and cereals[33].

Recommended Daily Intake: The mean daily recommended percentage of calories from protein is from 0.8gr/kg up to 1.5 gr/kg (between 15-20% of the daily caloric intake) depending upon kidney and metabolic function. The Ministry of Health recommends that men aged 19-50 consume 60 grams of protein daily and women in this age group consume 46 grams of protein daily. With increasing age, the recommended amounts increase for both genders: men aged 51-64 should consume 63 grams daily and women 50 grams[11].

Typical Israeli Intake: According to the MABAT 1 Survey, on average, Israelis consume 71 ± 39 grams (mean ± SD) of protein each day: men consume 86 ± 43 grams (mean ± SD) and women consume 58 ± 29 grams (mean ± SD). The mean daily percentage of calories from protein was within the recommended range of 15-20%, in both sexes and in all age groups. In the Arab population, the mean daily protein intake decreased with age, in both genders. After adjustment for age, no statistically significant difference was found between the mean daily protein intake of Jews and Arabs [2]. Although, on average, sufficient protein is available in the Israeli diet (See Figure 4), certain sub-groups in the population do not consume sufficient quantities of protein, as they have either higher protein requirements or actually eat less than the population average. These include the elderly, who often cannot afford or do not have access to or interest in preparing protein-rich meals; the poor, who cannot afford healthy sources of protein, and individuals with certain diseases[36].

Figure 4 presents trends in the percent of total energy available as protein. This has increased in Israel as it has in several other European countries (the UK and Finland), whereas it has remained stable for the European region average and even declined since the 1990's in others (France, Italy).

Figure 4: Percentage of total energy from protein, Israel and selected European countries, 1970-2007



Source: WHO/Europe, European HFA Database, July 2011[8].

Baseline: 80.6% meet the EAR.

Developmental objective: Measure precise baseline consumption of protein by gender, age, and population group (with particular attention to the elderly and low SES groups) to determine target group(s) with inadequate intakes of protein in their diets.

6.1.4 Fiber

Health impact: One of the many definitions of dietary fiber equates them with carbohydrates – fruit, vegetable, and grains that cannot be broken down by digestion. Fiber provides bulk to food and helps maintain the health of the gastrointestinal system. Deficiency leads to constipation and may contribute to certain forms of cancer, such as colon cancer[37]. A diet rich in fiber is moderately associated with reduced risk of cardiovascular disease[33, 38].

Local health impact: A 2003 study assessed the comparative diets of 632 Israelis aged 40-71 and free of diabetes or other major chronic disease, but belonging to different ethnic groups. They were followed up for 18 years to assess their impact on all-cause mortality. Dietary fiber intake was measured on the basis of a detailed Food Frequency Questionnaire. Among those of Yemenite origin, 71.4% consumed 25 grams of fiber per day, while people from other ethnic groups had lower fiber intakes: North African – 50.0%, other Middle Eastern origin – 58.2%, and in those of European/American origin – 52.7%

The adjusted hazard ratio for all-cause mortality (HR) was 43% lower in those consuming ≥ 25 grams per day of fiber. HR's in the other groups ranged from 1.56-1.77, as compared with those of Yemenite extraction[39].

Dietary sources: Fruits, vegetables, and whole grains are all excellent sources of dietary fiber.

Recommended Daily Intake: The Ministry of Health recommends that adult men, age 19-50, consume 38 grams of fiber each day. As men age, their recommended fiber intake decreases. Thus, 30 grams per day are recommended over age 50. For women aged 19-50, the recommended amount is 25 grams per day; it decreases to 21 grams per day over age 50 years[11].

Typical Israeli Intake: According to MABAT 1, Israelis consume, on average, only 17 ± 10 grams (mean ± SD) of fiber per day: men consume 19 ± 10 grams (mean ± SD), and women 15 ± 9 grams (mean ± SD). After adjustment for age, the mean daily fiber intake of Jewish men was significantly higher than that of Arab men. The median consumption of fiber is 15 grams per day[2]. In all age groups and in both genders, the median daily fiber intake was lower than that recommended by the DRI. As evidenced by the Health for All Database[8] (see Figure 5 below), Israelis have high levels of access to fiber-rich foods such as fruits and vegetables. This access, however, does not ensure adequate consumption due to various age, ethnic, income groups, and other causes.

Baseline: Currently unknown.

Developmental objective: Measure precise baseline consumption of fiber by gender, age and population group to determine target group(s) with inadequate intakes of fiber in their diets.

6.1.5 Fruits and Vegetables

Health impact: Fruits and vegetables are sources of many vitamins, minerals, fiber and other natural substances that may help protect from chronic diseases. Some of these nutrients may also be found in other foods. Thus, eating a balanced diet is one of the keys to maintaining good health. Compared with people who consume a diet consisting of only small amounts of fruits and vegetables, those who eat more generous amounts as part of a healthful diet are likely to have reduced risk of developing chronic diseases, including stroke and perhaps other cardiovascular diseases, as well as certain cancers[40].

Local health impact: A diet rich in fruits and vegetables is part of the cardio-protective Mediterranean diet. Cardiovascular disease (heart disease and stroke) was responsible for 26% of all deaths in Israel in the year 2007[41]. Unfortunately, a 2005 study of a random sample of over 1100 Israeli men and women aged 35+ indicated that only 19% of the men and 17% of the women ingested what could be defined as a true (e.g., among other components, a high intake of vegetables and fruits) Mediterranean diet[42].

Recommended Daily Intake: The basic Israeli food guide issued by the Ministry of Health recommends a minimum daily intake of 5 servings of fruit and vegetables per day for all, preferably 2 servings per day of fruit and 3 servings per day of vegetables, which is similar to recommendations in many western countries[43].

Typical Israeli Intake: Israelis have a relatively high consumption of fruit and vegetables compared to their counterparts in the European Union.[8] According to MABAT 1, Israelis consume an average of 2.5± 2.1 servings per day (mean ± SD) of vegetables, and 2 ± 1.7 servings per day (mean ± SD) of fruit. The median number of servings per day of vegetables and fruit is 2 and 1.6 servings, respectively[2]. As mentioned in the section on fiber, Figure 5 below clearly shows that Israel leads the representative group of European countries selected as comparators for this report in terms of fruit and vegetable availability. This parameter has shown short term variability but broadly speaking, has remained relatively stable over the past forty years.

Baseline: The percentage consuming less than the DRI is unknown.

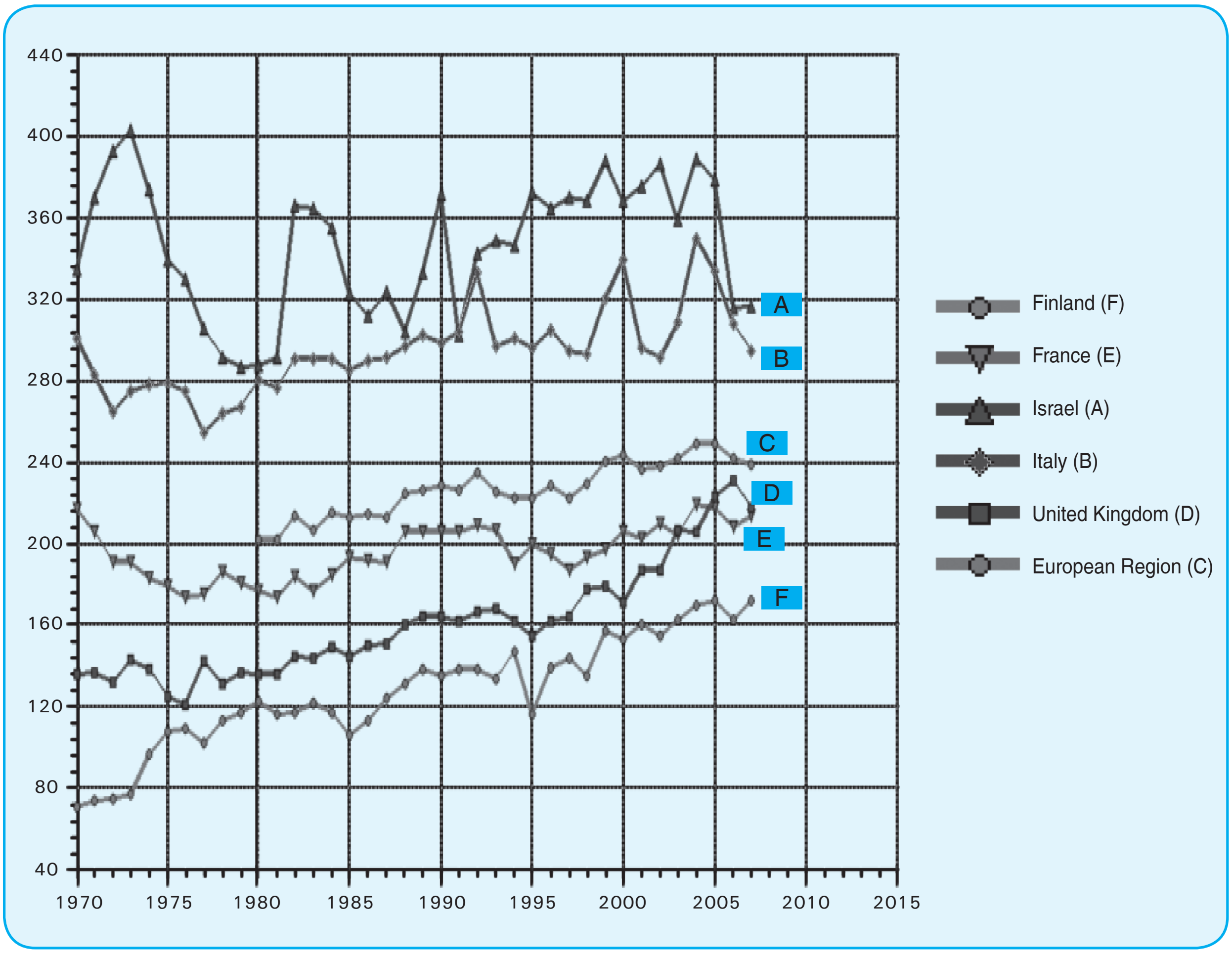
Objective: Due to the clear benefits of a diet rich in fruit and vegetables on the one hand, and the likely under-consumption of these macronutrients in the current Israeli diet, a target value of 50% of the population consuming at least 3 servings of vegetables and 2 servings of fruit per day has been set**.**

Rationale: The objective is achievable via implementation of existing multifaceted health promotion efforts.

Developmental objectives:

1. Assess the percentage of Israelis eating at least 2 servings of fruit and 3 servings of vegetables per.
2. Tailor the DRI to meet age, weight, gender-specific, and energy expenditure specific levels[44].

Figure 5: Fruit and vegetable availability per person per year, Israel and selected European countries, 1970-2007



Source: WHO/Europe, European HFA Database, July 2011[8].

6.2 Micronutrients

Micronutrient deficiencies are of great public health and socioeconomic importance worldwide. They characterize low-income countries, but are also significant contributors to health problems in industrialized societies, with a stronger impact among high-risk groups. They mainly affect vulnerable groups including women, children, and elderly individuals, and significantly contribute to the chronic diseases largely responsible for the burden of morbidity and mortality in these countries[45]. Micronutrient deficiencies have been the subject of many studies and conferences over the past decade and have been reviewed in the Israeli context[46].

6.2.1 Minerals

As described in any basic nutrition textbook[47], the body needs a small, but sustained intake of eighteen minerals to support body maintenance and multiple regulatory activities. Minerals are distributed in many of foods, but they are generally present in small amounts. Diets must contain a sufficient variety of foods to meet daily requirements. If metabolic needs are not met, a deficiency is the result. Deficiency disorders vary with the mineral involved, the duration and extent of the deficiency, the status of body stores, and the rate of depletion. In situations where a balanced diet is difficult to maintain, enrichment, fortification, and supplementation are necessary to provide essential nutrients.

6.2.1.1 Calcium

Health Impact: Calcium is a critical component of bones and teeth, building and maintaining structure, and serves an important function in skeletal and cardiac muscle contraction. Adequate calcium intake is particularly important during childhood and adolescence, where growth is accelerated, as intake during this period may influence peak bone mass. Adequate consumption is also important for post-menopausal women because their rate of bone loss is accelerated[48,49].

Calcium also plays a role in blood coagulation and in neuromuscular stability. Calcium deficiency is a risk factor for decreased bone mineralization, which can cause a variety of problems at different ages. Calcium deficient children are at increased risk for rickets. Adults are at risk for osteomalacia and osteopenia, and elderly persons are at risk for osteoporosis and fractures of the hip, spine, and forearm. Twenty percent of people suffering from a hip fracture die within one year of the fracture, nearly one third require nursing home care, and less than one third recover their pre-fracture level of independent functioning. Thus, calcium deficiency is a life-long concern that must be prevented at an early age to avoid these devastating complications[50].

Local health impact: MABAT 1 found that 4.3% of the Jewish population aged 25-64 in Israel has been diagnosed with osteoporosis (7.5% of women, 0.7% of men)[1].There are no data available on the Arab Israeli population because too few of those surveyed had knowledge of such a diagnosis[2]. Data on osteoporosis in the elderly is included in the Healthy Israel 2020 (HI2020) chapter on geriatric prevention.

Dietary sources: Milk and milk products, such as cheeses and yogurts contain calcium. Sardines, broccoli, and green leafy vegetables are also calcium-rich. Lime-processed corn, calcium-enriched grains, and calcium-fortified food and beverages are also good sources of calcium.

Recommended Daily Intake: The Ministry of Health recommends consumption of 1000 milligrams of calcium per day for adult men and women up to the age of 50. The recommended amount increases to 1200 milligrams for adult men and women age 51 and above[11]. The Israeli MOH recommends that the population consume at least 3 servings per day of dairy products.

Typical Israeli Intake: According to MABAT 1, Israelis consume an average of 494 ± 290 (mean ± SD) milligrams of calcium per day: men consume 520 ± 304 (mean ± SD) milligrams, while women consume 470 ± 275 (mean ± SD) milligrams. Among Jewish men and women, mean daily calcium intake increased with age, from age 30-39 on. After adjustment for age, the mean daily calcium intake was higher for Jews than Arabs, in both genders. The median daily calcium intake was lower than the DRI, in both sexes and in all age groups. The median daily intake of calcium in Israelis aged 25-64 was only 439 milligrams calcium; This was only 43% of the recommended amount for men, and only 40% of the recommended amount for women[2].

One study in the Negev showed that Israelis' calcium intake is inversely related to their socioeconomic status; people in lower socioeconomic strata consumed significantly less calcium and other vitamins and minerals than their counterparts in higher socioeconomic groups[36]. Milk product consumption in Israel is lower than that in Western Europe. According to MABAT 1, milk and dairy product consumption varies considerably by age group and ethnic group. The median consumption of milk products servings per day shows that Israelis consume, on average, only 1 serving per day[2].

Baseline: The percentage meeting the EAR is 5%.

Objective: Increase the percentage of Israelis meeting the EAR to 50%.

Rationale: This objective can be achieved via fortification of flour with calcium as described in the Interventions section and through implementation of multifaceted health promotion strategies.

6.2.1.2 Fluoride

Health impact: Fluoride is important to the development and maintenance of healthy teeth. Fluoridation of community water has been recognized as one of the ten great public health achievements in the twentieth century[51]. This topic is extensively covered in the HI2020 chapter on Oral Health and hence will not be elaborated upon with here.

6.2.1.3 Iodine

Health impact: Iodine is critical for the proper functioning of the thyroid gland, a major regulator of metabolism. Iodine deficiency is one of the three most common micronutrient deficiencies, worldwide. The WHO estimates that just fewer than 2 billion people suffer from some degree of iodine deficiency. Iodine deficiency is the most common cause of preventable brain damage and mental retardation in childhood. Deficiency can also lead to goiter, increased rates of stillbirth and spontaneous abortions, and infant deaths. During pregnancy, iodine deficiency can result in fetal hypothyroidism, which can cause significant mental retardation[52].

Local health impact: Reports of clinical goiter appeared in the Israeli medical literature during the 1950s to 1980s, but have not been reported since53. A survey of iodine levels among pregnant women and school children in the western Galilee and in some areas of the Judea-Samaria/West Bank in the mid-1980's showed low urinary iodine levels in pregnant women and in school children in Arab villages in the Western Galilee and in some higher locations in Judea-Samaria/West Bank. Hence, provision of sufficient iodine from drinking tap water cannot be assumed[54].

Dietary sources: Iodine is found in fish, seaweed, and seafood. It is also added to many processed foods and is available in iodized salt. Iodized salt is produced in Israel for consumption in the Palestinian Authority, where it is mandatory; It is available in Israel but is more expensive than "regular" salt. Most salt produced and used in Israel is not iodized. Fortunately, water from the Sea of Galilee is iodized, but while this reaches a significant proportion of the population, not all Israelis get their water from this source[55]. A study of the iodine concentration in groundwater from the year 2000 showed it to be too low in iodine to provide adequate intake for those drinking it.

Recommended Daily Intake: The Ministry of Health recommends consumption of 150 micrograms of iodine per day for all adults over 19 years old (RDA)[7].

Typical Israeli intake: Iodine intake was not included in MABAT 1. A 2004 study in the coastal area showed that up to 26% of Israelis have some degree of iodine deficiency56 . It is also important to consider the community of Ethiopian immigrants who came to Israel from goiter-endemic areas; Ethiopian children were found to be iodine deficient even a year after emigration[57, 58].

Baseline: The percentage meeting the DRI is unknown.

Developmental data objective: Assess the overall, gender, and age-specific percentage of Israelis meeting the DRI.

6.2.1.4 Iron

Note: The maternal-child-adolescent health chapter of HI2020 provides in-depth coverage of anemia in the newborn and during pregnancy)

Health Impact: Iron is critical for the synthesis of hemoglobin, the oxygen-carrying molecule in red blood cells. Iron deficiency can range in severity from depleted iron stores to clinical anemia. Anemia results in decreased linear growth, reduced work capacity, diminished learning ability[59], and greater risk of preterm delivery and low birth weight[60]. There is a correlation between low hemoglobin levels and an increased prevalence and complications of diarrhea and respiratory diseases in children[61]. Women are susceptible to iron deficiency anemia as a result of iron loss during menstruation and due to dietary habits focusing on vegetarianism or slimness[62]. Pregnant women are at greater risk because of increased iron requirements in pregnancy while the fetus develops. Infants and young children are at risk for iron-deficiency anemia secondary to the demands of growth, with potential damaging effects on intellectual development and growth patterns.

Iron-deficiency anemia is the most common nutritional deficiency in the world, and is also widely prevalent in developed countries. It leads to important adverse health, educational and economic effects. Iron deficiency and anemia reduce the work capacity of individuals and populations, resulting in serious economic obstacles to national development[63]. This serious public health problem has received considerable attention from UNICEF and the WHO since the 1980's, and by the CDC and Women, Infant and Children (WIC) supplementation program in the US[64, 65].

Local health impact: Iron deficiency anemia has long been recognized as an import health problem in Israel, particularly among women and pregnant women, as well as in infants and toddlers. MABAT 1 showed that 20.7% of adults reported having been diagnosed with iron deficiency anemia[1]. Women are more commonly diagnosed than men: 35.9% of women, but only 3.9% of men reported such a diagnosis. Fifteen percent of female military recruits are iron-deficient[66]. Iron deficiency anemia is six times more common in Jewish women than in Arab women, and twelve times more common in Jewish men than Arab men[1]. This may be due to low levels of meat consumption, and or koshering of meat, which may reduce its iron content.

Iron-deficiency anemia was common in Israeli infants during the middle of the twentieth century, affecting 86% of one-year-old children in 1946. By 1985, the prevalence had decreased to 50%. In that year, a significant public health effort was made to increase iron supplementation and promote avoidance of cow's milk before the age of one. This campaign was, to a large extent, successful, and the prevalence of iron-deficiency anemia dropped to 11% by 199667. A 2006 study found the prevalence of anemia among Israeli infants to be 15.5%[68]. Unfortunately, multiple studies have shown that the prevalence among Arab infants is double that of Jewish infants[69].

Iron supplements, fortification of infant cereals, and widespread fortification of breakfast cereals have reduced the severity of the problem, but its current level remains a source of public health concern[70].

Dietary sources: Iron is found in animal products, with the primary sources being red meat, liver, eggs, fish, shellfish, and poultry. Iron in non-animal products such as lentils, beans, spinach, peas and grapes, whole or enriched grains, cereals and seeds is less bioavailable, but all iron absorption is enhanced with adequate vitamin C intake[71].

Recommended Daily Intake: The Ministry of Health recommends consumption of 8 milligrams iron per day for men and post-menopausal women, and 18mg per day for pre-menopausal women (RDA)[11].

Typical Israeli intake: According to the MABAT 1, Israelis consume an average of 10.1 ± 6.1 (mean ± SD) mg of iron per day: men consume 11.9 ± 6.6 (mean ± SD) mg, while women consume 8.51 ± 5 (mean ± SD) mg. Among Jewish men, the mean daily iron intake decreased with age. After adjustment for age, no statistically significant difference was found between the mean daily iron intake of Jews and Arabs. Among men in all age groups and among women aged 51-64, the median daily iron intake was higher than the EAR. Among women aged 25-50, the median daily iron intake was somewhat lower than the EAR. As per MABAT 1, 43.3% of women aged 25-30 meet the EAR. The median daily iron intake among men was 8.8 mg higher than the EAR[2].

Baseline: The percentage meeting the EAR is 70%.

Objective: Increase the percentage meeting the EAR to 97%.

Rationale: The objective is achievable via implementation of existing multifaceted health promotion efforts.

6.2.1.5 Magnesium

Health Impact: Magnesium plays many roles in maintaining normal biological functioning. It is involved in muscle contraction, neural transmission, and bone mineralization. Magnesium also contributes to blood pressure regulation. Deficiency can manifest with muscle weakness, tremors, confusion, hallucination, and swallowing difficulties. Toxicity, which generally occurs only in people with renal disease, can manifest as diarrhea, nausea, vomiting, and low blood pressure[72].

Local health impact: Limited information is available on the health impact of magnesium in Israel.

Dietary Sources: Magnesium is found in nuts, seeds, soybeans, tofu, chocolate, green leafy vegetables, dairy products and legumes[72, 73].

Recommended Daily Intake: The Ministry of Health recommends that male adults, aged 19-30, consume 400 milligrams of magnesium per day. Women aged 19-30 should consume 310 milligrams per day. For adults aged 31-64, the recommendation for men is to consume 420 milligrams per day, and for women to consume 320 milligrams per day (RDA)[11].

Typical Israeli intake: According to MABAT 1, Israelis consume an average of 344± 219 (mean ± SD) mg of magnesium per day: men consume 404 ± 233 (mean ± SD) mg, while women consume 291± 190 (mean ± SD) mg. After adjustment for age, the mean daily magnesium intake was higher for Jews than Arabs, in both genders. Among women in all age groups and among men aged 25-50, the median daily magnesium intake was slightly lower than the EAR. According to the MABAT 1 the percentage of Israeli women age 25-30 years meeting the EAR for magnesium was 29.8%. Among men aged 51-64, the median daily magnesium intake was slightly higher than the EAR. The median daily magnesium intake among women was, on average, 91% of the EAR[2].

Baseline: The percentage meeting the EAR is 46%.

Objective: Increase the percentage meeting the EAR to 97%.

Rationale: This objective is achievable via implementation of existing multifaceted health promotion efforts.

6.2.1.6 Phosphorus

Health Impact: Phosphorus is involved in the maintenance of healthy bones and teeth. It also plays an essential role in the synthesis of DNA and in the metabolism of sugars. Phosphorus deficiency can lead to tooth decay, bone loss, weakness, and poor appetite. Excess phosphorus, usually a result of renal failure, can disrupt the calcium balance in the body via stimulation of parathyroid hormone secretion.

Local health impact: Limited information is available on the health impact of phosphorus in Israel.

Dietary sources: Milk, meat, nuts, eggs, legumes, and grains are all good sources of dietary phosphorus[74].

Recommended Daily Intake: The Ministry of Health recommends that adults aged 19-64 consume 700 milligrams of phosphorus per day (RDA)[11].

Typical Israeli intake: According to MABAT 1, Israelis consume an average of 1082± 538 (mean ± SD) mg of phosphorus per day; men consume 1259± 576 (mean ± SD) mg, while women consume 922 ± 444 (mean ± SD) mg. Among Arab women, the mean daily phosphorus intake decreased with age. After adjustment for age, no significant difference was found between the mean daily phosphorus intake of Jews and Arabs, in both genders. Among both men and women, the median daily phosphorus intake was higher than the DRI, in all age groups. Among men, the median daily phosphorus intake was, on average, twice as high as the DRI. Among women, it was1.5 times higher than the DRI[2].

Baseline: The percentage meeting the EAR is 86%.

Developmental objective: Assess the gender, age, and population-group specific percentage meeting the EAR.

6.2.1.7 Potassium

Health Impact: Potassium is essential for fluid balance in body cells and a balance is maintained with calcium and sodium. Potassium is important for normal muscle and nerve responsiveness, heart rhythm, and, in particular, intracellular fluid pressure and osmotic balance[75]. Only eight percent of the potassium ingested through food consumption is retained; the rest is readily excreted. Deficiency conditions are rarely due to dietary deficiency, but may be secondary to dehydration or chronic illness. Excess potassium in the blood (hyperkalemia) may be due to reduced renal function, an abnormal breakdown of protein, and severe infection. The most common causes of hyperkalemia are complications of renal dialysis for kidney failure. Some medications reduce the excretion of potassium, such as some diuretics and angiotensin converting enzyme (ACE) inhibitors.

Local health impact: Limited information is available on the health impact of potassium in Israel.

Dietary Sources: Most foods contain potassium, including all meat, fish, fowl, and vegetables, milk products, and most fruit.

Recommended Daily Intake: The Ministry of Health recommended dietary intake is 4.7 gm per day or higher for adults (RDA)[11].

Typical Israeli intake: According to MABAT 1, Israelis consume an average of 2580± mg 1191 (mean ± SD) mg of potassium per day; men consume 2890± 1285 (mean ± SD) mg, while women consume 2299 ± 1020 (mean ± SD) mg. Among Jewish men, the mean daily potassium intake increased with age, from ages 30-39 and above. Among Jewish women, the mean daily potassium intake increased up to age 50-59. Among Arab women aged 60-64, the mean daily potassium intake was considerably lower than that in the other age groups. After adjustment for age, the mean daily potassium intake was significantly higher among Jews than Arabs, in both genders. Among both men and women, the median daily potassium intake was lower than the AI n, in all age groups: the median daily potassium intake of men was 57% that of the AI. Among women, the median potassium intake was 46% of the AI[2].

Baseline: 5.6% of the Israelis meet the AI.

Objective: Increase the percentage meeting the AI to 50%.

Rationale: This objective is achievable via implementation of existing multifaceted health promotion efforts. Potassium, intake is expected to increase with the increase in vegetables and fruit consumption.

6.2.1.8 Sodium

Health impact: Sodium is necessary to maintain fluid balance in the body and to control muscle and nerve irritability. Significant deficiency can result in intravascular fluid loss and circulatory collapse. This is particularly relevant in the case of dehydration secondary to diarrheal illnesses. Rehydration must be done using salt-water solutions to be effective and prevent vascular collapse. This may also be important for prevention of dehydration among sportsmen, hikers, soldiers and other working physically in hot dry conditions with salt solutions as used in international sports clubs[76].

High levels of salt intake are associated with hypertension in a linear fashion, without any apparent plateau effect. Hypertension is a risk factor for cardiovascular disease, including strokes, heart attacks, and heart failure, and for impaired kidney function[77]. Additionally, high sodium intake in the form of sodium chloride may increase urinary calcium excretion, leading to the loss of calcium from bone[78].

Local health impact: In Israel, 13.5% of adults had been diagnosed with hypertension (self-reported hypertension) as reported in MABAT 1[1]. For epidemiologic details and screening strategies, the reader is directed to the HI 2020 chapter on chronic diseases.

Dietary sources: Most dietary sodium is consumed in processed foods such as breads, soups, pickles, sauces, snacks, and ready-to-eat meals. Diets with higher caloric intake tend to also have higher sodium content[76]. Salt is used in the koshering of meat and may contribute to higher salt content in the meat[79]. The relative ubiquity of salt in the Israeli diet results in higher discretionary table salt use, since foods without added salt may be perceived as lacking in flavor for people accustomed to the high salt content of processed food[80].

Recommended Daily Intake: The Ministry of Health recommends consumption of no more than 1.5g of sodium per day at ages 19-50, and no more than 1.3 g per day from age 51+. The latter is approximately equivalent to 5-6g of table salt (RDA)[11].

Typical Israeli intake: According to MABAT 1, Israelis consume an average of 2.8 ± 1.5 (mean ± SD) gram of sodium per day: men consume 3.3 ± 1.6 (mean ± SD) gram, while women consume 2.3 ± 1.3 (mean ± SD) gram. Among Jews of both sexes, the mean daily sodium intake decreased with age, except for an increase in the 50-59 year-old age group. After adjustment for age, the mean daily intake of sodium was significantly higher among Jewish men than among Arab men. Among women, the opposite was true: the mean daily sodium intake was significantly higher among Arab women than among Jewish women. Among both men and women, the median daily sodium intake was higher than the DRI recommendations in all age groups. Among men, the median daily sodium intake was twice as high as the recommended level. Among women, it was 1.5 times higher than the DRI[2]. These figures did not include discretionary salt use at the table.

Baseline: The percentage consuming more than the DRI is unknown. Based on previous data and international trends it is likely that Israelis need to reduce their salt intake.

Target value: Reduce salt consumption by 25% by 2015 and by 35% by 2020.

Rationale: This objective is achievable based on ongoing efforts to reduce the sodium content of foods and encourage intake of DASH (Dietary Approaches to Stop Hypertension)-type diets. Several countries such as Finland (since 1975) and, recently, the UK, have succeeded in reducing salt intake, the former by over 40% over nearly four decades, and the latter by nearly 10%.in only four years (2004-8)[81].

Developmental objective: Due to changing sodium content of processed foods there is a need to obtain current data for sodium consumption. Consumption levels of sodium in the population will be assessed in the MABAT 2 survey. Attention should also be focused on sodium and water consumption in replacement solutions to prevent dehydration during physically stressful situations in hot dry conditions.

6.2.1.9 Zinc

Health Impact: Zinc plays a vital role in cellular metabolism, particularly in immune functions and catalytic activity of many enzymes in rapidly dividing cells. It is therefore especially important during childhood and adolescent growth, within the immune system and gastrointestinal tract tissues. Consequently, infants, children, and pregnant and lactating women are at particular risk for developing zinc deficiency. This suggests that mild to moderate deficiency may be quite prevalent, although the specific extent of zinc deficiency world-wide is not well documented. In zinc deficient children it has been shown that zinc supplementation improves stunted growth, and lowers the rates, severity, and duration of diarrhea episodes and of pneumonia[82].

Local health impact: Limited information is available on the health impact of zinc in Israel.

Dietary Sources: Zinc is found in meat, poultry and fish.

Recommended Daily Intake: The Ministry of Health recommends that adult men aged 19-64 consume 11 milligrams of zinc per day. The recommendation for adult women is 8 milligrams per day, with more during pregnancy and during lactation (RDA)[11]

Typical Israeli intake: According to MABAT 1, Israelis consume an average of 9.1± 5.8 (mean ± SD) milligrams of zinc per day: men consume 11± 6.7 (mean ± SD) milligrams, while women consume 7.4 ± 4.2 (mean ± SD) milligrams. After adjustment for age, no statistically significant difference was found between the mean daily zinc intake of Jews and Arabs of both genders.

Among women in all age groups and among men aged 31-50, the median daily zinc intake was lower than the DRI. Among men aged 25-30 and 51-64, the median daily zinc intake was higher than the DRI. Among men and women, the median daily zinc intake was very close to the DRI, for all age groups.[2]

Baseline: The percentage meeting the EAR is 52%.

Objective: Increase the percentage meeting the EAR to 97%.

Rationale: The objective is achievable via implementation of existing multifaceted health promotion efforts.

Developmental interventional objective: Assess utility of additional strategies such as fortification of flour with zinc[83].

6.2.2 Water

Total water needs vary by age and environmental conditions. Thirst is the desire to drink triggered by both behavioral and physiological factors such as a decrease in blood volume or severe dehydration. US standards for daily water consumption include drinking water, water in beverages, and water contained in food. Because normal hydration can be maintained over a wide range of water intakes, the Adequate Intake (AI) for total water was set based on the median total water intake from US survey data[76]. The AI for total water intake for young men and women (age 19 to 30 years) is 3.7 L and 2.7 L per day, respectively (data for older adults is unavailable).

In the NHANES III studies, fluids (drinking water and beverages) provided 3.0L (13 cups) and 2.2L (9 cups) per day for men and women age 19 to 30, respectively. This represents approximately 81 percent of total water intake. Water contained in food provided 19 percent of total water intake[84].

The 2008 Israel Water Survey measured water intake among adults, including water from "all sources". On average, survey respondents consumed 2.9 cups (0.725 liters) of tap water and 14 cups (3.5 liters) of all beverages per day. Intakes were higher in the warmer South than in the North (15.3 cups (3.825 liters) vs. 12.8 cups (3.2 liters))[85].

Baseline: The percentage consuming less than the recommended daily volume is unknown.

Developmental objective: Assess daily adult water intake, including separate determination of fluid from bottled water. This will be undertaken in the MABAT 2 survey.

6.2.3 Vitamins

Vitamins are organic compounds that are essential for specific functions of the body, including growth, reproduction, resistance to infection and health maintenance. Vitamins are usually classified as fat soluble (e.g. vitamins A, E, D, and K), and water soluble (vitamin B6, vitamin B12, vitamin C, biotin, folic acid, niacin, pantothenic acid, riboflavin, and thiamin). They are found in fruits, vegetables and grains, but may be destroyed in heat and through boiling of foods. Water soluble vitamins in excess of body needs are excreted. Fat soluble vitamins are found in animal, fish, oils and dairy foods. They can accumulate in fatty body tissue in excess of needs and thus may cause health problems.

Vitamins must be present in the diet despite the fact that the body requires only relatively small quantities of them; they cannot be synthesized in sufficient quantities. Vitamins are naturally present in many foods, so a balanced diet should also be sufficient in vitamins. However, there are many situations where a balanced diet is difficult to maintain or not adhered to. This situation leads to vitamin deficiencies.

6.2.3.1 Water soluble vitamins

6.2.3.1.1 Vitamin C

Health Impact: Vitamin C helps maintain collagen formation and is an important antioxidant. Vitamin C also increases iron absorption in the gut. Severe deficiency leads to scurvy, poor bone and cartilage formation (and therefore stunting of growth), anemia (secondary to poor iron absorption), easy bleeding, and infections[86]. Since vitamin C is a water-soluble vitamin, it is not stored in fatty body tissues. Hence, there is no risk of toxicity, despite intake from multiple sources in a regular diet. Though rare, outbreaks of scurvy still occur in isolated populations where diets low in fruits and vegetables must be maintained for months on end. It was once very common among sailors, before vitamin C- rich foods began to be stocked on board ship. Bottle-fed infants also suffered from scurvy before formulas were fortified. Borderline deficiencies may still be quite common[87].

Local health impact: Unknown, but may potentially be a cofactor in the high prevalence of anemia in infants and among certain sectors of the population.

Dietary Sources: Fresh fruits and vegetables such as citrus fruit, kiwis, red peppers and broccoli are excellent sources of vitamin C.

Recommended Daily Intake: The Ministry of Health recommends consumption of 90 milligrams of vitamin C per day for adult men aged 19-64; for women in the same age group, the recommendation is 75 milligrams per day (RDA)[11].

Typical Israeli Intake: According to the MABAT 1, Israelis consume an average of 122± 112 (mean ± SD) milligrams of vitamin C per day: men consume 131± 122 (mean ± SD) milligrams, while women consume 114 ± 101 (mean ± SD) milligrams. After adjustment for age, the mean daily Vitamin C intake was significantly higher among Jews than Arabs, in both genders. Among both men and women, the median daily vitamin C intake was higher than the DRI, in all age groups. Among men, the median daily vitamin C intake was 1.3 times higher than the DRI, and amongst women, it was 1.4 times higher[2].

Baseline: The percentage meeting the EAR is 65%.

Objective: Increase the percentage meeting the EAR to 97%.

Rationale: This objective is achievable via implementation of existing multifaceted health promotion efforts.

6.2.3.1.2 Vitamin B Group

The B vitamin group consists of water-soluble vitamins essential for many metabolic processes. Many are associated with serious deficiency conditions of clinical and public health importance. The specific health impact of each B vitamin deficiency is detailed below. The B vitamin group includes the following:

- Vitamin B1 – thiamin
- Vitamin B2 – riboflavin
- Vitamin B3 – niacin
- Vitamin B5 – pantothenic acid
- Vitamin B6 – pyridoxine
- Vitamin B7 – biotin
- Vitamin B9 – folic acid
- Vitamin B12 – cobalamin

6.2.3.1.2.1 Vitamin B1 – Thiamin

Health Impact: Vitamin B1 is a coenzyme in the metabolism of carbohydrates and branched chain amino acids. It is directly involved in neural function. Moderate deficiency can lead to fatigue, apathy, nausea, irritability, and numbness, secondary to derangement of carbohydrate metabolism. Severe deficiency can cause beriberi with heart failure (the predominant manifestation in neonates) or chronic peripheral neuropathy.

In combination with deficiencies of other B-complex vitamins, vitamin B1 deficiency can lead to neuropathy in many forms, e.g., Wernicke-Korsakoff syndrome (most commonly in alcoholics). Vitamin B1 deficiency is most prevalent in areas where diets are low in animal products, low in fruits and vegetables, and where grain is milled before consumption. Pregnant and lactating women, infants, and children are at highest risk for deficiency. The amount of vitamin B1 that is secreted in breast-milk is influenced by the mother's stores[88].

Local health impact: Thiamin deficiency has been described in Israel[89]. Beriberi resulted in the deaths of a Chinese foreign-worker in 2003[90]. A deficiency of vitamin B1 in a soy-based infant formula caused death and permanent disability in a number of Israeli infants in a tragic episode in recent years[91, 92].

Dietary sources: Vitamin B1 can be found in enriched, fortified, or whole-grain products, including bread and bread products and in ready-to-eat cereals. The milling and preparation of cereal grains removes almost all of the vitamin B1 that is naturally found in those foods. As such, restoration of the vitamin B1 is important to allow sufficient dietary intake[93].

Recommended Daily Intake: The Ministry of Health recommends consumption of 1.2 milligrams of vitamin B1 per day for men of all ages and 1.1 milligrams per day for women (RDA).[11]

Average Israeli Intake: According to the MABAT 1, Israelis consume an average of 0.9± 0.9 (mean ± SD) milligrams of vitamin B1 per day: men consume 1.0± 0.7 (mean ± SD) milligrams, while women consume 0.8± 0.7 (mean ± SD) milligrams. After adjustment for age, the mean daily thiamin intake was significantly higher among Jews than Arabs, in both genders. The median daily thiamin intake was lower than the EAR, in both sexes and in all age groups, except for males in the 25-30 age group, where the median intake matched the EAR. Among men, the median daily thiamin intake was 93% of the EAR, and among women, it was 78% of the EAR[2]. The percentage of Israeli women aged 31-50 meeting the EAR for thiamin is 27.3%.

Baseline: The percentage of the population meeting the EAR is 36%.

Objective: Increase the percentage meeting the EAR to 75%.

Rationale: This objective is achievable via implementation of existing multifaceted health promotion efforts, along with the recommended fortification of flour with B complex vitamins described in the Interventions section below.

6.2.3.1.2.2 Vitamin B2 – Riboflavin

Health Impact: Vitamin B2, also known as riboflavin, is a precursor of many nucleotides that participate in various metabolic pathways and in energy production. Deficiency can lead to symptoms including weakness, mouth pain, and burning eyes. It also reduces the absorption and utilization of iron. Severe deficiency can cause brain dysfunction, dermatitis, and microcytic anemia. Isolated vitamin B2 deficiency is rare; deficiency occurs most commonly in association with deficiency of the full vitamin B complex[94].

Local health impact: Unknown.

Dietary Sources: Meat and dairy products are the main dietary sources of riboflavin. Green leafy vegetables are also a reasonably good source of vitamin B2[95]. The milling and preparation of cereal grains removes almost all the small amount of vitamin B2 naturally found in those foods. As such, restoration of the vitamin B2 is important to allow sufficient dietary intake[96].

Recommended Daily Intake: The Ministry of Health recommends consumption of 1.3 milligrams of vitamin B2 per day for men and 1.1 milligrams of vitamin B2 per day for women, aged 19-64 (RDA)[11].

Typical Israeli Intake: According to the MABAT 1, Israelis consume an average of 1.6 ± 1.2 (mean ± SD) milligrams of riboflavin per day: men consume 1.8± 0.9 (mean ± SD) milligrams, while women consume 1.4 ± 1.4 (mean ± SD) milligrams. After adjustment for age, the mean daily riboflavin intake was significantly higher among Jews than Arabs, in both genders. The median daily riboflavin intake was higher than the DRI, in both sexes and in all age groups. Among men, the median daily riboflavin intake was1.4 times the DRI. Among women, it was1.3 times as high[2].

Baseline: 74% meet the EAR.

Objective: Increase the percentage of those meeting the EAR to 97%.

Rationale: This objective is achievable via implementation of existing multifaceted health promotion efforts, along with the recommended fortification of flour with B complex vitamins described in the Interventions section below.

6.2.3.1.2.3 Vitamin B3 – Niacin

Health impact: Vitamin B3, also known as niacin, is involved in the oxidative processes of metabolism; it is important in maintaining normal gastrointestinal and neurological function. It also reduces blood lipids and raises high-density lipoproteins. This helps slow the progression of atherosclerosis and cardiovascular disease. Vitamin B3 deficiency results in pellagra, which manifests as glossitis, weakness, mental confusion, insomnia, aggression, ataxia, dilated cardiomyopathy, and ("the four D's"): diarrhea, dermatitis, and can eventually lead to dementia and even death[99].

Local health impact: Groups at risk for micronutrient and niacin deficiency in Israel include the Bedouin, Ethiopian immigrants, migrant workers and elderly populations that may have food insecurity[97].

Dietary sources: Vitamin B3 can be found in liver, peanuts, chicken, tuna and salmon. The body can also synthesize niacin from tryptophan. Good dietary sources of tryptophan include milk and turkey. The milling and preparation of cereal grains removes almost the entire vitamin B3 that is naturally found in those foods [100,101] As such, restoration of the vitamin B3 is important to allow sufficient dietary intake.

Recommended Daily Intake: The Ministry of Health recommends consumption of 16 milligrams of vitamin B3 per day by men aged 19-64; for women, the recommendation is 14 milligrams per day (RDA)[11].

Typical Israeli intake: According to the MABAT 1, Israelis consume an average of 21.3± 15.4 (mean ± SD) milligrams of niacin per day: men consume 26.2± 16.6 (mean ± SD) milligrams, while women consume 16.8± 12.6 (mean ± SD) milligrams. Among Jews, the mean daily niacin intake increased with age, in both sexes. Among Arabs, the opposite was true: the mean daily niacin intake decreased with age, in both sexes. After adjustment for age, the mean daily niacin intake was significantly higher among Jews than Arabs, in both sexes. In all age groups and in both genders, the median daily niacin intake was higher than the DRI. Among men, the median daily niacin intake was, on average, 1.8 times higher and among women, it was, on average, 1.2 times higher than the DRI[2].

Baseline: 74% meet the EAR.

Objective: Increase the percentage of those meeting the EAR to 97%.

Rationale: This objective is achievable via implementation of existing multifaceted health promotion efforts, along with the recommended fortification of flour with B complex vitamins described in the Interventions section below.

6.2.3.1.2.4 Vitamin B5-Pantothenic acid

Health impact: Pantothenic acid is used in the synthesis of coenzyme A (CoA). It facilitates transport carbon atoms within the cell, is important in energy metabolism and is important in the biosynthesis of many important compounds such as fatty acids, cholesterol, and acetylcholine. It is involved in signal transduction and enzyme activation and deactivation. Deficiency is exceptionally rare and has not been thoroughly studied. In the few cases where deficiency has been seen (victims of starvation and limited volunteer trials) nearly all symptoms can be reversed by administration of pantothenic acid[99].

Local health impact: Unknown**.**

Dietary sources: Small quantities are found in nearly every food. Large amounts are present in whole-grain cereals, legumes, eggs, meat, royal jelly, broccoli, avocado, and yogurt[100].

Recommended Daily Intake: An RDA has not been determined. An Adequate Intake level of 5 mg/day for adults has been set[11].

Typical Israeli intake: Unknown.

Baseline: Unknown.

Developmental data objective: Assess the overall, gender, age, and SES-related intake to determine the percentage meeting the DRI.

6.2.3.1.2.5 Vitamin B6 – Pyridoxine

Health Impact: Vitamin B6 functions as a co-enzyme in various reactions involved in amino acid synthesis and protein metabolism. Vitamin B6 also prevents neuropathy that occurs as a side-effect of treatment with isoniazid for tuberculosis. Deficiency can result in neurological disorders (irritability, depression, and muscle weakness), cardiomyopathy, liver damage, and skin changes. Vitamin B6 deficiency is also a risk factor for elevated plasma homocysteine levels. Isolated vitamin B6 deficiency is rare; deficiency occurs most commonly in association with deficiency of the full vitamin B complex[99]

Local health impact: Unknown.

Dietary sources: Vitamin B6 is available in many foods, but the best sources are meats, whole grain products, vegetables, and nuts. However, the milling and preparation of cereal grains removes almost all of the vitamin B6 that is naturally found in those foods As such, restoration of the vitamin B6 in cereal grain products is important to facilitate sufficient dietary intake[100].

Recommended Daily Intake: The Ministry of Health recommends consumption of 1.3 milligrams of vitamin B6 per day by all adults aged 19-50. For men aged 51-64, the recommendation is 1.7 milligrams per day; for women in that same age group, the recommendation is 1.5 milligrams per day (RDA)[11].

Typical Israeli intake: According to MABAT 1, Israelis consume an average of 1.5± 0.9 (mean ± SD) milligrams of vitamin B6 per day: men consume 1.8± 0.9 (mean ± SD) milligrams, while women consume 1.3 ± 0.7 (mean ± SD) milligrams. After adjustment for age, the mean daily Vitamin B6 intake was higher for Jews than Arabs, in both genders. Among men, the median daily Vitamin B6 intake was, on average, 1.4 times higher than the Dietary Reference Intakes recommendations. Among women, the median daily Vitamin B6 intake was close to the recommended amount in the 25-30 age group, exactly matched the recommendations in the 31-50 age group, and was 92% of the recommended level in the 51-64 age group[2].

Baseline: 60% meet the EAR.

Objective: Increase the percentage of those meeting the EAR to 97%.

Rationale: This objective is achievable via implementation of existing multifaceted health promotion efforts, along with the recommended fortification of flour with B complex vitamins described in the Interventions section below.

6.2.3.1.2.6 Vitamin B7-Biotin

Health impact: Biotin is a coenzyme in the metabolism of fatty acids, isoleucine, and valine, and it plays a role in gluconeogenesis. It is necessary for cell growth, the production of fatty acids, and the metabolism of fats and amino acids. Biotin plays a role in generating biochemical energy during aerobic respiration (the citric acid cycle). It helps transfer carbon dioxide and may also be helpful in maintaining a steady blood sugar level. Biotin is often recommended for strengthening hair and nails [99].

Local health impact: Unknown.

Dietary sources: Bacteria produce biotin in excess of the body's daily requirements. Biotin is consumed from a wide range of food sources in the diet, however there are few particularly rich sources. Foods with a relatively high biotin content include raw egg yolk (however, the consumption of egg whites with egg yolks minimizes the effectiveness of egg yolk's biotin in one's body), liver, some vegetables, and peanuts[100].

Recommended daily intake: The dietary biotin intake in Western populations has been estimated to be 35 to 70 µg/d98.Statutory agencies in many countries, including the US, Australia, and Israel do not prescribe a recommended daily allowance of biotin. The Adequate Intake level is 30 µg/d[11].

Typical Israeli intake: Unknown.

Baseline: Unknown.

Developmental data objective: Assess the overall, gender, age, and SES-related intake to determine the percentage meeting the DRI.

6.2.3.1.2.7 Vitamin B 9 – Folic Acid

Health Impact: Folic acid, also known as folate or vitamin B9, is involved in myriad biological functions. These include DNA synthesis and gene expression, amino acid metabolism, myelin production and neurotransmitter synthesis. Deficiency of folic acid during pregnancy can lead to a macrocytic anemia[99]. Since the 1990s, it has been known that deficiency of folic acid in the body can lead to a number of birth defects and congenital conditions, including neural tube defects. The latter is a major group of congenital disorders that range in severity from anencephaly to spina bifida. Deficiency of folic acid is also associated with increased levels of homocysteine, an amino acid that has also been linked to cardiovascular disease, so that folic acid fortification is considered to have benefits for men as well as women[99].

Local health impact: A 2006 study found that rates of neural tube defects identified during pregnancies in Israel have substantially decreased (-31% in Jews and -24% in Arabs and Druze) during the 2002-4 period vs. the 1999-2000 period, possibly reflecting prenatal diagnosis and termination of affected pregnancies, as well as reflecting the impact of recommendations being issued to women of childbearing age to take folic acid supplements. Fortification of flour is recommended to reach the majority of fertile women with adequate folic acid intake[100].

Dietary sources: Humans cannot synthesize or generate folic acid; it must be obtained from dietary sources, exclusively. Folic acid is relatively abundant in green leafy vegetables. It can also be found in fortified cereals and in enriched breads and bread-products[100].

Recommended Daily Intake: The Ministry of Health recommends consumption of 400 micrograms of folic acid per day for adults[11], and this amount as daily supplements for women of childbearing age (RDA).

Typical Israeli Intake: According to MABAT 1, Israelis consume an average of 258± 175 (mean ± SD) micrograms of folate per day: men consume 303± 203 (mean ± SD) micrograms, while women consume 217 ± 132 (mean ± SD) micrograms. Among men, the median daily folate intake decreased with age. After adjustment for age, the mean daily folate intake was higher for Arabs than Jews, in both genders. In all age groups and in both genders, the median daily folate intake was lower than the DRI.

Among men, the median daily folate intake was 83% of the DRI and among women it was 60%[2].

Baseline: 24% meet the EAR

Objective: Increase the percentage of those meeting the EAR to 75%.

Rationale: This objective is achievable via implementation of existing multifaceted health promotion efforts to increase consumption of folate-rich foods , along with the recommended fortification of flour with B complex vitamins described in the Interventions section below.

6.2.3.1.2.8 Vitamin B12 – Cobalamin

Health Impact: Vitamin B12 is critical to the health of the blood and nervous systems; deficiency causes macrocytic anemia. Sequelae may include degeneration of cerebral tissue, the optic nerves, the spinal cord, and peripheral nerves[100]. Many population groups are at risk for vitamin B12 deficiency. Elderly individuals are susceptible for a variety of reasons such as low income[10, 101] (preventing them from purchasing nutritionally appropriate food), physiological changes (e.g., decreased intrinsic factor secretion in the stomach), and declining health (e.g., advanced tooth decay) leading to dietary changes[102] and poor dietary intake[103]. Chronic deficiency may also be seen in alcoholism secondary to poor nutritional intake[104]. Low vitamin B12 levels, along with insufficient levels of folate, are associated with increased homocysteine levels, and may increase the risk of heart disease.

Local health impact: Many subgroups in the Israeli population have been found to be vitamin B12 deficient. One study found that 40% of Israeli elders have low or borderline vitamin B12 levels105. A 2006 study of obese Israeli children and adolescents found that they had significantly lower levels of vitamin B12 than their normal weight counterparts, and that each incremental increase in weight led to further reductions of vitamin B12 levels[106]. An unpublished study by Kark et al. showed that Israeli young adults have lower serum vitamin B12 levels than their American counterparts[107].

Low vitamin B12 levels, along with insufficient levels of folate are associated with increased homocysteine levels, and may increase the risk of heart disease.

Dietary sources: Vitamin B12 is only found in animal products such as meat, fish, poultry, and in fortified cereals[101]. Vegetarian diets that do not include eggs or dairy products are, by definition, deficient in Vitamin B12; individuals following such diets must receive supplements in order to achieve sufficient levels of vitamin B12.

Recommended Daily Intake: The Ministry of Health recommends consumption of 2.4 micrograms of vitamin B12 per day, for adults of all ages (RDA)[11].

Typical Israeli Intake: According to MABAT 1, Israeli adults consume an average of 3.3 ± 6.8 (mean ± SD) micrograms of vitamin B12 per day: men consume 3.9± 6.7 (mean ± SD) micrograms, while women consume 2.7 ± 6.8 (mean ± SD) micrograms. After adjustment for age, no statistically significant difference was found between the mean daily Vitamin B12 intake of Jews and Arabs. Among men of all ages, the median daily Vitamin B12 intake was 1.2 times higher than the DRI. Among women, the median daily Vitamin B12 intake was 80% of the DRI in the 25-30 age group, 85% of the DRI in the 31-50 age group, and exactly matched the DRI in the 51-64 age group[2].

Baseline: 49.9% meet the EAR.

Objective: Increase the percentage of those meeting the EAR to 97%.

Rationale: This objective is achievable via implementation of existing multifaceted health promotion efforts, along with the recommended fortification of flour with B complex vitamins described in the Interventions section below.

6.2.3.2 Fat Soluble Vitamins

6.2.3.2.1 Vitamin A

Health Impact: Vitamin A plays an important role in the prevention and treatment of various eye disorders; it is important in forming visual pigment. It is also involved in normal immune function and in reproduction. Deficiency can result in night blindness and xerophthalmia ("dry-eye"), and in decreased resistance to infections. Supplementation of vitamin A in vitamin-deficient children lowers the morbidity associated with diarrheal illnesses and lowers mortality from measles and all-cause mortality[108]. Vitamin A-deficiency is also associated with higher maternal mortality and poor outcomes in pregnancy and lactation, particularly in developing countries[109]. Vitamin A supplementation selectively improved the linear growth of preschool children in Indonesia[110].

Vitamin A is one of the three most common micronutrient deficiencies worldwide; it is estimated that 254 million pre-school age children are vitamin A-deficient. About 3 million children worldwide manifest some signs of vitamin A deficiency-associated ocular changes. Approximately 800,000 deaths each year can be attributed to vitamin A deficiency. Some countries in Central America have fortified sugar with vitamin A, with good results in reduction of vitamin A deficiency[111, 112].

Local health impact: Unknown.

Dietary sources: There are two forms of vitamin A: the active form, known as retinol, is present in animal products such as liver, kidney, oily fish, and eggs, while the pro-vitamin form, known as carotenoids, is found in fruits such as oranges, and in yellow and dark green vegetables, such as carrots, broccoli and spinach[113, 115]. Vitamin A fortification is mandatory in margarine and 1% milk in Israel along with vitamin D.

Recommended Daily Intake: The Ministry of Health recommends consumption of 900 micrograms per day for all adult men over 19 years old, and 700 micrograms per day for all adult women (RDA)[11]

Typical Israeli intake: According to MABAT 1, Israelis consume an average of 968 ± 1460.12(mean ± SD) of RE (Retinol Equivalent), men consume 1016.5 ± 1577.31(mean ± SD) RE, women consume 924.4 ± 1344.1 (mean ± SD) RE[2].

Baseline: 64.5% meet the EAR.

Objective: Increase the percentage of those meeting the EAR to 97%.

Rationale: The target is achievable through increased consumption of Vitamin E-rich foods.

6.2.3.2.2 Vitamin D

Health Impact: Vitamin D is critical for calcium absorption and maintenance of calcium and phosphorus homeostasis, all of which are important for bone growth, thickness, and density[114]. It is also involved in cell differentiation and secretion of certain hormones, including parathyroid hormone and insulin[51, 115]. Deficiency leads to rickets (in children) and osteomalacia (in adults). In combination with calcium deficiency, vitamin D deficiency can also contribute to osteopenia and osteoporosis.

Adult women are at high risk for low serum vitamin D due to dietary deficiency, and/or lack of exposure to solar ultraviolet radiation. They are thus susceptible to osteoporosis and its consequences such as fractures of the hip, wrist, and vertebrae[116]. There is a rapidly growing literature indicating widespread prevalence of vitamin D-deficiency in many age groups, and many locations, including generally sunny climates (where lack of exposure to the sun occurs due to lifestyle and cultural reasons)[117, 118]. Vitamin D has been associated with a positive role in the prevention of multiple sclerosis, diabetes (both type 1 and 2), hypertension, cardiovascular disease, and colon cancer[119, 120].

Local health impact: Vitamin D is produced by the skin upon exposure to solar ultraviolet (UV) radiation. Given that it is relatively sunny in Israel, it has been generally assumed that no deficiency state existed here. However, it must be noted that sunlight varies according to latitudes of residence, seasons, and work and recreation patterns limit daily exposure to sunlight. Sun exposure is also influenced by ethnic/religious customs (e.g., Arab women and Haredi men and women, tend to cover most skin surfaces[121]) and mobility. Thus, homebound or institutionalized elderly persons are also at high risk for low vitamin D levels[122, 123].

Persons may be relatively unexposed to solar-UV radiation. Additionally, the efficiency with which the skin can synthesize Vitamin D decreases with age[124]. Obese and dark-skinned individuals such as Ethiopian immigrants also synthesize less Vitamin D following solar UV exposure than their non-obese or light-skinned counterparts[125]. Teenage girls and elderly women living in northern latitudes in Europe have low levels of vitamin D in the winter[126]. It is therefore insufficient to rely on solar exposure to provide adequate levels of Vitamin D for many demographic groups in the Israeli population. Vitamin D deficiency has also been documented in other countries in the region[127, 128] as well as in various subpopulations in Israel, including the hospitalized elderly[129], heavily-covered and dark-skinned pregnant Bedouin women[130], in Ethiopian infants[131], children and adolescents[132], and recently even in presumably healthy workers[133].

Vitamin D is generally low in breast milk, and is even lower in the breast milk of women who are themselves deficient as a result of a variety of factors including seasonal changes in solar ultraviolet radiation, lack of exposure to the sun due to indoor work and leisure, total body coverage for religious/ethnic reasons, obesity, and low intake. As a result, exclusively breast-fed babies are at high risk for rickets if not supplemented with vitamin D drops[134].

Dietary sources: Vitamin D occurs naturally in fish liver oils (i.e., cod liver oil), which was commonly given to children to prevent rickets from the 1920s up to the 1960s. Vitamin D is also found in the flesh of fatty fish (i.e., salmon, tuna, cod, sardines, mackerel), and in egg yolks[129]. Recent food technology has developed vitamin D – rich mushrooms as well[135]. Vitamin D-fortified dairy products and cereals also provide a dietary source for vitamin D, but this practice mainly takes place in North America.

Recommended Daily Intake: In 2003, The American Academy of Pediatrics recommended vitamin D supplementation for all infants, especially those who are breast fed, and for children and adolescents insufficiently exposed to solar rays, especially in relation to season of the year, latitude of residence, and level of outdoor recreational activities. Well-baby clinics ("Tipot Halav") in Israel have for many decades recommended supplementation with vitamin D drops for all infants from birth to one year of age[136].

Subsequently, in 2008, the American Academy of Pediatrics (AAP) recommended an increase in daily intake vitamin D for infants (including exclusively and partially breastfed infants) and children and adolescents up to age 18 at a level of 400 IU, higher than those then recommended by the Food and Nutrition Board[137] These AAP recommendations were based on evidence from more recent clinical trials and the history of safe use of vitamin D in pediatric and adolescent populations.

In November 2010, the US Institute of Medicine issued updated Recommended Daily Allowances for Vitamin D. These are presented in the following table:

Table 2: Dietary Reference Intakes for Calcium and Vitamin D

	Calcium			Vitamin D		
Life Stage Group	Estimated Average Requirement (mg/day)	Recommended Dietary Allowance (mg/day)	Upper Level Intake (mg/day)	Estimated Average Requirement (IU/day)	Recommended Dietary Allowance (IU/day)	Upper Level Intake (IU/day)
Infants 0 to 6 months	*	*	1,000	**	**	1,000
Infants 6 to 12 months	*	*	1,500	**	**	1,500
1–3 years old	500	700	2,500	400	600	2,500
4–8 years	800	1,000	2,500	400	600	3,000
9–13 years old	1,100	1,300	3,000	400	600	4,000
14–18 years old	1,100	1,300	3,000	400	600	
19–30 years old	800	1,000	2,500	400	600	4,000
31–50 years old	800	1,000	2,500	400	600	4,000
51–70 year old males	800	1,000	2,000	400	600	4,000
51–70 year old females	1,000	1,200	2,000	400	600	4,000
>70 years old	1,000	1,200	2,000	400	800	4,000
14–18 years old, pregnant/lactating	1,100	1,300	3,000	400	600	4,000
19–50 years old, pregnant/lactating	800	1,000	2,500	400	600	4,000

*For infants, Adequate Intake is 200 mg/day for 0 to 6 months of age and 260 mg/day for 6 to 12 months of age.
**For infants, Adequate Intake is 400 IU/day for 0 to 6 months of age and 400 IU/day for 6 to 12 months of age.

Many experts and professional groups and abroad[138, 139,140] and in Israel have debated the methodology and conclusions of the IOM report and have recommended increased supplementation in the elderly with doses ranging from 1000 up to 2000 IU daily[141].

In addition, the Israeli Sick Funds have reportedly been increasing the frequency of vitamin D testing, indicating greater appreciation of the importance of vitamin D and the potential for low blood levels of vitamin D among adults**.**

As stated above, there is distinct evidence of Vitamin D insufficiency among various segments of the population. Increasing the RDA for children (age one and above), adolescents, and adults up to and including the age of 70 by 50% (from 400 IU/d to 600 IU/d) should lead to improved health of the population. Implementing this recommendation warrants consideration of a combination of moderate solar ultraviolet ray exposure, improved dietary intake along with Vitamin D fortification of certain foods, as well as supplementation.

Typical Israeli intake: Intake of vitamin D has not been measured nor recorded on a national level to date in Israel.

Baseline: The percentage consuming less than the DRI is unknown**.**

Developmental data objective: Assess the overall, gender, age, and SES-related percentage meeting the DRI.

6.2.3.2.3 Vitamin E (alpha-tocopherol)

Health Impact: Vitamin E has anti-oxidant, immune-regulating, anti-cell proliferation, and blood vessel dilating properties. Endothelial calls rich in vitamin E are better able to prevent blood components from aggregating on their surface. All these traits gave researchers hope that it would be beneficial in preventing chronic diseases such as coronary artery disease (CAD), cancer, macular degeneration, and cognitive decline. Unfortunately, randomized controlled trials with vitamin E have not proven its benefit for the general middle aged and elderly population in the prevention of CAD or cancer. There is some evidence from the Age-Related Eye Disease (ARED) study that that a cocktail including 400IU of vitamin E, 500 mg vitamin C, 15 mg beta-carotene, 80 mg zinc and 2 mg copper given for over 6 years can slow the progression of early stage macular degeneration. Most of the studies assessing the impact on cognitive decline have been negative[142].

Local Health Impact: A recent meta-analysis of Israeli and Canadian patients with Type 2 diabetes mellitus and the haptoglobin 2-2 variant has shown an impressive capacity of vitamin E to reduce the incidence of a composite cardiovascular endpoint consisting of myocardial infarctions, strokes, and cardiovascular death in these patients[143].

Dietary Sources: Numerous foods provide vitamin E: nuts, seeds, and vegetable oils are among the best sources of alpha-tocopherol, and significant amounts are available in green leafy vegetables and in fortified cereals[144].

Recommended Daily Intake: The Ministry of Health recommends 15 milligrams per day (RDA)[11].

Note: The EAR is 12 milligrams per day.

Typical Daily Intake: The MABAT 1 survey found lower than recommended intakes in men (median intake = 9.5 mg per day, = 80% of EAR) and particularly women (median intake = 6.8 milligrams per day, = 57% of EAR).This trend was noted at ages 25-30, 31-50, and 51-64 (i.e., all the ages surveyed). After age adjustment, intake in Jews was significantly higher than in Arabs in both genders[2].

Baseline: 75% meet the EAR**.**

Objective: Increase the percentage of those meeting the EAR to 97%.

Rationale: This objective is achievable via implementation of existing multifaceted health promotion efforts.

6.2.3.2.4 Vitamin K

Health Impact: Vitamin K is essential for normal blood clotting. It is involved in the synthesis of clotting factors II, VII, IX, and X. Deficiency leads to easy bruising and bleeding and problems clotting. Vitamin K is essential for newborns who may suffer bleeding tendencies in the first 3 months of life due to poor production of thrombin, particularly in breast fed infants. Hemolytic Disease of the Newborn (HDN) or Vitamin K Deficiency Bleeding Disorder (VKDBD) can cause intracranial or other bleeding and death. This is counteracted by routine administration of vitamin K by injection within hours of birth as recommended by the American Academy of Pediatrics since 1961 and renewed in 2003.

Infants are at particular risk for vitamin K deficiency and, therefore, the increased risk of bleeding that the deficiency causes. There are low levels of vitamin K in breast milk and infants do not produce their own vitamin K until their guts are colonized with bacteria. Due to the short half-life of the clotting factors listed above, vitamin K stores are essential for the maintenance of normal clotting[145, 146].

Most infant formulas are fortified with vitamin K, so vitamin K deficiency is almost exclusively a problem of breast-fed children. The incidence of classical vitamin K deficiency bleeding in newborns has been found to be as high as 1.5% of births. Bleeding is usually from the umbilicus, the gastrointestinal tract, and surgical sites (e.g., circumcision), or, uncommonly, in the brain. Mortality from intracranial hemorrhages from late Hemorrhagic Disease of the Newborn is frequently reported in the literature from countries such as Turkey and India which do not have routine us of vitamin K injection, and also in countries using oral vitamin K, but without sufficient repeated dosages. All infants born in Israel receive 1mg intramuscular injection of vitamin K just after birth, as is common practice in most US hospitals[147].

Vitamin K is also essential for bone growth and blood clotting. While usually present in healthy with normal diets, the inadequate intake may not be reached especially in chronic disease conditions and long term therapy with antagonist drugs.

Local Health Impact: Vitamin K deficiency has been rare in Israel since the 1980s, since compliance with parenteral vitamin K for newborns is believed to be universal in Israeli maternity care units. Adult health impact is unknown.

Dietary sources: Vitamin K is found in cauliflower, brussel sprouts, broccoli, cabbage and kale and in green leafy vegetables, such as spinach and Swiss chard. As mentioned above, it is also synthesized by bacteria in the gastrointestinal tract[148].

Recommended Daily Intake: The Ministry of Health recommends consumption of 120 micrograms per day for all adult men over 19 years old, and 90 micrograms per day for all adult women of vitamin K (RDA)[11].

Typical Israeli Intake: Typical intake of vitamin K in Israel has not been measured or recorded to date.

Baseline: The percentage consuming less than the DRI is unknown.

Developmental data objective: Assess the overall, gender, age, and SES-related percentage of those meeting the DRI.

7. Interventions

7.1 Background

With the development of the nutritional sciences in the early part of the twentieth century, knowledge rapidly grew about the essential role of vitamins and minerals, now referred to as essential micronutrients, and they became part of a complete approach to public health. Public health interventions, among others, are responsible for the addition of some 25 out of a total of 30 years of increased life expectancy at birth in the United States during the 20th century, with safe food and nutrition playing a major role. These achievements are well characterized by the following quote: "*Since 1900, safer and healthier foods have resulted from decreases in microbial contamination and increases in nutritional content. Identifying essential micronutrients and establishing food fortification programs have almost eliminated major nutritional deficiency diseases such as rickets, goiter and pellagra in the United States*"[5]. Specific public health interventional strategies follow.

7.2 Food fortification

7.2.1 Overview

Food fortification implies replacement of essential vitamins and minerals lost in food processing of commonly used foods, or augmenting their levels to adequate and safe levels for provision of daily recommended intake for the bulk of the population. Currently, food fortification and enrichment involves restoring nutrients in an amount approximately equal to the natural content in the food before processing, and may also include adding the nutrient at higher than naturally present levels or adding nutrients that are not naturally present. The food fortification process also allows for standardization of nutrients that show variable concentrations, and for compensation for seasonal and processing variations, such as with the addition of vitamin C to orange juice and other fruit drinks.

Following World War I, food fortification and enrichment were widely adopted in the US with iodization of salt (Morton's Iodized Salt) following studies of goiter among World War I army recruits, and fortification of flour with vitamin B complex to prevent pellagra which was a major disease in the southern US in the 1920s. Fortification of food became well accepted in the US and adopted in 1941 by President Roosevelt in the preparation for war as mandatory for foods considered "enriched". This was done to correct or prevent nutritional deficiencies in populations or to restore nutrients lost during food processing. During this period, the addition of iodine to salt, vitamins A and D to margarine and the vitamin B-complex and iron to flour and bread products was established as accepted practice. Fortification of flour with folic acid was made mandatory in the United States and Canada in 1998.

A Canadian policy review in 2005 decided to retain current fortification practices to prevent and correct nutritional problems, such as the ongoing requirement for the addition of vitamin D to milk to combat the childhood disease of rickets, and the ongoing addition of folic acid to flour to reduce birth defects. Mandatory fortification of foods to restore vitamins and minerals lost through processing continues, and fortification also provides vitamins and minerals deemed to be needed to prevent deficiency conditions in the population. In addition, a new provision for a category of "discretionary fortification" by the manufacturer has been established, within defined limits set by Health Canada to meet market demands[149].

Israel has a long tradition in food fortification, going back to wartime practices in the British empire during World War II. From 1954 to 1984, fortification of flour with iron and vitamin B and with vitamin D was mandatory. This regulation was cancelled in 1984; The rationale for this decision is unknown to the authors of this report. In 1996, the Israeli Ministry of Health appointed a committee headed by Professor Elliot Berry, Professor of Nutrition at Hadassah-Hebrew University to review the issue of micronutrient deficiencies in Israel, The committee reviewed the available evidence from human studies, but this took place before the MABAT 1 survey was carried out, and before evidence that folic acid fortification was a successful intervention in preventing birth defects. The committee found strong evidence of micronutrient deficiencies in the country, and recommended restoration of micronutrients lost in processing such as milling of flour, and fortification with those and other vital minerals and vitamins (see Appendix 2)[150].

During the period from 2001-2008, a Joint Task Force of the Israeli Academy of Sciences, the US Institute of Medicine of the National Academy of Science, the Jordanian Academy of Science and Technology, and the Palestinian Academy of Science developed the recommendations summarized in Table 3. Since 2006, many of these recommendations have been implemented in Jordan and in the Palestinian Authority, including mandatory iodization of all domestic and imported salt, and fortification of both imported and domestic flour with iron, vitamin B complex and folic acid[151]. Some of this flour is imported by the Palestinian Authority from Israeli mills. Fortification of flour and salt has not been implemented by the Israeli Ministry of Health, but negotiations are underway with the Standards Institute which has the regulatory authority over food standards in Israel for flour, milk, and salt standards which are mandatory. The millers, with the exception of several firms, have refused to implement fortification of flour on a voluntary basis, but will be obliged to accept the regulations of the Standards Institute or regulations promulgated by the Ministry of Health and the Ministry of Industry, Trade and Labor.

Table 3: Recommended Mandatory Fortification of Foods, 2006

Food Vehicle	Micronutrient Fortificant	Current Status 2008
Flour	Vitamins B1, B2, B6, folic acid, B12, iron	Mandatory during the 1954-1984 period, but then deregulated. Currently implemented by a few millers on voluntary basis. Requires Ministry of Health regulations to mandate.
Salt (table, industrial, animal)	Iodine	Implemented for salt supplied to the Palestinian Authority; not implemented for Israel.
Milk, 3%	Vitamins D	Recommended to be implemented in all milks, soft cheeses, and yoghurts.
Milk, 1%	Vitamins A and D	Currently fortified by Ministry of Health regulation in place since World War II.
Margarine	Vitamins A and D	Currently fortified by Ministry of Health regulation since World War II.
Fruit drinks	Vitamin C	Implemented widely as a preservative in recent years by manufacturers.

Specific recommendations appear in the following Fortification Guidelines section. They follow the current Canadian regulations[152].

It should be emphasized that food fortification is a dynamic field and thus the following recommendations should be updated as needed through continuous monitoring of the scientific literature and best practice of public health nutrition.

7.2.2 Fortification Guidelines

The World Health Organization's April 2009 Consensus Statement endorses Flour Fortification Guidelines, updating the WHO's in-depth review recommending food fortification published in their 2006 Guidelines for Food Fortification[153].

The type and quantity of vitamins and minerals to add to flour is decided by each country, and the chart below offers guidelines to help countries develop their standards. These recommendations are the result of nearly 100 leading nutrition, pharmaceutical, and cereal scientists and milling experts from the public and private sectors from around the world meeting in 2008 to harmonize their advice for countries considering wheat and/or maize flour fortification.

Table 4: Average levels of nutrients to consider adding to fortified wheat flour based on extraction, fortificant compound, and estimated per capita flour availability[154].

Nutrient	Flour Extraction Rate5	Compound	Level of nutrient to be added in parts per million (ppm) by estimated per capita wheat flour availability (gram per day)[1]			
			<75[2] gram per day	75-149 gram per day	150-300 gram per day	>300[2] gram per day
Iron	Low	NaFeEDTA	40	40	20	15
		Ferrous Sulfate	60	60	30	20
		Ferrous Fumarate	60	60	30	20
		Electrolyte Iron	NR[3]	NR[3]	60	40
	High	NaFeEDTA	40	40	20	15
Zinc4	Low	Zinc Oxide	95	55	40	30
	High	Zinc Oxide	100	100	80	70
Folic Acid	Low or High	Folic Acid	5.0	2.6	1.3	1.0
Vitamin B12	Low or High	Cyanocobalamin	0.04	0.02	0.01	0.008
Vitamin A	Low or High	Vitamin A Palmitate	5.9	3	1.5	1

Notes:

1 These estimated levels consider only wheat flour as main fortification vehicle in a public health program. If other mass fortification programs with other food vehicles are implemented effectively, these suggested fortification levels may need to be adjusted downwards as needed.

2 Estimated per capita consumption of <75 grams per day does not allow for addition of sufficient level of fortificant to cover micronutrients needs for women of childbearing age. Fortification of additional food vehicles and other interventions should be considered.

3 NR = Not Recommended because the very high levels of electrolytic iron needed would negatively affect sensory properties of fortified flour.

4 These amounts of zinc fortification assume 5 mg zinc intake and no additional phytate intake from other dietary sources.

5 This term is defined as the yield of flour obtained from wheat in the milling process. A 100% extraction (or straight-run) is wholemeal flour containing all of the grain; lower extraction rates are the whiter flours from which progressively more of the **bran** and **germ** (and thus B vitamins and iron) are excluded, down to a figure of 72% extraction, which is normal white flour.

7.2.3 Specific Nutrients

7.2.3.1 Minerals

7.2.3.1.1 Iodine

Many international organizations, including the World Health Assembly, World Summit for Children, World Health Organization, and the leaders at the Special Summit on Children at the United Nations, have all prioritized the elimination of iodine deficiency, calling for universal mandatory fortification of salt with iodine. Many countries have virtually eliminated iodine deficiency diseases by virtue of their salt iodization programs; Israel is not among them. Iodized salt is produced in Israel, mainly upon request for the Palestinian Authority, but is poorly marketed in Israel where most salt in uniodized.

Recommendation: In compliance with the recommendation by the World Health Organization, it should be mandatory for all salt in Israel, including agricultural and industrial salts, to be fortified with 20mg/kg[155]. Future step-wise reductions of recommended salt intake and salt concentration in processed foods should be taken into consideration when planning the multi-year effort.

It should be noted that standardization of iodine intake is problematic in Western Europe and many other parts of the world. Therefore iodization of salt should be accompanied by monitoring of urinary iodine levels in children and pregnant women, with supplementation during pregnancy and infancy[156].Monitoring of urinary iodine excretion in children should be instituted according to WHO recommendations[157].

7.2.3.1.2 Iron

Canada and the United States have mandated fortification of flour with iron, among other nutrients, for many decades, with great success in reducing micronutrient deficiencies. Iron levels and compounds based on minimum amounts of iron have been shown to improve iron status of young women in efficacy studies, with levels adjusted for flour consumption and iron bioavailability.

Recommendation: All flour in Israel should be fortified at levels similar to those used in the US and Canada (44 mg/kg)[158], with adjustment for local wheat milling techniques, the type of iron used for fortification, and the estimated average annual wheat product consumption. For further details, see Appendix 2.

7.2.3.1.3 Calcium

Fortification of foods such as cereals and juices provide important sources of calcium. Consumption of the above is encouraged along with daily intake of calcium-rich foods including fruits, vegetables, whole grains, and fat-free or low-fat milk and dairy products such as milk, cheese, and yogurt. Some vegetables provide significant amounts of calcium, as do lean meats, poultry, fish, beans, eggs, and nuts[159].

Recommendation: All flour in Israel should be fortified at levels similar to those mandatory in the UK (and voluntary in the US and Canada): 1400 mg/kg[160].

7.2.3.2 Vitamins

7.2.3.2.1 Water-soluble vitamins

7.2.3.2.1.1 B vitamins

The B vitamins have been crucial in public health policy through most of the 20th century as a result of lessons learned from experiences such as the pellagra epidemic in the southern United States, and the famous Goldberger investigations by the US Public Health Service[161]. This led to fortification of flour with B vitamins in southern states in the US and mandatory since 1941 (iron and vitamin complex), as well as in salt (iodine) and milk (vitamin D).

This issue became even more important in improving public health with the 1990's discovery that folic acid taken before pregnancy could prevent neural tube birth defects. This was especially important and timely, since attempts to increase consumption of folic acid among women of child-bearing age through health education methods had had only very limited success in many international trials.

Although a study done in Israel showed that this approach encouraged pre-pregnancy use of folic acid and prevented birth defects (NTD)[103], the authors recommend implementing food fortification to further increase folic acid uptake. Folic acid supplements for women of childbearing age and folic acid fortification of flour are now recommended practice in many countries including in Israel, but compliance with supplementation recommendations is problematic: usually less than 40% of women of childbearing age take folate as indicated beginning in the preconception period[162]. This has recently been corroborated in an Israeli study as well[163].Consequently, fortification should be considered a more reliable and cost-effective method of protecting against these defects, which are both devastating to parents and costly to society.

Fortification of flour with vitamins is mandatory throughout the North and South American countries along with iron, vitamins B including folic acid and vitamin B12[164]. The effectiveness of such fortification was evident following the mandatory flour fortification instituted by Canada, This policy led to a 46% reduction in neural tube defects, with a greater reduction in the more common spina bifida[165]. Folic acid is beneficial to other segments of society as well, eliminating folic-acid deficiency anemia and promoting genomic stability, and has been linked in observational studies to a reduction in cardiovascular disease[166].

Since adoption of folic acid fortification of flour in the US, Canada and Chile in 1998, many countries in Central and South America have implemented similar fortification. The US Centers for Disease Control and Prevention reported in 2008 that: "From 2004 to 2007, the number of countries with documented national regulations for mandatory wheat-flour fortification increased from 33 to 54. Fifty of the 54 countries with mandatory fortification in 2007 required fortification with both iron and folic acid, two with folic acid but not iron, and two with iron but not folic acid. Twenty-four of those countries also mandated wheat-flour fortification with thiamin, riboflavin, and niacin; two with thiamin and riboflavin; and two with thiamin. The percentage of wheat flour processed in roller mills that was fortified increased from 18% in 2004 to 27% in 2007. Nearly 540 million additional persons, including 167 million additional women aged 15-60 years, had access to fortified wheat flour in 2007 compared with 2004, and the annual number of newborns whose mothers had access to fortified wheat flour during pregnancy increased by approximately 14 million"[167].

Recommendation[5,157]**:** Every kilogram of flour should contain the following nutrients:

B1 (Thiamin)	6 mg
B2 (Riboflavin)	4.5 mg
B3 (Niacin or niacinamide)	50 mg
B6 (Pyridoxine)	2.5 mg
B9 (Folic acid)	1.5 mg
B12 **(**Cobalamin)	0.01 mg

Note: These amounts are calculated based on average consumption of 200 mg per person per day, with Feasible Fortification Levels (FFLs), Legal Minimum Levels (LMLs) and Maximum Tolerable Levels (MTLs). They will be adjusted to Israeli consumption patterns. WHO calculates the cost of these fortificants at $2.34 USD per metric ton of wheat flour, thus adding 0.5% to the cost of the fortified flour.

7.2.3.2.2 Fat-soluble vitamins

7.2.3.2.2.1 Vitamin A

The average daily consumption of vitamin A among both men and women is over the DRI, but only 64.5% meet the EAR. No international recommendations exist to date due to gaps in knowledge of key factors needed for decision-making[168].

7.2.3.2.2.2 Vitamin D

Vitamin D supplements are recommended for 1-12 month olds by the well-baby clinics (*Tipot Halav*) in Israel, and have been for many decades[140].

Fortification of milk with vitamin D has been routine and virtually universal in the United States since the 1940's, and in Canada it has been the law since 1979[169]. Canada and many other countries also fortify margarine with vitamins A and D[170], as does Israel[171]. As per the results of the MABAT 2 survey, Israel should decide what dairy products need to be fortified further than recommended today. Additionally, animal feed should be fortified so that milk has underlying vitamin D content, since cows are no longer raised outdoors with continuing sun exposure, and hence do not synthesize as much vitamin D as they once did. Consequently, they produce milk with smaller concentrations of the vitamin.

Recommendation: All liquid and soft dairy products, including milk and milk substitutes, soft cheeses, yoghurt should be fortified with 400 IU/liter Vitamin D, and margarine with 530 IU/100 grams by mandate of the Israel Standards Institute or through Ministry of Health regulations similar to Canadian regulations[129,172].

7.2.3.3 Fiber

There is a need to increase daily consumption of fiber. This is readily achievable by increasing consumption of fruits and vegetables and whole grains, particularly among subgroups in the population. The MOH is planning to work with the Ministry of Industry, Trade, and Labor and the Association of Industrialists to increase the percentage of whole grains in breads which are price-controlled.

7.3 Supplementation

7.3.1 Minerals

7.3.1.1 Iron

Infants aged 4 to 12 months should receive 15 mg per day. In light of the lack of iron-fortified flour and the difficulties posed to the clinician to ascertain socio-economic risk status, we recommend that serious consideration be given to increasing the universal iron supplementation period to 18 months. Fe-deficiency status should be assessed at 9 -12 months, 18 months, and in high risk toddlers (Arab/ Bedouin, ultraorthodox (haredi), low SES, low birth weight, and premature birth) at 24 months to determine need for continued supplementation.

7.3.2 Vitamins

7.3.2.1 Folic acid

As preventing neural tube defects requires women to begin prophylactic treatment with folate at least one month prior to conception, and it is well-established that a sizeable proportion of pregnancies are unplanned, it is recommended that all women of childbearing age should take at least 400 mcg daily[173].

7.3.2.2 Vitamin D

Infants should be supplemented with 400 IU of vitamin D per day, beginning the first few days of life[174]. Children and adolescents should also be supplemented with 400 IU vitamin D per day, even where milk is fortified with vitamin D. All persons 71 and older should receive supplements of 1000 IU per day145. In general, the “MABAT Larach survey” now being carried out[175], will provide further information regarding pregnancy and postnatal iron use, as well as on Vitamin D supplementation for infants.

Note: The above vitamin supplements should be considered for inclusion for funding in the Health Basket.

7.3.2.3 Vitamin K

All infants born in Israel should receive a 1mg intramuscular injection of vitamin K within 6 hours following birth, following standard practice as mandatory in US and Israeli hospitals[151-152].

7.3.2.4 Vitamin B12

There is evidence of Vitamin B12 deficiency among the frail elderly- those in long term institutional or in other special care. This has been also been noted in the community elderly.

Further research should be undertaken to establish the broad need for supplementation.

7.4 Food Content and Labeling by the Food Industry

7.4.1 Introduction

International practice has shown the effectiveness of food labeling and mandatory reduction of the content of potentially unhealthful ingredients in reducing risk factors and in improving health outcomes. This is a topic of continuing interest for all governments and has developed over the past two decades in Israel and is expected to continue evolving in the future.

The Ministry of Health currently mandates listing the following nutritional information on the labels of packaged foods: energy (kilocalories), total carbohydrates, protein, total fat and sodium. If the total fat content is greater than 4.5%, the Ministry of Health also requires listing of the specific types of fat content: saturated and unsaturated. Additionally, any food that is marketed as ‘enriched’ or ‘fortified’ must list the elements that are added to the food product and specify their quantities.

7.4.2 Specific nutrients

7.4.2.1 Carbohydrates

A general reduction in sugar being added to processed foods, such as fruit juices and baked goods, is one measure to contain high carbohydrate consumption. The inherent sugar may not be avoidable, but extra sugar should not be added. Sugar content of foods should be reduced by 15% by the year 2020. Added sugar should be labeled to allow shoppers proper choices in supermarkets. Use of artificial sweeteners may be preferred to reduce added sugar in processed foods such as fruit juice or baked goods; the US FDA has ruled that there is no evidence that regulated artificial sweeteners on the US market are related to cancer risk[176].

7.4.2.2 Fats

Food labels should more specifically describe the fat content in food products. Trans-fats are particularly harmful. The importation, production, an sale of trans fat-rich foods should be banned by the year 2020. In addition, these fats should be adequately labeled, thus assuring adequate choice for consumers in supermarkets. In Canada, and as will soon be the case in Israel, various types of fat content labeling exist. Among others, they include the following: “trans fat free”, or “low in saturated fats”[177]. The MOH is now in the process of changing labeling requirements to include trans-fat content, and specific fat content in all foods with a total fat content over 2%.

7.4.2.3 Sodium

As most dietary sodium comes from processed foods, it is important that food manufacturers reduce the amount of salt that is used in processing. The salt content in food should be gradually reduced: 25% by the year 2015 and 35% by the year 2020. Food manufacturers should list the amount of salt that is used in preparation of their products on the packaging; this would allow Israelis to better regulate their sodium consumption[178]. In Israel the law requires labeling of sodium content in mg/100 g of the product that is ready to eat[179]. This objective requires increased monitoring of manufacturers by the government.

7.5 Counseling

Intensive behavioral dietary counseling* of individuals with hyperlipidemia, cardiovascular, or diet-related chronic disease is effective in reducing the incidence of cardiovascular disease and various risk factors. This is achieved by changing their dietary behaviors, increasing intake of nutrients such as fruits and vegetables, fiber, and whole grains, while decreasing intake of saturated fats[180, 181].

The most effective interventions generally combine health education, behaviorally-oriented counseling, and patient reinforcement and follow-up. More intensive interventions, and those of longer duration, are associated with larger magnitude of benefit and more sustained changes in diet. Successful interventions have combined nutrition education with behavioral dietary counseling provided by a dietitian or aspecially trained primary care clinician (e.g., physician or nurse). Office-level systems supports (prompts, reminders, and counseling algorithms) have been found to significantly improve the delivery of appropriate dietary counseling by primary care clinicians.

These interventions require adequate training of healthcare providers in nutrition and developing / honing counseling skills using techniques such as motivational interviewing.

Health education materials such as the Israeli Ministry of Health (MOH) dietary intake guide and food pyramid (see Figure 6 below) provide consumers and providers with a model for dietary guidance. The following MOH sites containing additional nutritional tips: http://www.health.gov.il/units/eduction/catalog/tzuna_necuna.htm, http://www.health.gov.il/pages/default.asp?maincat=33&catId=846&PageId=4455

The Sick Funds should increase the availability of dietitians who are available to work with individuals and high-risk populations, such as diabetics[182], the obese, and cardiac patients[183, 184]. Patients must be made aware of the services available to them; referrals of high-risk patients to nutritional counseling should be built into the primary care system. In order to better equip all health care providers to counsel their patients about nutrition and healthy lifestyle choices, the various training programs need to increase the time allotted to nutrition in their curricula and the Sick Funds should include nutrition as part of continuing education courses for their providers. Preventive education and training of healthcare providers is the topic of an entire Healthy Israel 2020 committee report. Nutritional counseling should be a part of the current mandatory computerized field for primary care providers so that it can be assessed and incentivized by both the Health Funds and the MOH.

* Defined as provision of at least six, thirty-minute sessions

Figure 6: Food pyramid recommended daily servings of food, Israel, Ministry of Health.

Source: Department of Nutrition, Ministry of Health, 2008[185].

7.6 Community Health Interventions

7.6.1 The Community at Large

The Israeli Ministries of Health, Education, and Culture and Sport should actively encourage Israelis to make healthy eating choices, restrain body mass increases, and increase levels of physical activity in the context of a generally healthier lifestyle. They should conduct outreach educational programs, and survey the population to evaluate their baseline knowledge, attitudes, and practices as well as the efficacy of any interventions employed. This should include campaigns in municipalities and could be centered on the Ministry of Health's food pyramid. Further detail on obesity control interventions may be found in the Healthy Israel 2020 report on obesity control.

Large community-based interventional studies in the area of nutritional are less common than in the past. Many of those that have been conducted focused on improving cardiovascular health and were predominantly conducted in the US during the period 1990-2002.

A systematic review of these interventions[186] indicated success using the following strategies to increase the purchase and consumption of healthful foods:

1. Point of purchase nutrition education/labeling strategies;
2. Price reductions and the distribution of coupons to defray costs[187];
3. Mass and individual-level media interventions;
4. Provision of healthful eating guidelines to establishments with dining facilities such as restaurants, hotels, and clubs.
5. Improved availability of fruits, vegetables and other healthful foods in low income areas[188].

In general, high intensity, multi-faceted interventions were found to have a greater effect than those of lower intensity, but are inherently more expensive to field than the latter[189].

7.6.2 Schools

Although one systematic review[190] found insufficient evidence that multi-component school-based interventions were successful in increasing intake of fruits and vegetables and decreasing fat and saturated fat intake among school-aged children, two others[190, 191] concluded that demonstrable change in consumption can be achieved. These should be applied in Israel to a greater extent than in the past and appropriately evaluated to assure they are tailored to local needs and constraints.

The Ministry of Health has recommended to the Ministry of Education that schools provide more fruits and vegetables to children in place of salty or sweet foods and encourage parents and other caregivers to do the same at home. In fact, the Ministry of Education has published this recommendation on its website[192]. Beginning in elementary school, children should be taught about the nutritional values of food. School curricula and teacher training should provide sufficient background in nutrition so as to provide children with guidance in food selection and promote healthful food habits[193] The "Tafur Alay" ("Just Right for Me") project[194] is a typical school and community-based nutritional intervention promoting fruit consumption through a health education program. The Ministry of Education has recently begun inspection of school food and vending machine content and, in general, has designated healthy lifestyle as the central theme of the 2011-12 school year[195].

Since 2008, the Israeli MOH has conducted a monitoring program to assess child growth. Weight, height and BMIs are measured and assessed at schools. Parents of children whose measurements are high or low are notified so the child (and his or her family) can benefit from professional nutritional counseling[196].

7.6.3 Other institutions

All institutions that serve food, including the Israeli Defense Forces, worksites, private preschools and kindergartens, chronic care institutions, and correctional institutions should increase the inclusion of fruits and vegetables in the menus as has been done in various settings around the world.

7.7 Addressing Food Insecurity

7.7.1 Background

A variety of programs have been proposed to increase the purchasing power of the poor so as to lead to improved nutrition. These include a negative income tax for individuals or families earning below a certain threshold, eliminating the VAT on food purchased by the poor, and issuing food stamps via a credit card system to eliminate the stigma associated with buying food using paper stamps or vouchers[197]. This type of financial resource issue is best assessed by the government Ministries of Welfare and Finance.

Improving school-provided food programs for all children is another suggestion of special importance to poor children, as it avoids labeling the poor. Sixty-percent (200,000 (of pupils in public schools in Israel are provided with lunch. Many children are fed two meals a day at school, and children in religious schools often receive three meals, by virtue of their longer school day. It is imperative that the food these children receive be nutritious and model good nutritional choices for them. However, there is a lack of compliance by the municipalities and education system as stated in a recent report by the State Comptroller[198]. This shortcoming should be remedies through increased oversight and enforcement forthwith.

7.7.2 Food price supervision and subsidies

Beginning from the 1980's, governmental subsidies for foods were gradually reduced. Currently, no foods are subsidized apart from "special medical" foods, intended for those suffering from specific conditions, and also flour for preparation of gluten- free bread and other gluten-free foods for celiac patients. These are subsidized by the Ministry of Health to cover the special needs of this population group[199]. Similarly, in line with the law of price control for foods and services, there is a list of fixed maximum prices for certain products, with the prices being decided by the Ministry of Trade and Industry and/or the Ministry of Agriculture. The government does not subsidize food, but supervises pricing. Examples of foods currently price-controlled include the following: butter, HaEmek and Gilboa (yellow) hard cheese, salt, and white bread[200]. It is evident that price-controlled decisions generally do not correlate with recommendations for healthful and sensible nutrition as recommended by the Israeli MOH[186].

Price supervision of food of high nutritional value can increase their availability and consumption among lower socioeconomic groups, and should lead to reductions in expenditures on diseases caused by obesity and unhealthy nutrition such as cardiovascular disease, diabetes, hypertension and certain types of cancer.

The previous chapters of this report describe the clear health advantages in consuming foods such as whole grain cereals (such as whole-wheat flour or oats), whole meal bread, legumes, fruit and vegetables, foods such as low fat dairy products, poultry and meat, low fat spreads and sauces (mainly low in saturated and trans fats), and those foods reduced in sugar and salt as compared to other similar products.

The suggestions for price supervision or legislation for food prices of suitable healthy foods must be based on work carried out by professional committees, which should include representatives of research institutes, the food industry, the general public, and, of course, relevant government ministries. Table 5 contains suggested changes for healthy foods to be placed under price supervision.

Table 5: Foods Under Price Supervision

The current situation	Suggested changes
Lechem Achid (semi-whole wheat white bread (sliced and unsliced)), Challah	Add whole wheat bread and whole wheat pita
Table salt (coarse and fine)	Iodized salt
Milk and dairy products with 1% and 3% fat content in plastic bags and in cartons	Only fortified milk with Vitamin D and calcium
Fluid milk products: Eshel (4.5% fat), Leben (3% fat), sour cream (15% fat)	Retain Eshel and Leben without trade names
Butter	Delete
Full fat and semi fat hard cheeses: Emek, Gilboa. Packaging types: in blocks and pre-packaged.	Block (non-packaged) cheese with no more than 20% fat. No trade names should be specified.
Eggs, in trays of 12 units	Retain
-	Fresh fruit and vegetables for schools

8. Research and Monitoring

8.1 Research

In order to understand how best to address the nutritional needs of Israeli society, the government, at both the national and local level, must first understand the current nutritional status of Israelis. MABAT 1: The First Israeli National Health and Nutrition Survey, was modeled after the US National Health and Nutrition Survey (NHANES). It was conducted from 1999 to 2001 and its results were published in 20031, 2. The MABAT survey details the eating habits of Israelis and compares those choices to the recommendations made by the Ministry of Health, as described previously.

The Nutrition Department of the Ministry of Health had a plan to collaborate with the U.S. CDC and Al Quds University is implementing a parallel nutrition survey among the Palestinian populations of the West Bank, Gaza and East Jerusalem, but due to the political issues it was not carried out.

The MABAT 1 survey provides a wealth of information to help direct policy-makers in dietary standards and recommendations to manufacturers and the general public. This survey of a representative sample of the Israelis should be periodically repeated to enable the government to monitor trends in food intake, nutritional status, and general health of the population. The MABAT 2 survey of age group 25-64 commenced in December 2009. It incorporates modifications derived from the lessons learned from MABAT 1.

The “MABAT Larach survey” began in 2009 and is still under way as this chapter is being prepared for publication. It utilized a sample of 2000 infants and toddlers aged 0-2 years, and will explore dietary behaviors of this population, including breastfeeding. It should provide further information regarding pregnancy and postnatal iron use, and Vitamin D supplementation for infants.

8.2 Monitoring

Monitoring must take place at the individual level by healthcare providers. The Sick Funds should continue to monitor BMI, along with other health and nutrition indicators, paying particular attention to the nutritional needs of each life-stage. Along with the Well-baby clinics (*Tipot Chalav*), the Sick Funds should continue to monitor the nutritional status of infants, children, adolescents, as well as the elderly and other high nutritional risk groups. This data should be made available on a continuing basis.

The government currently regulates food content and quality. National and municipal authorities should monitor the food provided in institutions, pre-schools and schools, workplaces and in the IDF. When new policies require changes in the ingredients of food products, the responsibility for monitoring rests with the manufacturers, but must be overseen by the government.

9. Summary and implementation strategy

9.1 Introduction

Israel has advanced to developed country status, and as such, needs to meet the challenge of over-nutrition and the chronic diseases in its wake. Yet at the same time, it has not adequately reduced problematic social, ethnic, regional and economic gaps which manifest as significant inequalities in the types and quantities of food available to various groups, thus leading to under-nutrition as well. Prevention of subclinical and clinical deficiency conditions groups outlined in this paper should be accorded high national priority. In addition, the following paragraphs provide specific implementation details that are essential to the realization of the recommendations specified in this report.

9.2 Policy initiatives: Fortification, Supplementation, Labeling, and Financial strategies

Poverty reduction, selective vitamin/mineral supplementation, and food fortification are public health measures needed to ensure that all Israelis have adequate nutrition, irrespective of their food budgets or access to information. This translates into both the provision of accessible nutrients in the diet, as well as assuring that the public possesses the knowledge, attitudes, behaviors, and skills to take advantage of the range of foods provided. The former involves a combination of government regulation, industry incentives, and negotiation, while the latter primarily involves health education and promotion. Both require monitoring of performance.

Healthful nutrition can best be assured through a combination of enrichment and fortification of basic foods, such as bread, milk, and salt, along with provision of supplements for groups at special risk for deficiencies, including infants, children, adolescents, adult women, institutionalized elders and others.

Regulation of food products by public health authorities involves national and local governments. The food processing industry and the management and staff of restaurants and cafeterias must be educated about the standards set by the government. They should be encouraged and assisted to meet compliance expectations and self-regulation measures. Industry leaders and government officials must work together to ensure fulfillment of best manufacturing practices along with necessary monitoring.

Technical support, and in cases deemed to be of high national importance, financial incentives such as tax rebates or subsidies, should be considered to encourage food manufacturers to implement healthful food production in accordance with best international practice. The MOH, the Ministry of Agriculture, the Ministry of Industry, Trade, and Labor, and the National Standards Institute should oversee food manufacturers and the agricultural industry regarding food safety and nutritional quality in keeping with the Food Law. Regulations based on the highest international standards and dealing with manufacturing and institutional issues should be issued and periodically revised by the MOH.

9.3 Education of professionals, industry, and the general public

Nutrition education should be increased for health care providers throughout their educational cycle. The Sick Funds should oversee continued medical education. This recommendation is elaborated upon in the report of the Education and Training Committee of Healthy Israel 2020.

The Nutrition Department of the Ministry of Health is tasked with spearheading implementation of an expanded program in nutrition for the Israeli population as a whole, and its component groups with their differing nutritional needs. It collects information on the population's nutritional status and provides instruction and advice to the entire population and to special groups on topics ranging from infant to geriatric nutrition. Jointly with the MOH Health Education and Promotion Department, the Nutrition Department participates in nutritional instruction programs throughout the country for public health nurses, nutritional programs at nursing schools, symposia for employees of various government Ministries and other workplaces, and in instructional programs for interning dieticians.

Evidence-based guidelines for health foods and nutrition should continue to be published on a regular basis by the Ministry of Health for individuals, institutions, the Sick Funds, health care providers, food manufacturers, and for the general public.

Ultimately, the key to achieving significant long term progress lies in synergy: governmental agencies such as the Ministries of Health, Education, Agriculture, Social Welfare, Industry, Trade and Labor, Internal Security (responsible for the prison system) and Defense (via the Israeli Defense Forces) must work together on a national and community level, interfacing with local leaders in municipalities, schools, the faith community, and community centers to effect change. Leaders of commerce and industry and those setting the tone in the media have critical roles to play. Non-governmental organizations such as those providing care for the elderly and the disabled should be natural partners as well. All parties should direct their efforts at informing and empowering the public to truly leverage the vast human capital Israel has at its disposal.

9.4 Monitoring, research, and oversight

Nutrition is a dynamic field of public health and agricultural, epidemiologic, and nutritional sciences. It is in a continuing state of development and reevaluation as the scientific base expands. The Ministry of Health should conduct MABAT nutrition status monitoring every ten years, with specific surveys during intervening years. Infant and child growth (height, weight, head circumference, and BMI) should be monitored annually and published in summary reports and presented by age (e.g., anthropometric data on infants and children), gender, ethnic group, region of residence, and maternal education levels. Funding for continuing nutrition research by academic centers, in cooperation with the Ministry of Health, should be made available to broaden the information base available for policy generation and revision.

Expert advisory nutrition committees have been established in the United States, the United Kingdom, and in other countries to advise and enable the national public health authority to effectively coordinate, monitor, and implement nutrition policy objectives. **It is recommended that in Israel as well, a multi-sectoral and multidisciplinary Nutrition Advisory Committee (NAC) to the Ministry of Health be established**. It should serve as an advisory and facilitative group linking the Ministries of Health, Industry, Trade and Labor, Defense, Education and Agriculture as well as with food manufacturers' associations, academic and public representatives and the Sick Funds, to assist in policy development and implementation. Among other functions, the NAC would work to address any nutrition-related questions that arise and would, in general, increase nutrition awareness and behaviors among institutions, the general public, insurers, and providers, as well as facilitate the continued monitoring of nutrition statutes and regulations. (See Appendix 4 for a brief recapitulation of the recommendations).

9.5 Prioritized recommendations for implementation

9.5.1 Methodology

Prioritization of interventions was determined through consideration of the following factors: population reach (e.g., entire population > segment thereof), health impact, and practicability (including estimated cost and adherence). These were ranked from 1 (highest) to 3 (lowest) via committee consensus.

Note: Rankings for each of the above categories are listed in the order they appear above (i.e., reach, impact, and practicability) in parentheses from left to right.

9.5.2 Recommendations

1. **Implement mandatory fortification of basic foods** with the vitamins and minerals listed below. Fortification levels should reflect a balance between disease prevention and consumer safety, as reflected in international practice and the scientific literature. Regulation of voluntary fortification is important should be in concordance with mandatory fortification under supervision of the Ministry of Health. Imported foods should be fortified to meet the requirements of Israeli legislation (**Ranking: 1, 1, 1**).

   The Ministry of Health should work with the food industry and Standards Institute to achieve the following actions:

   Note: Specific concentrations appear in paragraph 6.2, Food fortification, above.

   a. All flour imported and/or produced in Israel should be fortified with iron, calcium and the full vitamin B complex, including folic acid.

   b. All salt should be fortified with iodine. This should take into account future step- wise reductions of recommended salt intake and salt concentration in processed foods.

   c. All dairy products (including milks, yoghurts, soft cheese, and milk substitutes) should be fortified with vitamin D.

   d. Community water supplies should be fluoridated (An in-depth discussion of this topic appears in the Oral Health report of the Healthy Israel 2020 initiative).

2. **Ensure more healthful food and drink** through regulation, definition of labeling standards for macro- and micronutrients, and provision of healthful menus in large organizations (**Ranking: 1, 1, 2**). Particular attention should be paid to the following:

    a. Ban trans fat-rich food by the year 2013. This should include importation, production, and sale of these foods. Trans fats should not be replaced with saturated fats.

    b. **Reduce the use of sodium** in manufactured foods by 25% by 2015 and by 35% by 2020, with clear labeling of foods with a high salt content.

    c. **Reduce the sugar content in processed foods** by 15 % by the year 2020. Sugars of all kinds should be clearly labeled on products.

    The MOH should work with the food industry as well as with schools, institutional settings (homes for the elderly, camps, universities, colleges, group residences, prisons and other communal settings), communities (at local food outlets, catering facilities, and at community functions where food is served), workplaces, and the Israel Defense Forces to develop standards which define minimum recommended intake levels of healthful nutrients and upper levels of those whose excessive intake may be harmful, as well as labels clearly identifying both.

3. **Healthcare providers should provide nutritional counseling for people with nutrition-related chronic diseases and/or risk factors** for disease in keeping with best international models of practice and in a culturally-appropriate fashion. This includes recommending the healthful diets delineated in this report, as well as the following dietary supplements:

    a. **Vitamin D:** intake of daily Vitamin D supplements and/or limited daily exposure to the midday sun, pending solar sensitivity of the skin. To assure adequate intake, children and adolescents should receive 400 IU supplements daily, and the elderly (age 71 and above) 1000 IU per day (**Ranking: 1, 1, 2**).

    b. **Iron:** Infants aged 4 to 12 months should receive 15 mg per day of iron. In light of the current lack of iron-fortified flour and the difficulties clinicians face ascertaining socio-economic risk status, it is recommended that serious consideration be given to extending the universal iron supplementation period to 18 months. Fe-deficiency status will be assessed at 9 -12 months,18 months, and in high-risk toddlers (Arab/Bedouin, ultra-orthodox (haredi), low SES, low birth weight, and premature birth) at 24 months to determine need for continued supplementation (**Ranking: 1, 1, 2**).

    c. **Folic acid:** Women of childbearing age should be encouraged by all health and social agencies and their healthcare providers to consume daily supplements containing 400 micrograms/day of folic acid (**Ranking:2, 1, 2**).

    Note: Folic acid and Vitamin D should be considered for inclusion and funding in the Health Basket.

4. **Vitamin K**: parenteral supplementation should continue to be provided at birth for all Newborns (**Ranking: 3, 1, 1**).

9.5.3 Conclusion

Israel has an ample food supply, and Israelis have a variety of healthful eating habits, such as a relatively high fruit and vegetable consumption, which are of great benefit to their nutritional status. Population mean and median values of many micronutrients such as the water-soluble vitamins (most B-vitamins, as well as vitamin C) are well within normal limits. Nevertheless, deficiency conditions exist in specific population groups, e.g., iron and folic acid deficiency among women. Increasing concern has been expressed regarding vitamin D deficiency in the population as well. Micronutrient deficiency conditions pose challenges for individuals, the population at large, for providers of health services, as well as for those entrusted with developing evidence-based and practicable public health policy.

At the other extreme, over-nutrition is likely with respect to nutrients such as trans fats and sodium. These account for a significant portion of the preventable chronic disease burden in Israel. Excess calorie consumption relative to energy expenditure is another critical area, leading to increasing rates of obesity, diabetes, certain cancers, and other debilitating chronic conditions.. The latter has been elaborated upon in the report of the HI2020 subcommittee on obesity control (chapter 5, Strategies and interventions page 91 in this volume).

These issues should be addressed utilizing the best available scientific evidence and international best practices in order to assure maintenance of the highest public health standards for the population. Systematic and comprehensive strategies such as micronutrient food fortification and supplementation, banning and/or creating disincentives to consume unhealthful foods, and food labeling tailored to the health literacy levels of broad segments of the population are essential. Societal measures such as healthful food provision to needy groups, ensuring adequate access to healthful food for all, education of the general public regarding the health benefits and risks of over- and under-nutrition, and careful monitoring of public health nutrition status are also vital to a nation's health. Implementation of these strategies will require a combination of regulatory and voluntary efforts by all involved parties, from food manufacturers through various retail food establishments, as well as caterers and those responsible for food vending machines in locations such as schools and worksites.

Training and education of health professionals about healthful nutrition is critical to achieving these ends. Continued research and monitoring of trends are necessary to provide the data and knowledge to meet ongoing challenges.

With these key health policy and practice ingredients in place, Israel should indeed possess a wholesome recipe for sound nutritional health.

Appendix 1: USDHHS, Healthy People 2020-Food and Nutrient Consumption Objectives

NWS-14 Increase the contribution of fruits to the diets of the population aged 2 years and older

Baseline:	0.5 cup equivalents of fruits per 1,000 calories was the mean daily intake by persons aged 2 years and older in 2001–04
Target:	0.9 cup equivalents per 1,000 calories
Target-Setting Method:	Evidence-based approach (Considered the baseline in relation to 2005 Dietary Guidelines for Americans [DGA] recommendations, past trends and potentially achievable shift in the usual intake distribution, and applicability of the target to subpopulations)
Data Source:	National Health and Nutrition Examination Survey (NHANES), CDC, NCHS and USDA, ARS

NWS-15 Increase the variety and contribution of vegetables to the diets of the population aged 2 years and older

NWS-15.1 Increase the contribution of total vegetables to the diets of the population aged 2 years and older	
Baseline:	0.8 cup equivalents of total vegetables per 1,000 calories was the mean daily intake by persons aged 2 years and older in 2001–04 (age adjusted to the year 2000 standard population)
Target:	1.1 cup equivalents per 1,000 calories
Target-Setting Method:	Evidence-based approach (Considered the baseline in relation to 2005 DGA recommendations, past trends and potentially achievable shift in the usual intake distribution, and applicability of the target to subpopulations)
Data Source:	National Health and Nutrition Examination Survey (NHANES), CDC, NCHS and USDA, ARS
NWS-15.1 Increase the contribution of dark green vegetables, orange vegetables, and legumes to the diets of the population aged 2 years and older	
Baseline:	0.1 cup equivalents of dark green or orange vegetables or legumes per 1,000 calories was the mean daily intake by persons aged 2 years and older in 2001–04 (age adjusted to the year 2000 standard population)
Target:	0.3 cup equivalents per 1,000 calories
Target-Setting Method:	Evidence-based approach (Considered the baseline in relation to USDA Food Guide recommendations, past trends and potentially achievable shift in the usual intake distribution, and applicability of the target to subpopulations)
Data Source:	National Health and Nutrition Examination Survey (NHANES), CDC, NCHS and USDA, ARS

NWS-16 Increase the contribution of whole grains to the diets of the population aged 2 years and older

Baseline:	0.3 ounce equivalents of whole grains per 1,000 calories was the mean daily intake by persons aged 2 years and older in 2001–04 (age adjusted to the year 2000 standard population)
Target:	0.6 ounce equivalents per 1,000 calories
Target-Setting Method:	Evidence-based approach (Considered the baseline in relation to 2005 DGA recommendation, past trends and potentially achievable shift in the usual intake distribution, and applicability of the target to subpopulations)
Data Source:	National Health and Nutrition Examination Survey (NHANES), CDC, NCHS and USDA, ARS

NWS-17 Reduce consumption of calories from solid fats and added sugars in the population aged 2 years and older

NWS-17.1 Reduce consumption of calories from solid fats	
Baseline:	18.9 percent was the mean percentage of total daily calorie intake provided by solid fats for the population aged 2 years and older in 2001–04 (age adjusted to the year 2000 standard population)
Target:	16.7 percent
Target-Setting Method:	Evidence-based approach (Considered the baseline in relation to USDA Food Guide recommendations, potentially achievable shift in the usual intake distribution, and applicability of the target to subpopulations)
Data Source:	National Health and Nutrition Examination Survey (NHANES), CDC, NCHS and USDA, ARS
NWS-17.2 Reduce consumption of calories from added sugars	
Baseline:	15.7 percent was the mean percentage of total daily calorie intake provided by added sugars for the population aged 2 years and older in 2001–04 (age adjusted to the year 2000 standard population)
Target:	10.8 percent
Target-Setting Method:	Evidence- based approach (Considered the baseline in relation to USDA Food Guide recommendations, potentially achievable shift in the usual intake distribution, and applicability of the target to subpopulations)
Data Source:	National Health and Nutrition Examination Survey (NHANES), CDC, NCHS and USDA, ARS
NWS-17.3 Reduce consumption of calories from solid fats and added sugars	
Baseline:	34.6 percent was the mean percentage of total daily calorie intake provided by solid fats and added sugars for the population aged 2 years and older in 2001–04 (age adjusted to the year 2000 standard population)
Target:	29.8 percent
Target-Setting Method:	Evidence-based approach (Considered the baseline in relation to USDA Food Guide recommendations, potentially achievable shift in the usual intake distribution, and applicability of the target to subpopulations)
Data Source:	National Health and Nutrition Examination Survey (NHANES), CDC, NCHS and USDA, ARS

NWS-18 Reduce consumption of saturated fat in the population aged 2 years and older

Baseline:	11.3 percent was the mean percentage of total daily calorie intake provided by saturated fat for the population aged 2 years and older in 2003–06 (age adjusted to the year 2000 standard population)
Target:	9.5 percent
Target-Setting Method:	Evidence-based approach (Considered the baseline in relation to 2005 DGA recommendation, past trends and potentially achievable shift in the usual intake distribution, and applicability of the target to subpopulations)
Data Source:	National Health and Nutrition Examination Survey (NHANES), CDC, NCHS and USDA, ARS

NWS-19 Reduce consumption of sodium in the population aged 2 years and older

Baseline:	3,641 milligrams of sodium from foods, dietary supplements and antacids, drinking water, and salt use at the table was the mean total daily intake by persons aged 2 years and older in 2003–06 (age adjusted to the year 2000 standard population)
Target:	2,300 milligrams
Target-Setting Method:	Evidence-based approach (Considered the baseline in relation to the 2005 DGA recommendations and Institute of Medicine [IOM] Dietary Reference Intakes [DRIs], past trends and potentially achievable shift in the usual intake distribution, and applicability
Data Source:	National Health and Nutrition Examination Survey (NHANES), CDC, NCHS and USDA, ARS

NWS-20 Increase consumption of calcium in the population aged 2 years and older

Baseline:	1,118 milligrams of calcium from foods, dietary supplements and antacids, and drinking water was the mean total daily intake by persons aged 2 years and older in 2003–06 (age adjusted to the year 2000 standard population)
Target:	1,300 milligrams
Target-Setting Method:	Evidence-based approach (Considered the baseline in relation to IOM DRIs, past trends and potentially achievable shift in the usual intake distribution, and applicability of the target to subpopulations)
Data Source:	National Health and Nutrition Examination Survey (NHANES), CDC, NCHS and USDA, ARS

Appendix 2: 1996 Berry Committee Report

Committee for the Evaluation of the Need for Food Enrichment with Vitamins and Minerals in Israel

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Introduction

There is a lack of up-to-date information in Israel as to the state of the country's nutrition. This impedes conduct of an in-depth discussion of the issue. As a result, the committee had to rely on policies taken from Western European and North American countries, with the caveat that the nature and needs of the Israeli population (immigrants, minorities, etc.) may be quite different.

At the outset, it is important to distinguish between two states:

1. Food restoration, meaning restoring the vitamins and minerals to various foodstuffs, primarily white bread, to replace that which was lost during the food processing phase.
2. Food supplementation / Fortification.

With respect to food restoration, there exist recommendations of the FAO/ WHO Codex Alimentarius Commission Food Standards Programme to restore ingredients such as vitamins and minerals to foods in cases where the ingredient was present in the original foodstuff prior to its processing in a quantity≥10% of the Recommended Daily Allowance (RDA). There is a consensus in Israel in favor of recommending this practice for items such as bread, milk, and milk products, and to anchor it in legislation (tables 1, 2). The same applies to foodstuffs intended to serve as substitutes for conventional foods, such as margarine/butter. Regarding thiamin, for example, it is worth mentioning that approximately 50% of the required daily allowance come from these foods.

On the other hand, Food supplementation / Fortification is the subject of dispute between two camps – the formalists and the pragmatists. The former claim that food enrichment should be applied in high-risk populations, where deficiency has been shown to exist, whereas the latter recommend that the supplements be provided to the entire population in order to reach the high-risk groups. There is no doubt that individual treatment by a doctor or dietician is preferable once a nutritional deficiency has been diagnosed, however, the at-risk groups – children, the elderly, women of childbearing age and the lower social percentiles – are unfortunately outside the traditional scope of monitoring and therefore not likel to be diagnosed by a relevant authority. In the interest of reaching these populations, to the case can be made to fortify foods, provided this does not pose a risk to the normal public at large. Those that hold this view feel that food supplementation is one of the most effective ways of reducing the risk of dietary deficiency in the population. At the other pole are the dieticians, researchers, and scientists who believe that uncontrolled food supplementation may cause a "dangerous" excess as well as send confusing dietary/educational messages to the public.

This discussion is not limited to the theoretical realm alone. For example, a survey among ambulatory population of the over-70 population in Jerusalem (table 3), indicates that low levels of hemoglobin (approximately 6%), iron (approximately 13%), and vitamin B12 (approximately 6%) exist. These deficiency levels are higher than the norm in Europe.

Information on nutritional deficiencies in Israel

1. **Iodine**

During the 1950's and 1960's Brand et al. published a number of papers referring to the high incidence of goiter in the north of Israel among the Arab population in the western Galilee and in residents of the Golan heights, as well as among the Jewish population in the (kibbutzim of) Upper Galilee and the Jezre'el Valley. This research indicated that the percentage of the population with clinical goiter ranged between 10-40%. The explanation presented at the time was that the populations in the villages and kibbutzim were not receiving sufficient iodine due to a lack of the mineral in the local water supply and soil, which led to a deficiency in the drinking water supply and in agricultural produce. Further surveys have not been conducted since the 1960s and there was no official response to these findings. Neither was there any response to the recommendations of the WHO regarding the worldwide fortification of salt (with iodine). This remains the case, despite the changes that have taken place since in the marketing of food products and water sources.

A survey of iodine in the water was conducted in the early 1980's by Rosenthal et al. in various places in the north of Israel. Very low levels of iodine were found in purified sewage water and in the waters of the Upper Jordan. The researchers tried to explain the decline in the reported cases of goiter as being the result of the fact that the population in the villages had since then changed their water and food sources with new sources rich in this mineral. Later on, Zack et al. tested the drinking water in the Southern Judean Hills and in the north, but found low iodine levels.

The prevention of iodine deficiency was raised once again by the WHO in 1986, as well as in Europe, where special emphasis was placed on recommendations for the prevention of clinical and subclinical deficiencies of the mineral. It was found that subclinical deficiency impacts the proper development of the embryonic and juvenile neural system without causing goiter or any other overt clinical symptom to appear and identify the state of deficiency. It was therefore recommended that salt be enriched with iodine. It may also be added to oil and flour.

2. **Iron**

The surveys conducted in Israel by Palti and Tulchinsky regarding the prevalence of anemia and iron deficiency indicate that a substantial problem exists, especially among high-risk populations such as infants, children, women of childbearing age, pregnant women and the elderly. Deficiency was very prevalent among infants, characterizing: some 45% of the population in a nationwide sample. Other research showed that infant iron deficiency causes long term damage to cerebral functions. This manifests primarily as the child reaches school age, in spite of the fact that by this time the child is no longer anemic. In a survey conducted among "healthy" donors, it was found that there was iron deficiency among 20% of the population.

The issue of infant iron deficiency was partially addressed in 1985, when the Ministry of Health recommended routine administration of iron to infants at 4-12 months of age, in addition to supplementation with vitamins A+D. A recommendation has also been issued to supplement pregnant women's diets with iron and folic acid. There are fears that these recommendations will not be fully implemented and there is still a debate among doctors as to administering iron and causing iron overload on the one hand, and the stimulation of the creation of free radicals on the other hand. Most manufacturers have been adding iron and vitamins to baby formulas as well as to breakfast cereals since 1986. The deciding factor here is economic/commercial, rather than for health reasons. Pediatric and gynecologic experts in the United States, as well as the scientific literature, recommend that iron deficiency be prevented through nutrition, by individual treatment and by fortifying foods with iron – especially foods consumed primarily by juveniles and adolescents.

3. **Vitamin D**

In spite of the abundance of sunshine throughout most of the year and the recommendations to fortify baby diets with vitamins A+D as a matter of routine, there is still room for concern as far as vitamin D deficiency is concerned. A survey done by the Department of Nutrition in the Ministry of Health in 1977/1978 using pediatricians in the family health clinics, found clinical markers of vitamin D deficiency among 1.8% of all patients.

Following a request from the Hospitalization Services Unit in the Ministry of Health in 1983, Sorokk Hospital reported some 50 cases of child admissions due to rickets, which was subsequently confirmed through X-rays and biochemistry tests over a five-year period. From the Afula hospital 141 hospitalized cases were reported between 1977 and 1982, and the Kaplan Medical Center reported 20 such cases.

Low levels of vitamin D were found among geriatric patients in the 1980s. In these reports there was a link between low levels of vitamin D and the incidence of osteomalacia. This led to the recommendation to prescribe supplements of vitamin D as a preventive treatment for the elderly.

It has been common in Israel for many years now to add vitamins A+D to margarine and low-fat milk, but not to regular milk or dairy products. Since the consumer population most in need of vitamin D is children, it is important to recommend the fortification of dairy products targeting this population, as well as the fortification of all the 1% milk everywhere in the country. As for the fortification of the 3% milk – this would be desirable, especially where there is evidence of a deficiency in calcium intake among female adolescents, and also in the event that research may indicate this in future.

4. **Calcium**

Certain communities in Israel have an aversion towards the consumption of dairy products, primarily due to lactose intolerance. In addition, women of childbearing age suffer from calcium deficiency in their diets. It is therefore recommended to consider food fortification with calcium to prevent osteoporosis.

5. **Ascorbic Acid (vitamin C)**

It would appear that there is a sufficiently abundant supply of vegetables and citrus fruit to provide for all of the population's dietary needs for vitamin C. However a survey among "healthy" blood donors showed a deficiency of ascorbic acid among some 26% of the population. Long-term hospitalization wards showed that 2% of the patients suffered from a deficiency.The Ministry of Health decided therefore to mandate a dosage of 50 mg ascorbic acid as a matter of routine among all patients in geriatric wards.

6. **Folic Acid**

In order to minimize the incidence of neural tube birth defects, folic acid must be added to flour and cereals at a rate of 0.43-1.4 mg/kg, if the US recommendation is to be adopted.

Recommendations

1. Establish an ongoing system for monitoring the state of the nutrition in the country via periodic nutritional surveys.
2. Set up a database with a control system (food labs) regarding the nutritional composition of every foodstuff consumed in Israel.
3. To restore to foodstuffs, primarily to bread from white flour, those vitamins and minerals lost in the process of their preparation: food restoration.

White flour / 100 grams:

Vitamin B1	Thiamine 0.45 – 0.75 mg.
Vitamin B2	Riboflavin 0.25 – 0.50 mg.
Niacin	16 mg.
Iron	3 – 5 mg.
Calcium carbonate	110 – 140 mg.

4. Food fortification – fortify certain foods with the following ingredients:
   a. Iodine in salt. This should be in the form of potassium iodide – up to 0.01%.
   b. Vitamin C
      Fortify at a level of 50-100 mg per 1000 cc in all non-natural beverages such as soft drinks, syrups (in accordance with the recommended dilution), as well as in sparkling drinks etc.
   c. Folic acid for flour and cereals – fortify in a range between 0.95 – 3.1 mg/kg.
5. The government should issue standards regarding the permitted upper and lower levels.
6. A standing committee should be established to supervise the implementation of the recommendations and the establishment of a monitoring infrastructure.

Food fortification is essential to the promotion of public health.

Food fortification without the existence of an assessment and monitoring system borders on the irresponsible and could be potentially harmful to the health of the public.

Table 1. Nutritional recommendations for food fortification in selected countries,1995: vitamins and minerals

Supplement	Canada	USA	UK	Israel
Iodine	Salt M	Salt O	Salt O	Salt O
Vitamin D	Milk M	Milk O Lo Fat O Flour O	Margarine M	Margarine M Lo Fat Milk O outside Jerusalem
Vitamin A	Milk M	Margarine M, Milk O ?M some States Lo Fat Milk M	Margarine M	Margarine M Lo Fat Milk O outside Jerusalem
Thiamine	Flour M (by standard)	Flour M if Enrich	Flour M	Flour O
Riboflavin	Flour M	Flour M if Enrich	-	-
Niacin	Flour M	Flour M if Enrich	Flour M	-
Iron	Flour M	Flour M if Enrich	Flour M	-
Folic acid	Flour O	-	Cereals O	-
Vitamin B6	Flour O	-	-	-
Pantothenic acid	Flour O	-	-	-
Calcium	Flour O	-	Flour M	-
Magnesium	Flour O	-	-	-

M – Mandatory
O – Optional

Table 2. Nutritional Recommendations regarding Dietary Restoration & Supplementation in Selected Countries - 1995: by Food Products

Supplement	Canada	USA	UK	Israel
Margarine	Vit A, D M	Vit A , M	Vit A, D M	Vit A D M
Milk	Vit A D M	Vit A D O		
Low Fat	Vit A D M	Vit D O, Vit A M		Outside Jeru M
Flour	Thiamine M Riboflavin M Niacin M Iron M	Thiamin M Enrich Riboflavin M Niacin M Iron M Vitamin D O	M- brown & white, not whole meal	Optional
Infant Formulae				
Juices		Vit C O		Vit C O
Cereals	Optional Niacin Riboflavin Thiamine Folic acid Vitamin D Vitamin B6 Vitamin B12 Iron	Optional	Optional	Optional

M – Mandatory
O – Optional

Table 3. Percentile values of “Healthy” 70 yr old Population in Jerusalem with Nutritional Indices around or below accepted normal ranges ((The numbers in brackets give the actual value

	MALES n = 245	FEMALES n = 213
Index - “normal value”	percentile (value)	percentile (value)
BMI < 20 kg/m2	5 (20.9)	5 (20.5)
Albumin g/dl	1 (31)	5 (32), 1 (29)
Hb <13g males, <12g / dl females	10 (13.2), 5 (12.6)	10 (12.1), 5 (11.7)
Iron < 10 (μg/dl)	10 (9.2)	10 (8.5)
Folic Acid (<3 ng/ml)	1 (2.8)	1 (3)
B12 (<200 pg/ml)	10 (170)	5 (191)
Total Lymph. (< 1.2 x10^3)	10 (1.23)	10 (1.18)
Cholesterol mmol/l	5 (3.9)	1 (4.1)
TG mmol/l	10 (0.75)	5 (0.71)

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Appendix 3: Israel Ministry of Health Dietary Reference Intakes

Table 1: Dietary Reference Intakes (DRIs): Recommended Dietary Allowances and Adequate Intakes, Vitamins
Food and Nutrition Board, Institute of Medicine, National Academies

Life Stage Group	Vitamin A (µg/d)[a]	Vitamin C (mg/d)	Vitamin D (µg/d)[b,c]	Vitamin E (mg/d)[d]	Vitamin K (µg/d)	Thiamin (mg/d)	Riboflavin (mg/d)	Niacin (mg/d)[e]	Vitamin B6 (mg/d)	Folate (µg/d)[f]	Vitamin B12 (µg/d)	Pantothenic Acid (mg/d)	Biotin (µg/d)	Choline (mg/d)[g]
Infants														
0 to 6 mo	400*	40*	5*	4*	2.0*	0.2*	0.3*	2*	0.1*	65*	0.4*	1.7*	5*	125*
7 to 12 mo	500*	50*	5*	5*	2.5*	0.3*	0.4*	4*	0.3*	80*	0.5*	1.8*	6*	150*
Children														
1-3 y	**300**	**15**	5*	**6**	30*	**0.5**	**0.5**	**6**	**0.5**	**150**	**0.9**	2*	8*	200*
4-8 y	**400**	**25**	5*	**7**	55*	**0.6**	**0.6**	**8**	**0.6**	**200**	1.2	3*	12*	250*
Males														
9-13 y	**600**	**45**	5*	**11**	60*	**0.9**	**0.9**	**12**	**1.0**	**300**	**1.8**	4*	20*	375*
14-18 y	**900**	**75**	5*	**15**	75*	**1.2**	**1.3**	**16**	**1.3**	**400**	**2.4**	5*	25*	550*
19-30 y	**900**	**90**	5*	**15**	120*	**1.2**	**1.3**	**16**	**1.3**	**400**	**2.4**	5*	30*	550*
31-50 y	**900**	**90**	5*	**15**	120*	**1.2**	**1.3**	**16**	**1.3**	**400**	**2.4**	5*	30*	550*
51-70 y	**900**	**90**	10*	**15**	120*	**1.2**	**1.3**	**16**	**1.7**	**400**	**2.4 8**	5*	30*	550*
>70 y	**900**	**90**	15*	**15**	120*	**1.2**	**1.3**	**16**	**1.7**	**400**	**2.4 8**	5*	30*	550*
Females														
9-13 y	**600**	**45**	5*	**11**	60*	**0.9**	**0.9**	**12**	**1.0**	**300**	**1.8**	4*	20*	375*
14-18 y	**700**	**65**	5*	**15**	75*	**1.0**	**1.0**	**14**	**1.2**	**400**[9]	**2.4**	5*	25*	400*
19-30 y	**700**	**75**	5*	**15**	90*	**1.1**	**1.1**	**14**	**1.3**	**400**[9]	**2.4**	5*	30*	425*
31-50 y	**700**	**75**	5*	**15**	90*	**1.1**	**1.1**	**14**	**1.3**	**400**[9]	**2.4**	5*	30*	425*
51-70 y	**700**	**75**	10*	**15**	90*	**1.1**	**1.1**	**14**	**1.5**	**400**	**2.4 8**	5*	30*	425*
>70 y	**700**	**75**	15*	**15**	90*	**1.1**	**1.1**	**14**	**1.5**	**400**	**2.4 8**	5*	30*	425*
Pregnancy														
≤18 y	**750**	**80**	5*	**15**	75*	**1.4**	**1.4**	**18**	**1.9**	**600**[10]	**2.6**	6*	30*	450*
19-30 y	**770**	**85**	5*	**15**	90*	**1.4**	**1.4**	**18**	**1.9**	**600**[10]	**2.6**	6*	30*	450*
31-50 y	**770**	**85**	5*	**15**	90*	**1.4**	**1.4**	**18**	**1.9**	**600**[10]	**2.6**	6*	30*	450*
Lactation														
≤18 y	**1,200**	**115**	5*	**19**	75*	**1.4**	**1.6**	**17**	**2.0**	**500**	**2.8**	7*	35*	550*
19-30 y	**1,300**	**120**	5*	**19**	90*	**1.4**	**1.6**	**17**	**2.0**	**500**	**2.8**	7*	35*	550*
31-50 y	**1,300**	**120**	5*	**19**	90*	**1.4**	**1.6**	**17**	**2.0**	**500**	**2.8**	7*	35*	550*

NOTE: This table (taken from the DRI reports, see www.nap.edu) presents Recommended Dietary Allowances (RDAs) in bold type and Adequate Intakes (AIs) in ordinary type followed by an asterisk (*). An RDA is the average daily dietary intake level; sufficient to meet the nutrient requirements of nearly all (97-98 percent) healthy individuals in a group. It is calculated from an Estimated Average Requirement (EAR). If sufficient scientific evidence is not available to establish an EAR, and thus calculate an RDA, an AI is usually developed. For healthy breastfed infants, an AI is the mean intake. The AI for other life stage and gender groups is believed to cover the needs of all healthy individuals in the groups, but lack of data or uncertainty in the data prevent being able to specify with confidence the percentage of individuals covered by this intake.

a As retinol activity equivalents (RAEs). 1 RAE = 1 µg retinol, 12 µg β-carotene, 24 µg α-carotene, or 24 µg β-cryptoxanthin. The RAE for dietary provitamin A carotenoids is two-fold greater than retinol equivalents (RE), whereas the RAE for preformed vitamin A is the same as RE.

b As cholecalciferol. 1 µg cholecalciferol = 40 IU vitamin D.

c Under the assumption of minimal sunlight.

d As α-tocopherol. α-Tocopherol includes RRR-α-tocopherol, the only form of α-tocopherol that occurs naturally in foods, and the 2R-stereoisomeric forms of α-tocopherol (RRR-, RSR-, RRS-, and RSS-α-tocopherol) that occur in fortified foods and supplements. It does not include the 2S-stereoisomeric forms of α-tocopherol (SRR-, SSR-, SRS-, and SSS-α-tocopherol), also found in fortified foods and supplements.

e As niacin equivalents (NE). 1 mg of niacin = 60 mg of tryptophan; 0–6 months = preformed niacin (not NE).

f As dietary folate equivalents (DFE). 1 DFE = 1 µg food folate = 0.6 µg of folic acid from fortified food or as a supplement consumed with food = 0.5 µg of a supplement taken on an empty stomach.

g Although AIs have been set for choline, there are few data to assess whether a dietary supply of choline is needed at all stages of the life cycle, and it may be that the choline requirement can be met by endogenous synthesis at some of these stages.

h Because 10 to 30 percent of older people may malabsorb food-bound B12, it is advisable for those older than 50 years to meet their RDA mainly by consuming foods fortified with B12 or a supplement containing B12.

i In view of evidence linking folate intake with neural tube defects in the fetus, it is recommended that all women capable of becoming pregnant consume 400 µg from supplements or fortified foods in addition to intake of food folate from a varied diet.

j It is assumed that women will continue consuming 400 µg from supplements or fortified food until their pregnancy is confirmed and they enter prenatal care, which ordinarily occurs after the end of the periconceptional period—the critical time for formation of the neural tube.

SOURCES: *Dietary Reference Intakes for Calcium, Phosphorous, Magnesium, Vitamin D, and Fluoride (1997); Dietary Reference Intakes for Thiamin, Riboflavin, Niacin, Vitamin B6, Folate, Vitamin B12, Pantothenic Acid, Biotin, and Choline (1998); Dietary Reference Intakes for Vitamin C, Vitamin E, Selenium, and Carotenoids (2000); Dietary Reference Intakes for Vitamin A, Vitamin K, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc (2001); Dietary Reference Intakes for Water, Potassium, Sodium, Chloride, and Sulfate (2005); and Dietary Reference Intakes for Calcium and Vitamin D (2011).*

These reports may be accessed via www.nap.edu.

Table 2: Dietary Reference Intakes (DRIs): Recommended Dietary Allowances and Adequate Intakes, Elements
Food and Nutrition Board, Institute of Medicine, National Academies

Life Stage Group	Calcium (mg/d)	Chromium (µg/d)	Copper (µg/d)	Fluoride (mg/d)	Iodine (µg/d)	Iron (mg/d)	Magnesium (mg/d)	Manganese (mg/d)	Molybdenum (µg/d)	Phosphorus (mg/d)	Selenium (µg/d)	Zinc (mg/d)	Potassium (g/d)	Sodium (g/d)	Chloride (g/d)
Infants															
0 to 6 mo	210*	0.2*	200*	0.01*	110*	0.27*	30*	0.003*	2*	100*	15*	2*	0.4*	0.12*	0.18*
6 to 12 mo	270*	5.5*	220*	0.5*	130*	**11**	75*	0.6*	3*	275*	20*	**3**	0.7*	0.37*	0.57*
Children															
1-3 y	500*	11*	**340**	0.7*	**90**	**7**	**80**	1.2*	**17**	**460**	**20**	**3**	3*	1*	1.5*
4-8 y	800*	15*	**440**	1*	**90**	**10**	**130**	1.5*	**22**	**500**	**30**	**5**	3.8*	1.2*	1.9*
Males															
9-13 y	1,300*	25*	**700**	2*	**120**	**8**	**240**	1.9*	**34**	**1,250**	**40**	**8**	4.5*	1.5*	2.3*
14-18 y	1,300*	35*	**890**	3*	**150**	**11**	**410**	2.2*	**43**	**1,250**	**55**	**11**	4.7*	1.5*	2.3*
19-30 y	1,000*	35*	**900**	4*	**150**	**8**	**400**	2.3*	**45**	**700**	**55**	**11**	4.7*	1.5*	2.3*
31-50 y	1,000*	35*	**900**	4*	**150**	**8**	**420**	2.3*	**45**	**700**	**55**	**11**	4.7*	1.5*	2.3*
51-70 y	1,200*	30*	**900**	4*	**150**	**8**	**420**	2.3*	**45**	**700**	**55**	**11**	4.7*	1.3*	2*
>70 y	1,200*	30*	**900**	4*	**150**	**8**	**420**	2.3*	**45**	**700**	**55**	**11**	4.7*	1.2*	1.8*
Females															
9-13 y	1,300*	21*	**700**	2*	**120**	**8**	**240**	1.6*	**34**	**1,250**	**40**	**8**	4.5*	1.5*	2.3*
14-18 y	1,300*	24*	**890**	3*	**150**	**15**	**360**	1.6*	**43**	**1,250**	**55**	**9**	4.7*	1.5*	2.3*
19-30 y	1,000*	25*	**900**	3*	**150**	**18**	**310**	1.8*	**45**	**700**	**55**	**8**	4.7*	1.5*	2.3*
31-50 y	1,000*	25*	**900**	3*	**150**	**18**	**320**	1.8*	**45**	**700**	**55**	**8**	4.7*	1.5*	2.3*
51-70 y	1,200*	20*	**900**	3*	**150**	**8**	**320**	1.8*	**45**	**700**	**55**	**8**	4.7*	1.3*	2*
>70 y	1,200*	20*	**900**	3*	**150**	**8**	**320**	1.8*	**45**	**700**	**55**	**8**	4.7*	1.2*	1.8*
Pregnancy															
≤18 y	1,300*	29*	**1,000**	3*	**220**	**27**	**400**	2.0*	**50**	**1,250**	**60**	**13**	4.7*	1.5*	2.3*
19-30 y	1,000*	30*	**1,000**	3*	**220**	**27**	**350**	2.0*	**50**	**700**	**60**	**11**	4.7*	1.5*	2.3*
31-50 y	1,000*	30*	**1,000**	3*	**220**	**27**	**360**	2.0*	**50**	**700**	**60**	**11**	4.7*	1.5*	2.3*
Lactation															
≤18 y	1,300*	44*	**1,300**	3*	**290**	**10**	**360**	2.6*	**50**	**1,250**	**70**	**14**	5.1*	1.5*	2.3*
19-30 y	1,000*	45*	**1,300**	3*	**290**	**9**	**310**	2.6*	**50**	**700**	**70**	**12**	5.1*	1.5*	2.3*
31-50 y	1,000*	45*	**1,300**	3*	**290**	**9**	**320**	2.6*	**50**	**700**	**70**	**12**	5.1*	1.5*	2.3*

NOTE: This table (taken from the DRI reports, see www.nap.edu) presents Recommended Dietary Allowances (RDAs) in bold type and Adequate Intakes (AIs) in ordinary type followed by an asterisk (*). An RDA is the average daily dietary intake level; sufficient to meet the nutrient requirements of nearly all (97-98 percent) healthy individuals in a group. It is calculated from an Estimated Average Requirement (EAR). If sufficient scientific evidence is not available to establish an EAR, and thus calculate an RDA, an AI is usually developed. For healthy breastfed infants, an AI is the mean intake. The AI for other life stage and gender groups is believed to cover the needs of all healthy individuals in the groups, but lack of data or uncertainty in the data prevent being able to specify with confidence the percentage of individuals covered by this intake.

SOURCES: *Dietary Reference Intakes for Calcium, Phosphorous, Magnesium, Vitamin D, and Fluoride (1997); Dietary Reference Intakes for Thiamin, Riboflavin, Niacin, Vitamin B6, Folate, Vitamin B12, Pantothenic Acid, Biotin, and Choline (1998); Dietary Reference Intakes for Vitamin C, Vitamin E, Selenium, and Carotenoids (2000); and Dietary Reference Intakes for Vitamin A, Vitamin K, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc (2001); Dietary Reference Intakes for Water, Potassium, Sodium, Chloride, and Sulfate (2005); and Dietary Reference Intakes for Calcium and Vitamin D (2011).*

These reports may be accessed via www.nap.edu

Table 3: Dietary Reference Intakes (DRIs): Tolerable Upper Intake Levels, Vitamins
Food and Nutrition Board, Institute of Medicine, National Academies

Life Stage Group	Vitamin A (μg/d)a	Vitamin C (mg/d)	Vitamin D (μg/d)	Vitamin E (mg/d)b,c	Vitamin K	Thiamin	Riboflavin	Niacin (mg/d)c	Vitamin B6 (mg/d)	Folate (μg/d)c	Vitamin B12	Pantothen-ic Acid	Biotin	Choline (g/d)	Carotenoidsd
Infants															
0 to 6 mo	600	ND[e]	25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
7 to12 mo	600	ND	25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Children															
1-3 y	600	400	50	200	ND	ND	ND	10	30	300	ND	ND	ND	1.0	ND
4-8 y	900	650	50	300	ND	ND	ND	15	40	400	ND	ND	ND	1.0	ND
Males and Females															
9-13 y	1,700	1,200	50	600	ND	ND	ND	20	60	600	ND	ND	ND	2.0	ND
14-18 y	2,800	1,800	50	800	ND	ND	ND	30	80	800	ND	ND	ND	3.0	ND
19-70 y	3,000	2,000	50	1,000	ND	ND	ND	35	100	1,000	ND	ND	ND	3.5	ND
>70 y	3,000	2,000	50	1,000	ND	ND	ND	35	100	1,000	ND	ND	ND	3.5	ND
Pregnancy															
≤18 y	2,800	1,800	50	800	ND	ND	ND	30	80	800	ND	ND	ND	3.0	ND
19-50 y	3,000	2,000	50	1,000	ND	ND	ND	35	100	1,000	ND	ND	ND	3.5	ND
Lactation															
≤18 y	2,800	1,800	50	800	ND	ND	ND	30	80	800	ND	ND	ND	3.0	ND
19-50 y	3,000	2,000	50	1,000	ND	ND	ND	35	100	1,000	ND	ND	ND	3.5	ND

NOTE: A Tolerable Upper Intake Level (UL) is the highest level of daily nutrient intake that is likely to pose no risk of adverse health effects to almost all individuals in the general population. Unless otherwise specified, the UL represents total intake from food, water, and supplements. Due to a lack of suitable data, ULs could not be established for vitamin K, thiamin, riboflavin, vitamin B12, pantothenic acid, biotin, and carotenoids. In the absence of a UL, extra caution may be warranted in consuming levels above recommended intakes. Members of the general population should be advised not to routinely exceed the UL. The UL is not meant to apply to individuals who are treated with the nutrient under medical supervision or to individuals with predisposing conditions that modify their sensitivity to the nutrient.

a As preformed vitamin A only.

b As α-tocopherol; applies to any form of supplemental α-tocopherol.

c The ULs for vitamin E, niacin, and folate apply to synthetic forms obtained from supplements, fortified foods, or a combination of the two.

d β-Carotene supplements are advised only to serve as a provitamin A source for individuals at risk of vitamin A deficiency.

e ND = Not determinable due to lack of data of adverse effects in this age group and concern with regard to lack of ability to handle excess amounts. Source of intake should be from food only to prevent high levels of intake.

SOURCES: Dietary Reference Intakes for Calcium, Phosphorous, Magnesium, Vitamin D, and Fluoride (1997); Dietary Reference Intakes for Thiamin, Riboflavin, Niacin, Vitamin B6, Folate, Vitamin B12, Pantothenic Acid, Biotin, and Choline (1998); Dietary Reference Intakes for Vitamin C, Vitamine E, Selenium, and Carotenoids (2000); Dietary Reference Intakes for Vitamin A, Vitamin K, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc (2001); and Dietary Reference Intakes for Calcium and Vitamin D (2011).

These reports may be accessed via www.nap.edu.

Table 4: Dietary Reference Intakes (DRIs): Tolerable Upper Intake Levels, Elements
Food and Nutrition Board, Institute of Medicine, National Academies

Life Stage Group	Chlo-ride (g/d)	Sodium (g/d)	Zinc (mg/d)	Vanadium (mg/d)d	Sulfate	Siliconc	Sele-nium (μg/d)	Potas-sium	Phos-phorus (g/d)	Nickel (mg/d)	Molyb-denum (μg/d)	Man-ganese (mg/d)	Magnes-ium (mg/d)b	Iron (mg/d)	Iodine (μg/d)	Fluoride (mg/d)	Copper (μg/d)	Chrom-ium	Cal-cium (mg/d)	Boron (mg/d)	Arsen-ica
Infants																					
0 to 6 mo	ND[e]	ND	4	ND	ND	ND	45	ND	ND	ND	ND	ND	ND	40	ND	0.7	ND	ND	ND	ND	ND[6]
7 to12 mo	ND	ND	5	ND	ND	ND	60	ND	ND	ND	ND	ND	ND	40	ND	0.9	ND	ND	ND	ND	ND
Children																					
1-3 y	2.3	1.5	7	ND	ND	ND	90	ND	3	0.2	300	2	65	40	200	1.3	1,000	ND	2.5	3	ND
4-8 y	2.9	1.9	12	ND	ND	ND	150	ND	3	0.3	600	3	110	40	300	2.2	3,000	ND	2.5	6	ND
Males and Females																					
9-13 y	3.4	2.2	23	ND	ND	ND	280	ND	4	0.6	1,100	6	350	40	600	10	5,000	ND	2.5	11	ND
14-18 y	3.6	2.3	34	ND	ND	ND	400	ND	4	1.0	1,700	9	350	45	900	10	8,000	ND	2.5	17	ND
19-70 y	3.6	2.3	40	1.8	ND	ND	400	ND	4	1.0	2,000	11	350	45	1,100	10	10,000	ND	2.5	20	ND
>70 y	3.6	2.3	40	1.8	ND	ND	400	ND	3	1.0	2,000	11	350	45	1,100	10	10,000	ND	2.5	20	ND
Pregnancy																					
≤18 y	3.6	2.3	34	ND	ND	ND	400	ND	3.5	1.0	1,700	9	350	45	900	10	8,000	ND	2.5	17	ND
19-50 y	3.6	2.3	40	ND	ND	ND	400	ND	3.5	1.0	2,000	11	350	45	1,100	10	10,000	ND	2.5	20	ND
Lactation																					
≤18 y	3.6	2.3	34	ND	ND	ND	400	ND	4	1.0	1,700	9	350	45	900	10	8,000	ND	2.5	17	ND
19-50 y	3.6	2.3	40	ND	ND	ND	400	ND	4	1.0	2,000	11	350	45	1,100	10	10,000	ND	2.5	20	ND

NOTE: A Tolerable Upper Intake Level (UL) is the highest level of daily nutrient intake that is likely to pose no risk of adverse health effects to almost all individuals in the general population. Unless otherwise specified, the UL represents total intake from food, water, and supplements. Due to a lack of suitable data, ULs could not be established for vitamin K, thiamin, riboflavin, vitamin B12, pantothenic acid, biotin, and carotenoids. In the absence of a UL, extra caution may be warranted in consuming levels above recommended intakes. Members of the general population should be advised not to routinely exceed the UL. The UL is not meant to apply to individuals who are treated with the nutrient under medical supervision or to individuals with predisposing conditions that modify their sensitivity to the nutrient.

a Although the UL was not determined for arsenic, there is no justification for adding arsenic to food or supplements.

b The ULs for magnesium represent intake from a pharmacological agent only and do not include intake from food and water.

c Although silicon has not been shown to cause adverse effects in humans, there is no justification for adding silicon to supplements.

d Although vanadium in food has not been shown to cause adverse effects in humans, there is no justification for adding vanadium to food and vanadium supplements should be used with caution. The UL is based on adverse effects in laboratory animals and this data could be used to set a UL for adults but not children and adolescents.

e ND = Not determinable due to lack of data of adverse effects in this age group and concern with regard to lack of ability to handle excess amounts. Source of intake should be from food only to prevent high levels of intake.

SOURCES: *Dietary Reference Intakes for Calcium, Phosphorous, Magnesium, Vitamin D, and Fluoride (1997); Dietary Reference Intakes for Thiamin, Riboflavin, Niacin, Vitamin B6, Folate, Vitamin B12, Pantothenic Acid, Biotin, and Choline (1998); Dietary Reference Intakes for Vitamin C, Vitamin E, Selenium, and Carotenoids (2000); Dietary Reference Intakes for Vitamin A, Vitamin K, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc (2001); Dietary Reference Intakes for Water, Potassium, Sodium, Chloride, and Sulfate (2005); and Dietary Reference Intakes for Calcium and Vitamin D (2011).*

These reports may be accessed via www.nap.edu.

Table 5: Dietary Reference Intakes (DRIs): Recommended Dietary Allowances and Adequate Intakes, Total Water and Macronutrients
Food and Nutrition Board, Institute of Medicine, National Academies

Life Stage Group	Total Watera (L/d)	Carbohydrate (g/d)	Total Fiber (g/d)	Fat (g/d)	Linoleic Acid (g/d)	α-Linolenic Acid (g/d)	Proteinb (g/d)
Infants							
0 to 6 mo	0.7*	60*	ND	31*	4.4*	0.5*	9.1*
6-12 mo	0.8*	95*	ND	30*	4.6*	0.5*	11+
Children							
1-3 y	1.3*	**130**	19*	ND	7*	0.7*	**13**
4-8 y	1.7*	**130**	25*	ND	10*	0.9*	**19**
Males							
9-13 y	2.4*	**130**	31*	ND	12*	1.2*	**34**
14-18 y	3.3*	**130**	38*	ND	16*	1.6*	**52**
19-30 y	3.7*	**130**	38*	ND	17*	1.6*	**56**
31-50 y	3.7*	**130**	38*	ND	17*	1.6*	**56**
51-70 y	3.7*	**130**	30*	ND	14*	1.6*	**56**
>70 y	3.7*	**130**	30*	ND	14*	1.6*	**56**
Females							
9-13 y	2.1*	**130**	26*	ND	10*	1.0*	**34**
14-18 y	2.3*	**130**	26*	ND	11*	1.1*	**46**
19-30 y	2.7*	**130**	25*	ND	12*	1.1*	**46**
31-50 y	2.7*	**130**	25*	ND	12*	1.1*	**46**
51-70 y	2.7*	**130**	21*	ND	11*	1.1*	**46**
>70 y	2.7*	**130**	21*	ND	11*	1.1*	**46**
Pregnancy							
14-18 y	3.0*	**175**	28*	ND	13*	1.4*	**71**
19-30 y	3.0*	**175**	28*	ND	13*	1.4*	**71**
31-50 y	3.0*	**175**	28*	ND	13*	1.4*	**71**
Lactation							
14-18 y	3.8*	**210**	29*	ND	13*	1.3*	**71**
19-30 y	3.8*	**210**	29*	ND	13*	1.3*	**71**
31-50 y	3.8*	**210**	29*	ND	13*	1.3*	**71**

NOTE: This table (take from the DRI reports, see www.nap.edu) presents Recommended Dietary Allowances (RDA) in bold type and Adequate Intakes (AI) in ordinary type followed by an asterisk (*). An RDA is the average daily dietary intake level; sufficient to meet the nutrient requirements of nearly all (97-98 percent) healthy individuals in a group. It is calculated from an Estimated Average Requirement (EAR). If sufficient scientific evidence is not available to establish an EAR, and thus calculate an RDA, an AI is usually developed. For healthy breastfed infants, an AI is the mean intake. The AI for other life stage and gender groups is believed to cover the needs of all healthy individuals in the groups, but lack of data or uncertainty in the data prevent being able to specify with confidence the percentage of individuals covered by this intake.

a Total water includes all water contained in food, beverages, and drinking water.

b Based on g protein per kg of body weight for the reference body weight, e.g., for adults 0.8 g/kg body weight for the reference body weight.

c Not determined.

SOURCE: *Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids (2002/2005) and Dietary Reference Intakes for Water, Potassium, Sodium, Chloride, and Sulfate (2005).*

The report may be accessed via www.nap.edu.

Appendix 4: Summary of Main Committee Recommendations

Strategies	Specific Recommendations
Facilitative	
Increase the information base for continuous policy review	Nutrition research and collaboration
Promote data sources and cooperation in academic training and nutrition research	Nutrition research and collaboration
Promote continuous policy review and multi-sectorial cooperation	Appointment by the Ministry of Health of a multi-sectorial Nutrition Advisory Committee
Nutritional content	
Prevent micronutrient deficiency conditions so as to facilitate optimal growth development and prevent chronic diseases	Fortify the following basic foods: Salt with iodine, milk and milk products with vitamin D, flour with iron, vitamin B complex including folic acid, and B12, and calcium. Fluoridate community water
	Promote inclusion of folic acid and vitamin D supplements in the Health Basket especially for women of childbearing age, pregnant women, infants, children, elderly in the community and in institutional settings and others in institutional settings
Promote healthy nutrition and limit excess in all sectors of society	Promote increased fruit, vegetable, whole grain, and nut consumption in all population groups as well as decreased fat intake (especially trans and saturated fats), and decreased salt intake thorough regulatory initiatives to improve the nutritional environment, through clinical counseling and via educational campaigns in schools, communities, and workplaces

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