

## EUROPEAN HEALTH21 TARGET 11

### HEALTHIER LIVING

***By the year 2015, people across society should have adopted healthier patterns of living***

*(Adopted by the WHO Regional Committee for Europe at its forty-eighth session, Copenhagen, September 1998)*

### Abstract

The WHO Regional Office for Europe is committed to promoting an integrated approach to health promotion and disease prevention. These dietary guidelines provide information that health professionals can relay to their clients to help them prevent disease and promote health. This guide demonstrates that a healthy diet is based mainly on foods of plant origin, rather than animal origin. It also focuses on the need to provide information on the link between health and diet for the most vulnerable groups in society, notably people with low incomes. Just as the quality of air and water is vital, the quantity and quality of food eaten are crucial for human health. A healthy variety of safe food, produced in a sustainable way, is one of the best ways to support a healthy society. Within this context, this document presents twelve steps to healthy eating.

### Keywords

*diet*  
*nutrition policies*  
*nutritional requirements*  
*eating*  
*guidelines*

**CINDI food pyramid posters are available from:**  
WHO Regional Office for Europe  
Scherfigsvej 8, DK-2100 Copenhagen Ø, Denmark

ISBN 92 890 1183 1

---

#### © World Health Organization – 2000

All rights in this document are reserved by the WHO Regional Office for Europe. The document may nevertheless be freely reviewed, abstracted, reproduced or translated into any other language (but not for sale or for use in conjunction with commercial purposes) provided that full acknowledgement is given to the source. For the use of the WHO emblem, permission must be sought from the WHO Regional Office. Any translation should include the words: *The translator of this document is responsible for the accuracy of the translation.* The Regional Office would appreciate receiving three copies of any translation. Any views expressed by named authors are solely the responsibility of those authors. The mention of specific companies or of certain manufacturers' products does not imply that they are endorsed or recommended by the World Health Organization in preference to others of a similar nature that are not mentioned.





## Acknowledgements

The countrywide integrated noncommunicable disease intervention (CINDI) programme has identified food and nutrition policy as central to the prevention and control of noncommunicable diseases. This dietary guide has been prepared to assist CINDI member countries in the development of policies and programmes that foster food consumption patterns that are healthy and consistent with local conditions and culture.

The *CINDI dietary guide* was produced as the result of collaboration between the WHO CINDI programme and the WHO programme for nutrition policy, infant feeding and food security. On their behalf I wish to express sincere thanks to the many international nutrition and public health experts, including WHO collaborating centres, CINDI directors and programme personnel, who have contributed their time and expertise to develop the guide. Special appreciation is due to the following members of the CINDI Working Group on Nutrition, who were responsible for preparing, reviewing and commenting on the guide:

- Dr Zuzana Brazdova, Associate Professor, Department of Preventive Medicine, School of Medicine, Masaryk University, Brno, Czech Republic;
- Ms Maria Ellul, Director, Health Promotion, Department for Health Promotion and International Health, Malta (CINDI Director for Malta);
- Dr Janina Petkeviciene, Kaunas University of Medicine, Kaunas, Lithuania;
- Dr Ritva Prättälä, Senior Researcher, Health Education Research Unit, Department of Epidemiology and Health Promotion, National Public Health Institute, Helsinki, Finland;
- Dr Natalia Vartapetova, formerly in the Department of Policy Development of NCD Prevention & Health Promotion, State Research Centre for Preventive Medicine, Moscow, Russian Federation;
- Dr Jozica Maucec Zakotnik, Community Health Centre, Ljubljana, Slovenia (CINDI Director for Slovenia).

Appreciation is also extended to the following for their expert contributions:

- Professor Philip James, Director, Public Health Policy Group, London, United Kingdom
- Professor Pekka Puska, Director, Division of Health & Chronic Diseases, National Public Health Institute, Helsinki, Finland, Chairman CINDI Management Committee (*CINDI Director for Finland*).
- Professor F. de Padua, Director, National Institute of Preventive Cardiology, Lisbon, Portugal (*CINDI Director for Portugal*).
- Dr A. Petrasovits, Chief, Cardiovascular Diseases Prevention Unit, Health Promotion Directorate, Health Canada, Ottawa, Ontario, Canada (*CINDI Director for Canada*).
- Professor I. P. Smyrnova, Executive Director, Research Institute of Cardiology, Kiev, Ukraine (*CINDI Director for Ukraine*).
- Professor V. Grabauskas, Rector, Kaunas Medical University, Kaunas, Lithuania (*CINDI Director for Lithuania*).

Professor David MacLean  
Professor and Head, Department of Community Health and  
Epidemiology, and Director, WHO Collaborating Centre for  
Community Health, Faculty of Medicine, Clinical Research  
Centre, Dalhousie University, Halifax, Nova Scotia, Canada  
(*Chair, CINDI Working Group on Nutrition*)



Professor David Maclean, Ms Maria Ellul, Dr Natalia Vartapetova, Dr Janina Petkeviciene, Dr Jozica Maucec Zakotnik, Dr Ritva Prättälä, Dr Aileen Robertson and Dr Zuzana Brazdova (seated)

## Foreword

The WHO Regional Office for Europe is committed to encouraging and supporting countries to develop and implement their food and nutrition policies and action plans. Within this perspective this dietary guide has been produced to strengthen the capacity of health professionals to do their part. WHO is supporting the implementation of this guide in many countries, as it presents an efficient investment for improving public health in the Region.

Just like clean air and water, a variety of high-quality food is crucial for human health. Health is influenced not only by the health sector but also by others, notably agriculture and the other sectors involved with supplying food. The availability of a healthy variety of safe food is one of the best ways to promote health. Within this context, the WHO Regional Office for Europe has developed this tool for health professionals. It contains twelve steps for healthy eating.

This dietary guide and accompanying poster were produced with technical input from experts working with the countrywide integrated noncommunicable disease intervention (CINDI) programme and the programme for nutrition policy, infant feeding and food security. The WHO Regional Office for Europe would like very sincerely to thank all these experts, especially Professor David MacLean, who are committed to encouraging WHO to develop and promote new tools which help implement food and nutrition policies.

Food and the role it plays in improving health should be perceived as an integral part of a primary health service. Professionals in the health sector generally lack a sufficient understanding of the central role food plays in relation to health. In contrast, the general public is becoming very concerned about the relationship between food and health. Health professionals should be a source of correct and consistent information on nutrition, and this guide has been produced to facilitate this.

A large proportion of the health service budget is used to treat nutrition-related diseases, such as cardiovascular diseases, specific cancers, non-insulin dependent diabetes and obesity. Preventing these diseases could substantially reduce these costs and the enormous burden to society, especially vulnerable groups. We hope that the *CINDI dietary guide* will enable health professionals to carry out their role effectively within this fundamental area of public health.

**Marc Danzon**  
**WHO Regional Director for Europe**



## Contents

<u>Foreword</u> .....	v
<u>WHO CINDI programme</u> .....	1
<u>Increasing need for comprehensive food and nutrition policies</u> .....	1
<u>Intended audience for the guide</u> .....	2
<u>Developing a dietary guide in different countries</u> .....	2
<u>Changing food patterns in Europe</u> .....	3
<u>CINDI pyramid</u> .....	5
<u>Physical activity: fostering healthy living</u> .....	6
<u>Enjoy a healthy diet! Bon Appetit! Guten Appetit! !</u> .....	6
<u>Twelve steps to healthy eating</u> .....	7
<u>Other important issues</u> .....	23
<u>Vitamin and mineral supplements</u> .....	23
<u>Water</u> .....	24
<u>Annex 1. Principles for the development of a pictorial food model</u> .....	25
<u>Annex 2. Nutrient content of food groups</u> .....	26
<u>Annex 3. Locally grown vegetables and fruit</u> .....	30
<u>Annex 4. Dietary fats and coronary heart disease (CHD) risk</u> .....	32
<u>Annex 5 Alcohol content of beverages</u> .....	33
<u>Bibliography</u> .....	34



## WHO CINDI programme

The overall objective of the WHO countrywide integrated noncommunicable disease intervention (CINDI) programme is to improve health by reducing mortality and morbidity from the major noncommunicable diseases (NCD) through integrated collaborative interventions that prevent disease and promote health. CINDI aims to reduce the risk of NCD by reducing the risk factors common to them, such as smoking, alcohol abuse and psychosocial stress, in addition to physical inactivity and unhealthy nutrition.

Research begun following the Second World War and still under way demonstrates that a diet that is high in saturated fats (such as lard), oils (such as hydrogenated vegetable oils), high-fat dairy products (butter, cream and certain cheeses) and high-fat meat products, and low in vegetables and fruit, contributes significantly to the development of cardiovascular diseases, some cancers and obesity. This guide is designed to help prevent these diseases and promote health.

The WHO *CINDI dietary guide* mainly addresses the problems associated with nutrition, and only touches on physical activity and excess alcohol consumption. The CINDI programme has collaborated with the WHO programme for nutrition policy, infant feeding and food security to develop the guide, which incorporates the principles of Health21, the health for all policy framework for the WHO European Region. The guide was developed with the help of many international nutrition and public health experts, many from the countries that participate in CINDI.

## Increasing need for comprehensive food and nutrition policies

Traditionally, the link between nutrition and health was based on the scientific evidence relating to the deficiency of macro- and micronutrients. While sufficient food that is both safe and healthy is needed to prevent deficiency, it is now widely recognized that too much of certain foods combined with too little of others increases the risk of NCD. The need for public policy on food and nutrition to be more comprehensive is increasingly recognized. Policies must help prevent nutritional deficiencies while addressing issues such as providing access to enough of the foods that help prevent NCD, notably vegetables and fruit. Moreover, these foods should be grown in such a way to protect both public health and the environment.

How food is produced (some animal breeds which are intensively reared in some countries, acquire excess amounts of saturated fat) and how food is distributed (an increasing number of very large supermarkets may result in the closure of street markets and local shops) affect health. Trends in food trade show that food is a commodity with great economic value: health specialists must therefore ensure that its economic value does not overshadow the vital role that food plays as a determinant of health. Increasingly the public recognizes this, especially in the light of recent food scares within the European Union (EU), so the health sector could strengthen its links with the public through consumer groups, to highlight the need for policies that address the relationship between health and the quality of food.

Although the CINDI guide is written from a nutritional health perspective – namely, to prevent disease – it should be seen as a component of the broader perspective described above. The guide includes a summary of some of the key evidence supporting the relationship between diet and health, with emphasis on the prevention of NCD such as cardiovascular diseases, certain cancers, hypertension, obesity and non insulin-dependent diabetes, for which unhealthy nutrition and physical inactivity are both important risk factors.

## **Intended audience for the guide**

The guide is written for health professionals and policy-makers, especially those involved in preventing disease and promoting health. This document can guide CINDI programmes in developing their own dietary guidelines and may stimulate the production of national dietary guidelines where they do not yet exist. The guide is designed to transmit the best dietary information in order to prevent disease and keep populations healthy.

A population approach was used to develop the guide, remembering the wide variation among individuals within a population; health professionals should take account of this when interpreting the information. The guide provides a basis for developing strategies to accomplish a variety of tasks, such as creating public information campaigns, risk factor assessment protocols, menus in mass catering institutions, public health nutrition training courses and a client education guide for health professionals.

## **Developing a dietary guide in different countries**

The *CINDI dietary guide* is based on foods, rather than nutrients. This form of guidance is more practical; people purchase and eat foods, not nutrients. The guide can be readily adapted to suit the eating habits, cultures and environments of different countries and regions, so health professionals are encouraged to adapt it to suit local conditions and translate it into local languages.

The adapted recommendations must ensure that the nutrient needs of the population are covered and reduce the risk of NCD. Moreover, they should be in accord with public health policies that promote both a healthy environment and a local food economy.

Specific recommendations in different parts of the WHO European Region will vary with the variety of foods available. For example, consumption of rye bread can be promoted in some parts of northern Europe but, since rye is not grown in all regions, it would be unrealistic to expect all communities to eat rye bread regularly.

In northern Europe, the diet is traditionally low in vegetables and fruit and high in saturated fats coming mainly from meat and dairy products. In contrast, the so-called Mediterranean diet is made possible by the abundance of foods low in saturated fats and plant foods grown in the south. Though still the major cause of premature mortality, rates of mortality from NCD are lower in some Mediterranean countries than in Europe as a whole. In southern Europe, dietary guidelines can therefore help protect, support and promote healthy traditional habits, such as the high consumption of grains, legumes, vegetables, fruits, fish and olive oil. In other countries, dietary guidelines can

serve as a stimulus for change, especially to decrease the intake of saturated fats and increase that of vegetables and fruits.

To make their implementation feasible and effective, dietary guidelines must take account of both the dietary patterns and the prevalence of NCD in each country. Health professionals should review the premature mortality rates, morbidity data and the available data on diet and nutritional status before developing their own dietary guidelines, to tailor them to correspond to local conditions.

## Changing food patterns in Europe

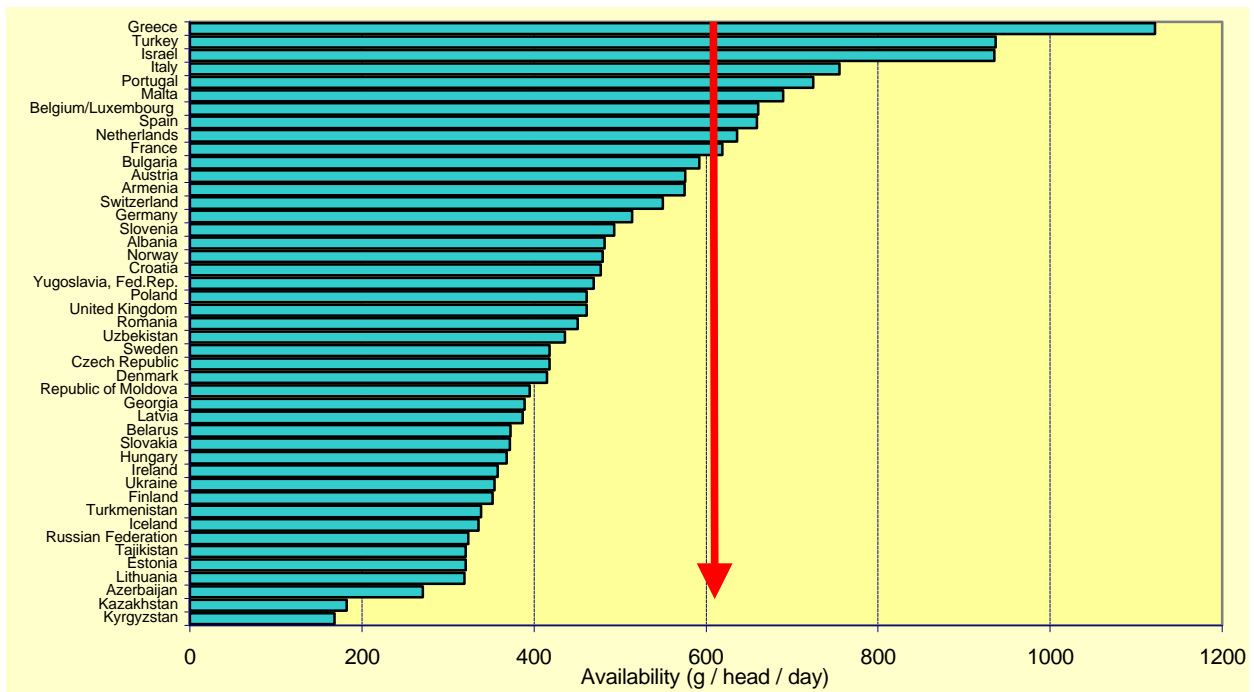
In general there is a need to change the pattern of food intake within Europe towards a diet that contains low amounts of saturated fat and high amounts of vegetables and fruit. For example, the quantity of vegetables and fruit consumed in Europe is not sufficient for optimal health and disease prevention. One problem is that the amount of vegetables and fruit available may be insufficient to meet the WHO recommendations.<sup>1</sup> (See the third of the 12 steps to healthy eating in the next section.) Fig. 1 is based on data from food balance sheets compiled by the Food and Agriculture Organization (FAO) of the United Nations, which show a huge variation in the amount of vegetables and fruits available in Europe: from less than 200 g per person per day in Kyrgyzstan to more than five times this in Greece (around 1 kg per person per day).

Only France, the Netherlands, Spain, Belgium, Luxembourg, Malta, Portugal, Italy, Israel, Turkey and Greece have the “total availability” of vegetables and fruit necessary to meet the consumption of the recommended 400 g per person per day. “Total availability” could imply that all the vegetables and fruit grown are eaten, but this is not the case. On average around 30% of what is available may be lost to spoilage, waste or destruction. Ideally, each region should therefore aim to produce at least 600 g vegetables and fruit per head per day to ensure that there is enough to allow each person to consume more than 400 g per day. This amount is the average intake, so the amount needed will vary according to energy needs. A young child should eat more than 200 g per day and a tall, active man will need around 600 g per day. Moreover, seasonal shortages will create problems of availability and access at certain times of year and so create food insecurity during these periods.

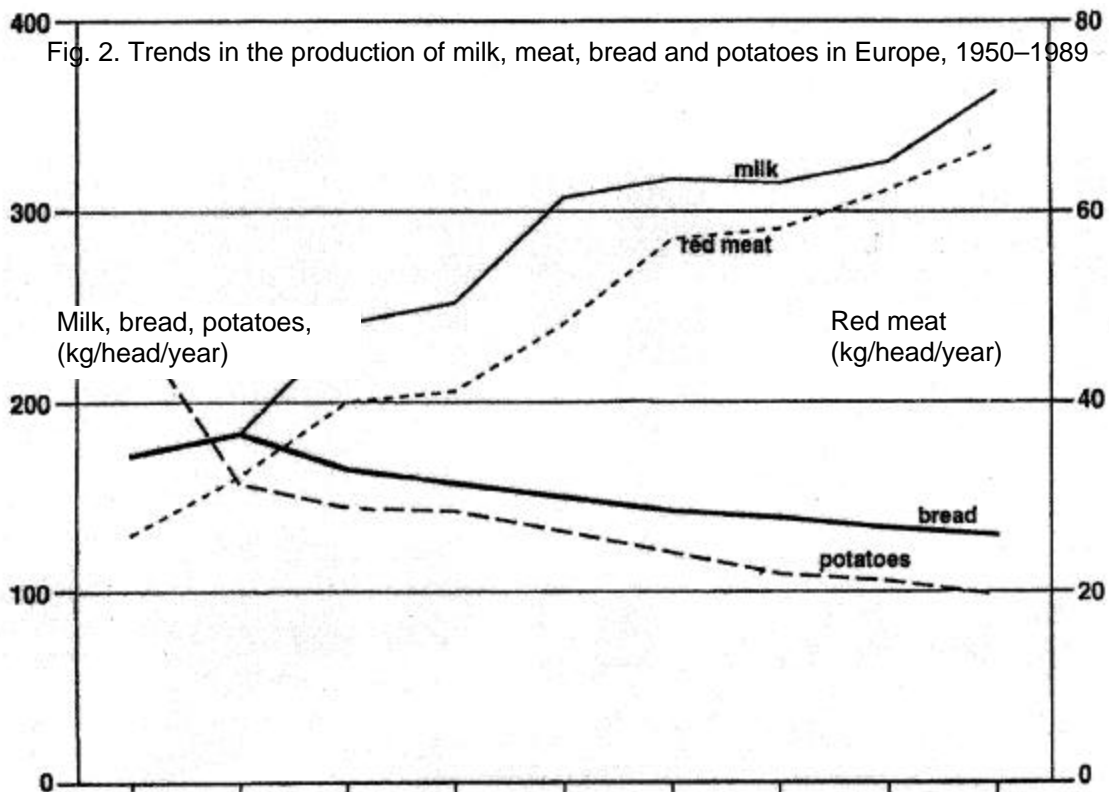
---

<sup>1</sup> *Diet, nutrition, and the prevention of chronic diseases: report of a WHO Study Group* (Geneva, World Health Organization, 1990 (WHO Technical Report Series, No. 797)) is the source of WHO recommendations on this and the following pages.

Fig. 1. Total vegetable and fruit availability in the WHO European Region, 1994



The availability of plant foods, such as potatoes, root vegetables and cereals, decreased in response to policy initiatives after the Second World War. Data from FAO during the period 1950–1989 illustrate a 25% decrease on average in the availability of potatoes, root vegetables and cereals, and a 50% increase in the production of meat and meat products and milk and dairy products (Fig. 2). In 1991 the average quantity of meat and meat products was 225 g per person per day, ranging from around 50 g in Albania to over 250 g in Germany and Denmark.



One of the conclusions is that diets in Europe have become unbalanced and contain insufficient foods of plant origin. Trends in food production and therefore food consumption changed after the Second World War. Food policies after the war were successful in eliminating food insecurity, indeed these led to an overproduction of animal products. Current food production trends are therefore not in line with modern nutrition policies, such as those recommended by WHO, which are designed to increase consumption of vegetables and fruit and decrease consumption of saturated fat. The 12 steps to healthy eating outlined in the next section provide some practical ways of implementing nutrition policies.

As consumers eat more food prepared outside the home, this creates new opportunities to influence dietary habits. In Finland, for example, on average each Finn eats about 125 meals outside the home every year. To improve the nutritional value of the meals provided by the Finnish authorities, vegetables are included in their cost. The CINDI guide could assist mass catering institutions run by local, regional and national authorities to develop similar strategies to improve eating patterns.

## CINDI pyramid

The CINDI pyramid assists in the selection of the food groups required for healthy nutrition. It makes use of the colour scheme of traffic lights: green for proceeding, orange for caution and red for stopping to consider before consuming. The CINDI pyramid appears on the cover of this document, and posters are available on request from the **Year** Regional Office for Europe. The poster also shows four active individual figures. Annex 2 provides some principles to aid the development of pictorial food models such as the pyramid.

The CINDI pyramid helps to illustrate both the variety and the proportions of foods needed for a healthy diet. The more physically active a person is, the more servings are needed (see Table 1, Annex 2). Food energy was traditionally measured in calories, or kilocalories (kcal), but now the metric form, the joule, is almost universally used (1 kcal = 4.2 kJ). Adults normally require around 6500–14 000 kJ per day, depending on gender, age, body size and level of physical activity. WHO recommends that more than half the daily energy should come from a mixture of foods from the two green layers at the base of the pyramid, the lower of which includes bread, grains, pasta, rice and potatoes. This means that, in a diet comprising 6000 kJ, at least half of total energy (3000 kJ) should come from this group. (See step 2 and Table 2, Annex 2.)

From the upper green layer, WHO recommends the intake of at least 400 g of vegetables (in addition to potatoes), and fruit per day which translates into around 5–6 portions daily (see step 3 and tables 3 and 4, Annex 2). One portion is equivalent to one fruit, such as an apple or pear, or one serving of vegetables, around 80 g in weight. Fresh varieties are best and, if possible, locally grown produce in season (Annex 3). Frozen and dried vegetables and fruits are also encouraged, but canned and preserved varieties can also be useful (although they do not contain vitamin C unless stated on the label of commercial brands).

The orange layer urges caution. Proportionally, only small amounts of food from the orange layer are needed in a healthy diet. On the right is the food group consisting of meats and meat alternatives. Beans, lentils, legumes, fish, eggs, poultry and lean meat should replace high-fat meat and meat products. When such foods are eaten, only small amounts need be consumed because the body only needs around 0.8 g protein per kg ideal body weight daily (see step 6 and Table 5, Annex 2).

On the left of the orange layer is the group containing low-fat milk and dairy products that help ensure adequate calcium intake (see step 7 and Table 6, Annex 2). The number of servings will vary from person to person and from day to day, depending on age, body size and gender.

At the very top of the pyramid is the red zone, in which people are urged to stop and consider before consuming. This red zone includes only energy-dense foods containing mostly energy with few micronutrients (see steps 5, 8 and 9). Only very small amounts from this group, are needed to supply additional energy over and above that already provided by the other food groups (Table 1, Annex 2).

## **Physical activity: fostering healthy living**

As mentioned above the poster also shows four active individual figures highlighting the importance of combining a healthy diet with physical activity. Nowadays practically everyone would benefit from being more active, because a sedentary lifestyle is a risk factor common to many chronic diseases. The human body has evolved as an energy-consuming machine. Humans have evolved from our physically active ancestors, who were hunters and gatherers. Current lifestyles require less physical activity so we store the excess energy we consume as fat. Some examples of changing lifestyles include increased use of cars, watching television and less physical activity in the home due to the invention of electrical appliances. Coupled with other lifestyle habits (such as smoking), excess body weight contributes to the increased risk of NCD.

Physical activity has numerous beneficial effects regardless of age. People who have healthy lifestyles and regularly engage in moderate exercise are less likely to develop non insulin-dependent diabetes, cardiovascular diseases, hip fractures or mental malaise. Moreover, they can maintain their body weight better than the less active. Daily exercise is encouraged (see step 4), because people with daily exercise schemes integrated into routine lifestyles consistently show improvements on both psychological and physiological wellbeing.

## **Enjoy a healthy diet! Bon Appetit! Guten Appetit!**

!

Eating is one of life's greatest pleasures. Food choice depends on tradition, culture and environment, as well as on the nutritional needs of people of different ages, genders and lifestyles. People eat for enjoyment and they satisfy their appetite by eating foods that they like and are available. Family, friends and society play a major role in the way people select food and plan meals, and food is an essential ingredient of social interaction. The *CINDI dietary guide* will help health professionals to develop local recommendations that reduce the risk of disease while acknowledging that enjoying food is an essential social component of daily life.

## Twelve steps to healthy eating

The *CINDI dietary guide* highlights 12 key areas for action. It summarizes them as steps; each step is accompanied by a detailed explanation in the following pages.

- 1. Eat a nutritious diet based on a variety of foods originating mainly from plants, rather than animals.**
- 2. Eat bread, grains, pasta, rice or potatoes several times per day.**
- 3. Eat a variety of vegetables and fruits, preferably fresh and local, several times per day (at least 400 g per day).**
- 4. Maintain body weight between the recommended limits (a BMI of 20–25<sup>2</sup>) by taking moderate levels of physical activity, preferably daily.**
- 5. Control fat intake (not more than 30% of daily energy) and replace most saturated fats with unsaturated vegetable oils or soft margarines.**
- 6. Replace fatty meat and meat products with beans, legumes, lentils, fish, poultry or lean meat.**
- 7. Use milk and dairy products (kefir, sour milk, yoghurt and cheese) that are low in both fat and salt.**
- 8. Select foods that are low in sugar, and eat refined sugar sparingly, limiting the frequency of sugary drinks and sweets.**
- 9. Choose a low-salt diet. Total salt intake should not be more than one teaspoon (6 g) per day, including the salt in bread and processed, cured and preserved foods. (Salt iodization should be universal where iodine deficiency is endemic.)**
- 10. If alcohol is consumed, limit intake to no more than 2 drinks (each containing 10 g of alcohol) per day.**
- 11. Prepare food in a safe and hygienic way. Steam, bake, boil or microwave to help reduce the amount of added fat.**
- 12. Promote exclusive breastfeeding and the introduction of safe and adequate complementary foods from the age of about 6 months, but not before 4 months, while breastfeeding continues during the first years of life.<sup>3</sup>**

---

<sup>2</sup> BMI (body mass index) is derived from a person's weight in kg, divided by height in m<sup>2</sup>. The recommended levels are adapted from the global WHO recommendation of 18.5–24.9 as a normal BMI (*Obesity: preventing and managing the global epidemic: report of a WHO Consultation on Obesity, Geneva, 3–5 June 1997*. Geneva, World Health Organization, 1998, p. 9 (document WHO/NUT/NCD/98.1)).

<sup>3</sup> Michaelsen, K.F. et al. *Feeding and nutrition of infants and young children: guidelines for the WHO European Region, with emphasis on former Soviet countries*. Copenhagen, WHO Regional Office for Europe, 2000 (WHO Regional Publications, European Series, No. 87).

It is important that each step be considered, not in isolation, but within the context of all the others steps and the written explanations following each.

**1. Eat a nutritious diet based on a variety of foods originating mainly from plants, rather than animals.**

In addition to nutrients, food contains combinations of other substances, most of which abound in plants. A variety of these plant foods needs to be eaten because no single food can supply everything. For example, potatoes provide vitamin C, but not iron; whole-grain cereals provide iron, but not vitamin C. A healthy diet must therefore contain a large variety of the plant foods illustrated in the two green layers at the base of the pyramid.

Plant foods contain many biologically active components, or metabolites, which have been used for centuries in traditional cures and herbal medicines. These plant metabolites are related to their potential protective role against chronic diseases, notably specific cancers and cardiovascular disease. This interest in identifying metabolites has arisen because of the strength of the epidemiological evidence showing that their consumption protects against disease.<sup>4,5</sup> Many plant metabolites, however, are not nutrients in the traditional sense and are sometimes called non-nutrients. These include substances such as dietary fibre and related substances, phytosterols, lignans, flavonoids, glucosinolates, phenols, terpenes and allium compounds. Over 2000 pigments exist in the plants we eat and these are found in a variety of different plants, some of which are listed in Table 1.

Table 1. Examples of plant foods and the metabolites (non-nutrients) they contain

Plant foods containing protective non-nutrients	Non-nutrient
Oats, wheat, rye, soybean	Fibre and related substances
Most vegetables and fruits	Fibre and related substances
Maize, rape seed, sunflower seeds, soybean	Phytosterols
Rye bran, berries, nuts	Lignans
Onions, lettuce, tomato, peppers, citrus fruits, soy products	Flavonoids
Broccoli, cabbage, Brussels sprouts	Glucosinolates
Grapes, raspberries, strawberries	Phenols
Citrus fruits, cherries, herbs	Terpenes
Garlic, onions, leeks	Allium compounds

It is important to eat as wide a variety as possible of different plant foods to ensure an intake of all these protective substances. Taking vitamin supplements or extracted plant substances as a replacement for, or in addition to, eating good wholesome food is unnecessary and in general is not required on health grounds. It is important to eat a wide variety of all foods. The CINDI pyramid

<sup>4</sup> Craig, W.J. Phytochemicals: guardians of our health. *Journal of the American Dietetic Association*, **10**(Suppl. 2): S199–S204 (1997).

<sup>5</sup> John, T. & Romeo, J.T., ed. *Functionality of food phytochemicals*. New York, Plenum Press, 1997. (Recent Advances in Phytochemistry, Vol. 31).

poster illustrates the different food groups that ensure an optimum nutrient intake. The following eleven steps explain how diet related NCD, including anaemia, can be prevented.

## **2. Eat bread, grains, pasta, rice or potatoes several times per day.**

Bread, grains, pasta, rice or potatoes should form the foundation of all meals, as shown in the base of the food pyramid. WHO recommends that more than half of daily energy come from this food group because it is low in fat and rich in both nutrients and non-nutrients. In addition to providing energy, the foods in this group contribute significantly to the intake of protein, fibre, minerals (potassium, calcium and magnesium) and vitamins (vitamin C, folate, B6, carotenoids). The nutritional benefits of these foods, especially their role in disease prevention, should be publicized.

Unfortunately, many people mistakenly believe that bread and potatoes are more “fattening” than other foods. The energy content of starch is actually much lower than that of either fat or alcohol. Starch provides only 16 kJ energy per gram; the corresponding figures for fat and alcohol are 38 kJ and 29 kJ respectively. An energy-dense diet (one containing a lot of fat, refined sugar and alcohol, combined with few micronutrients and non-nutrients) promotes overconsumption of food, leading eventually to obesity, possibly combined with nutrient deficiencies.

As do grains and potatoes, all types of bread contain different types of dietary fibre (especially whole grain varieties, but even white bread contributes significant amounts of fibre, particularly a fibre-related substance called resistant starch). In addition, different fibre types are present in legumes, beans, vegetables and fruit (see step 3). Eating a variety of fibre-containing foods is important for preventing constipation, diverticular disease and haemorrhoids.

Unfortunately, as discussed earlier, the consumption level of this food group started to fall after the Second World War. Although there are many reasons for this trend, the fact that some health professionals tend to undervalue the importance of eating plenty bread, grains, pasta, rice and potatoes, and overemphasize the importance of animal protein, does not improve the situation. Health professionals have a key role in correcting this perception and reversing the decline in potato and bread consumption. Eating large amounts of cereals and bread (preferably whole-grain), and potatoes needs to be promoted as the foundation of a healthy diet.

## **3. Eat a variety of vegetables and fruits, preferably fresh and local, several times per day (at least 400 g per day).**

WHO recommends an intake of at least 400 g vegetables (in addition to potatoes) and fruits per day. These appear in the upper green layer of the food pyramid, and tables 3 and 4 in Annex 2 suggest serving sizes. Epidemiological studies published during the 1980s and 1990s confirm that the prevalence of cardiovascular diseases, certain cancers and most micronutrient deficiencies is lower where vegetable and fruit intake is at this level or higher. The exact mechanisms and compounds responsible for the protective effects have not been completely identified. Nevertheless, eating as wide a variety as possible of vegetables and fruits throughout the year clearly ensures an adequate intake of most micronutrients, dietary fibres and a host of essential non-nutrient substances (see step 1). Moreover, vegetables and fruits are low in fat and energy, if eaten in their natural form, so eating them helps reduce the risk of obesity.

One of the dietary risk factors suspected of contributing to increased morbidity from cardiovascular diseases and cancer is the deficiency of antioxidants (such as carotenoids and vitamins C and E). Serum low-density lipoprotein (LDL) cholesterol may be oxidized in the presence of excess free radicals (highly reactive molecules produced during normal metabolism and present in cigarette smoke). Once oxidized, LDL cholesterol can attach to the blood vessel walls eventually leading to the development of atheromas, advanced lesions of atherosclerosis.

Another prevalent public health problem in the WHO European Region, notably in women and young children, is anaemia mainly resulting from the deficiency of iron and other micronutrients. The intake of vitamin C (present in most vegetables and fruits) along with iron-rich foods (such as beans and lentils), however, improves the absorption of iron and so reduces the risk of iron-deficiency anaemia. In addition, many vegetables contain iron, and the best sources are leafy greens, such as broccoli, kale, turnip greens and spinach. The absorption of the iron present in vegetables is enhanced if they are accompanied by small amounts of lean red meat, liver, fish or fermented products. Other trace elements and minerals, such as potassium, magnesium and calcium, can also be found in vegetables and fruit, and they help reduce the risk of hypertension in addition to preventing micronutrient deficiencies.

Additional micronutrients present in vegetables and fruits are the B vitamins, including folate and B6. Folic acid has a well known role in preventing anaemia, but also helps to prevent neural tube defects. Accordingly, women in their childbearing years are encouraged to eat more folate-rich foods, particularly before becoming pregnant (in some countries, folic acid supplements are recommended for women contemplating pregnancy). Good sources of folic acid include red beans, soybeans, lentils, chickpeas, peas and peanuts, as well as bread, citrus fruits, liver and green vegetables such as spinach, Brussels sprouts and broccoli. Folic acid may also play a role in helping to reduce the risk of cardiovascular diseases through reducing the levels of homocysteine in the blood stream.

The human body requires a daily intake of dietary fibre both soluble and insoluble. This should be obtained from a mixture of the foods depicted at the base (the two green layers) of the CINDI pyramid, thus ensuring a sufficient intake of both soluble and insoluble fibre. Soluble fibres are beneficial through modifying the metabolism of fats and carbohydrates, and play a role in controlling the levels of cholesterol and sugar in the blood. Insoluble fibre helps to prevent constipation and maintain regular bowel habits. Both forms of fibre appear to play a role in the prevention of colon and breast cancer.

As mentioned previously (see step 1), some of the health benefits associated with vegetables and fruits come from their non-nutrient components, such as plant sterols and flavonoids. Plant sterols play a role in lowering serum cholesterol levels while flavonoids appear to reduce the formation of blood clots, caused during platelet aggregation, in addition to their role as antioxidants. As discussed earlier, the isolation, identification and quantification of all these active metabolites is an area of major research, although still at an early stage of development. This is why the recommendation is to eat as wide a variety of vegetable and fruits as possible, and so ensure the consumption of all possible protective non-nutrients.

When preserving or buying processed vegetables and fruits, people should prefer those with the minimum amount of added fats, oils, sugars and salt, as indicated on the label. The availability of fresh produce varies by season and region, but the use of frozen, dried and preserved vegetables and fruits can help to ensure a varied supply throughout the year. Whenever possible, local, environmentally safe varieties should be selected (Annex 3).

#### **4. Maintain body weight between the recommended limits (a BMI of 20–25) by taking moderate levels of physical activity, preferably daily.**

Healthy weight maintenance is achieved by choosing a nutritious diet, such as illustrated in the CINDI food pyramid, balanced by daily physical activity. Around half the adults in Europe are overweight; this means that their weight is too heavy compared with their height, and their BMI (see p. 6) is over 25.

People who are overweight should try to lose weight, or at least not gain more and become obese. Obesity, a BMI greater than 30, increases the risk of non insulin-dependent diabetes, hypertension, cardiovascular diseases, certain cancers, arthritis and other disorders.

The ideal adult body is a BMI of between 20 and 25, as shown in Fig. 3. Moreover, how fat is distributed within the body, measured by waist circumference, confers additional risk. The risk of developing non insulin-dependent diabetes, hypertension and heart disease is much greater in people with excess fat within the abdominal area (upper-body obesity or apple shape) compared with the hips and thighs (lower-body obesity or pear shape) (Fig. 4). Waist measurement is therefore very useful for indicating those who are at most risk and appears to be even more predictive than BMI.

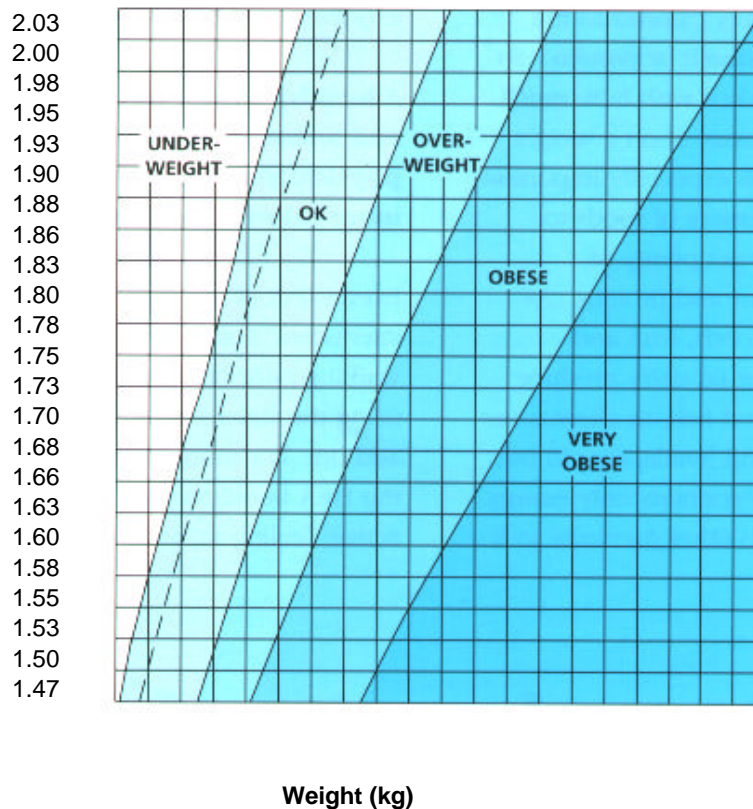
In **men**, the risk of obesity associated with metabolic complications increases with a waist circumference over 95 cm and the risk increases *substantially* if the waist is over 100 cm. In **women**, the risk of obesity associated with metabolic complications increases with a waist circumference over 80 cm and the risk increases *substantially* at over 90 cm.<sup>6</sup>

To maintain a healthy weight, people need to balance the amount of energy eaten with the amount of energy expended. Most people spend too much of their day in activities that require little energy, such as driving, using a computer or watching television. Instead, it is recommended to adopt a more physically active lifestyle.

---

<sup>6</sup> Adapted from *Obesity: preventing and managing the global epidemic: report of a WHO Consultation on Obesity, Geneva, 3–5 June 1997*. Geneva, World Health Organization, 1998 (document WHO/NUT/NCD/98.1). The lower values of waist circumference correspond roughly to a BMI value in the overweight range and the higher values correspond to obesity.

Fig. 3. Body mass index chart



**Underweight** (BMI < 18.5) More food may be needed and this should be part of a well balanced and nutritious diet. In cases of very low weight, a doctor should be consulted.

**OK** (BMI = 20-25)  
The right quantity of food is being eaten to maintain weight in the desirable range for health, but make sure there is a healthy balance in the diet. People at the lower end of the weight range should maintain their weight and not be tempted to aim for the underweight category

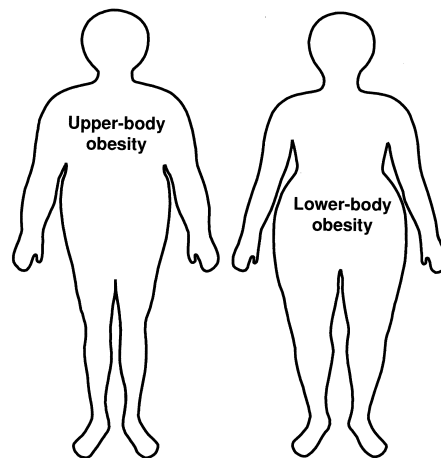
**Overweight** (BMI = 25-29.9) Some loss of weight would be beneficial to health.

**Obese** (BMI = 30-39.9)  
In view of the risk from further weight gain, it is really important for people in this category to lose weight.

**Very obese** (BMI > 40)  
Being this overweight could seriously affect health and wellbeing. There is an urgent need to lose weight. It is advisable for a doctor or dietician to be consulted.

**Source:** Adapted from *Eight guidelines for a healthy diet. A guide for nutrition educators*. (London, Health Education Authority, 1994; reproduced by permission).

Fig. 4. Apple shape or pear shape



The 1997 US Surgeon General's report on physical activity highlighted that moderate activity, such as brisk walking (6 km per hour), for a minimum of 30 minutes almost every day can improve energy balance.<sup>7</sup> Alternatives to walking include cycling, swimming and jogging. Exercise should be promoted according to its cultural appropriateness in different countries. The best strategy is to choose activities that can be easily incorporated into the daily routine and so sustained over time.

The main goal should be to convert everyone, especially inactive children, adolescents and adults, to a pattern of more active living. Modest daily exercise, such as walking and cycling, where the energy expended amounts to roughly an extra 250–800 kJ per hour, depending on the intensity, should be encouraged. In sedentary, overweight or obese people, an extra 3 hours daily simply standing, rather than sitting, increases the 24-hour energy expenditure.

People trying to lose weight should do so slowly. A safe rate of weight loss is around 0.5 kg per week until the goal is reached. Crash diets that severely restrict energy or prevent a person from eating a wide variety of foods, especially vegetables, fruits, bread and potatoes (see step 5), should not be recommended. Extreme approaches to weight loss, such as the use of laxatives, drugs (such as amphetamines) and diuretics, are dangerous.

To tackle weight problems successfully, increased physical activity in combination with a diet resembling the one depicted in the CINDI food pyramid should be promoted. There is no magic answer, and most of the products advertised to help lose weight are just gimmicks, usually not effective in the long term. A real bonus, and therefore an incentive for a sustainable physically active lifestyle, however, is the feeling of wellbeing and improved psychological and general health that results from increased physical activity.

---

<sup>7</sup> US Department of Health and Human Services. *Physical activity and health: a report of the Surgeon General*. Atlanta, US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Disease Prevention and Health Promotion, 1996.

**5. Control fat intake (not more than 30% of daily energy) and replace most saturated fats with unsaturated vegetable oils or soft margarines.**

Fats supply energy and essential fatty acids, some of which promote absorption of the fat-soluble vitamins (A, D, E and K). Eating large amounts of certain fats, however, is linked to the risk of developing NCD, notably cardiovascular diseases. In addition, eating large amounts of any fat or oil can increase body weight, so the amount of fat required in a diet depends on the person's energy needs.

WHO recommends that healthy diets contain at most 30% of their energy from fat. The three main types of fats are: saturated, monounsaturated and polyunsaturated (Annex 4). Saturated fat should supply less than 10% of total energy intake. Polyunsaturated fat should constitute around 7% of total energy. The balance of dietary fat should be monounsaturated. Fatty foods normally contain a mixture of all, but in varying proportions, so that around half of the fat energy in a healthy diet should come from monounsaturated fats and the remainder from a mix of saturated and polyunsaturated fats.

Monounsaturated are found mostly in olive oil, rape-seed (canola) oil, peanut oil, and avocado. Monounsaturated oils help to maintain the level of the protective high-density lipoprotein (HDL) cholesterol.

Saturated fats are mostly found in foods of animal origin, such as lard, meat and meat products, milk and dairy products, and some vegetable margarines, especially the ones that remain hard at room temperature. Many bakery or commercial products are also sources of saturated fats. A high intake of saturated fats is strongly associated with high levels of the potentially harmful LDL cholesterol and total serum cholesterol. Some saturated fats also increase the risk of thrombosis, leading to cerebrovascular accident or myocardial infarction.

Polyunsaturated fats come from two main sources, plants and oily fish. Some are essential for humans because they cannot be synthesized by the body. One group, the omega-6, comprise linoleic and linolenic fats and are found in soft margarines and oils made from safflower, sunflower, corn and soybean and cottonseed oils. They promote absorption of antioxidants (vitamin E and carotenoids) and the fat soluble vitamins and lower the level of LDL cholesterol. If taken in too large amounts, however, they may also lower the level of the protective HDL cholesterol. Moreover, a high intake of polyunsaturated fatty acids may increase the risk of their oxidation, because of their chemical configuration, and so produce excessive amounts of damaging free radicals (see step 3). As mentioned, the recommended share of energy coming from polyunsaturated fat should therefore be limited to around 7% of total daily energy, and at least one sixth of this should come from oily fish.

The second group of polyunsaturated fatty acids (omega-3) comes from oily fish, such as herring, mackerel, trout and sardines. Evidence shows that a consumption around twice weekly of oil-rich fish reduces the risk of platelet aggregation and formation of blood clots, and so lowers the risk of thrombosis, cerebrovascular accident or myocardial infarction. Oil-rich fish can also have a small but positive effect on lowering the levels of LDL cholesterol. In addition, it has a powerful effect on lowering blood levels of triglycerides, high levels of which are associated with increased risk of

cardiovascular diseases. Thus a weekly intake of oily fish reduces the risk of cardiovascular diseases in many different ways.

Dietary cholesterol (Annex 4), such as that found in eggs, may increase total serum cholesterol and LDL cholesterol in healthy people if eaten in very large amounts. Dietary cholesterol usually only adversely affects the serum cholesterol in susceptible individuals, however, and only if consumed in substantial amounts. The response induced by dietary cholesterol is far less than that induced by eating saturated fats found in lard, fatty meat and meat products, fatty milk and dairy products, and margarines made from hydrogenated oils. To reduce population serum cholesterol levels, it is therefore important to stress the need to reduce saturated dietary fat intake. It is advisable not to overemphasize the need to restrict the intake of eggs, since they provide a cheap and valuable source of many nutrients.

The term trans fatty acids is now in use (Annex 4). Trans fatty acids are formed when vegetable and fish oils are processed from liquid to solid at room temperature to produce hardened margarines. Trans fatty acids tend to have a biological action similar to saturated fats and have been associated with an increased risk of developing cardiovascular diseases. These hydrogenated oils (possibly present in hard margarines or commercial biscuits and cakes) raise LDL and lower HDL cholesterol levels. Most margarine manufacturers are aware of the problem, and many have reduced the level of trans fatty acids in their products. Nevertheless, consumers should be encouraged to check labels on margarines and to seek information to ensure that processed foods do not contain trans fatty acids.

Adults eating excessive amounts of fatty foods readily consume too much energy, and the normal physiological process whereby appetite is controlled (which occurs after eating starch-containing food) appears to be absent. This passive overconsumption of food leads to weight gain, particularly in inactive people. Cutting back the intake of all types of fats, including those present in prepared foods, helps reduce energy intake and so promote weight maintenance or loss, if necessary.

## **6. Replace fatty meat and meat products with beans, legumes, lentils, fish, poultry or lean meat.**

Legumes, beans, lentils and nuts, as well as meat, poultry, fish (including shellfish and sardines) and eggs (illustrated in the right-hand side of the orange layer of the food pyramid), are important sources of protein and iron. Protein deficiency is not a public health problem in the European Region, while iron-deficiency anaemia is (see steps 3 and 12). Legumes, including beans, peas and canned baked beans, are good sources of iron, but the iron is not absorbed as well as that in meat and fish. Sprouting or fermenting the beans improves the iron absorption. Alternatively, as already discussed under step 3, eating the beans along with a small amount of lean meat or fish also improves absorption. Eating liver once per week is inexpensive, and an effective way of preventing iron-deficiency anaemia (Table 5, Annex 2).

Along with milk and dairy products, meat and animal products contribute the largest percentage of saturated fat to the diet, particularly where animal rearing and butchery practices produce meat with a very high fat content. Fat of animal origin is usually mainly saturated, so, if meat is eaten, only small amounts are required to satisfy nutritional needs. Lean cuts should be selected and all visible fat should be trimmed off. Meat products, such as sausage, pies, salamis and tinned meats, usually

have a high content of saturated fat and so should be replaced with legumes, beans, lentils, fish, eggs, poultry or lean meat.

In addition, because of the potential links between high red-meat intake and colon cancer (especially when combined with a low vegetable intake), the 1997 world report on cancer recommended that the average intake of red meat be limited to less than 80 g daily: “It is preferable to choose fish, poultry, or meat from non-domesticated animals in place of red meat”.<sup>8</sup>

The WHO recommendation to reduce the intake of fatty meat and animal products has given rise to some concern about the possible risk of protein deficiency. This concern is unfounded, and based on the fact that protein recommendations, especially those made just after the Second World War, used to be much too high: in some cases, nearly twice as high as current WHO recommendations.

This change in recommendations resulted from a scientific analysis carried out by WHO and FAO in the 1980s. It was recommended that 0.8 g protein per kg ideal body weight was more than enough to supply a population with enough protein. Moreover, much less emphasis is now placed on the need to eat animal protein, and proteins from plant sources are recognized to be equally beneficial. People concerned about possible protein deficiency need to be reassured that bread, pasta, beans, peas, etc. should contribute most of the protein in a healthy diet.

As stated earlier, in the section on changing food patterns, meat production increased substantially after the Second World War (Fig. 2). These high production levels, combined with outdated nutrient recommendations, have resulted in European populations’ unnecessarily high intake of meat and meat products. Most international recommendations now advise eating less meat than in the past. The Member States of the WHO European Region have not yet universally accepted this recommendation. Convincing the public that an excessive consumption of meat, especially if it has a high fat content, could be harmful to health appears to be difficult in some countries.

## **7. Use milk and dairy products (kefir, sour milk, yoghurt and cheese) that are low in both fat and salt.**

Only moderate amounts of food should be selected from the milk and dairy products group (illustrated in the left side of the orange layer of the food pyramid) on a regular basis (serving sizes are suggested in Table 6, Annex 2). Different types of cream and sour cream can be safely avoided, since these contain a lot of saturated fat and very little protein or other essential micronutrients. In some countries people add soured cream (smetana) to vegetables and other cooked dishes. This habit should be discouraged, and low-fat yoghurt or other low-fat products substituted.

Most other milk and dairy products provide many different nutrients, especially protein and calcium. Women, children and adolescents, especially girls, need to eat foods that contain a lot of calcium. Calcium is needed to ensure the development of healthy teeth and bones, and plays an important role in cell metabolism. Calcium recommendations vary widely from country to country, from around 500 mg to 1000 mg, or more, per day for adults. Given this wide variation, larger amounts of calcium-rich foods are needed to satisfy the high recommendations in some countries. The current

---

<sup>8</sup> *Food, nutrition, and the prevention of cancer: a global perspective*. Washington, DC, American Institute for Cancer Research, 1997.

scientific consensus is that the evidence seems insufficient to support the need for very high intake levels of calcium, so most countries recommend an intake of around 700 mg per day for most adults, with possibly higher levels for groups with increased requirements.

Fortunately, most people can obtain enough calcium, while still maintaining a low fat intake, by selecting the recommended low-fat or skimmed milk and low-fat dairy products in moderate amounts. The calcium is present in the main body of the milk, not in the cream or fat that is removed.

People who do not eat foods from this group should try to get their calcium from other foods; canned fish, such as sardines, anchovies and salmon, contain small bones that contribute calcium to the diet. Dark green leafy vegetables and cereals, whole-grain or fortified, also provide a small amount of calcium.

The salt content of dairy products such as cheese may be high, so low-salt varieties should be encouraged where possible. The producer should state the amount of salt in a food product on its label. In addition, salt should be iodized, especially in areas where iodine deficiency is endemic; where animal fodder for cows contains iodine, this will automatically be transferred to the population via milk and dairy products (see step 9).

#### **8. Select foods that are low in sugar, and eat refined sugar sparingly, limiting the frequency of sugary drinks and sweets.**

Carbohydrates can be subdivided into two main groups: starches (including some dietary fibres) and simple sugars, such as mono- and disaccharides. Starch, however, is the main form of carbohydrate found in most foods. In addition to providing energy, sugars produce the sensation of sweetness. Each type of sugar contributes the same amount of energy to the diet regardless of its sweetness, except when the sugar is not completely absorbed.

Foods may contain many different types of refined sugars: brown sugar, corn sweeteners, corn syrup, fructose, fruit juice concentrate, glucose (dextrose), high-fructose corn syrup, honey, invert sugar, lactose, maltose, molasses, raw sugar, table sugar (sucrose) or syrup. If present in processed food, they should be listed on the label. If one sugar appears first on the ingredients list or if several are listed, the food has a high sugar content. None of these sugars is necessary in a healthy diet. Since they supply only energy and few nutrients, they can be safely excluded without posing any risk to health.

In fact, sugar may pose a risk to health by promoting tooth decay. The more often a person consumes food or drinks that contain sugar, and the longer these are in the mouth, the greater the risk of tooth decay. Thus the frequent taking of sugary foods and drinks, such as between meals, is more harmful to teeth than eating sugar at meal-time and then brushing the teeth. Regular daily dental hygiene, including brushing with a fluoride toothpaste and flossing, will help prevent tooth decay.

Sugar substitutes, such as saccharin and aspartame, are artificial sweeteners usually added to foods to help them taste sweet. Most neither promote tooth decay nor provide energy, and may be useful in

diabetic or low-energy diets. Not all substitutes, however, are low in energy (such as sorbitol). Some foods that are labelled “low in sugar” may contain fat and so still be high in energy. The public may mistakenly assume that commercial so-called diet foods are useful but, without reduced energy intake and increased physical activity, the use of sugar substitutes alone will not result in any health improvements.

Most people like sweet tastes, and sugar is used in food preparation as a preservative, thickener and baking aid. For this reason many processed foods contain what is sometimes called hidden sugar. For example, one portion of sweet cake or pastry may contain around 30 g of sugar and a 300-ml soft drink may contain roughly 40 g, which translates to about 450 kJ and 600 kJ, respectively. In 1990, WHO recommended that no more than 10% of daily energy come from sugar. If high-sugar products are frequently consumed on a daily basis, the intake of sugar may soon amount to much more than 10% of the daily energy intake.

**9. Choose a low-salt diet. Total salt intake should not be more than one teaspoon (6 g) per day, including the salt in bread and processed, cured and preserved foods. (Salt iodization should be universal where iodine deficiency is endemic.)**

A high prevalence of hypertension and increased morbidity and mortality from cerebrovascular disease are associated with a high salt intake. WHO therefore recommends an upper limit of 6 g salt per day. Most people eat much more than this, often unknowingly, because salt is hidden in foods such as bread, cheese, and preserved and processed foods. In many countries, such as Finland and the United Kingdom, processed foods contribute around 80% of the daily salt intake, with only around 20% added knowingly in cooking or at the table. The food industry need to reduce the amount of salt in processed and manufactured foods, especially in staple foods such as bread.

People get used to the taste of salt, and so may add it to food to enhance it, often without tasting first. This preference for salty food weakens, however, if people gradually reduce their salt intake. The desire for salt and salty tastes disappears relatively quickly and, after a period of reducing salt intake, people soon find salty foods unpleasant to the taste buds. In the United States it is common for people not to add any salt, either in cooking or at the table. The following are some specific suggestions to help reduce salt:

- Processed foods should be labelled; if not, consumers should ask about the salt content.
- Food products that contain a lot of salt (smoked, canned, pickled and cured products) should be eaten in small amounts and not on a regular basis.
- The consumption of low-salt foods such as vegetables and fruits should be increased.
- The amount of salt added during cooking and food preparation should be reduced; instead, herbs and spices could be added to flavour food.
- Finally, people should not automatically add salt to food, but taste it first.

Iodine deficiency is common in some countries, and poses a health risk mainly to children, resulting in cretinism, and women, resulting in goitre, if left untreated. WHO and the United Nations Children’s Fund (UNICEF) recommend universal salt iodization, which means that all salt used by the food industry and bought by households should be iodized, using potassium iodate in areas

where iodine deficiency is endemic. Moreover, universal salt iodization includes the recommendation that fodder fed to cows also be iodized, so that milk and milk products can also be a source of iodine.

Universal salt iodization can be implemented by means of state legislation, and all countries with endemic iodine deficiency should have national laws that are properly enforced. In the Netherlands, salt in bread is iodized; in Iceland, iodine is obtained mainly from fish. In other countries, such as the Nordic countries, Poland and the United Kingdom, the population gets iodine mostly from milk and dairy products, as a result of farmers feeding it to their cows.

The promotion of iodized salt should not result in increased salt intake. The necessary monitoring of iodine intake through salt iodization is a unique opportunity to evaluate and monitor salt intake and to respect the WHO recommendation to maintain or decrease salt intake at healthy levels.

**10. If alcohol is consumed, limit intake to no more than 2 drinks (each containing 10 g of alcohol) per day.**

Alcohol is made by the fermentation of carbohydrate and has an energy value of 29 kJ per gram. Alcohol intoxication due to excessive drinking or binge drinking greatly increases the risk of morbidity and mortality.

Adverse health effects of excessive alcohol consumption have been observed in the brain, liver, heart muscles, blood, intestines, nerves, pancreas and nutritional status. Alcohol dependence can lead to deficiencies of nutrients, including thiamin, riboflavin, niacin, pyridoxine, folic acid and vitamin C, and zinc and magnesium. These disorders arise for various reasons: the failure to eat a nutritious variety of food containing these nutrients, malabsorption in the small intestine leading to a decreased nutrient absorption, or metabolic disturbances that interfere with the normal metabolism of nutrients. In some countries, alcohol recommendations are set at a lower level for women. Pregnant women should refrain from drinking alcohol.

**11. Prepare food in a safe and hygienic way. Steam, bake, boil or microwave to help reduce the amount of added fat.**

Although the development of programmes dealing with food safety and food security is beyond the scope of this CINDI guide, health professionals need to understand that food preparation and storage are important. Food should be prepared and handled in ways that preserve its nutrient quality and limit the likelihood of contamination. On request, the WHO Regional Office for Europe provides specific information on how to handle vegetables and fruits grown in potentially contaminated soil.

A few factors are responsible for a large proportion of the incidence of foodborne disease: preparing food too far ahead of consumption, leaving food too long at a temperature that permits bacterial proliferation, inadequate heating, cross-contamination and handling of food by an infected person. Health professionals can convey accurate information on food preparation and the following material has been adapted from WHO recommendations to provide guidance.<sup>9</sup>

---

<sup>9</sup> A WHO leaflet (document WHO/FNU/FOS/94.3) provides more information and advice on hygiene in food-service and mass-catering establishments.

1. **Choose foods processed for safety.** Some foods may not be safe unless processed, such as pasteurized milk as opposed to raw milk.
2. **Cook food thoroughly.** Many raw foods, notably poultry, meat and unpasteurized milk, may be contaminated with pathogens. Thorough cooking will kill these, as long as all parts of the food reach at least 70 °C. Frozen meat and poultry should be thoroughly thawed before cooking.
3. **Eat cooked food as soon as possible.** When cooked food cools, microbes begin to proliferate. The longer the wait, the greater the risk.
4. **Store cooked foods carefully.** Stored food should be kept either hot (near or above 60 °C) or cool (near or below 10 °C), especially if stored for more than four hours. Foods for infants should not be stored at all. In an overburdened refrigerator, hot food may not be able to cool quickly enough and, if the centre remains warm (above 10 °C) for too long, microbes quickly proliferate.
5. **Reheat cooked food thoroughly.** Reheating is the best protection against microbes that develop during storage. All parts of food must reach at least 70 °C.
6. **Avoid contact between raw and cooked food.** Cross-contamination can be direct if raw poultry comes into contact with cooked food, or indirect when an unwashed cutting board and knife are used in cutting first raw and then cooked poultry.
7. **Wash hands repeatedly.** People should wash their hands before and after preparing food and such activities as changing a baby, going to the toilet, touching pets, etc. After preparing raw food, people should wash their hands before touching cooked food. Infected skin should be covered.
8. **All kitchen surfaces should be kept clean.** Every crumb or spot is a potential reservoir for germs. Dishcloths should be changed regularly and boiled if contaminated. The cloths used for cleaning floors should be washed frequently.
9. **Protect food from insects, rodents and other animals.** People should store food in tightly sealed containers away from pathogenic microorganisms that cause foodborne disease.
10. **Use pure water.** If there is any doubt about its quality, water should be boiled before making ice or adding it to food, especially if it is used in a meal for a young child.

The amount of fat, oil, salt and sugar added during preservation, cooking or preparation should be reduced as much as possible. Steaming, grilling, baking and boiling are healthier than frying, because these methods require less fat. If it is necessary to fry, new-style pans with Teflon coating require less fat. Food can be cooked in its own juice or in a low-fat sauce, or covered in aluminium foil and baked in the oven; notably fish and meat taste pleasant when baked. Food can be grilled without adding extra oils or fats, and the use of refrigerators and freezers has reduced the need to add sugar and salt to preserve food.

Traditional recipes, developed during the period when most people were more physically active, can be a major source of fat. On the one hand, traditional recipes should be preserved, since they are an

integral part of local culture; on the other hand, they should be brought more into line with recommendations, designed for societies that are now less active.

Unprocessed cereal grains, such as home-made muesli or porridge, provide an excellent alternative to commercial breakfast cereals, which are relatively expensive and may contain a lot of sugar and salt. Honey or jams may be used to sweeten home-made porridges, but they should be used sparingly, and sweet-tasting berries or fruit used instead. In baking, as little sugar as possible can be incorporated into cakes; instead they can be sweetened with dried or diced fresh fruits.

Most leafy greens should be steamed or boiled in very little water for around 5 minutes and, if fats are added after preparation, they should be kept to a minimum. Some people, especially children, may eat too few vegetables because they do not like the taste. Vegetables can taste very unpleasant if not cooked properly and especially if overcooked. Learning cooking skills at home and at school is vital. The value of promoting cooking skills for future generations cannot be overestimated.

**12. Promote exclusive breastfeeding and the introduction of safe and adequate complementary foods from the age of about 6 months, but not before 4, while breastfeeding continues during the first years of life.**

Breastfeeding is well known to provide the best start in life for infants, but the benefits to the mother may be less well known. Lactation results in a number of adaptations that benefit maternal health in both the short and long terms. It promotes a more rapid return of the uterus to its pre-pregnant state. In addition, a woman's iron stores are mobilized during lactation and intestinal iron absorption increases to conserve and increase these stores. Contrary to common belief, anaemic women can breastfeed normally and lactation should not be seen as a contraindication.

In the longer term, lactation leads to more rapid weight loss and return to pre-pregnancy weight, which may help to prevent the development of obesity. There is evidence that lactation reduces the risk of the development of disease in mothers.<sup>10</sup> Several studies have shown that extended lactation is associated with reduced risk of pre-menopausal breast and ovarian cancer.

In addition to the benefits to the mother, breastfeeding protects infants against common infections, especially diarrhoeal and respiratory diseases. Even in the best, most hygienic conditions, babies fed breast-milk substitutes are 5 times more likely than breastfed babies to suffer diarrhoeal disease, 14 times more likely to die from diarrhoeal diseases and 3 times more likely to die from respiratory diseases. Breastfeeding lowers the risk of a baby getting urinary tract infections. Exclusive breastfeeding limits the prevalence of allergies, asthma and eczema, and immunization is more effective in breastfed infants.

Exclusive breastfeeding means feeding a baby on demand (baby-led feeding) day and night, without resorting to bottle feeds or other foods or fluids, or the use of dummies. Breastfeeding is the best way to keep both infant and mother healthy. Breast-milk alone is all a baby needs for about 6 months. At around this time, vegetables and fruits should be introduced first and then rice or cereal porridges, with fish and meat being introduced a little later.

---

<sup>10</sup> Heinig, M.J. & Dewey, K.G. Health effects of breastfeeding for mothers: a critical review. *Nutrition research reviews*, **10**: 35–56 (1997).

Awareness of the importance of breastfeeding is growing fast, but even some well educated health professionals still lack an understanding of how to help mothers. This is not their fault; established medical practices have unknowingly damaged breastfeeding for years. The best health authorities now encourage the reform of hospital practices and community support for breastfeeding. Global initiatives such as The WHO/UNICEF Baby-Friendly Hospital Initiative promote ten steps to successful breastfeeding. These are based on the best knowledge of practices that help mothers and babies.

Commercially made baby milks, even those made by the most sophisticated and scientific methods, can never match breast-milk because they are derived from animal milk or soybean, and so they do not contain anti-infective factors. Even if a manufacturer could copy human milk, it could never be right for each child, because each mother's milk changes according to her child's needs. Colostrum, the early, thicker, yellow breast-milk, acts as the first immunization, and provides a superdose of antibodies and vitamins. Colostrum helps babies expel their first dark faeces (meconium). The change from colostrum into mature milk matches the newborn's needs. Breast-milk then changes composition during a breastfeed and changes according to the child's age.

Almost all women are able to breastfeed. Unfortunately, many common practices make breastfeeding go wrong and breastfeeding skills were lost in the twentieth century. Mistaken ideas went into medical textbooks, so doctors and many nurses not only do not know the benefits and best practices for breastfeeding but also provide the wrong advice.

No other food or liquid is needed during about the first 6 (but at least 4) months of life. Breast-milk, including colostrum, is the perfectly balanced food and drink for babies. Plain water; glucose, dextrose or sugar water; teas; herbal drinks; juices; gripe water; cow's milk; or any other fluid (including commercial baby milks) all reduce the amount of breast-milk that the baby takes in. All these products are unnecessary, except in the rarest cases, and may have health implications. They can introduce bacteria, cause allergies and irritate the baby's intestines. If given soon after birth they will delay the establishment of breastfeeding and reduce breast-milk supply. Exclusive breastfeeding is the ideal and all other fluids interfere with the process. Breast-milk contains the exact amount of water that the baby needs, even in the hottest, driest climates. The baby absorbs the fluid in breast-milk better than any other drink.

At around 6 months, but not before the end of the fourth month, mashed or grated vegetables and fruit should be introduced. In addition, breastfeeding should be continued until the child is at least 12 months of age. When babies start to eat mashed or grated family foods, then they can be given cooled boiled water, though breast-milk will supply enough fluid if safe water is unavailable. Infants should not be given sugared drinks, which contain no useful nutrients and can damage the teeth. Both tea and cow's milk contribute to iron-deficiency anaemia; for this reason, cow's milk should be given at around 9–12 months, not earlier.<sup>11</sup> Tea should not be given to infants and young children. In contrast, breast-milk into the second year can provide about one third of a child's energy

---

<sup>11</sup>. Michaelsen, K.F. et al. *Feeding and nutrition of infants and young children: guidelines for the WHO European Region, with emphasis on former Soviet countries*. Copenhagen, WHO Regional Office for Europe, 2000 (WHO Regional Publications, European Series, No. 87).

and protein needs. Breast-milk is a good source of vitamins A and C and protects against infection, even after infancy.

## Other important issues

### Vitamin and mineral supplements

Vegetables, salads and fruits, rather than tablets or supplements, are the best source of vitamins and minerals. Prescriptions of micronutrients, biologically active substances or multivitamins are usually unnecessary, especially if people follow advice similar to that presented here. Indeed, excess doses can at best cause unnecessary expense and at worst be harmful. For example, nearly all documented cases of vitamin D toxicity were caused by taking supplements.

Most countries have their own recommendations on vitamin supplements for vulnerable groups such as young children, pregnant and lactating women, and older people. This may include recommendations for vitamin D. For example, in the United States, 200 IU (5 g) per day is recommended for people under 50 years, 400 IU (10 g) per day for those aged 50–70 years and 600 IU (15 g) per day for those over 70 years.

Sunlight, however, is the main source of vitamin D. Even 10–15 minutes of sunlight on the arms and face around three times a week is probably sufficient to manufacture enough vitamin D to meet most needs. One study conducted in Boston<sup>12</sup> concluded that for middle-aged and older adults, exposure of the hands, face and arms to moderate doses of sunlight (approx 5-30 minutes/day) two to three times per week during the summer months was sufficient to provide adequate vitamin D synthesis. It was found that little vitamin D synthesis occurs in the skin from November through to December in Boston. Adequate exposure to UV light is more difficult to achieve in more northern latitudes<sup>13</sup>. Thus it becomes very important in northerly regions for, especially, children and vegans to be exposed to ample sunlight in the summer. Because vitamin D<sub>3</sub> is fat-soluble it can be stored in adipose tissue and therefore what is produced in the summer can be released from storage during the winter months of no sunlight.

Those who live at a southerly latitude can synthesise sufficient vitamin D from a minimal amount of sun exposure from April through to October with very reduced or no synthesis during the remaining part of the year. During the winter in northern countries, there may be six or more months of very little or no sun and so infants and young children in these countries may require vitamin D supplements during this time.

Rickets and osteomalacia result from a vitamin D deficiency that prevents the absorption of calcium. Rickets usually occurs among the young, most probably owing to the tradition of covering babies and keeping them inside during the first few months of life. Children should be outside as much as possible. Osteomalacia and osteoporotic hip fractures among older people are thought to be related

---

<sup>12</sup> Holick MF Vitamin D requirements for the elderly. Clin Nutr 1986; 5: 129-31.

<sup>13</sup> Lu Z, Chen TC, Kline L et al Photosynthesis of previtamin D in cities around the world. In: Holick MF, Kligman A eds. Proceedings of the Biologic Effects of Light Symposium. Berlin: Walter DeGruyter & Co, 1992; 48-52.

to vitamin D deficiency. Walking outdoors combines the benefits of physical activity to bones with the daily dose of vitamin D via sunlight, and so should be promoted.

Sunscreen creams in countries with long hours of sunshine prevent increased risk of developing skin cancer, but they can reduce or even shut down the synthesis of vitamin D. Where this is a concern, around 15 minutes sun exposure without sunscreen, in the early morning or late afternoon when the sun is less damaging, should be recommended; then sunscreen should be applied if people stay longer in the sun. Because of the wide variation in latitudes in the WHO European Region, country policies to prevent vitamin D deficiency will vary markedly.

## **Water**

Food usually provides more than half the daily fluid requirement. People obtain water from beverages and food, and produce it in body cells following the metabolism of fat, alcohol, protein and carbohydrate. Tap water should be taken in place of most soft drinks. Water is perhaps the most essential nutrient, since people can do without it for only a short time. The requirement for water is influenced by environmental conditions. For example, in very hot climates a great deal of water is lost, not only as sweat but also in expired air.

Making household water supplies safe has contributed dramatically to human health. In areas where the quality of the water is not ensured, it is advisable to boil water and drink it after it has cooled. Recommending that the public drink bottled water is not necessary; in some countries, the commercial varieties have been reported to be more contaminated than the local water supply.

## *Annex 1*

### **Principles for the development of a pictorial food model**

The following are principles for use in developing a pictorial food model similar to the CINDI pyramid.

1. Form a working group.
2. Review food consumption patterns.
3. Draw conclusions as to the diet–health linkages and main problems.
4. Identify relevant key national policies (agriculture, education, environment, social welfare and health).
5. Determine the critical health, food and nutrition issues to be addressed by the model.
6. Define the target groups and content of the model.
7. Ensure the socioeconomic feasibility and cultural appropriateness of the information conveyed.
8. Define the purpose, goals and targets of the model.
9. Ensure that the model gives main messages for the public.
10. Highlight the locally grown vegetables and fruits available.
11. Consider seasonality; highlight when different local foods are in season.
12. Consider whether the material takes account of health policy and reflects a broad scientific consensus.
13. Acknowledge any controversy about an issue covered by the materials.
14. Ensure that the materials are not misleading.
15. Place the illustrations in the context of a healthy lifestyle.
16. Clearly mark the model with the date of its issue.
17. In any accompanying text, number the pages; explain any abbreviations and acronyms used; cite other useful sources of information; and give brief summaries of key points where relevant.
18. If the materials are designed for use in schools, ensure they are referenced in the national curriculum.
19. Ensure that the materials recognize the complexity of the social and cultural messages attached to food and the potential effects that these could have on the vulnerable.
20. Clearly state the names and addresses of the originators and issuing institution.
21. If the model is developed in collaboration with the private sector, be sure to retain copyright and not to allow any vested interest to influence the model in its favour.
22. When referring to particular foods, use generic names, not logos and trade names. If brand-name products are mentioned, for example, to help users identify particular types of products, mention them sparingly and in a relevant context.
23. Assess the appropriateness of the model by preliminary testing with focus groups.
24. Monitor changes in knowledge, attitudes, skills, dietary intake and nutritional status as a result of the model's implementation.

## Annex 2

### Nutrient content of food groups

Models A, B and C illustrate a selection of diets that represent a normal range of energy intakes: low (6500 kJ (1500 kcal)), medium (9200 kJ (2200 kcal)), or high (12 500 kJ (2800 kcal)) depending on activity levels, gender, body size and age (Tables 1–6). All values are approximate, rounded up or down, and are not exact.

Table 1. Examples of diet models, based on foods from the different groups, and their nutrient content

#### A. Diet models

Food groups and serving size	Models and number of servings		
	A	B	C
Bread, pasta, rice and potatoes (100 g)	3	4.5	6
Vegetables (100 g)	3	4	5
Fruit (100 g)	2	3	4
Milk and dairy products (100 g)	2	2.5	3
Meat and alternatives (100 g)	1	2	3

#### B. Diet models and their nutrient content

Nutrients	Model A	Model B	Model C
Energy (kJ)	6500	9200	12 500
(kcal)	1500	2200	2800
Proteins (g)	65	90	115
Fat (g)	30	50	70
Carbohydrates (g)	220	330	430
Calcium (mg)	800	1000	1300
Iron (mg)	17	25	35
Potassium (mg)	2600	3700	5000
Fibre (g)	22	32	42
Vitamin A (µg)	820	1130	1430
Vitamin B1 (mg)	1.2	2.0	2.5
Vitamin B2 (mg)	1.0	1.5	2.0
Vitamin B6 (mg)	1.5	2.2	3.0
Vitamin B12 (mg)	2.0	3.0	4.0
Vitamin C (mg)	70	100	130
Vitamin E (mg)	7	10	14
Energy from fat (%)	19	21	21

**Source:** Perlin, C. et al. *Food tables. 1st Part.* Prague, Nutrition Society, 1992, and Perlin, C. et al. *Food tables. 2nd Part.* Prague, Nutrition Society, 1993.

If extra fats or oils (an additional 10 g, 11 g or 14 g, respectively) are eaten, the following extra energy (and vitamin E from oils containing vitamin E) would be added to the diet:

Nutrients	10 g	11 g	14 g
Energy (kJ)	6300	9300	12 300
Vitamin E (mg)	10	15	20
Total fat (g)	40	60	80
Energy from total fat%	24	24	25

These calculations show that the selected diets are still below the recommended maximum of 30% of energy coming from fat.

Table 2. Nutrient content of numbers of servings from the bread, pasta, rice and potatoes group (1 serving = 100 g)

Nutrients	Servings		
	3	4.5	6
Energy (kJ)	2900	4300	5800
Proteins (g)	20	30	40
Fat (g)	7.5	11	15
Carbohydrates (g)	150	200	300
Calcium (mg)	80	120	160
Iron (mg)	6	9	12
Potassium (mg)	500	700	1000
Fibre (g)	9	14	18
Vitamin A (g)	2	3	4
Vitamin B1 (mg)	0.5	0.8	1.0
Vitamin B2 (mg)	0.2	0.3	0.5
Vitamin B6 (mg)	0.6	0.9	1.2
Vitamin B12 (g)	0	0	0
Vitamin C <sup>a</sup> (mg)	0	0	0
Vitamin E (mg)	4	5	8

<sup>a</sup> Unless potatoes are eaten (potatoes contain 20 mg per 100 g – average value – but vitamin C content varies widely).

Table 3. Nutrient content of numbers of servings from the vegetables group (1 serving = 100 g)

Nutrients	Servings		
	3	4	5
Energy (kJ)	900	1200	1500
Proteins (g)	14	19	24
Fat (g)	2	3	4
Carbohydrates (g)	40	50	60
Calcium (mg)	140	190	230
Iron (mg)	6	8	10
Potassium (mg)	1000	1500	2000
Fibre (g)	8	10	12
Vitamin A (g)	400	550	700
Vitamin B1 (mg)	0.3	0.4	0.5
Vitamin B2 (mg)	0.2	0.2	0.3
Vitamin B6 (mg)	0.6	0.8	1
Vitamin B12 (g)	0	0	0
Vitamin C (mg)	35	50	60
Vitamin E (mg)	3	4	5

Table 4. Nutrient content of numbers of servings from the fruit group  
(1 serving = 100 g)

Nutrients	Servings		
	2	3	4
Energy (kJ)	500	750	1000
Proteins (g)	2	3	4
Fat (g)	0.5	0.8	1.0
Carbohydrates (g)	30	50	60
Calcium (mg)	40	65	80
Iron (mg)	1.5	2.5	3.0
Potassium (mg)	350	500	700
Fibre (g)	5	7	10
Vitamin A ( µg)	180	260	350
Vitamin B1 (mg)	0.1	0.1	0.2
Vitamin B2 (mg)	0.1	0.1	0.2
Vitamin B6 (mg)	0.1	0.2	0.3
Vitamin B12 ( µg)	0	0	0
Vitamin C (mg)	30	50	60
Vitamin E (mg)	0.2	0.3	0.4

Table 5. Nutrient content of numbers of servings from the meat and alternatives group  
(1 serving = 80 g (cooked weight))

Nutrients	Number of servings		
	1	2	3
Energy (kJ)	700	1400	2100
Proteins (g)	6	12	18
Fat (lean meat) (g)	10	20	30
Carbohydrates (g)	4	8	12
Calcium (mg)	40	80	120
Iron <sup>a</sup> (mg)	2.5	5.0	7.5
Potassium (mg)	250	500	750
Fibre (g)	0.5	1.0	1.5
Vitamin A ( µg)	25	50	75
Vitamin B1 (mg)	0.2	0.5	0.7
Vitamin B2 (mg)	0.1	0.2	0.2
Vitamin B6 (mg)	0.1	0.3	0.4
Vitamin B12 ( µg)	1.4	2.7	4.1
Vitamin C (mg)	0	0	0
Vitamin E (mg)	1	1.5	2

<sup>a</sup> Liver has a much (5 times) higher iron content.

Table 6. Nutrient content of numbers of servings from the milk and dairy products group  
(1 serving = 125 g)

Nutrients	Servings		
	2	2.5	3
Energy (kJ)	900	1200	1400
Proteins (g)	20	25	30
Fat (g)	10	12	14
Carbohydrates (g)	10	15	20
Calcium (mg)	500	600	700
Iron (mg)	0.5	0.6	0.7
Potassium (mg)	400	450	500
Fibre (g)	0	0	0
Vitamin A ( g)	200	250	300
Vitamin B1 (mg)	0.1	0.1	0.2
Vitamin B2 (mg)	0.5	0.6	0.8
Vitamin B6 (mg)	0	0	0
Vitamin B12 ( g)	0.5	0.6	0.7
Vitamin C (mg)	2	3	4
Vitamin E (mg)	0	0	0

**Source:** All values are taken from the official food composition tables, which are based on the food composition tables from Germany. (Perlin, C. et al. *Food tables. 1st Part.* Prague, Nutrition Society, 1992, and Perlin, C. et al. *Food tables. 2nd Part.* Prague, Nutrition Society, 1993).

### *Annex 3*

#### **Locally grown vegetables and fruit**

Nutrition education designed to decrease diet-related diseases is inextricably linked to agricultural and natural resource issues. The most appropriate dietary guidelines not only promote health but also conserve natural resources. Dietary guidelines should be evaluated in terms not only of their nutrient content but also of the environmental costs of implementing the recommended action: the cost of food production, processing, packaging, transport, storage and marketing. The CINDI dietary guide has been designed to promote horticultural sustainability through emphasizing the role of locally grown vegetables and fruit. One of the aims is to support food systems that preserve the rural countryside and farmland and require less energy for transport.

Despite the many benefits to consumers and industry gained from increased globalization, there is growing concern that this trend could threaten the long-term sustainability of food security. Local food systems should not be isolated from the global food system; the aim should be to achieve a level of self-reliance that reflects local environmental and community health priorities. The long-term sustainability of food production will depend on reaching a balance between the local and global systems that minimizes environmental damage and promotes economic and community viability. Local food systems will only be viable if consumers buy local produce and this will depend on availability, price and quality.

Food policies made after the Second World War were very successful; indeed, deficiency of protein and energy was eliminated from the European Region. Nevertheless, deficiency remains – a deficiency of the vitamins, minerals and non-nutrients found in vegetables and fruit. Future food policies that include health considerations must therefore focus on increasing the availability of vegetables and fruit. Local varieties are vital to future food security and growing them safeguards biodiversity and the nutrition security of future generations.

The closer vegetables and fruits are grown to the consumer, the more likely that local produce will be fresh and have a higher nutrient content than produce that has been stored and/or transported for long distances. During storage and transport, the level of vitamin C is reduced. Every time a container is jostled, oxygen may penetrate more quickly, especially if the tissues are damaged, and the aging process speeds up. Vitamins A, B and E can be destroyed by rough handling or bright lights and, if produce is exposed to air, oxidation of flavonoids occurs, resulting in compositional changes and the formation of undesirable colours and flavours.

Growers who sell direct, or through local shops and markets, are usually keen to maintain their number of customers by offering good quality, flavour and variety. However, local retailers need to be supported because, if local shops and farmers markets disappear, local growers have no outlet for their produce and consequently may be forced out of business and so threaten local food security.

The average current intake of vegetables and fruit in the European Region is far too low. It will improve only if availability of and access to vegetables and fruit are improved, especially for vulnerable groups, notably the unemployed, ethnic minorities or low-income groups. Availability and access can be improved if more vegetables and fruit are grown locally and sold at affordable prices. If fresh food is easily accessible, there is less need to buy products with a long shelf-life, which contain few vitamins and minerals but are rich in energy and may contain excess preservatives, such as salt and sugars.

Fears that locally grown vegetables and fruits may be contaminated is a concern in many regions, but they can be grown safely in high-risk areas and expert advice can be sought.<sup>14</sup> In summary, local vegetable and fruit production can have many economic, social and environmental benefits in addition to preventing NCD and improving mental and psychological health, such as:

- creating more opportunities for local employment
- stimulating local economic growth
- enhancing social and community life
- improving the aesthetics of the local environment
- increasing opportunity for more active lifestyles
- facilitating the recycling of organic waste
- providing closer links between consumers and producers
- enabling environmental sustainability.

---

<sup>14</sup> The WHO Regional Office for Europe can provide a booklet on this topic: *Contaminated soil in gardens: how to avoid the harmful effects*. Copenhagen, WHO Regional Office for Europe, 1999 (document EUR/ICP/LVNG 03 01 02(A)).

*Annex 4*

**Dietary fats and coronary heart disease (CHD) risk**

<b>Dietary factor</b>	<b>Dietary source</b>	<b>Effects on CHD risk</b>
Saturated fatty acids (SFA)	Butter, lard, milk fat, cheese, meat, sausages, coconut oil	Strong association between a high intake of certain SFA (notably myristic, lauric and palmitic) with elevated levels of total and LDL cholesterol  Increased risk of thrombosis from several SFA, such as stearic
Polyunsaturated fatty acids		
Omega-6	Corn, sunflower and safflower oil	Reduced blood levels of total and LDL cholesterol but, in large amounts, possible lowering of protective HDL
Omega-3	Fish oils and fats in vegetables and nuts (such as walnuts)	Reduced blood levels of LDL cholesterol (but only if initial levels high) and possible increase in HDL  Powerful antithrombotic and antiarrhythmic action
Monounsaturated fatty acids	Olive oil, canola oil, rapeseed oil	Reduced blood levels of LDL cholesterol (perhaps an independent effect or due to displacement of SFAs)  Protection of HDL
Trans fatty acids	Hydrogenated fat in margarines, biscuits, cakes, fast foods	Raised blood levels of total and LDL cholesterol, lowered HDL cholesterol, and increased lipoprotein(a)  Possibly more harmful than SFAs
Total fat		No strong association with blood cholesterol levels, but contribution to other risk factors such as obesity and Factor VII clotting activation. A high fat intake is often associated with a high SFA intake.
Dietary cholesterol	Eggs, meat, butter, milk	Raised blood levels of total cholesterol, but principal effect by amplifying the impact of SFAs  Less effect when diet low in total fat (individuals vary greatly in their response)

*Annex 5***Alcohol content of beverages**

<b>Beverage (and alcohol content – % volume/volume)</b>	<b>Standard drink (ml)</b>	<b>Alcohol content (g)</b>
Beer (5%)	250	9.8
Wine (11%)	120	10.4
Spirits (40%)	30	9.4

**Source:** *British journal of addiction*, **85**: 1171–1175 (1990).

## Bibliography

- Carbohydrates in human nutrition: report of a Joint FAO/WHO Expert Consultation, Rome, 14–18 April 1997. Rome, Food and Nutrition Organization of the United Nations, 1998 (FAO Food and Nutrition Paper 66).
- CINDI nutrition action plan*. Copenhagen, WHO Regional Office for Europe, 1998 (draft document).
- Comparative analysis of implementation of the Innocenti Declaration*. Copenhagen, WHO Regional Office for Europe, 1998 (document EUR/ICP/LVNG 01 01 02).
- Comparative analysis of nutrition policies in the WHO European Region*. Copenhagen, WHO Regional Office for Europe, 1998 (document EUR/ICP/LVNG 01 02 01).
- Contaminated soil in gardens: how to avoid the harmful effects*. Copenhagen, WHO Regional Office for Europe, 1999 (document EUR/ICP/LVNG 03 01 02(A)).
- Craig, W.J. Phytochemicals: guardians of our health. *Journal of the American Dietetic Association*, **10**(Suppl. 2): S199–S204 (1997).
- Delange, F. et al., ed. *Elimination of iodine deficiency disorders (IDD) in central and eastern Europe, the Commonwealth of Independent States, and the Baltic states: Proceedings of a conference held in Munich, Germany, 3–6 September 1997*. Geneva, World Health Organization, 1998 (document WHO/EURO/NUT/98.1).
- Department of Health. *Nutritional aspects of the development of cancer: report of the Working Group on Diet and Cancer of the Committee on Medical Aspects of Food and Nutrition Policy*. London, The Stationery Office, 1998 (Report on Health and Social Subjects 48).
- Diet, nutrition, and the prevention of chronic diseases: report of a WHO Study Group*. Geneva, World Health Organization, 1990 (WHO Technical Report Series, No. 797).
- Döbrössy, L., ed. *Prevention in primary care: recommendations for good practice*. Copenhagen, WHO Regional Office for Europe, 1994 (document EUR/ICP/CIND 94 01/PB01).
- Eight guidelines for a healthy diet. A guide for nutrition educators*. London, Health Education Authority, 1994.
- Energy and protein requirements: report of a Joint FAO/WHO/UNU Expert Consultation*. Geneva, World Health Organization, 1985 (WHO Technical Report Series, No. 724).
- Fats and oils in human nutrition: report of a joint expert consultation*. Rome, Food and Nutrition Organization of the United Nations, 1994 (FAO Food and Nutrition Paper 57).
- Food, nutrition, and the prevention of cancer: a global perspective*. Washington, DC, American Institute for Cancer Research, 1997.
- Heinig, J.M. & Dewey, K.G. Health effects of breastfeeding for mothers: a critical review. *Nutrition research reviews*, **10**: 35–56 (1997).
- James, W.P.T. et al. *Healthy nutrition: preventing nutrition-related disease in Europe*. Copenhagen, WHO Regional Office for Europe, 1988 (WHO Regional Publications, European Series, No. 24).
- John, T. & Romeo, J.T., ed. *Functionality of food phytochemicals*. New York, Plenum Press, 1997. (Recent Advances in Phytochemistry, Vol. 31).
- Michaelsen, K.F. et al. *Feeding and nutrition of infants and young children: guidelines for the WHO European Region, with emphasis on former Soviet countries*. Copenhagen, WHO Regional Office for Europe, 2000 (WHO Regional Publications, European Series, No. 87).

*Obesity: preventing and managing the global epidemic: report of a WHO Consultation on Obesity, Geneva, 3–5 June 1997.* Geneva, World Health Organization, 1998 (document WHO/NUT/NCD/98.1).

*Preparation and use of food-based dietary guidelines: report of a Joint FAO/WHO Consultation.* Geneva, World Health Organization, 1998 (WHO Technical Report Series, No. 880).

*Urban food and nutrition action plan.* Copenhagen, WHO Regional Office for Europe, 1999 (document).

US Department of Health and Human Services. *Physical activity and health: a report of the Surgeon General.* Atlanta, US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Disease Prevention and Health Promotion, 1996.

WHO/UNICEF/ICCIDD. *Recommended iodine levels in salt and guidelines for monitoring their adequacy and effectiveness.* Geneva, World Health Organization (document WHO/NUT/96.13).

National Research Council. *Recommended Dietary Allowances.* 10<sup>th</sup> edition. National Academy Press, Washington D.C. 1989 (ISBN 0-309-04041-8).