



Scientific Facts on Diet and Nutrition

Prevention of Chronic Diseases

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GreenFacts

Level 2 - Details on Diet and Nutrition

1.	To what extent does diet play a role in chronic diseases?	3
1.1	How does diet influence the global burden of chronic disease?	3
1.2	What are the nutrition problems in the developing world?	3
2.	How are diets changing?	4
2.1	How many (kilo)calories are consumed every day?	4
2.2	How much fat is consumed?	5
2.3	How much animal products are consumed?	5
2.4	How much fish is consumed?	6
2.5	How much fruits and vegetables are consumed?	7
2.6	What future changes in food consumption are expected?	7
2.7	Conclusions on food consumption	8
3.	How are chronic diseases linked to diet and nutrition?	8
3.1	How does diet affect health at different stages of life?	8
3.2	What are the combined effects of different risk factors over time?	9
3.3	How can genes and food interact?	10
3.4	How can chronic disease be tackled throughout life?	10
4.	Are certain dietary intakes recommended to prevent chronic diseases?	11
4.1	What are "population nutrient intake goals"?	11
4.2	How strong is scientific evidence?	11
4.3	What nutrient intakes are generally recommended for a balanced diet?	11
4.4	What level of physical activity is recommended for good health?	12
5.	Excess weight gain and obesity	13
5.1	Is obesity a growing problem?	13
5.2	How can diet and physical activity affect obesity?	13
5.3	What factors are known to affect obesity?	13
5.4	How could obesity be prevented?	15
6.	Diabetes	16
6.1	Is diabetes a growing problem?	16
6.2	How can diet and physical activity affect diabetes?	16
6.3	What factors are known to affect diabetes?	17
6.4	How could diabetes be prevented?	17
7.	Cardiovascular diseases	18
7.1	Are cardiovascular diseases a growing problem?	18
7.2	How can diet and physical activity affect cardiovascular diseases?	18
7.3	What nutrients are known to affect cardiovascular diseases?	18
7.4	What food items are known to affect cardiovascular diseases?	19
7.5	How could cardiovascular diseases be prevented?	20
8.	Cancer	21
8.1	Is cancer a growing problem?	21
8.2	How can diet and physical activity affect the occurrence of cancer?	21
8.3	What cancers are predominant in developing countries?	22
8.4	What cancers are predominant in developed countries?	23

8.5	How could cancer be prevented?.....	23
9.	Dental diseases.....	24
9.1	Are dental diseases a growing problem?.....	24
9.2	How can diet affect dental diseases?.....	25
9.3	Dietary sugars and dental caries.....	25
9.4	Dietary factors which protect against dental caries.....	26
9.5	How could dental diseases be prevented?.....	27
10.	Osteoporosis.....	27
10.1	Is osteoporosis a growing problem?.....	27
10.2	How can diet and physical activity and other factors affect osteoporosis?.....	28
10.3	How could osteoporosis be prevented?.....	28
11.	Conclusion	
	(only in level 1)	
12.	Other views and links	
	(only in level 1)	

This Digest is a faithful summary of the leading scientific consensus report produced in 2003 by the World Health Organization (WHO) and the Food & Agriculture Organization (FAO):
"Diet, Nutrition and the prevention of chronic diseases"

The full Digest is available at: <https://www.greenfacts.org/en/diet-nutrition/>



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- Each question is answered in Level 1 with a short summary.
- These answers are developed in more detail in Level 2.
- Level 3 consists of the Source document, the internationally recognised scientific consensus report which is faithfully summarised in Level 2 and further in Level 1.

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1. To what extent does diet play a role in chronic diseases?

1.1 How does diet influence the global burden of chronic disease?

Chronic diseases are long-term diseases that are not contagious and largely preventable. They include diseases such as obesity, diabetes, cardiovascular diseases, cancer, osteoporosis, and dental diseases and present a growing burden for society.



In 2001, chronic diseases accounted for approximately 60% of deaths worldwide. Almost half of these deaths are attributed to cardiovascular diseases. In addition, obesity and diabetes already affect a large proportion of the population and have, worryingly, started to appear earlier in life.

Shifts towards a high-fat, energy-dense diet and a sedentary lifestyle, first occurred in industrial regions and more recently also in developing countries. Factors that can increase the risk of developing chronic diseases are an unhealthy diet, physical inactivity, tobacco use, and alcohol consumption. Genetic and economic factors, also play a role in developing these diseases.

As chronic diseases are largely preventable, a global strategy on diet, physical activity and health is needed. Changes in the diet that may be helpful in reducing the risk of chronic diseases include eating a diet that is low in fat and sugars and rich in fruits, vegetables and wholegrain foods.

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 2.1 The global burden of chronic diseases [see http://www.who.int/entity/nutrition/topics/2_background/en/index.html#diet2.1]*

1.2 What are the nutrition problems in the developing world?

Hunger and malnutrition are the most devastating problems facing the world's poorest nations and affect nearly 30% of humanity.

Health consequences of malnutrition include disability and stunted mental and physical growth. They affect hundreds of millions of people, especially in the developing world, where approximately 60% of deaths among children under the age of five years are associated with malnutrition.

Preventable causes of nutrition-related diseases include:

- Iodine deficiency, a cause of brain damage and mental retardation,
- Iron deficiency, a cause of anemia,
- Vitamin A deficiency, a cause of childhood blindness.

Slowed growth in the womb, which leads to low birth weight, affects nearly a quarter of all newborn babies. It can profoundly influence childhood growth, survival, and physical and mental capacity, as well as increase the risk of developing diet-related chronic diseases later in life.

Many developing countries now face persisting food insecurity and undernutrition as well as emerging epidemics of chronic diseases, such as obesity, heart disease, hypertension, stroke, and diabetes. This is not surprising, given the rapidity with which traditional diets and lifestyles are changing across the world.

This double burden of disease can be most effectively addressed by integrating policies and programmes designed to prevent chronic diseases such as obesity, as well as nutritional deficiencies and food-related infectious diseases. Indeed, sufficient, safe and varied food supplies prevent malnutrition while reducing the risk of chronic diseases. Such an integrated approach is recommended for both developing and developed countries.

This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases

Section 2.2 The double burden of diseases in the developing world and [see http://www.who.int/entity/nutrition/topics/2_background/en/index1.html#diet2.2] Section 2.3 An integrated approach to diet-related and nutrition-related diseases [see http://www.who.int/entity/nutrition/topics/2_background/en/index1.html#diet2.3]

2. How are diets changing?

Diets evolve over time because of factors such as changes in food availability, food prices, and level of income. Traditional, largely plant-based diets are being replaced by diets that are high in sugars and animal fats and low in starches, dietary fibre, fruits, and vegetables. This transition, combined with a general trend towards a more sedentary lifestyle and a low level of physical activity, is an underlying factor in the risk of developing chronic diseases.

This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases

3.1 Introduction [see http://www.who.int/entity/nutrition/topics/3_foodconsumption/en/index.html#diet3.1]

2.1 How many (kilo)calories are consumed every day?

The food consumption per person is often estimated based on national (sales) statistics that are averaged out over the entire population. In terms of energy content, expressed in kilocalories (kcal) per person per day, the average food consumption appears to have steadily increased in countries around the world.

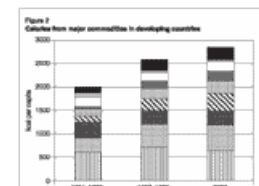


Figure 2: Calories from major commodities in developing countries [see Annex 3, p. 31]

On average, the amount of food consumed per person has increased by nearly 20% between the mid 1960s and late 1990s, reaching an estimated 2803 kcal per day. The increase has generally been even greater in developing countries. However, levels of consumption have remained nearly constant in sub-Saharan Africa and have fallen in countries in economic transition.

Table 1: Global and Regional per capita food consumption. [[see Annex 13, p. 36](#)]

This increase in food consumption has been accompanied by a shift in dietary energy sources away from basic foods such as cereals and potatoes, and towards animal products and vegetable oils.

Table 2: Vegetable and animal sources of energy. [[see Annex 14, p. 37](#)]

This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases

Section 3.2 Developments in the availability of dietary energy [see http://www.who.int/entity/nutrition/topics/3_foodconsumption/en/index.html#diet3.2]

2.2 How much fat is consumed?

As the overall food consumption is increasing, the fat content of the diet (including fats and oils contained in or added to foods) is also changing. Over the past three decades a remarkable increase in the intake of dietary fats and has taken place practically everywhere, except in Africa where consumption levels have stagnated. The fat consumption remains highest in parts of North America and Europe.



Saturated fatty acids are often found in animal products

Table 3: Trends in the dietary supply of fat [see Annex 15, p. 38]

The recommended share of dietary energy (in kcal) that should be derived from fats ranges from a minimum of 15% to a maximum of 35%. In 1990, however, energy from fats fell below the recommended minimum in several countries in sub-Saharan Africa and South Asia, whilst it exceeded the recommended maximum in many countries in Western Europe and North America.

Dietary fats are made up of different fatty acids depending on the food source. A growing proportion of fats are acquired from animal products which tend to be particularly high in saturated fats.

- Saturated fatty acids are often found in animal fats and, eaten in high quantities, can raise cholesterol levels.
- Monounsaturated and polyunsaturated fatty acids are found in nuts, seafood and certain vegetable oils and can lower cholesterol levels.
- Trans-fatty acids are unsaturated fatty acids that behave in a similar way to saturated fatty acids. They are found in hydrogenated oils, such as margarines, and some animal-based foods and can raise cholesterol levels.

The consumption of certain types of vegetable oils is increasing in parts of the world. In particular, in developing countries, the intake of hardened margarines (that are rich in trans-fatty acids) is increasing because they do not need to be refrigerated.

As the demand for olive oil has increased, production has shifted from traditional methods to a more intensive form of cultivation, which might have negative effects on the environment. The development of new processes may enable the production of oil that has a healthy fatty acid composition.

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 3.3 Availability and changes in consumption of dietary fat [see http://www.who.int/entity/nutrition/topics/3_foodconsumption/en/index2.html#diet3.3]*

2.3 How much animal products are consumed?

The livestock sector is growing at an unprecedented rate as a result of population growth, rising incomes, and urbanization (which leads to better distribution network for a wider variety of animal products). Although the average consumption of animal products has strongly increased in countries such as Brazil and China, the levels are still well below that of North America and most other developed countries.

Table 4: Per capita consumption of livestock products [see Annex 16, p. 39]

As diets become richer and more diverse, the high-value protein that the livestock sector offers improves the nutrition of the vast majority of the world. Livestock products not only

provide high-value protein but are also important sources of a wide range of essential micronutrients. These nutrients include minerals such as iron and zinc, and vitamins such as vitamin A. For the large majority of people in the world, particularly in developing countries, livestock products remain a desired food for nutritional value and taste. However, excessive consumption of animal products can lead to excessive intakes of fat in some countries and social classes leading to health risks.

The growing demand for livestock products results in more intensive production systems that are likely to have undesirable impacts on the environment. For instance, meat production requires a lot more land and water than the production of plant-based foods. Whilst a hectare of land may provide enough rice or potatoes to feed 19 to 22 people over one year, the same amount of land only provide enough lamb or beef to feed one or two people.

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 3.4 Availability and changes in consumption of animal products [see http://www.who.int/entity/nutrition/topics/3_foodconsumption/en/index4.html#diet3.4]*

2.4 How much fish is consumed?

Approximately one billion people worldwide rely on fish as their main source of animal protein. Consumption of fish is usually higher in areas that are near the coast, where alternative protein sources are lacking, or where there is a strong preference for fish. On average, fish, crustaceans, and molluscs account for around 15% of the total animal protein intake of the human population.



See also GreenFacts' Fisheries Digest [see <https://www.greenfacts.org/en/fisheries/index.htm>]

The average amount of fish and fishery products consumed per person nearly doubled over 40 years, reaching 16 kg per year in 1997. However, the majority of fish stocks are already being fully exploited and as a consequence total production has levelled off since the 1970s. This is cause for concern because fisheries are an important source of the world's food, employment, and revenue.

Recommendations for daily intake of fish should take into account not only its nutritional value, but the future availability of this food source for human consumption as well. This availability will depend on the sustainability of marine fish stocks and the proportion of fishery products used in animal feed.

See "How much is consumed per person?" in our digest on Fisheries [see <https://www.greenfacts.org/en/fisheries/1-2/04-utilization.htm#2>]

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 3.5 Availability and consumption of fish [see http://www.who.int/entity/nutrition/topics/3_foodconsumption/en/index5.html#diet3.5]*

2.5 How much fruits and vegetables are consumed?

A diet high in fruits and vegetables is recommended for a good health, yet currently only a small minority of the world's population eats an adequate amount.

Between 1970 and 2000, the average worldwide consumption of vegetables increased from 60 kg to over 100 kg per person, but trends vary between countries and regions. A low consumption of fruits and vegetables is a persistent phenomenon in many regions of the developing world, especially in Africa.

In urban areas, people tend to be further away from primary food production which may reduce their access to fresh fruit and vegetables. In this situation the poor may find it especially hard to obtain fruits and vegetables whilst people with higher incomes may have better access to a more diverse and nutritious diet.



Vegetables recommended for good health

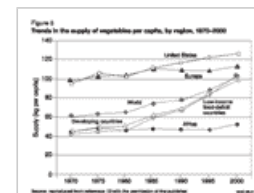


Figure 3: Trends in the supply of vegetables per capita [see Annex 4, p. 32]

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 3.6 Availability and consumption of fruits and vegetables [see http://www.who.int/entity/nutrition/topics/3_foodconsumption/en/index5.html#diet3.6]*

2.6 What future changes in food consumption are expected?

The world's agricultural production is growing. However, this growth has slowed in recent years, raising fears that the world may not be capable of growing enough food to ensure that future populations are adequately fed.

The slowdown has occurred not because of shortages of land or water but rather because demand for agricultural products has also slowed. This is mainly due to the fact that the world's population is growing more slowly and that a high share of the population is too poor to have significant purchasing power.

In developing countries, demand (especially for animal products) is expected to grow faster than production and there will be a need for imports. Extending cultivated land area, and increasing land productivity (possibly by creating irrigation systems) may help increase crop yields and satisfy demand.

Between now and 2030 the average daily energy intake per person is expected to increase by 100 kilocalories in developing countries. Diets previously based on cereal, roots and tubers will increasingly be replaced by diets that are rich in meat, dairy-products and oil. Average consumption of oil crops is expected to rise more rapidly than that of cereals and average consumption of animal products could increase by 44% over the same period.

By 2030, the increase in consumption of fishery products is expected to be more and more limited by environmental factors. Currently, the rapid growth of the aquaculture sector is compensating for the slowdown in marine fish catches.

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 3.7 Future trends in demand, food availability and consumption [see http://www.who.int/entity/nutrition/topics/3_foodconsumption/en/index6.html#diet3.7]*



See also GreenFacts' GM-crops Digest [see <https://www.greenfacts.org/en/gmo/index.htm>]

2.7 Conclusions on food consumption

Changes in diets are needed to cope with the burgeoning epidemic of chronic diseases. All sectors in the food chain, from "farm to table", will need to be involved in meeting this challenge.

Recommended actions include:

- carrying out consumption surveys that provide more reliable information on actual food consumption patterns than national statistics.
- monitoring the impact of dietary recommendations on consumer behavior.
- considering how agriculture, livestock, fisheries and horticulture could deal with potential future demands of an increasing and more affluent population.
- addressing the impacts of intensive production systems, longer storage and transport routes, changes in composition and diversity of consumption patterns.
- taking into account the role of trade in the context of improving diet, nutrition and the prevention of chronic diseases.
- considering the impact of agricultural policies and subsidies on the structure of the agricultural sector and food availability.

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 3.8 Conclusions [see http://www.who.int/entity/nutrition/topics/3_foodconsumption/en/index7.html#diet3.8]*

3. How are chronic diseases linked to diet and nutrition?

Diet largely defines a person's health, growth, and development. Lifestyle factors that affect individuals, such as tobacco use and physical inactivity, are increasingly recognized as playing a role in the development of chronic disease. Moreover, the social, cultural, political and economic environment can aggravate the health of populations unless healthy lifestyles are actively promoted.

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
4.1 Introduction [see http://www.who.int/entity/nutrition/topics/4_dietnutrition_prevention/en/index.html#diet4.1]*

3.1 How does diet affect health at different stages of life?

The risks of developing chronic diseases begin in fetal life and continue into old age. Thus, adult chronic diseases reflect the combined effects of prior exposure to damaging environments. Preventive measures can, therefore, be taken at all life stages.

In the womb and in early infancy, several risk factors can influence susceptibility to the development of diet-related chronic diseases later in life. Delayed fetal growth has been associated with an increased risk of coronary heart disease, stroke, diabetes and high blood pressure. Unusually large size at birth, possibly resulting from overnutrition in the womb, has been linked to an increased risk of diseases such as diabetes and cardiovascular disease.



Adopting habits in childhood
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Breastfeeding may lower the risk of later developing obesity. In contrast, breast-milk substitutes (formula) may increase the risk of developing several chronic diseases, such as type 1 diabetes and cancer, in childhood and adolescence. The level of cholesterol and specific type of fatty acids present in the milk fed to babies are thought to affect the maintenance of cholesterol levels in later life.

During infancy and childhood, both delayed growth and excessive weight or height gain have been shown to contribute to chronic disease in later life. For instance, infants with a low weight or short stature may experience an increased risk of coronary heart disease, stroke, or diabetes. Shorter children who gain height particularly quickly have an increased risk of stroke and certain cancers.

During childhood and adolescence, the adoption of habits such as unhealthy diets, low-levels of exercise, as well as alcohol and tobacco use has been shown to increase the risk of developing certain chronic diseases.

An unhealthy diet contributes to high blood pressure in children causing changes in the body which are associated with the risk of developing cardiovascular disease and obesity. A high calorie intake in childhood is also linked to an increased risk of cancer in later life. Worryingly, not only do chronic diseases occur earlier and earlier in life, but they tend to persist throughout life.

Most chronic diseases are expressed in **adulthood**; therefore, it is a critical time for reducing risk factors and increasing effective treatment. Risk factors that prevail during adulthood have been strongly linked with cardiovascular disease and diabetes including tobacco use, obesity, physical inactivity, high cholesterol level, high blood pressure and alcohol consumption. An individual's ability to take control over his or her life and to make healthy lifestyle decisions appears to be an important determinant of health.

The main burden of chronic diseases is observed in **people older than 60**. Cardiovascular disease, type 2 diabetes and some cancers are most common at this stage in life. This is mainly due to multiple disease processes combining with age-related losses in physiological functions. As the risk of developing disease is generally believed to be reversible at any age there is an absolute benefit for ageing individuals to eat healthily, maintain their weight, and continue to exercise.

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 4.2 Diet, nutrition and the prevention of chronic diseases through the life course [see http://www.who.int/entity/nutrition/topics/4_dietnutrition_prevention/en/index.html#diet4.2]*

3.2 What are the combined effects of different risk factors over time?

The overall risk of developing chronic disease depends on several factors and how they interact throughout life.

Risk factors can combine, or cluster together, and increase the risk of developing disease. For instance, children and adolescents with unhealthy diets and lifestyles tend to be affected simultaneously by factors such as raised blood pressure and impaired glucose tolerance. Combinations of unhealthy habits such as excessive television viewing and low levels of exercise add to the risk. In older children and adolescents, regular alcohol and tobacco use also contributes to high blood pressure which can lead to other risk factors in early adulthood.

Chronic diseases such as obesity, and unhealthy habits such as smoking during pregnancy, can affect the health of the next generation.



See also GreenFacts' Tobacco Digest [see <https://www.greenfacts.org/en/tobacco/index.htm>]



See also GreenFacts' Alcohol Digest [see <https://www.greenfacts.org/en/alcohol/index.htm>]

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 4.3 Interactions between early and later factors throughout the life course [see http://www.who.int/entity/nutrition/topics/4_dietnutrition_prevention/en/index4.html#diet4.3]*

3.3 How can genes and food interact?

Both genetic and environmental factors are likely to have an effect on health and susceptibility to disease. Genetic factors determine how susceptible a person is to develop a disease, whilst environmental factors determine which susceptible individuals will actually develop an illness.

Changes in dietary patterns may affect people in different ways because of genetic variations between individuals. While targeted dietary advice for susceptible populations or individuals is desirable, it is more practical to focus on overall environmental changes that might reduce the number of susceptible persons that go on to develop the disease.

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 4.4 Gene-nutrient interactions and genetic susceptibility [see http://www.who.int/entity/nutrition/topics/4_dietnutrition_prevention/en/index4.html#diet4.4]*

3.4 How can chronic disease be tackled throughout life?

Scientific evidence suggests that it is possible that maintaining a healthy lifestyle can prevent and control chronic disease. Major risk factors that have been proven to contribute to chronic diseases are unhealthy diets, lack of physical activity, and smoking.

Taking steps to reduce risk factors throughout life can have a massive impact on the control of chronic disease. For instance, 80% of cases of coronary heart disease, 90% of cases of type 2 diabetes, and about one-third of cancers could be avoided by elimination of certain risk factors.

A lifestyle combining physical activity, food variety, and social interaction is the most conducive to good health. A diet including at least 20-30 biologically distinct types of food appears to be required for optimal health. It is generally recommended to increase the consumption of fruits, vegetables, and fish, and to adjust the types of fats and oils consumed, as well as the amount of sugars and starch in the diet.



Physical activity is part of a healthy lifestyle
© Micro Application

The majority of people are not complying with or not aware of current dietary guidelines resulting in only a small percentage of the population currently consuming the recommended levels of different foods. To increase awareness, national governments should produce guidelines that are simple and realistic.

There is a definite need to address risk factors in adulthood and among older people, as benefits resulting from lifestyle modification may be seen within 3-5 years. The promotion of healthy lifestyle choices should be undertaken on a national scale and reinforced on a local level to ensure that guidelines reach everybody, creating health-promoting environments particularly for those most at risk.

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 4.5 Intervening throughout life [see http://www.who.int/entity/nutrition/topics/4_dietnutrition_prevention/en/index5.html#diet4.5]*

4. Are certain dietary intakes recommended to prevent chronic diseases?

4.1 What are "population nutrient intake goals"?

There are no specific dietary intakes recommended for the prevention of chronic diseases, only "safe ranges" that are considered consistent with the maintenance of health in a population as a whole. If population averages fall outside this range, health concerns are likely to arise.

Table 6: Ranges of population nutrient intake goals [see Annex 17, p. 40]

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 5.1.1 Background [see http://www.who.int/entity/nutrition/topics/5_population_nutrient/en/index.html#diet5.1.1]*

4.2 How strong is scientific evidence?

Dietary recommendations for a population should aim at minimizing the risk of developing diseases. The risk of developing a particular disease linked to a particular risk factor should be assessed based on the results of multiple controlled trials. Moreover, the risk of many diet-related problems is also linked to environmental factors which lead to changes in behaviour and particularly to excess weight gain.

Scientific evidence can be classified as convincing [see Annex 2, p. 30] , probable [see Annex 2, p. 30] , possible [see Annex 2, p. 30] , or insufficient depending on the number and type of studies carried out and the consistency of the results.

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 5.1.2 Strength of evidence [see http://www.who.int/entity/nutrition/topics/5_population_nutrient/en/index.html#diet5.1.2]*

4.3 What nutrient intakes are generally recommended for a balanced diet?

Table 6 presents the population nutrient intake goals proposed by the Joint WHO/FAO Expert Consultation to the national and regional bodies responsible for establishing dietary recommendations for the prevention of diet-related chronic diseases. These goals are expressed in numerical terms, rather than as increases or decreases in intakes of specific nutrients, because the desirable change will depend upon existing intakes in the particular population, and could be in either direction.



Table 6: Ranges of population nutrient intake goals [see Annex 17, p. 40]

The recommended range for **total fat** is 15 to 30% of total dietary energy intake, whereas the minimum fat intake, which is considered consistent with good health, is 20%. However, highly physically active groups with diets rich in vegetables, legumes, fruits and wholegrain cereals may consume a total fat intake of up to 35% without the risk of unhealthy weight gain.

Higher intakes of **free sugars** threaten the nutrient quality of diets by providing significant energy without specific nutrients. Drinks that are rich in free sugars increase overall energy intake by reducing appetite control. Thus, restriction of free sugars is likely to contribute

to reducing the risk of unhealthy weight gain. To this length, the WHO recommends a population goal for free sugars of less than 10% of total energy intake. It is recognized, with respect of the prevention of obesity, that setting such a goal for the average free sugar intake of a population remains controversial (Comment [see Annex 1, p. 30]).

The recommended intake of fruits and vegetables combined with the consumption of wholegrain cereals is likely to provide an adequate amount of total dietary fibre, i.e. more than 25 g per day.

To assess the weight status of an adult the body mass index (BMI) is calculated by dividing weight in kilograms (kg) by the height in meters squared (m^2). The goal for individuals is to maintain a BMI in the range of 18.5-24.9kg/ m^2 and to avoid a weight gain of more than 5 kg during adult life.

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 5.1.3 A summary of population nutrient intake goaly [see http://www.who.int/entity/nutrition/topics/5_population_nutrient/en/index.html#diet5.1.3]*

4.4 What level of physical activity is recommended for good health?

It is recommended that people of all ages engage in at least 30 minutes of moderate physical activity (such as brisk walking) every day. This level of activity, which is found to be sufficient for maintaining cardiovascular health, is particularly relevant for those who lead otherwise inactive lives.



People of all ages engage can benefit from physical activity © Micro Application

For most people, engaging in a higher level of physical activity for a longer period of time can provide even greater health benefits. At least 60 minutes a day of moderate-intensity activity is recommended in order to prevent obesity.

Additionally, it is recommended that adults engage in strength training exercises at least twice a week in order to maintain muscle strength, and hence preserve independence in performing the activities of daily life and reduce the risk of falling.

The recommended daily activity can be accomplished in several short sessions and can include physical tasks performed in the home (such as household chores) or at work.

When determining an appropriate level of physical activity, potential benefits and risks should be considered on an individual basis.

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 5.1.3 A summary of population nutrient intake goals, Physical activity [see http://www.who.int/nutrition/topics/5_population_nutrient/en/index1.html]*

5. Excess weight gain and obesity

5.1 Is obesity a growing problem?

While obesity is most common in developed countries, almost all countries are now affected by this worldwide epidemic, as diets are becoming richer and people more inactive. The increase in the number of cases of excessive weight gain and obesity has been paralleled by an increase in some chronic diseases such as cardiovascular disease and diabetes. In the United States obesity and physical inactivity alone accounted for about 9% of total health care costs in 1995. Obesity also entails social and economic costs in terms of lost workdays, visits to the doctor and premature deaths.



Within a country, the occurrence of obesity tends to vary between certain age groups and socioeconomic classes. For example, in the most affluent countries, obesity is now affecting not only middle aged people, but also increasingly young adults and children.

Population education strategies supported by substantial policy changes could be effective in eventually reversing these trends.

This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases

5.2.1 Background – 5.2.1 Trends [see http://www.who.int/entity/nutrition/topics/5_population_nutrient/en/index3.html#diet5.2.1]

5.2 How can diet and physical activity affect obesity?

Certain types of foods and eating habits have been linked to weight gain and obesity, for instance snacking, binge-eating, and eating out.

Physical activity and physical fitness are important factors in reducing the risk of unhealthy weight gain and related illnesses, such as heart diseases, and moderate to high fitness entails health benefits (independently of body weight).

With increasing overweight, as measured by the Body Mass Index (BMI), there is an increase in mortality rates and in the proportion of people with additional health conditions. In one study in the USA, over half of all deaths in women with a BMI greater than 29 kg/m² could be directly attributed to their obesity.



This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases

Section 5.2.3 Diet, physical activity and excess weight gain and obesity [see http://www.who.int/entity/nutrition/topics/5_population_nutrient/en/index3.html#diet5.2.3]

5.3 What factors are known to affect obesity?

convincing evidence [see Annex 2, p. 30] shows that weight gain can result from low physical activity, while regular exercise can help to maintain a healthy body weight.

There is convincing evidence [see Annex 2, p. 30] that regular physical activity helps prevent unhealthy weight gain whereas sedentary lifestyles, particularly sedentary occupations and inactive recreational activities such as watching television, promote it. Between 45 and 60 minutes of moderate-intensity physical activity on most days or every day are recommended to prevent unhealthy weight gain. Preventing weight gain after substantial weight loss may require about 60-90 minutes of physical activity per day.

A high intake of dietary fibre has been shown to promote weight loss. Contrastingly, weight gain is promoted by a high intake of energy-dense foods that contain a lot of fat or sugar and few nutrients.

The long-term effectiveness of most dietary strategies for weight loss, including low-fat diets, remains uncertain unless these strategies are accompanied by changes in physical activity and food behaviours. Weight-loss diets that lack evidence from trials of long-term effectiveness and nutritional adequacy cannot be recommended for populations.

Table 7: Summary of strength of evidence on factors that might promote or protect against weight gain and obesity [see Annex 18, p. 41]

Advertisements are constantly promoting foods that are fried and high in fat and sugar. The fact that children can be exposed to such ads through television, might explain the strong relationships found between television viewing and obesity in children. High sugar drinks probably contribute to weight gain as well. Just one extra glass of soda or fruit drinks per day can increase a child's risk of becoming obese by 60%. This evidence makes a strong case for limiting the amount of high sugar drinks consumed by children.

Several large studies showed that breastfeeding probably protects the baby against unhealthy weight gain while providing many other benefits as well. The attitude of children towards food and exercise is largely dependent on their experiences in the home and school environments. Introduction to healthy foods in the home and appropriate teaching in schools can help children make healthy choices regarding food and exercise.

Studies have also shown **possible links** between food portion sizes and weight gain. People may overestimate appropriate portion sizes and therefore eat more than they should. Eating out may also contribute to excess weight gain because food prepared outside the home is typically higher in fat and cholesterol than home-made meals. In contrast, eating foods that breakdown slowly, releasing glucose over a long time (low-glycaemic foods) could possibly protect against unhealthy weight gain.

Certain psychological factors may influence eating patterns and therefore increase the risk of obesity. A "rigid restraint" all-or-nothing approach to eating, dieting, and weight control is probably associated with a higher risk of obesity. The risk is lower for a "flexible restraint" eating pattern with a more gradual approach to dieting in which "fattening" foods are eaten in limited quantities without feelings of guilt.

Other possible factors have been studied, but evidence of an effect on weight gain or obesity is insufficient. For example, there is insufficient evidence that alcohol intake increases the risk of obesity.

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 5.2.4 Strength of evidence [see http://www.who.int/entity/nutrition/topics/5_population_nutrient/en/index3.html#diet5.2.3]*

5.4 How could obesity be prevented?

Obesity can be prevented by encouraging healthy habits early in life.

During infancy, parents should ensure that the child is receiving nutritious food in appropriate quantities. This can initially best be achieved through breastfeeding. If, however, a milk formula is used, it should not contain added starch or sugars. Parents should accept the child's ability to regulate energy intake rather than feeding until the plate is empty.



During childhood and adolescence, parents should encourage physical activity and a diet which contains plenty of fruits and vegetables. Excessive television viewing and the consumption of energy-dense foods and drinks with added sugars should be discouraged and, where possible, replaced by family activities and home-made meals.

In developing countries, programmes designed to address undernutrition should take into consideration both stature and weight to avoid overfeeding.

In countries in economic transition, as populations become more sedentary and able to access energy-dense foods, there is a need to maintain the healthy components of traditional diets and to educate mothers and poor communities about nutrition and obesity.

Individuals can reduce the overall risk of obesity by:

- **Maintaining a BMI (Body Mass Index) of 18.5-24.9 kg/m².** BMI is an indicator of the prevalence of obesity within a population and the median for the adult population should be in the range of 21-23 kg/m².
Table 8: Classification of overweight in adults according to BMI
[see Annex 19, p. 42]
- **Controlling waist circumference.** Waist measurements give an indication of abdominal fat mass and total body fat. Above a certain waist measurement, there is an increased risk of metabolic complications (102 cm for men, and 88 cm for women) which can in turn increase the risk of developing chronic diseases.
- **Engaging in one hour of moderate physical activity per day** (for instance walking).
- **Controlling total energy intake** by consuming less energy-dense foods and drinks, and more fruits, vegetables and fibre.

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 5.2 Recommendations for preventing excess weight gain and obesity [see http://www.who.int/nutrition/topics/5_population_nutrient/en/index5.html]*

6. Diabetes

6.1 Is diabetes a growing problem?

Diabetes is a disease that develops when the body is unable to produce or respond to insulin in the normal way. There are two types of diabetes.

Type 1 diabetes is less common and associated with a total lack of insulin. Previously known as insulin-dependent diabetes, it usually results from the destruction of the insulin-producing cells of the pancreas by the immune system. Both genetic and environmental factors seem to be involved in the onset of the disease.



Type 2 diabetes, previously known as non-insulin-dependent diabetes, accounts for most cases of diabetes worldwide. In this form of the disease, the body's failure to respond to insulin in the normal way leads to the overproduction of insulin, which may result in a partial failure of the insulin producing cells of the pancreas and consequently insufficient insulin production.

Serious complications that can result from diabetes include blindness, kidney failure, amputation, infections, coronary heart disease and stroke. Lifestyle changes are key to both reducing the risk of developing and treating type 2 diabetes.

The number of cases of diabetes worldwide is currently estimated to be around 150 million. This number is expected to double by 2025. The condition, previously seen mostly in adults, is now affecting all age groups, including adolescents and children, especially in high-risk populations.

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 5.3 5.3.1 Background – 5.3.2 Trends [see http://www.who.int/entity/nutrition/topics/5_population_nutrient/en/index7.html#diet5.3.1]*

6.2 How can diet and physical activity affect diabetes?

Genetic and environmental factors determine the likelihood of developing type 2 diabetes. The increase in number of cases appears to be due mainly to environmental changes, particularly lifestyle factors that contribute to weight gain and obesity.

The most dramatic increases occur in societies experiencing major changes in diet, reductions in physical activity, and where there are many overweight or obese individuals.

In all societies, overweight and obesity increase the risk of type 2 diabetes, especially when excess fat is stored in the abdomen.

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 5.3.3 Diet, physical activity and diabetes [see http://www.who.int/entity/nutrition/topics/5_population_nutrient/en/index7.html#diet5.3.3]*

6.3 What factors are known to affect diabetes?

There is convincing evidence [see Annex 2, p. 30] that excessive weight gain and excess fat in the abdomen increases the risk of developing type 2 diabetes. Excess fat in the abdomen is an important factor in the development of insulin resistance, a condition that underlies most cases of type 2 diabetes.



Children of mothers who are affected by diabetes during pregnancy are also at high risk of developing obesity and type 2 diabetes in childhood. Delayed growth in the womb and low birth weight may also increase the risk of developing resistance to insulin.

Overall, studies on humans indicate a probable causal link between saturated fatty acids and type 2 diabetes, and a possible causal association between total fat intake and type 2 diabetes.

In overweight people, voluntary weight loss enhances insulin sensitivity and reduces the risk of type 2 diabetes. Regular vigorous exercise may improve insulin sensitivity and thus reduce the risk of developing type 2 diabetes.

Table 9: Summary of strength of evidence on lifestyle factors and risk of developing type 2 diabetes [see Annex 20, p. 42]

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 5.3.4 Strength of evidence [see http://www.who.int/entity/nutrition/topics/5_population_nutrient/en/index7.html#diet5.3.4]*

6.4 How could diabetes be prevented?

Specific measures can be taken to reduce the risk for diabetes, especially efforts that focus on controlling weight and preventing obesity and cardiovascular disease. Measures include:

- Avoiding weight gain of more than 5 kg in adult life and treating excessive weight gain and obesity.
- Maintaining a mean Body Mass Index (BMI) in the range of 21-23 kg/m².
- Voluntary weight loss in overweight or obese people with higher than normal blood sugar levels.
- Engaging in at least a moderate level of physical activity for one hour or more in the course of the day on most days of the week. Exercising at 80 to 90% of maximum heart rate for at least 20 minutes five days per week may substantially improve insulin sensitivity
- Ensuring a low saturated fat intake.
- Consuming at least 20g of dietary fibre per day (i.e. whole grain cereals, fruit and vegetables).

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 5.3.5 Disease-specific recommendations [see http://www.who.int/entity/nutrition/topics/5_population_nutrient/en/index8.html#diet5.3.5]*

7. Cardiovascular diseases

7.1 Are cardiovascular diseases a growing problem?

Significant lifestyle changes in the second half of the 20th century have greatly contributed to the emerging epidemic of chronic diseases such as cardiovascular diseases (CVD).

Currently, 15.3 million people are estimated to die from cardiovascular diseases every year; that represents one-third of all global deaths from all causes. In the next two decades, the increasing burden of cardiovascular diseases will be borne mostly by developing countries.



*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 5.4.1 Background – 5.4.2 Trends [see http://www.who.int/entity/nutrition/topics/5_population_nutrient/en/index10.html#diet5.4]*

They include amongst others:

- **atherosclerosis**, which occurs when fatty deposits clog and harden arteries,
- **coronary heart disease**, caused by the reduced blood supply to the heart muscle,
- **stroke**, caused by inadequate blood flow to the brain leading to the death of brain cells,
- **hypertension**, occurs when blood pressure is higher than the normal range,
- **cardiac arrhythmias**, which are irregular or abnormal heartbeats.

7.2 How can diet and physical activity affect cardiovascular diseases?

There tends to be a delay between the exposure to risk factors such as poor nutrition, insufficient physical activity and tobacco use and the onset of cardiovascular diseases. This risk is increased by biological factors such as obesity, high blood pressure, diabetes and low cardio-respiratory fitness.

Cardiovascular disease death rates therefore tend to reflect risks encountered at some point in the past.

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 5.4.3 Diet, physical activity and cardiovascular disease [see http://www.who.int/entity/nutrition/topics/5_population_nutrient/en/index10.html#diet5.4.3]*

7.3 What nutrients are known to affect cardiovascular diseases?

Table 10 Summary of strength of evidence on lifestyle factors
[see Annex 5, p. 32]

A high intake of **dietary fats** strongly influences the risk of developing cardiovascular disease (CVD).

Saturated fatty acids commonly found in dairy products and meat raise cholesterol levels. Moreover, studies have also shown trans fatty acids, found in industrially hardened oils, increase the risk of coronary heart disease. While they have been



eliminated from spreads in many parts of the world, trans fatty acids are still found in deep-fried fast foods and baked goods.

The most effective replacement for saturated fatty acids in the diet are polyunsaturated fatty acids (PUFAs) which can lower the risk of developing cardiovascular disease. In particular, they are found in soybean and sunflower oils as well as in fatty fish and plant foods. Polyunsaturated fatty acids have many positive effects, notably on blood pressure, heart function, blood clotting, and inflammatory mechanisms.

Most of this evidence is a result of fish consumption studies. In one particular study, a group of patients who survived a heart attack were given fish oils over several years. Compared to patients who did not receive fish oil, this group had a 20% reduction in total mortality, a 30% reduction in cardiovascular death and a 45% decrease in sudden death.

Cholesterol, which is an essential component of cell membranes and certain hormones, is produced by the liver, but it is also present in dairy products, meat and eggs. A high amount of a certain type of cholesterol (Low Density Lipoprotein or LDL) in the blood can lead to its deposition in the arteries that can restrict blood flow and may cause heart problems. It is not clear whether dietary cholesterol is associated with cardiovascular disease, but it is recommended to avoid excessive intake. Cholesterol is not, in fact, required in the diet because it is produced by the liver in sufficient amounts.

Dietary fibre is also a major factor in reducing total cholesterol in the blood and LDL cholesterol in particular. Eating a diet high in fibre and wholegrain cereals can reduce the risk of coronary heart disease.

An intake of 0.8 mg of **folic acid** could possibly reduce the risk of coronary heart disease (reduced blood supply to the heart muscle) by 16% and the risk of stroke by 24%. Flavonoids, compounds that occur in a variety of foods such as tea, onions and apples, could also possibly reduce the risk of coronary heart disease. There is insufficient evidence to support the theory that antioxidants such as Vitamin E, Vitamin C or b-carotene might reduce the risk of cardiovascular diseases (CVD).

A high intake of **salt** (sodium) has been linked to high blood pressure, a major risk factor for stroke and coronary heart disease.

There is convincing evidence [see Annex 2, p. 30] that a reduction in the daily intake of sodium (by 50 mmol, i.e about 1.2g across the world would lead to reduction in the number of deaths resulting from strokes and coronary heart disease (by about 22% and 16% respectively).

Taking potassium supplements has been shown to reduce blood pressure and the risk of CVD. However, the recommended level of fruit and vegetable consumption supplies an adequate intake of potassium and there is no evidence in favour of long term potassium supplementation to reduce the risk of CVD.

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 5.4.4 Strength of evidence [see http://www.who.int/entity/nutrition/topics/5_population_nutrient/en/index10.html#diet5.4.4]*

7.4 What food items are known to affect cardiovascular diseases?

Consumption of **fruits and vegetables** has been widely associated with good health. Recent studies show a protective effect against coronary heart disease, stroke and high blood pressure.

Fish consumption also reduces the risk of coronary heart disease. The benefits are most evident in high risk groups. For these groups, consuming 40-60g of fish per day would lead to a 50% reduction in the number of deaths from coronary heart disease. Other dietary factors may also contribute to reducing the risk.

Nuts are high in unsaturated fatty acids and low in saturated fats, which contribute to lowering cholesterol levels. Several animal experiments have suggested that isoflavones, present in **soy products**, may provide protection against coronary heart disease.

Alcohol can have both a damaging and protective role in the development of cardiovascular disease. Despite convincing evidence [see Annex 2, p. 30] that low to moderate alcohol consumption reduces the risk of coronary heart disease, consumption should be limited because of the risk of other cardiovascular diseases and health problems.



See also GreenFacts' Alcohol Digest [see <https://www.greenfacts.org/en/alcohol/index.htm>]

Coffee beans contain a substance called cafestol, which can raise the level of cholesterol in the blood and may increase the risk of coronary heart disease. The amount of cafestol in the cup depends on the brewing method: zero for paper-filtered drip coffee and high for unfiltered coffee which is widely drunk in Greece, the Middle East and Turkey.

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 5.4.4 Strength of evidence, Food items and food groups [see http://www.who.int/nutrition/topics/5_population_nutrient/en/index11.html]*

7.5 How could cardiovascular diseases be prevented?

To promote cardiovascular health, intake of saturated fats should be limited to less than 10% of daily energy intake for most people, and to less than 7% for high-risk groups. Products commonly used for cooking, such as hydrogenated fats or coconut and palm oil, contain saturated fatty acids. Limiting the amount of saturated fatty acids consumed can be accomplished by restricting the intake of fat from dairy and meat sources, avoiding the use of hydrogenated oils in cooking, and ensuring a regular intake of fish (once or twice per week). A diet comprising of a total fat intake of up to 35% does not increase the risk of unhealthy weight gain in physically active people who consume a lot of fruits, vegetables, legumes and wholegrain cereals.

Table 10: Summary of strength of evidence on lifestyle factors [see Annex 5, p. 32]

A daily intake of 400 to 500 g of **fruits and vegetables** such as berries, green leafy vegetables and legumes is recommended to reduce the risk of coronary heart disease, stroke and high blood pressure. This daily consumption provides an adequate amount of potassium, which lowers blood pressure and is protective against stroke and cardiac arrhythmias. Other beneficial effects are due to the phytonutrients and fibre contained in fruits and vegetables. Indeed, fibre that is also found in wholegrain cereals helps protect against coronary heart disease and lowers blood pressure.

Restricting **salt** (sodium chloride) intake to less than 5 g per day generally helps to reduce the risk of coronary heart disease and stroke. Restricting salt intake even more, to 1.7g of sodium per day may provide additional benefits such as helping to reduce blood pressure. However, precautions should be taken in special cases such as pregnant women who may be adversely affected by sodium reduction.

Fish consumption once or twice per week is protective against coronary heart disease and stroke. Vegetarians should ensure an adequate intake of the essential fatty acid alpha-linolenic acid which is also found in plant sources (such as canola and soybean oils, pumpkins, and walnuts).

Although low to moderate **alcohol** consumption may protect against coronary heart disease, other health risks associated with alcohol may outweigh these benefits.

Thirty minutes of moderate **physical activity** every day may be sufficient to raise fitness of the heart and lungs which in turn may reduce the risk of CVD. A longer duration and a higher activity level would provide an even greater benefit. However, people who are generally inactive should avoid sudden and high-intensity bursts of physical activity.

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 5.4.5 Disease-specific recommendations [see http://www.who.int/entity/nutrition/topics/5_population_nutrient/en/index12.html#diet5.4.5]*

8. Cancer

8.1 Is cancer a growing problem?

Cancer is now a major cause of mortality. This is largely due to the fact that people tend to live longer, with fewer people dying from other causes such as infectious diseases. In 2000, over 6 million people died from cancer, and there were an estimated 10 million new cases. Between 2000 and 2020, the total number of cases of cancer is predicted to increase by 73% in the developing world and by 29% in the developed world, largely as a result of an increase in the number of old people.



See also GreenFacts' Tobacco Digest [see <https://www.greenfacts.org/en/tobacco/index.htm>]

Cancer is caused by a variety of identified and unidentified factors. The most important proven cause of cancer is tobacco smoking. Other important factors include diet, alcohol consumption, physical activity, infectious diseases, hormonal factors and exposure to radiation. The incidence of lung, colon and rectum, breast, and prostate cancer tends to be higher in developed countries, whereas the incidence of stomach cancer is higher in less developed countries.



See also GreenFacts' Alcohol Digest [see <https://www.greenfacts.org/en/alcohol/index.htm>]

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 5.5.1 Background – 5.5.2 Trend [see http://www.who.int/nutrition/topics/5_population_nutrient/en/index15.html]*

8.2 How can diet and physical activity affect the occurrence of cancer?

The likelihood of developing cancer may increase or decrease depending on what people eat how often they exercise. Dietary factors are estimated to account for approximately 30% of cancers in industrialized countries, making diet second only to tobacco as a theoretically preventable cause of cancer.

Research to date has uncovered few definite relationships between specific dietary factors and cancer risk.

Factors for which there is evidence of an increased risk include:

- Obesity
- High intake of alcoholic beverages, aflatoxins (a toxic substance produced by certain molds), and preserved meat and salted or fermenting fish.
- Consuming drinks and food that are extremely hot (thermally)

Overall, about 20-33% of cancers affecting the breasts, colon, uterus lining, kidney and oesophagus are attributable to unhealthy body weight and lack of physical activity.

Studies have investigated the specific role of diet in the development of major cancers

Lung cancer is the most common cancer in the world and over 80% of cases in developed countries are caused by tobacco smoking. The possible preventive effect of fruit and vegetables consumption against lung cancer remains controversial.

Risk factors in developing **oral cavity, pharynx and oesophagus cancers** seem to vary between countries. In developed countries, alcohol and tobacco alone cause up to 75% of these cancers. In developing countries, 60% of these cancers are attributed to a diet low in fruits, vegetables and animal products. Throughout the world, consuming extremely hot (thermally) drinks and food increases the risk of these cancers.

The risk of developing cancer of the uterus lining is greater in women who are obese, probably because of changes in hormone levels. Some studies suggest that a diet high in fruits and vegetables and low in fat might reduce the risk in developing **endometrial cancer**.

Overweight and obesity may cause up to 30% of **kidney cancer** cases.

Changes in diet and nutrition may play an important role in the increasing frequency of specific cancers. However, though Africa, Asia and Latin America represent two thirds or more of the world population, data on diet and cancer from these regions is lacking and more research is needed. Traditional and industrial food processing methods as well as microbiological and chemical food contaminants are factors that may contribute to the carcinogenicity of diets.

Table 11: Summary of strength of evidence
on lifestyle factors and the risk of developing cancer [[see Annex 6, p. 33](#)]

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 5.5.3 Diet, physical activity and cancer – 5.5.4 Strength of evidence [see http://www.who.int/entity/nutrition/topics/5_population_nutrient/en/index15.html#diet5.5.3]*

8.3 What cancers are predominant in developing countries?

Although **stomach cancer** was once the most common cancer in the world, the number of deaths from this type of cancer have been decreasing over the past 20 years in all developed countries. Dietary factors are thought to play an important role and substantial evidence suggests that a high intake of salty, preserved foods can increase the risk of stomach cancer, whilst a diet rich in fruits and vegetables may reduce the risk. A bacterial infection of the stomach (*helicobacter pylori*) is known to contribute to an increased risk.

Liver cancer occurs much more frequently in developing regions such as sub-Saharan Africa and Southeast Asia. In these regions liver cancer is closely linked to certain infections (hepatitis B or hepatitis C) and to eating foods that have been contaminated by a toxic substance produced by certain molds (aflatoxin). In North America and Europe, excessive alcohol consumption is the main dietary risk factor for liver cancer.

See our Alcohol Digest [see <https://www.greenfacts.org/en/alcohol/index.htm>]

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 5.5.4 Strength of evidence [see http://www.who.int/entity/nutrition/topics/5_population_nutrient/en/index15.html#diet5.5.4]*

8.4 What cancers are predominant in developed countries?

Colorectal cancers occur ten times more frequently in developed countries than in developing countries. This difference might largely be explained by international variations in diet. Aspects linked with the Western diet, such as a high intake of fat and preserved meat or overweight, seem to increase the risk of colorectal cancer. A high intake of dietary fibre, folate, calcium, and fruits and vegetables might decrease the risk of colorectal cancer. In addition, increased physical activity has been consistently associated with a reduced rate of colon cancer.

Cancer of the pancreas is more common in developed countries than in developing countries. Overweight might increase the risk of developing pancreatic cancer. Moreover, the risk might increase with a high intake of meat, and decrease with a high intake of vegetables.

Breast cancer is the second most common cancer in the world and the most common among women. It occurs much more frequently in developed countries than in less developed countries. This may reflect differences in risk factors linked to reproduction, such as age at the onset of menstruation, age of giving birth, number of children, and breastfeeding. Differences in dietary habits and physical activity may also contribute. Although obesity affects women of all ages, it only increases the risk of developing breast cancer in postmenopausal women. Many studies have shown a small increase in risk of breast cancer as alcohol consumption increases.

Mortality rates from **prostate cancer** are ten times higher in North America and Europe than in Asia, though figures are difficult to compare between countries because of different diagnostic practices. It is not yet clear if and how diet may influence the development of prostate cancer.

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 5.5.4 Strength of evidence [see http://www.who.int/entity/nutrition/topics/5_population_nutrient/en/index15.html#diet5.5.4]*

8.5 How could cancer be prevented?

The main diet and exercise-related recommendations for reducing the risk of cancers are as follows:

- Maintain a Body Mass Index (BMI) in the range of 18.5 to 24.9 kg/m² and avoid weight gain of more than 5 kg in adult life.
- Maintain regular physical activity, such as one hour of fast walking most days of the week
- Consumption of alcoholic beverages should be avoided or limited to two glasses of either beer, wine or spirits per day
- Consumption of salt-preserved foods, preserved meats (such as sausages, salami, bacon, ham) and salt should be limited.



Physical activity is part of a healthy lifestyle
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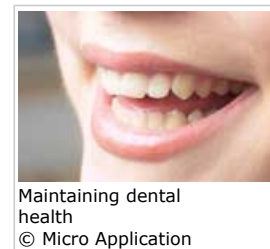
- Avoid eating foods that have been contaminated by aflatoxin, a toxic substance produced by certain molds.
- Eat at least 400 g of fruits and vegetables per day.
- Do not consume foods or drinks when they are at a very hot temperature.

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 5.5.5 Disease-specific recommendations [see http://www.who.int/entity/nutrition/topics/5_population_nutrient/en/index16.html#diet5.5.5]*

9. Dental diseases

9.1 Are dental diseases a growing problem?

In developed countries, dental diseases account for 5% - 10% of total health care costs, exceeding the cost of treating cardiovascular disease, cancer, and osteoporosis.



Maintaining dental health
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Dental diseases include among other things:

- **caries** which are cavities resulting from the action of bacteria on sugary foods,
- **dental erosion** which is the loss of hard tooth tissue (enamel and dentine) caused by acid attack,
- **periodontal disease** which refers to bacterial infections of the gums.

Despite the marked overall decline in **dental caries** over the past 30 years (perhaps due to exposure to an adequate amount of fluoride) the prevalence of dental caries remains unacceptably high in many developed countries.

In most developing countries, the prevalence rate of dental caries is relatively low and more than 90% of caries are untreated. However, there has been a recent increase in the prevalence of the disease. This increase is thought to be linked to changing diets, and particularly to an increase in sugar consumption without exposure to sufficient amounts of fluoride. Overall prevalence of dental caries in children remains high.

Table 12: Trends in levels of dental caries in 12-year-olds [[see Annex 7, p. 33](#)]

The number of people who have few or no natural teeth has declined over the past 20-30 years in several developed countries. As older people generally keep their teeth for longer, the problem of root caries is likely to become a significant public health concern in the future. As the average age of the population continues to increase, the number of people affected by **tooth loss** will grow.

Table 13: Prevalence of toothlessness in older people throughout the world
[[see Annex 8, p. 34](#)]

Dental erosion, which is related to diet, is a relatively new dental problem in many countries throughout the world. In some populations it is estimated that approximately 50% of children are affected.

Dental diseases have an impact on self-esteem, eating ability and nutrition.

This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases

Section 5.6.1 Background – 5.6.2 Trends [see http://www.who.int/entity/nutrition/topics/5_population_nutrient/en/index18.html#diet5.6.3]

9.2 How can diet affect dental diseases?

Bacterial fermentation of dietary sugars in the mouth is responsible for the loss of minerals from the teeth that can lead to the formation of caries. While the development of caries requires the presence of both sugars and bacteria, it is also influenced by the susceptibility of the tooth, the type of bacteria, and the quantity and quality of the saliva. Deficiencies of vitamins D and A have been shown to affect the natural development of the teeth, which can make them more susceptible to decay. Under nutrition, coupled with a high intake of sugars, may exacerbate the risk of caries.

Whilst severe vitamin C deficiency can result in inflammation of the gums, the most important factor in preventing periodontal disease is good oral hygiene. Undernutrition increases the severity of oral infections, such as gum disease.

Dental erosion can be caused by **dietary acids** such as those found in fruit drinks, soft drinks (including sports drinks), vinegar, citrus fruits and berries. Studies have shown that tooth enamel is softened within one hour of exposure to cola, but that this softening may be reversed by exposure to milk or cheese.

Summary of strength of evidence linking diet to:

Table 14: Dental caries [[see Annex 9, p. 34](#)]

Table 15: Dental erosion [[see Annex 10, p. 35](#)]

Table 16: Enamel development defects [[see Annex 11, p. 35](#)]

Table 17: Periodontal disease [[see Annex 12, p. 35](#)]

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 5.6.3 Diet and dental disease [see http://www.who.int/entity/nutrition/topics/5_population_nutrient/en/index18.html#diet5.6.3]*

9.3 Dietary sugars and dental caries

Sugars are the most important dietary factor in the development of dental caries.

Worldwide studies on human populations show an association between sugar consumption and level of dental caries. Isolated communities that consume a small amount of sugar have a very low level of this disease. Groups of people with a high exposure to sugars have a higher level. A strong correlation exists between both the amount and frequency of sugar consumption and the development of caries, even in countries that use preventative measures such as water fluoridation. In addition to solid foods, consumption of sugary drinks also increases the risk of developing dental cavities.



Insulin regulates blood sugar levels
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Studies have shown that **starches** are generally a much lower risk factor in developing dental caries than sugars. However, when starches are cooked or combined with sugars, the risk is greater.

As part of a normal mixed diet there is little evidence that fruit causes caries. Animal studies have shown that when fruit is consumed in very high frequencies (e.g. 17 times a day) it may induce caries.

The link between dietary sugars and dental caries is supported by a large body of evidence. However, the **limitations** of the different types of studies should be considered when interpreting results:

- Caries develop over time and therefore the dietary factors, several years previous to the appearance of caries, should be considered.
- Animals have different teeth than humans and therefore the results of animal studies are not always transferable to human cases.
- Studies sometimes measure the amount of acid produced from a food when bacteria in the mouth ferment it, in order to estimate the risk of caries, but such studies do not consider protective properties, such as effects on the flow of saliva

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 5.6.3 Diet and dental disease, Dietary sugars and dental caries [see http://www.who.int/entity/nutrition/topics/5_population_nutrient/en/index18.html#diet5.6.3]*

9.4 Dietary factors which protect against dental caries

Fluoride is the most effective preventative measure against the development of dental caries. The addition of fluoride to drinking water reduces dental caries in children by between 20% and 40%, but does not eliminate the risk of dental caries altogether. Thus, restricting consumption of sugars still has a role to play in the prevention of caries, even in situations where there is widespread use of fluoride.



See also our GreenFacts' Fluoride Digest [see <https://www.greenfacts.org/en/fluoride/index.htm>]

Excess ingestion of fluoride during enamel formation can lead to dental fluorosis, particularly in countries that have high levels of fluoride naturally present in water supplies.

Certain other dietary components have been shown to have protective properties against dental caries:

- Cow's milk (cheese) contains calcium, phosphorus, and casein which are believed to inhibit caries.
- Wholegrain foods require more chewing thereby stimulating the flow of saliva and protecting against caries.
- Peanuts, hard cheeses, and chewing gum also stimulate salivary flow and protect against caries.
- Black tea extract increases fluoride concentration in tooth plaque thereby reducing the risk of developing caries linked to a diet rich in sugars.

Studies have associated **breastfeeding** with lower levels of dental caries in early childhood. This is likely to be due to the fact that breastfed infants consume less sugar than infants fed formula milk to which free sugars are often added.

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 5.6.3 Diet and dental disease, Influence of fluoride [see http://www.who.int/nutrition/topics/5_population_nutrient/en/index20.html] and
5.6.3 Diet and dental disease, Dietary factors which protect against dental caries & Breastfeeding and dental caries [see http://www.who.int/nutrition/topics/5_population_nutrient/en/index21.html]*

9.5 How could dental diseases be prevented?

The main diet-related recommendations for reducing the risk of dental diseases are:

- Ensure that the intake of free sugars contributes on average less than 10% to the daily energy intake. Indeed, the occurrence of dental caries is lower in countries where the average daily consumption of sugars is below 40-55g per person which represents 6-10% of the daily energy intake.
- Restrict the frequency of consumption of foods and drinks that contain free sugars to a maximum of 4 times per day.
- Assure adequate exposure to fluoride to protect against caries
- Avoid nutrient deficiencies that can contribute to dental diseases.

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 5.6.5 Disease-specific recommendations [see http://www.who.int/entity/nutrition/topics/5_population_nutrient/en/index22.html#diet5.6.5]*

10. Osteoporosis

10.1 Is osteoporosis a growing problem?

Osteoporosis affects the bones of millions of people worldwide. The disease is characterized by low bone mass and deterioration of bone tissue, which leads to fragile bones and a greater risk of fracture, particularly in older people. Osteoporosis fractures are a significant cause of disability and premature death.

Fracture rates vary between men and women. In countries where fractures are frequent, women are affected three to four times more often than men. In countries where fracture rates are low, men and women are nearly equally affected. In both genders, the risk of vertebral and hip fractures increases with age, while the risk of wrist fractures levels off after the age of 60



Hip fracture rates are highest for Caucasian women living in temperate climates and lowest for women in Africa. The frequency of fractures has generally increased in countries in economic transition while rates in developed countries have levelled off.

Approximately 1.66 million hip fractures occur each year. This number is expected to increase four-fold by 2050 because of the increasing number of older people.

*This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases
Section 5 Population nutrient intake goals for preventing diet-related chronic diseases, 5.7 Recommendations for preventing osteoporosis, 5.7.1 Background – 5.7.2 Trends [see http://www.who.int/entity/nutrition/topics/5_population_nutrient/en/index25.html#diet5.7]*

10.2 How can diet and physical activity and other factors affect osteoporosis?

Calcium and **vitamin D** deficiencies increase the risk of osteoporosis in older people. Appropriate supply of certain nutrients, particularly calcium and vitamin D, have been shown to play a role in limiting the risk of osteoporosis in older people. Other nutrients that might be important for bone health include zinc, copper, manganese, boron, vitamin A, vitamin C, vitamin K, B vitamins, and potassium.

Calcium is a mineral that is essential to bone health in all stages of life, although the recommended daily intake is currently a subject of debate.

Vitamin D can be acquired from certain foods or can be produced in the body through the action of sunlight on the skin. Deficiency in **Vitamin D** can cause the softening of bones, leading to rickets in children and osteomalacia in adults. In older people less severe deficiencies have been linked to loss of bone minerals and osteoporotic fractures.

Evidence shows that sufficient intake of both vitamin D and calcium reduces the risk of osteoporosis in older people. In contrast, low body weight and high alcohol consumption increase the risk of osteoporosis. Fluoride intake does not appear to affect the risk of osteoporosis in older people.

This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases

Section 5 Population nutrient intake goals for preventing diet-related chronic diseases, 5.7 Recommendations for preventing osteoporosis, 5.7.3 Diet, physical activity and osteoporosis [see http://www.who.int/entity/nutrition/topics/5_population_nutrient/en/index25.html#diet5.7.3]

10.3 How could osteoporosis be prevented?

The risk of osteoporosis in older people may be reduced through a diet providing more **calcium** and **vitamin D**. However, such preventive measures should not necessarily be applied to all population groups across the world, but should rather focus on high risk sub-groups of populations. Indeed, calcium requirements vary between geographic regions and cultures because of differing dietary, genetic, and lifestyle factors. Furthermore, the interaction between calcium intake and physical activity, sun exposure, and intake of other dietary components needs to be considered before recommending increased calcium intake in countries with low fracture incidence in order to be in line with recommendations for developed countries.



In countries where fractures are very common, a calcium intake of at least 400-500 mg per day is required to prevent osteoporosis. It is also recommended that in order to obtain sufficient Vitamin D, especially when sunshine is limited, the diet should provide 5-10 mg per day.

Sources of calcium include dairy products, fish with edible bones, tortillas processed with lime, certain green vegetables such as broccoli, legumes, and tofu.

Even though calcium intakes through dairy products are higher in developed countries, hip fractures are more frequent there than in developing countries. This may be explained by the negative effect of animal protein which may outweigh the beneficial effect of calcium intake.

Prudent measures that contribute to preventing other chronic diseases may also be helpful in reducing fracture risk:

- Increase physical activity (especially activities that increase muscle strength, coordination and balance)
- Reduce sodium intake
- Increase intake of fruits and vegetables
- Maintain healthy body weight
- Avoid smoking
- Limit alcohol intake

This text is a summary of: WHO/FAO Diet, Nutrition and the prevention of chronic diseases

Section 5 Population nutrient intake goals for preventing diet-related chronic diseases, 5.7 Recommendations for preventing osteoporosis, 5.7.5 Disease-specific recommendations [see http://www.who.int/entity/nutrition/topics/5_population_nutrient/en/index25.html#diet5.7.5]

Annex

Annex 1: Comment

"The [Joint WHO/FAO Expert] Consultation recognized that a population goal for free sugars of less than 10% of total energy is controversial [with respect of the prevention of obesity]. However, the Consultation considered that the studies showing no effect of free sugars on excess weight have limitations."

Source & © WHODiet, Nutrition and the prevention of chronic diseases (2003) [see http://www.who.int/nutrition/topics/5_population_nutrient/en/index1.html]

Chapter 5 Population nutrient intake goals for preventing diet-related chronic diseases, 5.1.3 A summary of population nutrient intake goals, Free sugars

See also:

Comments on the draft report of the joint WHO/FAO expert consultation on diet, nutrition and the prevention of chronic diseases www.who.int/dietphysicalactivity/publications/ [see <http://www.who.int/dietphysicalactivity/publications/trs916/cmo/en/>]

Annex 2: Degrees of evidence by the Joint WHO/FAO Expert Consultation

In the Joint WHO/FAO Expert Consultation, scientific evidence has been categorized into four different levels of strength depending on the number and type of studies carried out and the consistency of the results:

- *Convincing evidence.*
- *Probable evidence.*
- *Possible evidence.*
- *Insufficient evidence.*

"Convincing evidence

Evidence based on epidemiological studies showing consistent associations between exposure and disease, with little or no evidence to the contrary. The available evidence is based on a substantial number of studies including prospective observational studies and where relevant, randomized controlled trials of sufficient size, duration and quality showing consistent effects. The association should be biologically plausible.

Probable evidence.

Evidence based on epidemiological studies showing fairly consistent associations between exposure and disease, but where there are perceived shortcomings in the available evidence or some evidence to the contrary, which precludes a more definite judgement. Shortcomings in the evidence may be any of the following: insufficient duration of trials (or studies); insufficient trials (or studies) available; inadequate sample sizes; incomplete follow-up. Laboratory evidence is usually supportive. Again, the association should be biologically plausible.

Possible evidence.

Evidence based mainly on findings from case-control and cross-sectional studies. Insufficient randomized controlled trials, observational studies or non-randomized controlled trials are available. Evidence based on non-epidemiological studies, such as clinical and laboratory investigations, is supportive. More trials are required to support the tentative associations, which should also be biologically plausible.

Insufficient evidence.

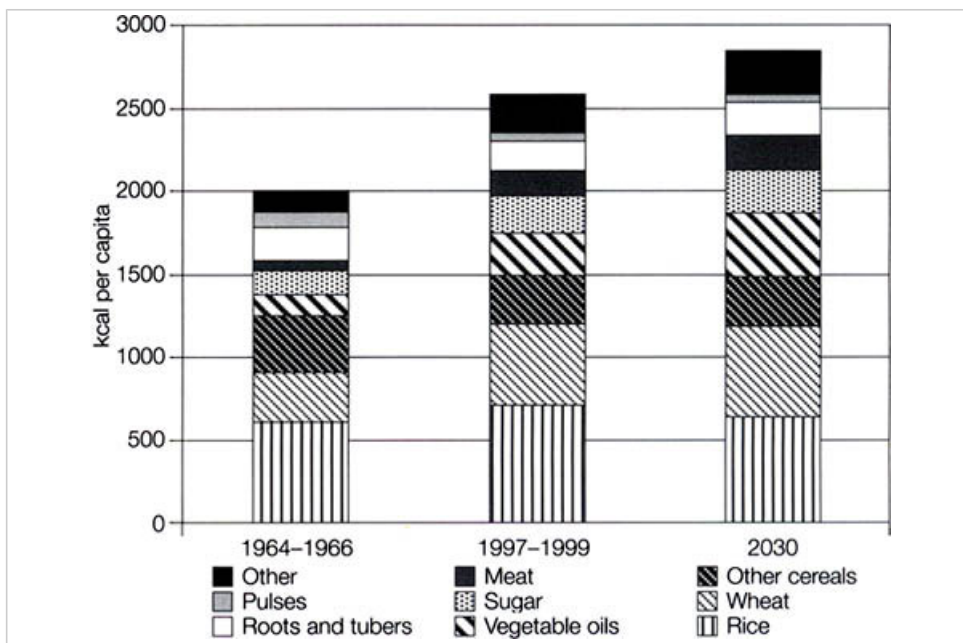
Evidence based on findings of a few studies which are suggestive, but are insufficient to establish an association between exposure and disease. Limited or no evidence is available from randomized controlled trials. More well designed research is required to support the tentative associations.

The strength of evidence linking dietary and lifestyle factors to the risk of developing obesity, type 2 diabetes, CVD [cardiovascular diseases], cancer, dental diseases, osteoporosis, graded according to the above categories, is summarized in tabular form, and attached to this report as an Annex [see www.who.int/nutrition/topics/annex/en/index.html [see <http://www.who.int/nutrition/topics/annex/en/index.html>]]."

*Source & © WHODiet, Nutrition and the prevention of chronic diseases (2003), Chapter 5 Population nutrient intake goals for preventing diet-related chronic diseases, 5.1 Overall goals, 5.1.2 Strength of evidence [see http://www.who.int/nutrition/topics/5_population_nutrient/en/index.html#diet5.1.2]
Chapter 5 Population nutrient intake goals for preventing diet-related chronic diseases, 5.1.3 A summary of population nutrient intake goals, Free sugars*

Annex 3:

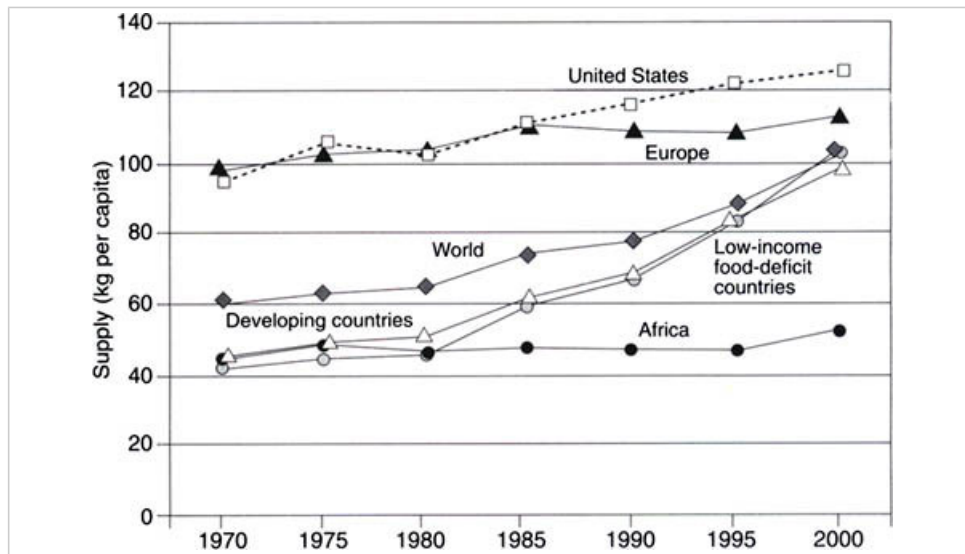
Figure 2. Calories from major commodities in developing countries



*Source: WHO/FAO "Diet, Nutrition and the prevention of chronic diseases"
Section 3. Global and regional food consumption patterns and trends [see http://www.who.int/nutrition/topics/3_foodconsumption/en/index6.html]*

Annex 4:

Figure 3: Trends in the supply of vegetables, by region, 1970-2000



Source: WHO/FAO "Diet, Nutrition and the prevention of chronic diseases"

Section 3.3 Availability and changes in consumption of dietary fat [see http://www.who.int/nutrition/topics/3_foodconsumption/en/index2.html]

Annex 5:

Table 10: Summary of strength of evidence on lifestyle factors and risk of developing cardiovascular diseases

Evidence	Decreased risk	No relationship	Increased risk
Convincing	Regular physical activity	Vitamin E supplements	Myristic and palmitic acids
	Linoleic acid		Trans fatty acids
	Fish and fish oils (EHA and DHA)		High sodium intake
	Vegetables and fruits (including berries)		Overweight
	Potassium		High alcohol intake (for stroke)
	Low to moderate alcohol intake (for coronary heart disease)		
Probable	a-Linolenic acid	Stearic acid	Dietary cholesterol
	Oleic acid		Unfiltered boiled coffee
	NSP		
	Wholegrain cereals Nuts (unsalted) Plant sterols/stanols Folate		
Possible	Flavonoids		Fats rich in lauric acid
	Soy products		Impaired fetal nutrition
Inufficient	Calcium		Beta-carotene supplements
	Magnesium Vitamin C		Carbohydrates
			Iron

EPA, eicosapentaenoic acid; DHA, docosahexaenoic acid; NSP, non-starch polysaccharides.

Source: WHO/FAO "Diet, Nutrition and the prevention of chronic diseases"

Section 5.4.5 Disease-specific recommendations [see http://www.who.int/nutrition/topics/5_population_nutrient/en/index12.html]

Annex 6:

Table 11: Summary of strength of evidence on lifestyle factors and the risk of developing cancer

Evidence	Decreased risk	Increased risk
Convincing^a	Physical activity (colon)	Overweight and obesity (oesophagus, colorectum, breast in postmenopausal women, endometrium, kidney) Alcohol (oral cavity, pharynx, larynx, oesophagus, liver, breast) Aflatoxin (liver) Chinese-style salted fish (nasopharynx)
Probable^a	Fruits and vegetables (oral cavity, oesophagus, stomach, colorectum ^b) Physical activity (breast)	Preserved meat (colorectum) Salt-preserved foods and salt (stomach) Very hot (thermally) drinks and food (oral cavity, pharynx, oesophagus)
Possible/insufficient	Fibre Soya Fish n-3 Fatty acids Carotenoids Vitamins B ₂ , B ₆ , folate, B ₁₂ , C, D, E Calcium, zinc and selenium Non-nutrient plant constituents (e.g. allium compounds, flavonoids, isoflavones, lignans)	Animal fats Heterocyclic amines Polycyclic aromatic hydrocarbons Nitrosamines

^a The "convincing" and "probable" categories in this report correspond to the "sufficient" category of the IARC report on weight control and physical activity (4) in terms of the public health and policy implications.

^b For colorectal cancer, a protective effect of fruit and vegetable intake has been suggested by many case-control studies but this has not been supported by results of several large prospective studies, suggesting that if a benefit does exist it is likely to be modest.

Source: WHO/FAO "Diet, Nutrition and the prevention of chronic diseases"
Section 5.5.4 Strength of evidence [see http://www.who.int/nutrition/topics/5_population_nutrient/en/index16.html]

Annex 7:

Table 12: Trends in levels of dental caries in 12-year-olds

mean [number of] delayed, missing, filled permanent teeth (DMFT)
per person aged 12 years [as a result of carries]

Country or area	Year	DMFT	Year	DMFT	Year	DMFT
Industrialized countries						
Australia	1956	9.3	1982	2.1	1998	0.8
Finland	1975	7.5	1982	4.0	1997	1.1
Japan	1975	5.9	1993	3.6	1999	2.4
Norway	1940	12.0	1979	4.5	1999	1.5
Romania	1985	5.0	1991	4.3	1996	3.8
Switzerland	1961-1963	9.6	1980	1.7	1996	0.8
United Kingdom	1983	3.1	1993	1.4	1996-1997	1.1
United States	1946	7.6	1980	2.6	1998	1.4
Developing countries						
Chile	1960	2.8	1978	6.6	1996	4.1
Democratic Republic of the Congo	1971	0.1	1982	0.3	1987	0.4-1.1
French Polynesia	1966	6.5	1986	3.2	1994	3.2
Islamic Republic of Iran	1974	2.4	1976	4.9	1995	2.0
Jordan	1962	0.2	1981	2.7	1995	3.3
Mexico	1975	5.3	1991	2.5-5.1	1997	2.5
Morocco	1970	2.6	1980	4.5	1999	2.5
Philippines	1967	1.4	1981	2.9	1998	4.6
Uganda	1966	0.4	1987	0.5	1993	0.4

DMFT, decayed, missing, filled permanent teeth.

Source: WHO/FAO "Diet, Nutrition and the prevention of chronic diseases"
Section 5.6.2 Trends [see http://www.who.int/nutrition/topics/5_population_nutrient/en/index18.html]

Annex 8:

Table 13: Prevalence of toothlessness (edentulousness) in older people throughout the world

Country or area	Prevalence of toothlessness (%)	Age group (years)
African Region		
Gambia	6	65 +
Madagascar	25	65-74
Region of the Americas		
Canada	58	65 +
United States	26	65-69
South-East Asian Region		
India	19	65-74
Indonesia	24	65 +
Sri Lanka	37	65-74
Thailand	16	65 +
European Region		
Albania	69	65 +
Austria	15	65-74
Bosnia and Herzegovina	78	65 +
Bulgaria	53	65 +
Denmark	27	65-74
Finland	41	65 +
Hungary	27	65-74
Iceland	15	65-74
Italy	19	65-74
Lithuania	14	65-74
Poland	25	65-74
Romania	26	65-74
Slovakia	44	65-74
Slovenia	16	65 +
United Kingdom	46	65 +
Eastern Mediterranean Region		
Egypt	7	65 +
Lebanon	20	64-75
Saudi Arabia	31-46	65 +
Western Pacific Region		
Cambodia	13	65-74
China	11	65-74
Malaysia	57	65 +
Singapore	21	65 +

Source: WHO/FAO "Diet, Nutrition and the prevention of chronic diseases"
Section 5.6.3 Diet and dental disease [see http://www.who.int/nutrition/topics/5_population_nutrient/en/index19.html]

Annex 9:

Table 14: Summary of strength of evidence linking diet to dental caries

Evidence	Decreased risk	No relationship	Increased risk
Convincing	Fluoride exposure (local and systematic)	Starch intake (cooked and raw starch foods, such as rice, potatoes and bread; excludes cakes, biscuits and snacks with added sugars)	Amount of free sugars Frequency of free sugars
Probable	Hard cheese Sugars-free chewing gum	Whole fresh fruit	
Possible	Xylitol Milk Dietary fibre		Undernutrition
Insufficient	Whole fresh fruit		Dried fruits

Source: WHO/FAO "Diet, Nutrition and the prevention of chronic diseases"
Section 5.6.4 Strength of evidence [see http://www.who.int/nutrition/topics/5_population_nutrient/en/index21.html]

Annex 10:

Table 15: Summary of strength of evidence linking diet to dental erosion

Evidence	Decreased risk	No relationship	Increased risk
Convincing			
Probable			Soft drinks and fruit juices
Possible	Hard cheese Fluoride		
Insufficient			Whole fresh fruit

Source: WHO/FAO "Diet, Nutrition and the prevention of chronic diseases"
Section 5.6.4 Strength of evidence [see http://www.who.int/nutrition/topics/5_population_nutrient/en/index22.htm]

Annex 11:

Table 16: Summary of strength of evidence linking diet to enamel developmental defects

Evidence	Decreased risk	No relationship	Increased risk
Convincing	Vitamin D		Excess fluoride
Probable			Hypocalcaemia

Source: WHO/FAO "Diet, Nutrition and the prevention of chronic diseases"
Section 5.6.4 Strength of evidence [see http://www.who.int/nutrition/topics/5_population_nutrient/en/index22.htm]

Annex 12:

Table 17: Summary of strength of evidence linking diet to periodontal disease

Evidence	Decreased risk	No relationship	Increased risk
Convincing	Good oral hygiene		Deficiency of vitamin C
Probable			
Possible			Undernutrition
Insufficient	Antioxidant nutrients	Vitamin E supplementation	Sucrose

Source: WHO/FAO "Diet, Nutrition and the prevention of chronic diseases"
Section 5.6.4 Strength of evidence [see http://www.who.int/nutrition/topics/5_population_nutrient/en/index22.htm]

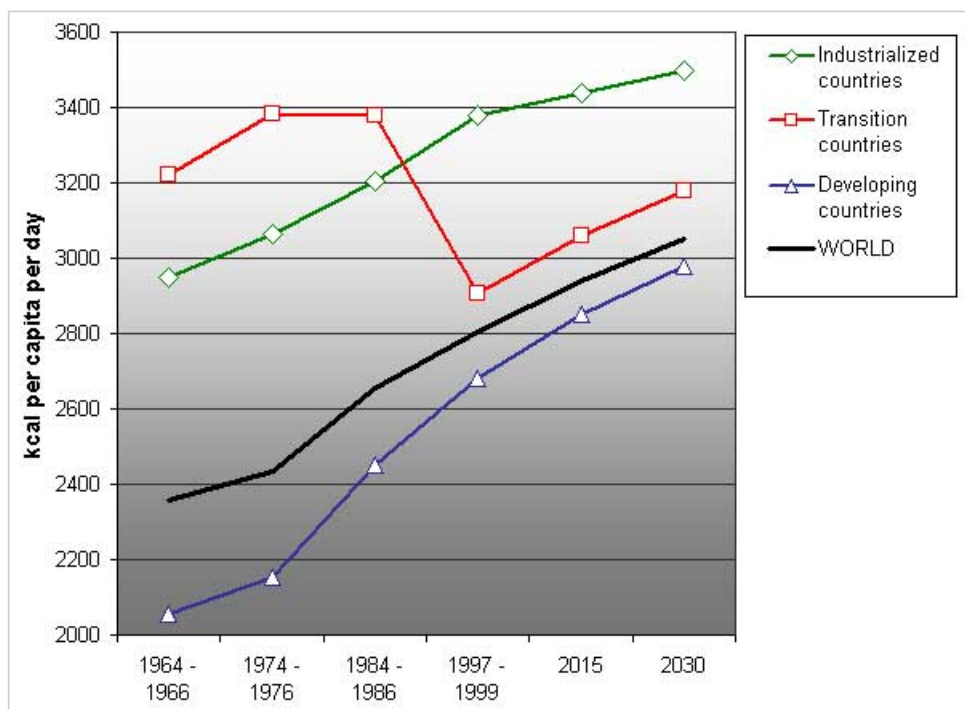
Annex 13:

Table 1: Global and regional per capita food consumption (kcal per capita per day)

Region	1964-1966	1974-1976	1984-1986	1997-1999	2015	2030
Sub-Saharan Africa ^a	2058	2079	2057	2195	2360	2540
South Asia	2017	1986	2205	2403	2700	2900
Developing countries	2054	2152	2450	2681	2850	2980
WORLD	2358	2435	2655	2803	2940	3050
Latin America and the Caribbean	2393	2546	2689	2824	2980	3140
Transition countries	3222	3385	3379	2906	3060	3180
East Asia	1957	2105	2559	2921	3060	3190
Near East and North Africa	2290	2591	2953	3006	3090	3170
Industrialized countries	2947	3065	3206	3380	3440	3500

^a Excludes South Africa.

Source: WHO/FAO "Diet, Nutrition and the prevention of chronic diseases"
 Section 3.2 Developments in the availability of dietary energy [see http://www.who.int/nutrition/topics/3_foodconsumption/en/index.html#diet3.2]



Source: Greenfacts based on the above table

Annex 14:

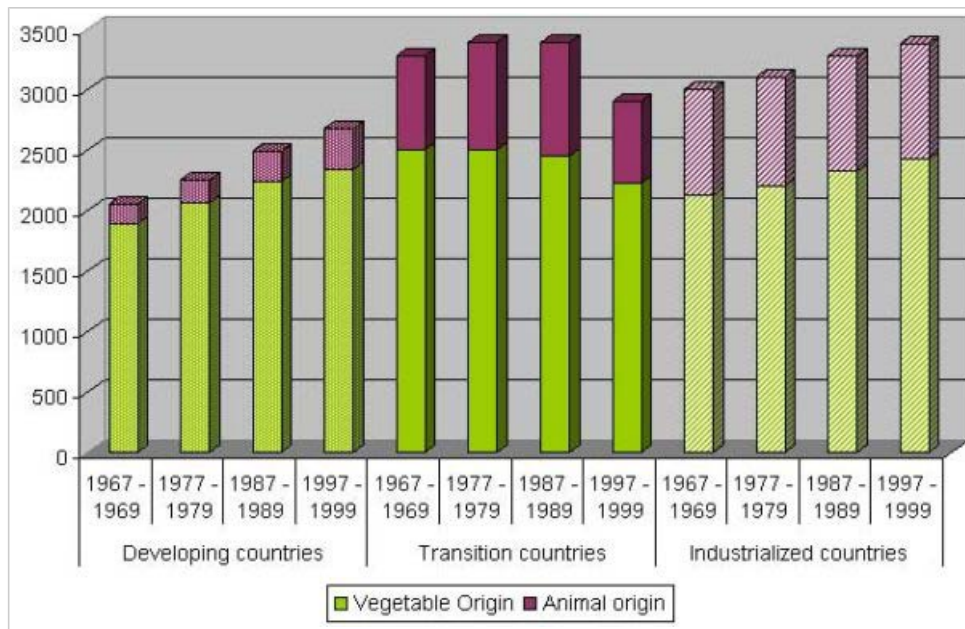
Table 2. Vegetable and animal sources of energy in the diet (kcal per capita per day)

Region	1967-1969			1977-1979			1987-1989			1997-1999		
	T	V	A	T	V	A	T	V	A	T	V	A
Developing countries	2059	1898	161	2254	2070	184	2490	2248	242	2681	2344	337
Transition countries	3287	2507	780	3400	2507	893	3396	2455	941	2906	2235	671
Industrialized countries	3003	2132	871	3112	2206	906	3283	2333	950	3380	2437	943

T, total kcal; V, kcal of vegetable origin; A, kcal of animal origin (including fish products).

Source: WHO/FAO "Diet, Nutrition and the prevention of chronic diseases"

3. Global and regional food consumption patterns and trends [see http://www.who.int/nutrition/topics/3_foodconsumption/en/index1.html]



Source: Greenfacts based on the above table

Annex 15:

Table 3: Vegetable and animal sources of energy in the diet (kcal per capita per day)

Supply of fat (g per capita per day)

Region	1967-1969	1977-1979	1987-1989	1997-1999	Change between 1967-1969 and 1997-1999
South Asia	29	32	39	45	16
Sub-Saharan Africa ^a	41	43	41	45	4
East and South-East Asia	28	32	44	52	24
North Africa	44	58	65	64	20
Near East	51	62	73	70	19
WORLD	53	57	67	73	20
China	24	27	48	79	55
Latin America and the Caribbean	54	65	73	79	25
Eastern Europe	90	111	116	104	14
Oceania	102	102	113	113	11
North America	117	125	138	143	26
European Community	117	128	143	148	31

^a Excludes South Africa.

Source: WHO/FAO "Diet, Nutrition and the prevention of chronic diseases"
 Section 3.3 Availability and changes in consumption of dietary fat [see http://www.who.int/nutrition/topics/3_foodconsumption/en/index2.html#diet3.3]

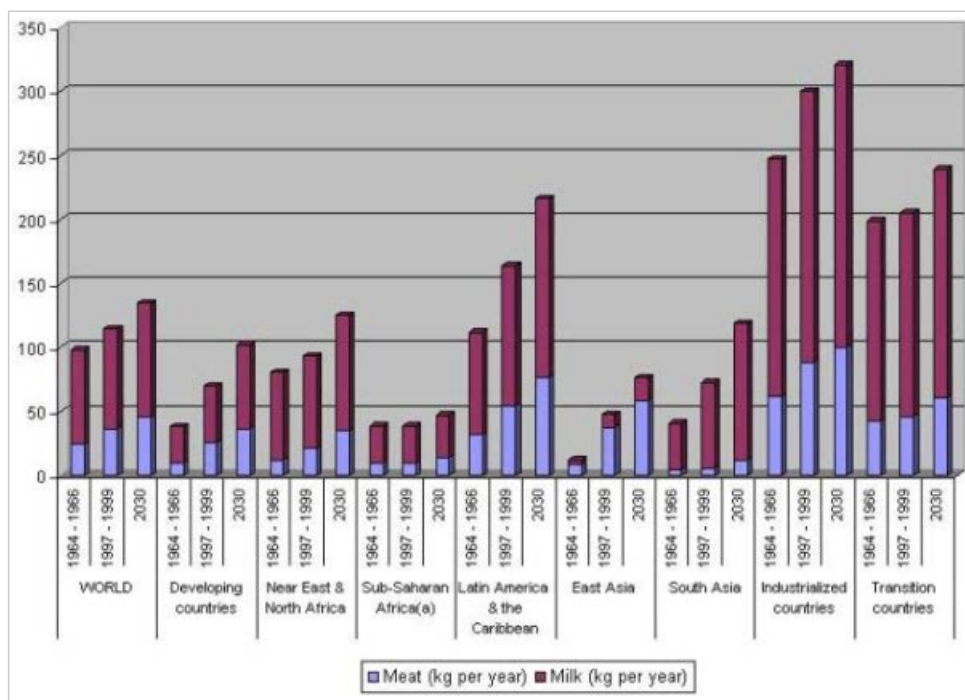
Annex 16:

Table 4. Per capita consumption of livestock products

Region	Meat (kg per year)			Milk (kg per year)		
	1964-1966	1997-1999	2030	1964-1966	1997-1999	2030
WORLD	24.2	36.4	45.3	73.9	78.1	89.5
Developing countries	10.2	25.5	36.7	28.0	44.6	65.8
Near East and North Africa	11.9	21.2	35.0	68.6	72.3	89.9
Sub-Saharan Africa^a	9.9	9.4	13.4	28.5	29.1	33.8
Latin America and the Caribbean	31.7	53.8	76.6	80.1	110.2	139.8
East Asia	8.7	37.7	58.5	3.6	10.0	17.8
South Asia	3.9	5.3	11.7	37.0	67.5	106.9
Industrialized countries	61.5	88.2	100.1	185.5	212.2	221.0
Transition countries	42.5	46.2	60.7	156.6	159.1	178.7

^a Excludes South Africa.

Source: WHO/FAO "Diet, Nutrition and the prevention of chronic diseases"
 Section 3.4 Availability and changes in consumption of animal products [see http://www.who.int/nutrition/topics/3_foodconsumption/en/index4.html]



Source: Greenfacts based on the above table

Annex 17:

Table 6. Ranges of population nutrient intake goals

Dietary factor		Goal (in % of total energy)
Total fat		15-30%
	Saturated fatty acids	<10%
	Polyunsaturated fatty acids (PUFAs)	6-10%
	n-6 Polyunsaturated fatty acids (PUFAs)	5-8%
	>n-3 Polyunsaturated fatty acids (PUFAs)	1-2%
	>Trans fatty acids	<1%
	>Monounsaturated fatty acids (MUFAs)	By difference ^a
Total carbohydrate		55-75%^b
	Free sugars ^c	<10%
Protein		10-15%^d
Dietary factor		Goal (in mg or g)
Cholesterol		<300mg per day
Sodium chloride (sodium) ^e		<5g per day (<2 g per day)
Fruits and vegetables		≥400g per day
Total dietary fibre		From foods ^f
Non-starch polysaccharides (NSP)		From foods ^f

^a This is calculated as: total fat - (saturated fatty acids + polyunsaturated fatty acids + trans fatty acids).

^b The percentage of total energy available after taking into account that consumed as protein and fat, hence the wide range. ^c The term "free sugars" refers to all monosaccharides and disaccharides added to foods by the manufacturer, cook or consumer, plus sugars naturally present in honey, syrups and fruit juices.

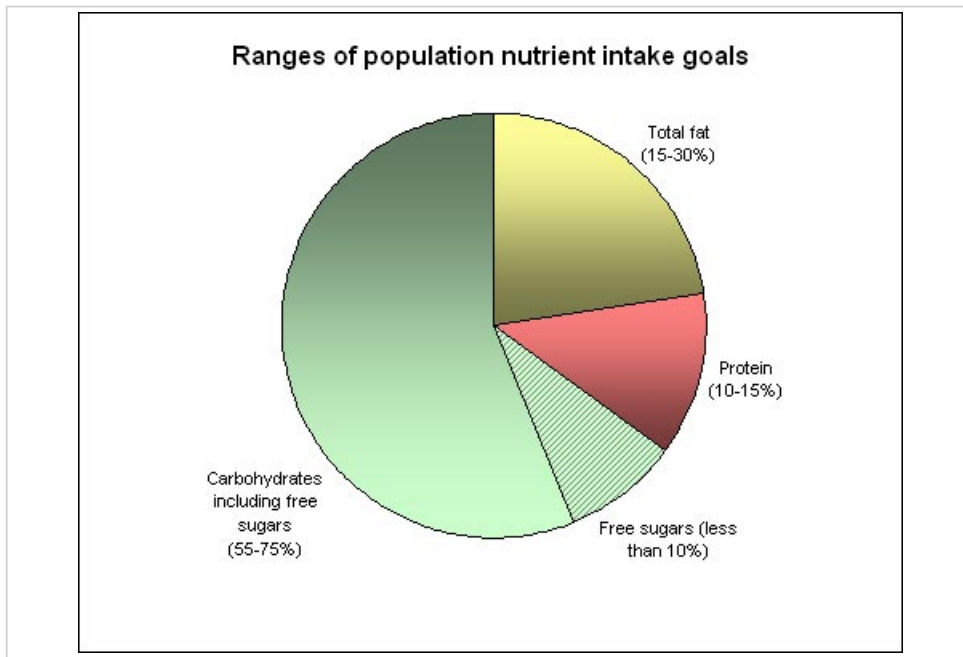
^d The suggested range should be seen in the light of the Joint WHO/FAO/UNU Expert Consultation on Protein and Amino Acid Requirements in Human Nutrition, held in Geneva from 9 to 16 April 2002(2).

^e Salt should be iodized appropriately (6). The need to adjust salt iodization, depending on observed sodium intake and surveillance of iodine status of the population, should be recognized.

^f See page 58, under "Non-starch polysaccharides".

Source: WHO/FAO "Diet, Nutrition and the prevention of chronic diseases"

Section 5.1.3 A summary of population nutrient intake goals [see http://www.who.int/nutrition/topics/5_population_nutrient/en/index.html#diet5.1.3]



Source: Greenfacts based on the above table

Annex 18:

Table 7: Summary of strength of evidence on factors

that might promote or protect against weight gain and obesity^a

Evidence	Decreased risk	No relationship	Increased risk
Convincing	Regular physical activity		Sedentary lifestyles
	High dietary intake of NSP (dietary fibre) ^b		High intake of energy-dense micronutrient-poor foods ^c
Probable	Home and school environments that support healthy food choices for children ^d		Heavy marketing of energy-dense foods ^d and fast-food outlets ^d
	Breastfeeding		High intake of sugars-sweetened soft drinks and fruit juices
			Adverse socioeconomic conditions ^d (in developed countries, especially for women)
Possible	Low glycaemic index foods	Protein content of the diet	Large portion sizes
			High proportion of food prepared outside the home (developed countries)
			"Rigid restraint/periodic disinhibition" eating patterns
Insufficient	Increased eating frequency		Alcohol

^a Strength of evidence: the totality of the evidence was taken into account. The World Cancer Research Fund schema was taken as the starting point but was modified in the following manner: randomized controlled trials were given prominence as the highest ranking study design (randomized controlled trials were not a major source of cancer evidence); associated evidence and expert opinion was also taken into account in relation to environmental determinants (direct trials were usually not available).

^b Specific amounts will depend on the analytical methodologies used to measure fibre.

^c Energy-dense and micronutrient-poor foods tend to be processed foods that are high in fat and/or sugars. Low energy-dense (or energy-dilute) foods, such as fruit, legumes, vegetables and whole grain cereals, are high in dietary fibre and water.

^d Associated evidence and expert opinion included.

Source: WHO/FAO "Diet, Nutrition and the prevention of chronic diseases"

Section 5.2.4 Strength of evidence [see http://www.who.int/nutrition/topics/5_population_nutrient/en/index3.html#diet5.2.4]

Annex 19:

Table 8: Classification of overweight in adults according to BMI^a

Classification	BMI (kg/m ²)	Risk of comorbidities
Underweight	<18.5	Low (but risk of other clinical problems increased)
Normal range	18.5-24.9	Average
Overweight	≥25.0	
Pre-obese	25.0-29.9	Increased
Obese class I	30.0-34.9	Moderate
Obese class II	35.0-39.9	Severe
Obese class III	≥40	Very severe

^a These BMI values are age-independent and the same for both sexes. However, BMI may not correspond to the same degree of fatness in different populations due, in part, to differences in body proportions. The table shows a simplistic relationship between BMI and the risk of comorbidity, which can be affected by a range of factors, including the nature and the risk of comorbidity, which can be affected by a range of factors, including the nature of the diet, ethnic group and activity level. The risks associated with increasing BMI are continuous and graded and begin at a BMI below 25. The interpretation of BMI gradings in relation to risk may differ for different populations. Both BMI and a measure of fat distribution (waist circumference or waist: hip ratio (WHR)) are important in calculating the risk of obesity comorbidities.

Source: WHO/FAO "Diet, Nutrition and the prevention of chronic diseases"

Section 5.2.6 Disease-specific recommendations [see http://www.who.int/nutrition/topics/5_population_nutrient/en/index5.html#diet5.2.6]

Annex 20:

Table 9: Summary of strength of evidence on lifestyle factors and risk of developing type 2 diabetes

Evidence	Decreased risk	No relationship	Increased risk
Convincing	Voluntary weight loss in overweight and obese people		Overweight and obesity
			Abdominal obesity
	Physical activity		Physical inactivity
			Maternal diabetes ^a
Probable	NSP		Saturated fats
			Intrauterine growth retardation
Possible	n-3 fatty acids		Total fat intake
	Low glycaemic index foods		Trans fatty acids
	Exclusive breastfeeding ^b		
Insufficient	Vitamin E		Excess alcohol
	Chromium		
	Magnesium		
	Moderate alcohol		

NSP, non-starch polysaccharides.
^a Includes gestational diabetes.
^b As a global public health recommendation, infants should be exclusively breastfed for the first six months of life to achieve optimal growth, development and health (59).

Source: WHO/FAO "Diet, Nutrition and the prevention of chronic diseases"

Section 5.3.4 Strength of evidence [see http://www.who.int/nutrition/topics/5_population_nutrient/en/index8.html]