

Diseases, Food and Health

THE RISKS OF INADEQUATE NUTRITIONAL PATTERNS AND THE BENEFITS OF THE MEDITERRANEAN DIET





in collaboration with the patronage of



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Abstract

Extensive scientific literature has long confirmed how nutrition has a strong impact on the health of the population. The most relevant factors and diseases related to inadequate nutritional styles are obesity, diabetes, cardiovascular diseases, tumours, non-alcoholic fatty liver disease, chronic bowel diseases, neuropsychiatric diseases and neurodegenerative diseases. It is no coincidence that one of the chapters of this research is titled "Health Comes from the Table".

Healthy eating should take into account the right mix of food nutrients to be combined with special attention paid to their origin, such as the production process. According to data from the Italian National Institute of Statistics (ISTAT), despite Italy having better obesity rate values, equal to 12%, the excess weight (overweight plus obesity) affected 46.4% of the elderly population as of 2023. In the USA, this percentage rises to 67.5%. The picture does not seem particularly reassuring even in the analysis of lower age groups, such as children and adolescents from 3 to 17 years of age.

According to the World Health Organization (WHO), people affected by obesity have an average life expectancy of five years lower than those with a 'healthy' weight status. A severely obese person could lose as much as 8–10 years of life – the same as a smoker – while for every 15 kilograms of excess weight, the risk of premature death increases by 30%.

Nutrition is thus not only a biological factor necessary for meeting our energy needs but is also fundamental for our health. In the frenzy that very often characterises our lives, with food choices frequently guided by principles such as convenience and speed, it is extremely important to recognise the contribution of a healthy diet, such as the Mediterranean diet, which stands as a very powerful tool in the prevention of pathological conditions that can compromise life expectancy and quality.

Non-communicable diseases pose a threat to the Goals of the 2030 Agenda, both for sustainable development and for the high social costs. The latest available data shows that for the EU health systems, the direct costs for cardiovascular diseases amount to €111 billion, whereas costs for cancer sit around 97 billion euro and expenditure due to diabetes in the adult population in Europe amounts to €167.5 billion. Moreover, on the economic, social and health costs related to the excess weight of the population of 52 countries, overweight and obesity represent a global cost quantifiable at 425 billion dollars each year. In Italy in particular, being overweight accounts for 9% of national health spending and potentially reduces GDP by 2.8%. This means that, overall, each Italian pays €289 in taxes per year to cover the costs of being overweight.

In this sense, adherence to the Mediterranean Diet, as a healthy and sustainable dietary model, is certainly a paradigm to be integrated with a series of simple rules. Among these is definitely attention to the ingredients and their origin through reading labels. Labels serve to provide consumers with essential information about the ingredients, storage methods, nutritional information and not least the origin of what we eat. As analysed in this report and also in various scientific publications, it is preferable to choose natural, seasonal and preferably local Km0 foods to be integrated into a balanced diet.



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Preface

by Claudio Franceschi, Emeritus Professor of Immunology at the University of Bologna

This rich and comprehensive document on nutrition by the Fondazione Aletheia, which is a useful but also pleasant read, begins by rightly emphasising that “Health Comes From The Table” and tackles the major issues related to all aspects of diet and nutrition, with the awareness that “tout se tient” (everything is connected) – agriculture, breeding, the biology/biochemistry/physiology of human and animal nutrition, food production processes and the market. Within this complex framework, the document takes up and focuses on the “Sustainable Diet”, according to the Food and Agriculture Organisation (FAO). Macronutrients (carbohydrates, proteins and fats or lipids) and micronutrients are analysed with particular attention to their origin, function, amount to be consumed in different ages and pathophysiological conditions and to the multiple and different diets and food choices. Labels that indicate the particular characteristics of a food are also reviewed. Very interesting are the paragraphs dedicated to the relationship between nutrition and the major conditions and chronic diseases in which nutrition plays a central role, such as obesity and being overweight, Type 2 diabetes, cardiovascular diseases and cancers, non-alcoholic fatty liver disease, chronic bowel diseases, neuropsychiatric diseases and neurodegenerative diseases. Finally, the document devotes two chapters to strategies for improving nutrition and promoting health, referring for example to the Mediterranean Diet, a recognised Intangible Cultural Heritage of Humanity and a flagship of our dietary tradition. In this regard and as an example, I would like to mention an extensive European project that I had the pleasure of coordinating and that has recruited people in 5 European countries (Italy, France, Poland, the Netherlands and the United Kingdom), with the involvement of more than

1,200 people aged between 65 and 79 years – half of whom followed a diet based on the principles of the Mediterranean Diet for a year while the other half continued to follow their usual diet. The results showed that the Mediterranean Diet has a whole series of favourable effects on body composition, on the state of chronic inflammation characteristic of ageing (“inflammaging”) and also on a whole series of cognitive parameters.

But perhaps even more interesting was the demonstration that a year of the Mediterranean Diet rejuvenated the elderly by reducing their “biological age” (evaluated with an epigenetic clock that measures the methylation of DNA cytosines) by more than a year compared to their chronological age. The text, in addition to having a precise and well-documented bibliography and a small vocabulary on the technical terms used, is illustrated with a series of images and boxes where some of the main topics are appropriately explored.

Happy reading!

1. Health Comes from the Table

The term “diet” comes from the Greek “*diaita*”, a word that in the Greek-Roman world meant “the mode, the way of living”. Already in the etymology of the word, it is possible to trace the connection between diet – today often mistakenly understood as a restrictive diet – and life in its many aspects. Hence the concept of “dietetics”, which in the Middle Ages designated everything that was able to preserve or restore health [1] and which today indicates the branch of medicine that deals not only with analysing the nutritional needs of the human body but also with providing the best strategies for an adequate and balanced diet through nutrition. Dietetics likewise plays a crucial role in formulating specific dietary regimens for individuals affected by certain diseases [2]. Nutrition is thus not only a biological factor necessary for meeting our energy needs but is also fundamental for our health. In the frenzy that very often characterises our lives, with food choices frequently guided by principles such as convenience and speed, it is extremely important to recognise the contribution of a healthy diet, such as the Mediterranean diet, which stands as a very powerful tool in the prevention of pathological conditions that can compromise life expectancy and quality. Within this context falls the definition of nutrition, as that “complex of biological processes that allow or condition the growth, development and integrity of the living organism in relation to the availability of energy, nutrients and other substances of nutritional interest” [3]. Macronutrients – being proteins, carbohydrates and fats – bind together to make up foods and determine their nutritional characteristics. Indeed, every food derives from the transformation of inorganic elements, through agriculture and breeding, starting from *autotrophic organisms*. For example, plants with chlorophyll photosynthesis manage to synthesise glucose (organic element) from carbon dioxide and water (inorganic elements), exploiting the energy of solar radiation. From here, the food chain of the higher organisms branches off. Agriculture and livestock are key to developing the food chain.

Thus, these two activities play a fundamental role in the production of food from which humans derive nourishment, through a series of biochemical reactions that take place in the digestive process. Indeed, the macronutrients contained in food in the form of complex molecules are reduced into simple molecules used by the body for its functioning. Healthy eating should take into account the right mix of food nutrients to be combined with special attention paid to their origin, such as the production process. The purpose of proper nutrition from a medical point of view is to provide the body with a supply of energy and nutrients appropriate to the actual need, determined by factors such as age, sex, body weight and physical activity. In general, the energy we introduce through food is used for our basic metabolism (55–70%), for *Diet-Induced Thermogenesis* (about 10%) and for physical activity (20–40%) [4].

Image 1.1: Process of transformation of food principles



Source: Elaboration by Fondazione Aletheia

This articulated framework includes the concept of “Sustainable Diet” proposed by the Food and Agriculture Organisation (FAO), which defines it as a model characterised by “diets with low environmental impact that contribute to food and nutritional security and a healthy life for present and future generations. Sustainable Diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically equitable and affordable, nutritionally adequate, safe and healthy, and optimise natural and human resources” [5].

1.1. Macronutrients and their role

Depending on the amount necessary for the body to function, food ingredients are divided into macronutrients and micronutrients. A macronutrient is defined as a caloric food component such as proteins, carbohydrates and fats, whereas a micronutrient is defined as a nutrient, such as vitamins and minerals [6]. Diet-Induced Thermogenesis varies depending on the quality and type of macronutrients contained in the food. It is higher for protein (20–30%), lower for carbohydrates (5–10%) and even lower for fats (2–5%) [4].

Table 1.1.1: Macronutrients and their functions and sources

CARBOHYDRAT	FUNCTION: energy, bioregulator, reserves SOURCE: fruit, grains and derivatives, legumes,
PROTEINS	FUNCTION: energy, plastic, bioregulator, transport, protection SOURCE: meat, fish, eggs, milk and derivatives, legumes, cereals, dried fruit, seeds and algae
FATS	FUNCTION: energy, plastic, temperature control, transport SOURCE: meat, cheese, fish, eggs, dried fruit, vegetable oils and animal fats

Source: Elaboration by Fondazione Aletheia [7, 8]

1.1.1. Carbohydrates

Carbohydrates, which are divided into simple and complex, represent the main source of energy for the body, with an average of one gram of carbohydrates providing 4 kcal [9]. According to the *Dietary Reference Intakes (DRIs) for nutrients and energy* for the Italian population, as defined by the Italian Society of Human Nutrition (SINU), the range of reference for the intake of total carbohydrates is 45–60% of the total energy of the diet, of which at least three quarters is in the form of complex carbohydrates and a quarter of simple carbohydrates. The latter should be taken in amounts not exceeding 15% of total energy [10] since their intake, particularly during childhood, accompanied by sedentary lifestyle and lack of consumption of complex carbohydrates and fibre, represents one of the risk factors for being overweight or obese [11]. Among simple carbohydrates we can distinguish monosaccharides, such as the fructose contained in fruit, disaccharides, such as the sucrose of common table sugar, oligosaccharides such as the fructo-oligosaccharides contained in vegetables. Among the complex carbohydrates we can distinguish: the starch contained in grains, potatoes and legumes; the fibre contained mainly in fruits and vegetables that our body is not able to use for energy but whose fermentation at the intestinal level by the bacterial flora represents an important activity for a whole series of functions, including the regulation of the absorption and passage of nutrients [7]. Carbohydrates not only fulfil the energy function, which remains the main factor, but are also involved in mechanisms such as the construction of sources of reserves, such as glycogen [12], or de novo lipogenesis, or the formation of fats from fructose [13], or even the regulation of the stimulation of hunger and satiety [14]. In many cases, the spread of inadequate nutritional patterns has led to excessive consumption of carbohydrates, especially refined, which – just like a high consumption of fat and protein – can lead to conditions such as being overweight and obese. In fact, the balance of caloric intake is a central element. However, even in the case of low-carb diets, characterised by the almost complete and prolonged elimination of carbohydrates, we see unsustainable choices in the long term which in many cases are at the origin of that “yo-yo” effect that leads many people, after having also lost a considerable number of kilos, to regain the weight little

by little [15]. In addition, although this condition is deliberately sought after in some specific pathological cases – such as severe obesity and in other cases in which it is useful for managing epilepsy in subjects with drug resistance, as affirmed by the Italian Epilepsy Association [16] [17] – a considerable limitation of carbohydrates significantly affects the quality of the diet. In fact, eliminating grains, fruits and legumes also eradicates all sources of micronutrients essential for the proper functioning of the body, including vitamins (such as thiamine, folate, vitamin A, E and B6), minerals (such as calcium, magnesium, iron or potassium) and fibre. Finally, to be thorough, it should be noted that the quantity is not the only factor but the quality of the carbohydrates in question is also important. To this end, processed foods – that is, foods rich in simple sugars and low in fibre – do not have a positive effect on blood sugar. In fact, digestion starts from the mouth and continues in the various organs of the digestive system. By splitting the sugar (complex molecule) into glucose (simple molecule), an instant rise in blood sugar is generated, known as a glycemic spike. This leads to immediate and massive insulin production that causes the postprandial spike to fall below normal values. This phenomenon explains why when meals are spicy, there is an immediate and positive impact on satiety which does not, however, last over time – on the contrary, it quickly passes and hunger returns [18]. Still, this condition does not occur in the presence of dietary fibre which, in addition to slowing the absorption of carbohydrates and gastric emptying, reducing the risk of the onset of diabetes, plays an extremely important role in establishing a state of wellbeing. In fact, fibre provides the starting substrate for the production of a series of beneficial substances, such as short-chain *fatty acids*, produced by the intestinal microflora and involved in numerous mechanisms, such as improving immune function. It also has anti-inflammatory properties and prevents a number of diet-related pathologies. Dietary patterns that do not involve the intake of fibre, such as the low-FODMAP diet ¹, often expose those who adopt them to a greater risk of infection or a greater likelihood of the onset of gastrointestinal disorders, such as leaky gut syndrome [19].

¹ FODMAP refers to short-chain oligosaccharides with contained prebiotic activity mainly in hard-to-digest fruits and vegetables, such as legumes, onions and garlic.

1.1.2. Proteins

Proteins are macromolecules comprised of chains of different amino acids. Function depends on how many and which amino acids make up a protein, which can be: plastic, that is, the maintenance and repair of cells and tissues; bioregulatory, since proteins are the constituents of hormones and enzymes; transport, with reference to “carrier” proteins, such as haemoglobin that transports oxygen from the lungs to the tissues or lipoproteins capable of transporting lipids in the blood; protective, as they carry out immune activity, in the form of antibodies; energetic, recalling that each gram of protein provides 4 kcal [9]. The intake levels of reference suggested by the Italian Society of Human Nutrition (SINU) are 0.90 grams/kilogram/day [10]. The human body deals with both the cleavage of proteins into amino acids, catabolism, and their synthesis, anabolism. To this end, the human body is capable of synthesising all the amino acids necessary for the formation of proteins except for nine which, for this reason, are defined as essential amino acids and must necessarily be introduced via the diet. Foods of animal origin – such as meat, fish, milk and eggs – contain all the essential amino acids whilst the proteins derived from these foods are called “noble”. Foods of plant origin, rather, need precise combinations in order to cover their nutritional needs in terms of protein. For example, legumes and grains combined complete each other’s amino acid pool and are equivalent, from a protein value perspective, to a food of animal origin [20]. On average, almost a third (29%) of Italians’ total daily protein comes from grains. Indeed, both grains and legumes have good protein content, even if of lower biological value than that of proteins from animal foods [4]. We know that ensuring an adequate supply of protein, especially at certain stages of life such as in old age, is essential for preventing the loss of muscle mass (sarcopenia) and bone (osteoporosis). Recently, interest in high-protein diets has grown, becoming popular in the search for personalised solutions for weight control, muscle building and improving physical performance. Waste products resulting from the breakdown of

proteins, such as ammonia, are then eliminated through the urine, involving the kidneys. For this reason, a high-protein diet, with a daily contribution of more than 30–35%, is strongly discouraged for people with chronic renal failure, as it could compromise or overload the kidneys and other organs [20].

1.1.3. Fats

Fats (or lipids) are the third category of macronutrients. They provide the energy necessary for the human body to function, such as carbohydrates, but also provide more than twice the energy: 9 kcal per gram [4], for a total of 20–35% of the daily energy requirement in a normal-weight adult subject [10]. In addition to the energy role, fats perform other important functions. At a cellular level, they make up cell membranes, in the form of phospholipids, ensuring their functioning, and represent the main component of the brain and myelin, being the sheath that lines neurons and allows the transmission of nerve impulses. They are also able to transport the fat-soluble vitamins, A, D, E, K, which would otherwise be lost and contribute to the production of various hormones such as sex hormones and aldosterone [21]. From a nutritional point of view, depending on the number and position of the double bonds present in the lipid, they can be classified into saturated and unsaturated fats, based on the fatty acid² of which the lipid molecule is composed. Saturated fatty acids are contained in meat and eggs, for example. Unsaturated fatty acids, unlike the previous, are distinguished as monounsaturated, for example the oleic acids contained in olive oil or polyunsaturated acids such as linoleic and linolenic acids contained in dried fruit. In addition, some fatty acids are considered essential as they cannot be synthesised by our body and thus can only be assimilated through food. These include omega-3, mainly contained in oily fish, and omega-6 found

² Short-chain fatty acids are the end metabolites of fermentation processes and perform relevant physiological functions in humans, acetic acid for muscles, the heart and the brain, propionic acid for gluconeogenesis and butyric acid for enterocyte nutrition.

especially in dried fruit. As reported in the Healthy Eating Guidelines drawn up by CREA (Council for Research in Agriculture and the Analysis of Agricultural Economics), both are important components of cell membranes and the precursors of many other substances in the body such as those involved in the regulation of blood pressure and inflammatory responses. Omega-3s, particularly important for cognitive development and cardiac function, are predominantly present in fish products [4]. There is definitely a correlation between fats and health. In fact, numerous studies relate excessive fat consumption and the onset of obesity. For this reason, they are the first nutrients to be reduced when you want to lose weight [22]. We also observe that fats from the diet are predominantly triglycerides, being molecules made up of fatty acids linked together by the presence of glycerol. Triglycerides are a storehouse for energy that is produced and stored at the level of adipose tissue that can be subcutaneous and visceral. The latter is the most metabolically-active. It interferes with the transmission of the insulin signal and causes insulin insensitivity. Excess visceral fat also promotes not only insulin resistance, but also dyslipidemia (a change in blood lipids) with an increase in Low-Density Lipoprotein (LDL₃) and a reduction in High-Density Lipoprotein (HDL₄). In this context, extra-virgin olive oil occupies a prominent position as it is a food particularly rich in monounsaturated fatty acids and, for this reason, is involved in a series of mechanisms that lead to the reduction of blood levels of LDL, an excess of which leads to artery obstruction. It also contains numerous “minor” components such as vitamins and phenolic compounds that exert beneficial effects on health. The polyphenols contained in extra-virgin olive oil, such as oleuropein and hydroxytyrosol, function as powerful antioxidants [23]. It is important to emphasise that there must always be a fair ratio between saturated and unsaturated fatty acids so as not to compromise the cells’ ability to communicate and interact with their environment. In fact, fatty acids are essential for the constitution of cell membranes that protect and enclose the cells of our body and regulate the exchange of substances

³ LDL transports the cholesterol synthesised by the liver to the cells of the body.

⁴ HDL removes excess cholesterol from various tissues.

with the extracellular environment. In particular, fats affect the fluidity of these membranes. Saturated fats tend to be solid at room temperature due to their chemical conformation, thus they contribute to the formation of rigid and inflexible membranes. Unsaturated fats, rather, tend to be liquid at room temperature so they can help keep the membranes more fluid [8].

1.2. Micronutrients

As reported by the European Food Safety Authority (EFSA), a micronutrient is a “nutrient [such as vitamins and minerals], that the body needs in small amounts for normal growth and development and health” [6]. Although they do not provide energy, they are fundamental for a wide range of functions.

Table 1.2.1: Micronutrients and their functions and sources



Source: Elaboration by Fondazione Aletheia [8]

Vitamins are organic compounds that can be divided into water-soluble and fat-soluble. Among the water-soluble vitamins, those of group B are the most numerous. Vitamin B12, for example, is necessary for the development and maturation of the central nervous system, especially in newborns, as well as for the maintenance of normal function. According to the Italian guidelines on Dietary Reference Intakes (DRIs), the average daily requirement of vitamin B12 varies from between 0.7 and 1.8 µg in children aged 1 to 14 years, up to 2 µg/day from 15 years onwards and 2.2–2.4 µg in particular circumstances such as pregnancy and lactation [10]. Deficiency could cause hypotonia, lethargy, tremors and, if prolonged, could result in the onset of megaloblastic anaemia, a disease characterised by morphological alterations of red and white blood cells

and platelets. This vitamin is found in all products of animal origin and, in particular, in fermented foods, such as yoghurt and cheese, being the result of bacterial metabolism [24, 25]. Amongst fat-soluble vitamins, particular attention is paid to vitamin A whose average requirement is estimated at between 200 and 500 µg depending on age, up to 800 µg when breastfeeding [10]. Deficiency of this vitamin causes harmful effects every year. According to data from WHO and the CDC (Centres for Disease Control and Prevention), about 500,000 children per annum lose their sight due to vitamin A deficiency and 70% die within the following year. The World Bank states the effects of widespread vitamin A deficiency, along with iron and iodine, can negatively affect the wealth of a country to the extent of 5% per annum [26]. Minerals, rather, are fundamental inorganic elements, even if in small quantities, to maintain water and electrolyte balance and bone structure. For example, iodine is an element that the human body concentrates in the thyroid where it plays a fundamental role in the synthesis of hormones involved in the development of the central nervous system and growth and, in adult life, in the maintenance of metabolic balance. WHO estimates show iodine deficiency is a serious public health issue [27]. According to data from the Iodine Global Network, in 2020 Italy – historically iodine-deficient – became one of the countries where iodine nutrition is adequate and sufficient to guarantee the balanced function of the thyroid gland thanks to the National Iodine Prophylaxis Programme launched on a voluntary basis in 2005 [28].

In summary:

- Nutrition is not only a biological factor necessary for meeting our energy needs but is also fundamental for our health.
- Healthy eating should take into account the right mix of food nutrients to be combined with special attention paid to their origin, such as the production process.
- Sustainable Diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically equitable and affordable, nutritionally adequate, safe and healthy, and optimise natural and human resources”.
- The quantity of carbohydrates is not the only factor to be taken into account in a healthy diet since the quality is also important. In fact, raw foods – that is, foods that are rich in simple sugars and low in fibre – do not have a positive effect on blood sugar.
- In addition to the energy role, fats perform other important functions. It is thus important to emphasise that there must always be a fair ratio between saturated and unsaturated fatty acids so as not to compromise the cells’ ability to communicate and interact with their environment.

2. Food-Related Chronic Diseases: Causes and Effects

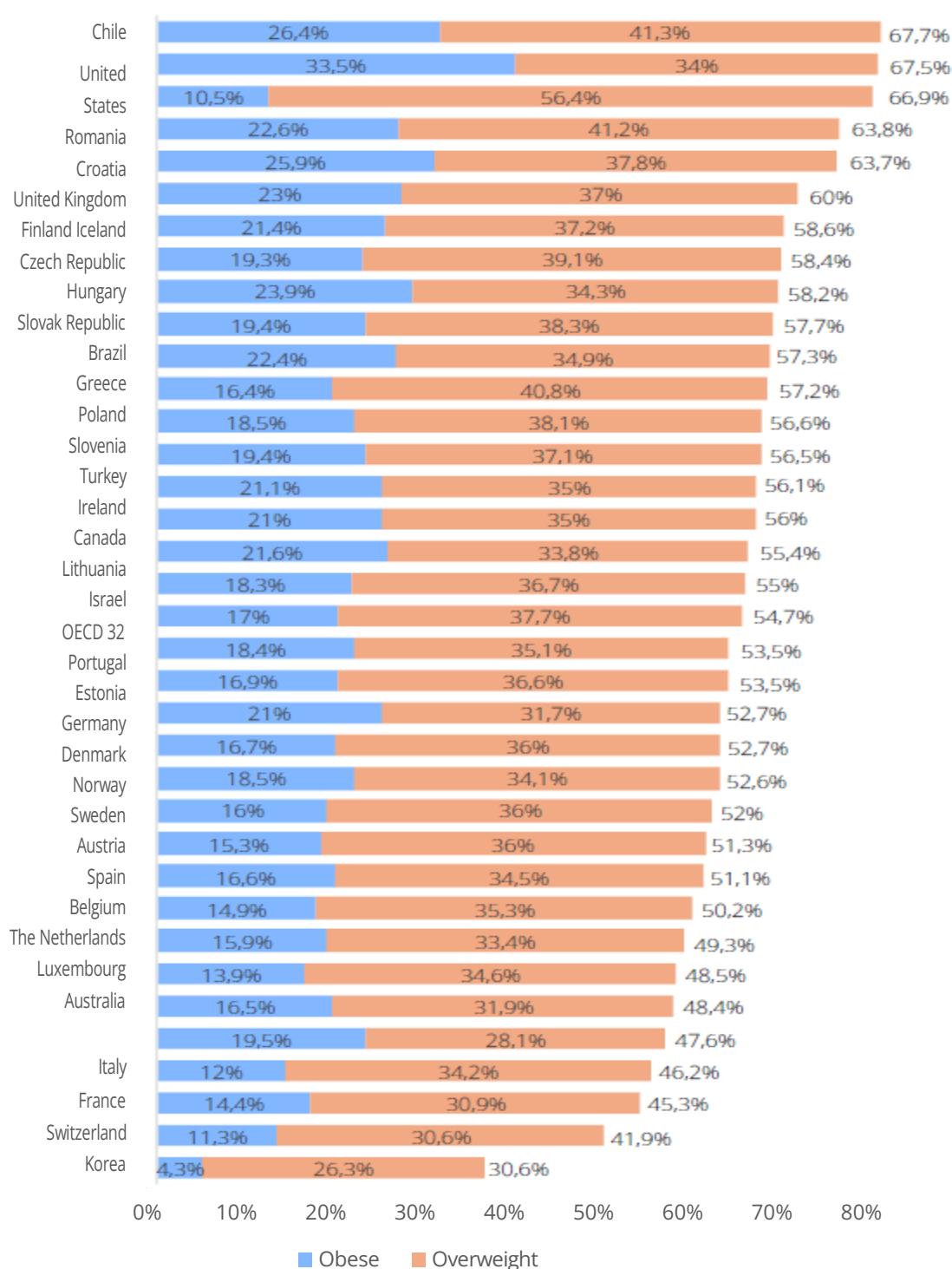
Nutrition, and in particular diet, is one of the factors that strongly affects the probability of the onset of chronic diseases originating from a combination of natural (non-communicable) factors. The most relevant factors and diseases related to inadequate nutritional styles are obesity, diabetes, cardiovascular diseases, tumours, non-alcoholic fatty liver disease, chronic bowel diseases, neuropsychiatric diseases and neurodegenerative disorders [11].

2.1. Being obese and overweight

Obesity is one of the main risk factors in the onset of chronic diseases. It is defined by the Higher Health Institute as an excessive accumulation of body fat in relation to lean mass, both in terms of absolute amount and distribution at precise points in the body. This is distinguished from being overweight thanks to the *Body Mass Index* (BMI) calculated as the ratio of weight (in kilograms) and height (in metres) squared. Specifically, you are overweight if your BMI sits between 25 and 29.9 and obese if the value exceeds 30 [11]. In Europe, this condition represents a growing concern, with one in three school-age children, one in four adolescents and almost 60% of the adult population now living in conditions of being overweight or obese [29]. Overall, according to the latest available data from each country collected by the Organisation for Economic Co-operation and Development (OECD), Italy appears to be one of the countries with the lowest obesity rate, at 12%. Better conditions only for Switzerland (11.3%), Romania (10.5%) and Korea (4.3%), significantly lower than the OECD32⁵ average of 18.4% [30].

⁵ The OECD32 countries are considered as all countries in the chart except Brazil, Romania and Croatia.

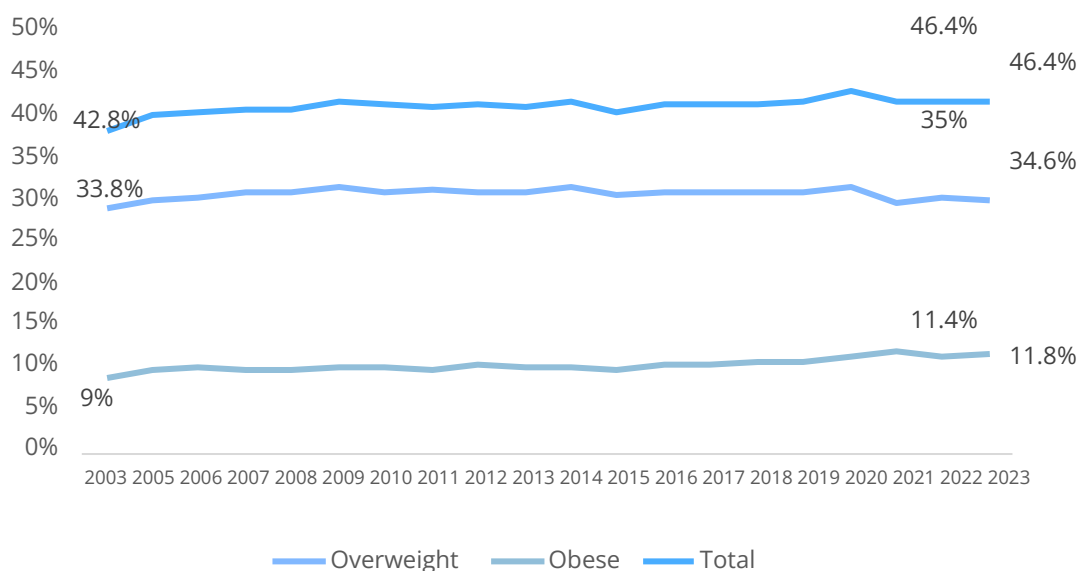
Chart 2.1.1: Rates of obesity and being overweight among adults



Source: Elaboration by Fondazione Aletheia based on OECD data

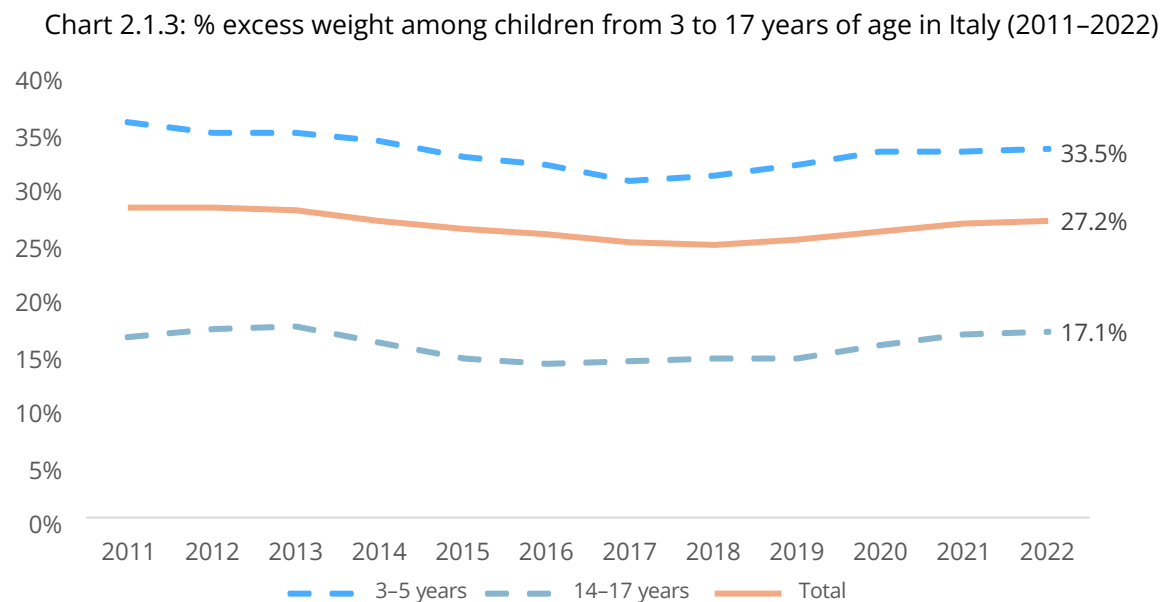
Considering in the analysis also the conditions of being overweight, according to the latest data from the Italian National Institute of Statistics (ISTAT) [31], in Italy in 2023 excess weight (overweight plus obesity) affected 46.4% of the elderly population. Of these, 34.6% are overweight and 11.8% are more severely obese. In particular, the obesity rate saw a slight downturn compared to 2021, the year of the pandemic, in which the highest *prevalence* ever reached was recorded, equal to 12% but an increase compared to 2022 in which a value of 11.4% was recorded. The overweight rate then saw a slight decrease compared to 35% recorded in 2022. People affected by obesity in 2021 were around 6 million, the highest absolute number recorded in recent decades. This figure fell in 2022 to around 5.6 million only to grow slightly in 2023 to around 5.8 million. As for the total number of overweight people, from 17.1 million in 2021, it rose to 17.3 million in 2022 and decreased to 17 million in 2023 [32]. In the last twenty years, this phenomenon has recorded a significant growth if we consider that in 2003, the rate of overweight people stood at 33.8% (just under 16 million), while that of obesity was at 9% (about 4.3 million) [33]. Over the last two decades, the number of overweight people has grown by 7.1% whereas the number of obese people has grown by 36.4%.

Chart 2.1.2: Trend in the rate of overweight and obese adults in Italy (last 20 years)



Source: Elaboration by Fondazione Aletheia based on ISTAT data

The picture does not seem particularly reassuring even in the analysis of lower age groups, such as children and adolescents from 3 to 17 years of age [34]. The reasons for this phenomenon can be attributed to changes in eating behaviours. According to ISTAT data, it is estimated that in Italy in the 2021–2022 two-year period, 27.2% of boys between the ages of 3 and 17 were overweight. More dramatic data is recorded in the youngest age group, between 3 and 5 years, where the percentage of overweight children increases in 2022 to reach a value of 33.5%, while the percentage of adolescents (14–17 years old) decreased to a value of 17% [32, 35].



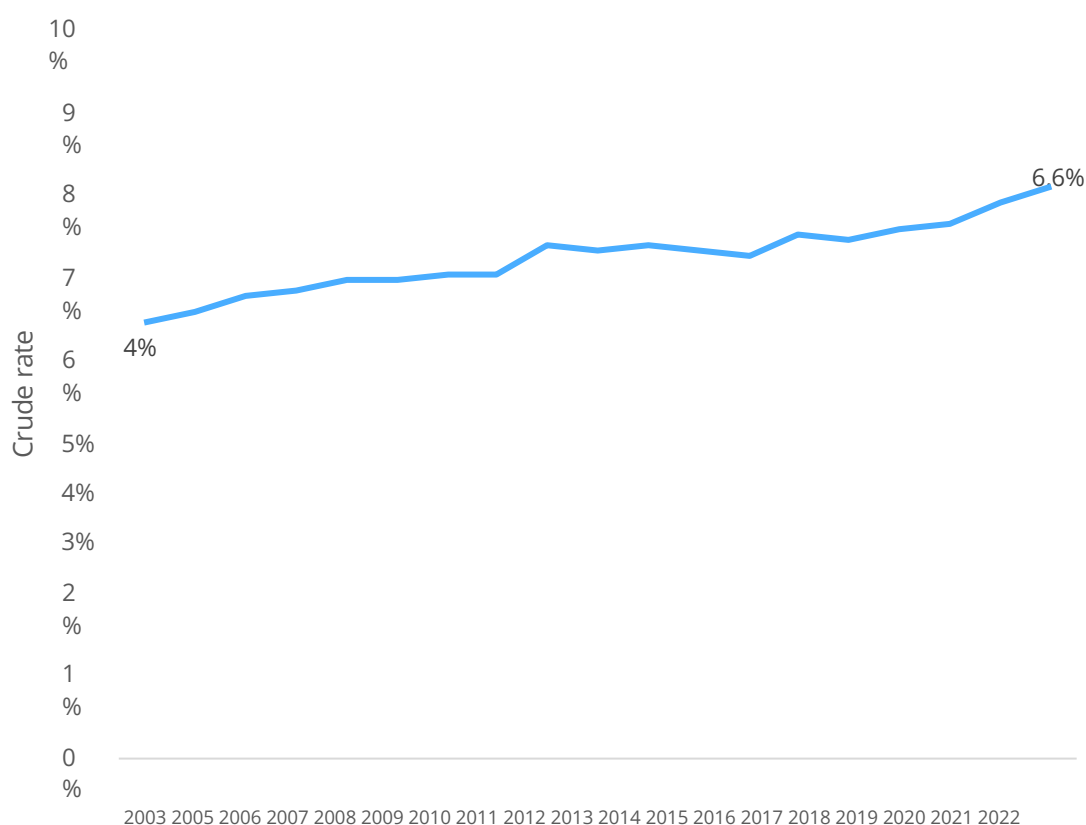
Source: Elaboration by Fondazione Aletheia based on ISTAT data

According to the World Health Organization (WHO), people affected by obesity have an average life expectancy of five years lower than those with a 'healthy' weight status (measured by BMI – optimal if within the values 18.5–24.9 kilograms/m²) [29]. The Higher Institute of Health has confirmed that a severely obese person could lose as much as 8–10 years of life – the same as a smoker – while for every 15 kilograms of excess weight, the risk of premature death increases by 30% [35]. This condition lays, among other things, the foundations for the onset of other complications at a metabolic level such as insulin resistance, diabetes or inflammatory processes at multiple levels. In 2019, the economic impact of being overweight or obese was estimated at 2.2% of global Gross Domestic Product (GDP). The 5% reduction in the expected prevalence of overweight and obese people between 2020 and 2060 could result in an average annual saving of around \$430 billion globally. Taking this data into account, the importance of and need for a public and private commitment to reducing existing obesogenic factors is clear, investing in particular in prevention policies and counter-actions [36].

2.2. Diabetes

According to the definition of the Italian National Institute of Health, diabetes is “a chronic disease characterised by the presence of high levels of glucose in the blood (*hyperglycaemia*) due to an altered amount or function of insulin”. [37]. When glucose enters the body's circulation, the pancreas produces a hormone, known as insulin, which allows it to enter the cells that use it for energy. Hyperglycaemic conditions occur when glucose builds up in the blood, generating multi-level decompensations. Diabetes manifests in several forms and is generally classified into two categories: Type 1 and Type 2. The first, unrelated to nutrition, is the result of an autoimmune reaction of the body in which antibodies do not recognise and actually destroy the cells responsible for the production of insulin, resulting in a partial or total hormonal deficit. Type 2 diabetes, rather, is more common and can depend on both a defect in insulin secretion and reduced insulin sensitivity, so the hormone has a reduced biological effect. Obesity is one of the main risk factors for the development of Type 2 diabetes, although not the only one. When a person suffers from obesity, the body frequently tends to develop a condition whereby the cells become less sensitive to the action of insulin, known as “insulin resistance”. In response to this resistance, the pancreas can up hormone production to try to keep blood glucose levels under control. In the long term, however, the pancreas may not be able to produce enough insulin, leading to a sustained increase in blood glucose levels and eventually the development of Type 2 diabetes. Obesity is closely related to insulin resistance, since excess adipose tissue, especially in the abdominal area, can release chemicals such as adipokines that interfere with the normal action of insulin. Thus, reducing body weight through a balanced diet and exercise can play a key role in both the prevention and control of Type 2 diabetes [38]. In Italy, according to ISTAT data, there is an increasing trend in the *incidence* of diabetes, rising from 4% in 2003 to 6.6% in 2022, seeing a growth of 65%.

Chart 2.2.1: Diabetes prevalence trend in Italy (2003–2022)



Source: Elaboration by Fondazione Aletheia based on ISTAT data

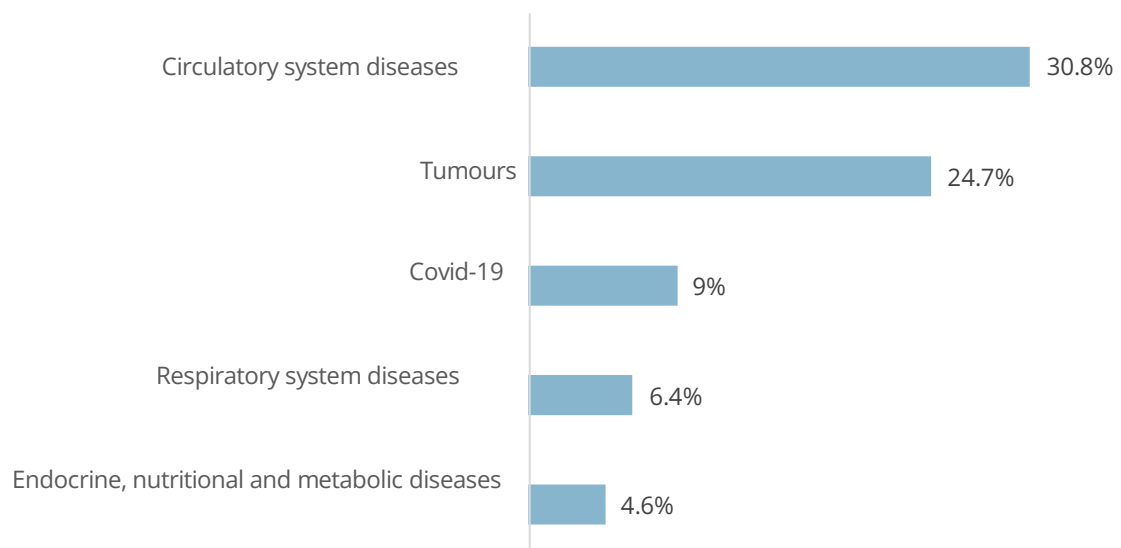
2.3. Cardiovascular diseases

The correlation between diabetes and cardiovascular disease is significant – people with diabetes, particularly in the case of type 2 diabetes, have a higher risk of developing cardiovascular disease. According to the PASSI (Progress of Healthcare Companies in Italy) surveillance system, among those who report a diagnosis of diabetes, 71% exceed the Ponderal Index⁶, 52% are hypertensive and 43% have high cholesterol levels, while for those who do not suffer from diabetes the prevalence is lower (41%, 18% and 21% respectively) [39]. Factors contributing to the association of cardiovascular disease and diabetes include insulin resistance and hyperglycaemia which, if chronic, can damage blood vessel tissue and increase the risk of atherosclerotic plaque formation or dyslipidaemia, as people affected by diabetes tend to have altered blood lipid levels and a chronic inflammatory state [40]. As such, many of the factors that influence the onset of diabetes and glucose metabolism are the same as those that also impact cardiovascular disease. From a

⁶A condition characterised by an excessive accumulation of body fat

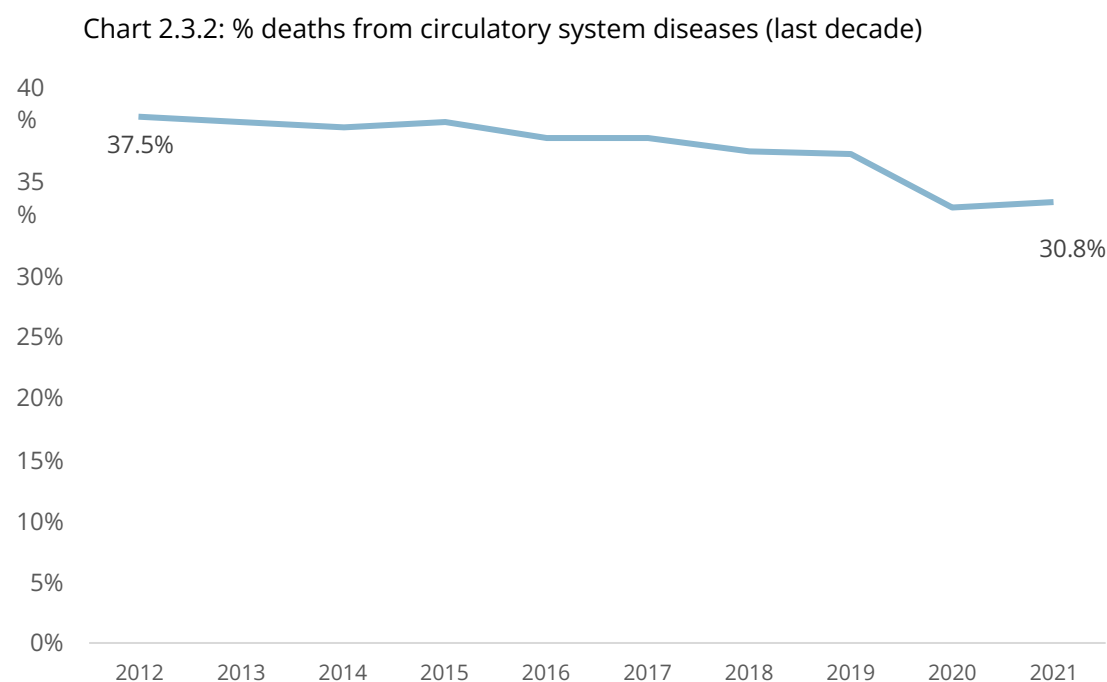
nutritional perspective, there are dietary habits that can reduce the risk of the onset of these diseases. These include replacing saturated fats with polyunsaturated fats for 5% of total calories reduces the risk of coronary heart disease events by about 20% [41]. The consumption of four portions of legumes per week contributes to reducing the risk by 20% compared to those who do not consume them [42]. Consuming half a portion of whole grains reduces the risk by 10% and by 20% for a whole portion [43]. These simple precautions are particularly important since cardiovascular diseases are the main cause of death in Italy. According to ISTAT data referring to 2021, 31% of deaths nationwide are attributable to this category of diseases, followed by cancers (24.7%) and Covid-19 (9%) [44].

Chart 2.3.1: % mortality by cause (2021)



Source: Elaboration by Fondazione Aletheia based on ISTAT data

However, it should be noted that in recent decades, there has been a decline in deaths due to diseases of the circulatory system, from an incidence of 37.5% of total deaths in 2012 to 31% in 2021 [44].

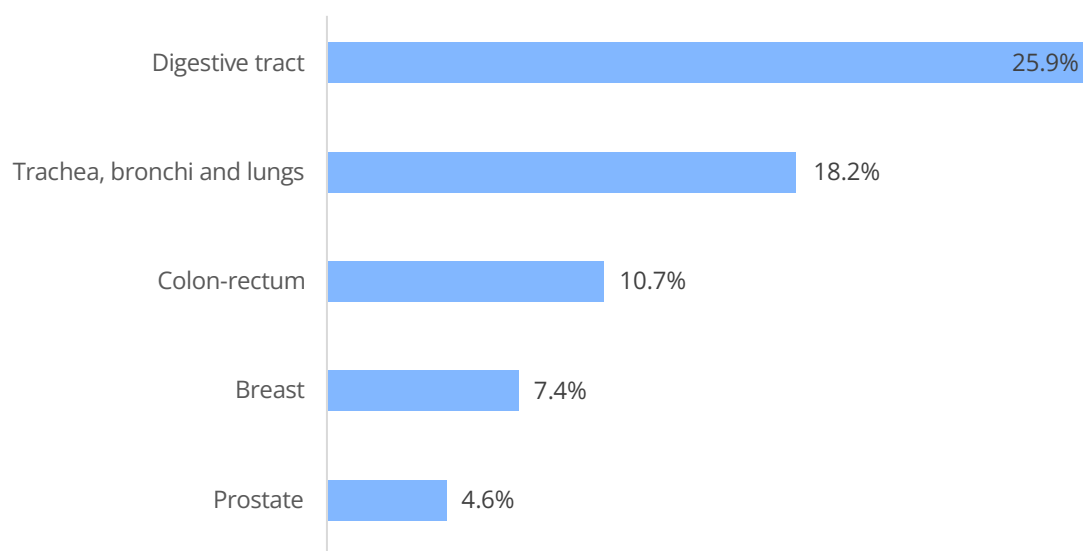


Source: Elaboration by Fondazione Aletheia based on ISTAT data

2.4. Tumours

According to the Higher Institute of Health, the term “tumour” includes a group of diseases characterised by the uncontrolled proliferation of cells. When cell transformation processes are out of control, their growth may occur in the surrounding tissues and other organs, compromising regular functioning [2]. As reported in the publication “I numeri del cancro in Italia 2023”, about 395,000 cancer cases of cancer were estimated, with an increase of more than 5% compared to 2020, when around 376,000 cases were estimated. According to 2021 ISTAT data, cancers are responsible for almost 1 in 4 deaths (24.7%) in Italy. Among these, those of the digestive tract (with a prevalence of 26%) are the most widespread before trachea, bronchus and lung cancers, together responsible for 18.2% of deaths, colorectal cancer (10.7%), breast cancer (7.4%) and prostate cancer (4.6%) [44].

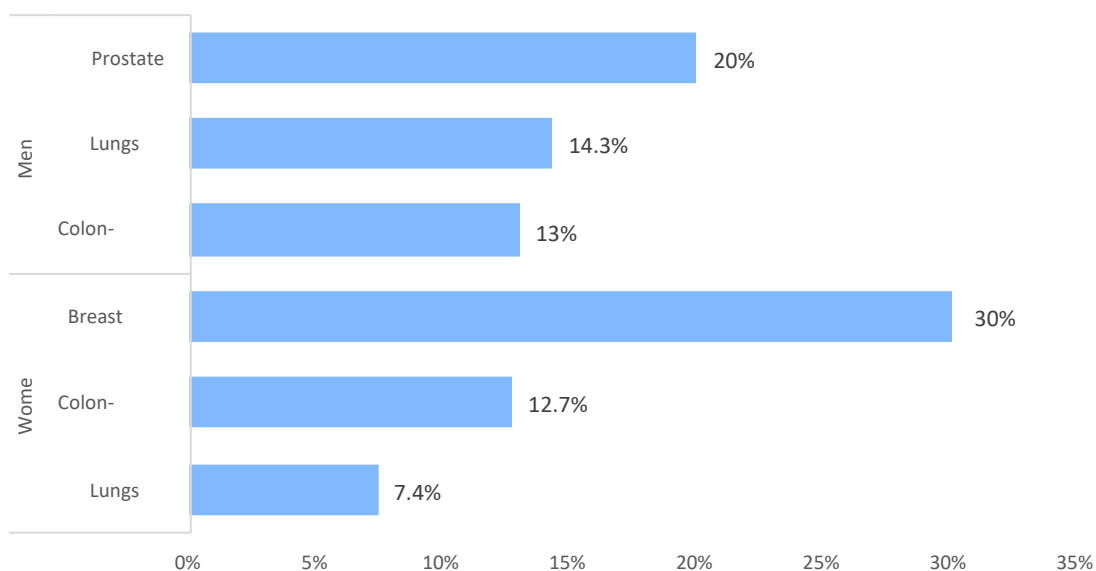
Chart 2.4.1: % of total mortality due to cancer (2021)



Source: Elaboration by Fondazione Aletheia based on ISTAT data

The most frequent neoplastic sites for men are the prostate which, according to estimates, constitutes about 20% of all male cancers, followed by the lung at 14.3% and colorectal cancer at 13%. For women, the most common are breast cancer at 30%, followed by colorectal cancer at 12.7% and lung at 7.4% [45].

Chart 2.4.2: Frequency % of main neoplastic sites (2023)



Source: Elaboration by Fondazione Aletheia based on AIOM (Italian Association of Medical Oncology) data

There are many risk factors for the onset of cancer. Among these is obesity which – as reported in the third edition of the report “Diet, Nutrition, Physical Activity and Cancer” from the World Cancer Research Fund – is a condition associated with inflammatory mediators and metabolic and endocrine abnormalities that promote cell growth and exert antiapoptotic effects⁷, so that cancer cells do not self-destruct even after serious DNA damage [46]. Obesity is also accompanied by a non-negligible behavioural risk: a sedentary lifestyle. As reported in the publication “I numeri del cancro in Italia”, WHO states that in the 2021–2022 two-year period, 47% of the adult population in Italy can be classified as “physically active” yet 30% lead a “sedentary life”. It is well-known that exercising is essential for preventing chronic non-communicable diseases and for improving people’s general wellbeing. Several studies confirm that physical activity can reduce the risks of diseases such as diabetes and cardiovascular diseases, even lowering the overall risk of cancer. In particular, exercise can protect against colorectal and breast cancer in menopausal women but has also been shown to have a protective effect for other types of cancer, such as oesophageal, liver, lung and others even in people who are overweight or who smoke [45]. This factor is particularly important, especially when considered together with other risk factors such as smoking and alcohol consumption. On the other hand, there are some habits that could act as protective factors such as the consumption of fruits and vegetables, unrefined carbohydrates, vitamin D and calcium. Fruits and vegetables are known to be low in fat and rich in vitamins, minerals and fibre and can play a decisive role in the prevention of heart disease and cancers, in particular with reference to the latter where they involve the digestive tract⁸. WHO recommends a daily consumption of at least 400 grams of fruit and vegetables, corresponding to about five servings of 80 grams (“five a day”). According to the data of the aforementioned PASSI system, in the 2021–2022 two-year period in Italy, only 7% of the adult population⁹ consumed the amount recommended by the guidelines, 38%

⁷ Apoptosis - genetically-controlled phenomenon that results in the programmed death of a cell at a certain point in its life cycle

⁸ Oesophagus, stomach, pancreas, colorectum, kidney

⁹ 18–69 years

consumed 3–4 servings and 52% consumed 1–2 servings [45]. According to the Italian Association for Cancer Research, based on a study conducted by the World Health Organization, there is a strong link between food choices and cancer prevention. In fact, according to WHO, adopting a balanced diet can help prevent up to 40% of cancers. This underlines the crucial role of nutrition in reducing the risk of cancers, including breast, colon, stomach and oesophagus. Conscious choices of nutrient-dense foods, such as fruits, vegetables, whole grains and lean protein, not only provide necessary support to the body but also act as a protective barrier against many diseases related to modern lifestyles [47].

2.5. Non-alcoholic fatty liver disease

Non-alcoholic fatty liver disease (NAFLD) is considered the hepatic manifestation of metabolic pathology and consists of a spectrum of hepatic pathologies including hepatic accumulation of lipids in more than 5% of hepatocytes (steatosis), hepatic inflammation (steatohepatitis), fibrosis, cirrhosis and the development of hepatocellular carcinoma [48]. In recent decades, NAFLD has become the most common liver disease in the world, affecting about a quarter of the adult population [49]. The global epidemiology of NAFLD is directly related to the obesity epidemic and is recognised as being closely associated with metabolic syndrome and its individual components, such as Type 2 diabetes, hyperlipidaemia and hypertension. Along with physical activity, a healthy diet is considered the cornerstone for managing NAFLD. A weight loss of 7–10% in body weight can lead to an improvement in liver steatosis, even in the most severe cases. A growing number of studies suggest that dietary fibre intake and the Mediterranean Diet [50] may be protective, whereas saturated and trans fatty acids, simple sugars and sugary drinks represent risk factors.

2.6. Chronic Inflammatory Bowel Diseases

Chronic Inflammatory Bowel Diseases (CIBDs) affect more than 2.5 million individuals in Europe, resulting in significant health and economic costs. CIBDs include ulcerative colitis and Crohn's disease. Crohn's disease is an extensive inflammatory condition that can occur in patches throughout the small intestine and colon, whereas ulcerative colitis is characterised by inflammation of the mucosa limited to the colon [51] [52] [53]. Both of these chronic inflammatory diseases of the gastrointestinal tract are primarily due to an abnormal mucosal immune response of the gut microbiota to various environmental factors [54]. Although the aetiology of these diseases appears to be multifactorial, the close relationship between dietary habits and the development of CIBDs has been demonstrated in recent decades [55] [56]. Diet is one of the main environmental factors that influence the intestinal microbiota, directly influencing host homeostasis, intestinal inflammation and immunological processes. More recently, many studies have looked into the impact of the consumption of various artificial food additives on the intestinal microbiota and on their positive associations with the development of Chronic Inflammatory Bowel Diseases through intestinal microbial modulation [57].

2.7. Neuropsychiatric disorders

Neuropsychiatric disorders such as anxiety and depression are the main causes of disease burden [58]. Studies on the global disease burden show that depressive disorders are among the most prevalent mental disorders and confer the greatest overall burden [59]. Poor diet quality has been implicated as a potentially-modifiable risk factor for depression [60]. The link between poor diet quality and depression has been widely observed using Diet Quality Indices. Further studies used a dietary pattern analysis approach – defining patterns such as high intake of fast food, sweets, savoury snacks and sugary drinks – and associated macronutrient content such as saturated fat and sugar intake [61] [62].

2.8. Neurodegenerative diseases

Neurodegenerative diseases are characterised by the progressive loss of neurons (neurodegeneration) in regions that compromise the function of this system. Progressive neurodegeneration leads to the presence of neurological and neuropsychological signs and symptoms including impaired balance, movement (ataxia), language, breathing, cardiac functions and cognitive decline (dementia). According to the National Institute of Neurologic Disorders and Stroke, the most prevalent neurodegenerative diseases are Alzheimer's disease, Parkinson's disease, amyotrophic lateral sclerosis, Friedreich's ataxia, Huntington's disease and spinal muscular atrophy [63] [64]. The prevalence of neurodegenerative diseases has increased in recent years, with more than 30 million individuals with dementia, a figure that could reach 75 million by 2030. The effects of dementia worldwide and its importance for public health have been described by the World Health Organization (WHO) as alarming [65]. Current lifestyles and dietary patterns are not only factors that increase the risk of developing metabolic diseases but also, in the medium-term, the development of neurodegenerative diseases. Diet plays an important role in the balance of the microbiota, since short-term changes in the dietary pattern lead to alterations in its diversity and composition with a greater degree of affect in individuals consuming low-fibre diets [66]. Diet, microbiota and neurodegenerative diseases are possible therapeutic and preventive targets, as dysregulation of gut microbiota is an important factor closely related to neurodegenerative diseases.



BOX 1. The costs of diet-related chronic diseases

Non-communicable diseases pose a threat to the Goals of the 2030 Agenda, both for sustainable development and for the high social costs. In fact, the goal of a 30% reduction in mortality caused by the four main diseases previously analysed by 2030 could be compromised and the economic impact on the healthcare system would also be affected. In fact, health expenditure is an important factor, considering that in 2020, EU countries recorded average healthcare costs equalling 9% of GDP [67]. In particular, the latest available data shows that for EU healthcare systems, the direct costs for cardiovascular diseases amount to €111 billion and those for cancer sit at around €97 billion. In addition, according to the latest estimates of the International Diabetes Federation European Region, the expenditure due to diabetes in the adult population in Europe amounts to €167.5 billion [67]. On top of all this, according to the data from the 2019 OECD analysis, the economic, social and health costs related to the excess weight of the population of 52 countries are quantifiable at 425 billion dollars per year [68]. The incidence of these expenditure items could be greatly reduced if we consider that about 60% of new diabetes cases, 18% of cardiovascular diseases and 8% of cancers are directly linked to overweight, causing about 3 million premature deaths each year. This all implies an annual contraction of European GDP of 3.3%, compared to an average cost of about 8.4% of the health system budget, with the extreme tip represented by the United States (14% of its healthcare budget) [68]. In Italy, the Ministry of Health, in its document on the prevention policies and counter-actions for being overweight and obese, stresses the need to combat such phenomena also as a cause of the slowdown in the country's economic growth. In fact, being overweight accounts for 9% of national health expenditure and potentially reduces GDP by 2.8% [69].

Overall, this means that each Italian pays €289 in taxes per year to cover the costs of being overweight [70]. To this end, a package of awareness-raising policies on the subject of prevention would guarantee savings for Italy tallying €62 million per year in health expenditure, preventing the onset of 144,000 cases of non-communicable diseases by 2050. In addition, a 20% reduction in calories from foods high in sugar, salt and saturated fats could prevent 688,000 chronic diseases in Italy by 2050, with a further saving of €278 million per year for Italian health expenditure, meaning around 7 billion over the next 25 years [70].

In summary:

- Obesity is one of the main risk factors in the onset of chronic diseases.
- According to data from the Italian National Institute of Statistics (ISTAT), despite Italy having better values concerning the obesity rate, equal to 12%, the excess weight (overweight plus obesity) affected 46.4% of the elderly population as of 2023. In the USA, this percentage rises to 67.5%.
- Over the last two decades, the number of overweight people in Italy has grown by 7.1% whereas the number of obese people has grown by 36.4%.
- A severely obese person could lose as much as 8–10 years of life – the same as a smoker – while for every 15 kilograms of excess weight, the risk of premature death increases by 30%.
- In Italy, according to ISTAT data, there is an increasing trend in the *incidence* of diabetes, rising from 4% in 2003 to 6.6% in 2022, seeing a growth of 65%.
- The correlation between diabetes and cardiovascular disease is significant – people with diabetes, particularly in the case of type 2 diabetes, have a higher risk of developing cardiovascular disease.
- Among those who report a diagnosis of diabetes, 71% are overweight, 52% are hypertensive and 43% have high cholesterol levels, while for those without diabetes the prevalence is lower (41%, 18% and 21% respectively).
- Replacing saturated fat with polyunsaturated fat for 5% of total calories reduces the risk of coronary heart disease by about 20%. The consumption of four servings of legumes per week contributes to reducing the risk by 20% compared to those who do not consume them at all. The consumption of half a portion of whole grains reduces the risk by 10% and by 20% for a whole portion.

- There are many risk factors for the onset of cancer. Among these we find obesity, as a condition associated with inflammatory mediators and metabolic and endocrine abnormalities that promote cell growth and exert anti-apoptotic effects, meaning cancer cells do not self-destruct even following serious DNA damage.
- There are some habits that could act as protective factors such as the consumption of fruits and vegetables, unrefined carbohydrates, vitamin D and calcium.
- WHO recommends a daily consumption of at least 400 grams of fruit and vegetables, corresponding to about five servings of 80 grams ("five a day"). According to the data of the aforementioned PASSI system, in the 2021–2022 two-year period, only 7% of the adult population in Italy consumed the amount recommended by the guidelines, 38% consumed 3–4 servings and 52% consumed 1–2 servings.
- According to WHO, adopting a balanced diet can help prevent up to 40% of cancers.
- The health costs related to these diseases entail an annual contraction of European GDP of 3.3%, compared to an average cost of 8.4% of the health system budget, with the extreme tip represented by the United States (14% of its healthcare budget).
- Problems related to being overweight represent 9% of national health expenditure and generate a contraction in GDP of 2.8% due to the higher costs required. The cost for each Italian is €289 in additional taxes per year.
- A 20% reduction in foods high in sugar, salt, calories and saturated fats could prevent 688,000 chronic diseases in Italy by 2050, with a further saving of €278 million per year in Italian health expenditure, meaning about €7 billion over the next 25 years.

3. The Mediterranean Diet: a healthy and sustainable model

The Mediterranean Diet is a set of skills, knowledge, practices and traditions that extend from the landscape to the table, including crops, harvesting, fishing, conservation, processing, preparation and, above all, the consumption of food. The Mediterranean Diet is characterised by a nutritional pattern that has remained constant over time and space, consisting mainly of olive oil, grains, fresh or dried fruits and vegetables, a moderate amount of fish, dairy products and meat, along with many condiments and spices, all accompanied by wine or infusions, always respecting the beliefs of each community. However, the Mediterranean Diet is not limited to food. It promotes social interaction, since common meals are the cornerstone of social customs and festive events (UNESCO, 2010). In 2010, with this definition, the Mediterranean Diet was inscribed on the UNESCO Representative List of Intangible Cultural Heritage¹⁰. The definition that incorporates and expresses different values covers:

- Gastronomic, by virtue of the strong international consensus towards “Mediterranean Cuisine” has always been appreciated for its unmistakable aromas and flavours that have made it famous throughout the world;
- Historical-cultural, encompassing everything that has been transmitted by tradition, as the result of centuries-old sedimentation that took place in the Mediterranean basin, including the characteristic and symbolic places of the Mediterranean Diet, spaces that can range from olive groves and vineyards to the market, passing through piazzas and popular gastronomic meeting places;
- Economic, as the value of the products that form the basis of the Mediterranean Diet recommended for daily consumption by nutritionists, is around €27 billion in Italy alone. In addition, numerous indicators

¹⁰ “Intangible Cultural Heritage” means the practices, representations, expressions, knowledge, skills – as well as the tools, objects, artefacts and cultural spaces associated with them – that communities, groups and, in some cases, individuals recognise as part of their cultural heritage. This Intangible Cultural Heritage, transmitted from generation to generation, is constantly recreated by communities and groups in response to their environment, their interaction with nature and their history, providing a sense of identity and continuity, thus promoting respect for cultural diversity and human creativity (UNESCO, 2003).

demonstrate how the production of the agri-food products that make up the Mediterranean Diet (mostly vegetables) have a low impact on natural resources compared to other types of diets such as, for example, the North American one characterised by a prevalent and in some cases excessive consumption of meat and sugars;

- Value related to human health that continues to be confirmed and updated by new studies and research carried out by scientific institutions in all advanced countries.

Following these considerations, the International Centre for Advanced Mediterranean Agronomic Studies (CIHEAM), in collaboration with other international institutions and organisations including the Food and Agriculture Organisation (FAO), launched a work programme in 2010 with the objective of verifying whether the Mediterranean Diet was a model of a Sustainable Diet¹¹. Through a series of seminars, workshops and international conferences, it was agreed that the Mediterranean Diet has numerous health-related benefits in helping reduce predisposing factors for chronic degenerative diseases closely related to nutrition, increasing social wellbeing and reducing public spending. Another sustainable benefit is represented by the low environmental impact linked to the greater consumption of plant products characterising this diet, the richness and appreciation of the value of agrobiodiversity and the contribution to the mitigation of climate change. Social and cultural benefits include the enhancement of the social value and cultural identity of food, greater social inclusion and greater consumer awareness. Finally, there are the benefits linked to local economic returns, sustainable territorial development,

¹¹ "Sustainable Diets" are those with low environmental impact that contribute to food and nutrition security and healthy living for present and future generations. Sustainable Diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically equitable and affordable, nutritionally adequate, safe and healthy, optimising natural and human resources. (Food and Agriculture Organisation/Bioversity International, 2010)

a reduction of rural poverty and the potential contribution the diet can make in reducing food waste and loss. The Mediterranean Diet thus affects social, cultural, environmental and economic aspects, as well as impacting the health and psycho-physical wellbeing of the human person through a positive thread touching all aspects of life. Despite these benefits, however, the Mediterranean Diet still has wide margins of affirmation in most Mediterranean countries, despite its growing popularity all around the world. This poses serious threats to sustainability for the conservation and transmission of the Mediterranean Diet to current and future generations, thus representing an intangible asset in danger of “erosion” which, moreover, is the reason why in 2010 the Mediterranean Diet was inscribed on the UNESCO Representative List of Intangible Cultural Heritage. Over the years, this important recognition has shown that it is no longer sufficient because, today more than ever, new enhancement and safeguard measures are needed to counteract the growing distancing of Mediterranean peoples from this healthy and sustainable food model. This is most likely due to the loss of awareness that we do not eat “nutrients” but “food”, which has a cultural, ethical, religious, social, environmental and economic value. Despite expressing all these values, the Mediterranean Diet has been almost exclusively associated with health benefits by removing all cultural factors related to diet. Today, we need to rebuild a new culture around the Mediterranean Diet that is suited to the times and suitable for all. A 21st-century Mediterranean Diet that identifies this regime as a Sustainable and Healthy Diet. To achieve such awareness, a “change in direction” is necessary, starting from a new perception of the Mediterranean Diet, considering it no longer a food model that is good exclusively for human health but also for that of the planet, which could favour the economic development of the territories and the social and cultural dimension of Mediterranean populations. This is precisely the theme addressed in the book, “Sustainable Food Systems. Change of Route in the Mediterranean” [71] in which, among the contributions of the 21 authors, a Mediterranean Diet emerges as an entry point for a better understanding of the multidimensional interdependencies between food production and consumption patterns. But in order to play this important role, the

Mediterranean Diet must become an adopted and accessible food model. Only in this way can it serve as a lever between production and consumption for the transition to Sustainable Food Systems while contributing to its protection which is, let us recall once more, the reason why it was inscribed on the UNESCO Representative List of Intangible Cultural Heritage. It is thus necessary to have a profound impact especially on the

Food Environment defined by the High Level Panel of Experts (HLPE)¹² as the “physical, economic, political and

socio-cultural context in which consumers engage with the food system to make their decisions about acquiring, preparing and consuming food” (HLPE, 2017). In fact, it is a mistake to think that it is sufficient to act only on the consumer through information, food education and awareness-raising as solely responsible for someone’s food choices. This is only partially true, because if the conscious consumer wants to practice the Mediterranean Diet, in many cases they cannot do so because the food environment in which they live proposes and forces them to make a certain type of choices truly far from those they would prefer. Only through an improvement of and cooperation between all players in the Food Environments will consumers be able to make more conscious food choices to improve not only their own health but also that of the planet, favouring the economic development of the territories and ensuring greater access to diversified local food. Acting on the food environment can provide an important contribution to the transition towards more sustainable Food Systems and at the same time to the revitalisation of a 21st-century Mediterranean Diet as a model of a sustainable and healthy diet for facing the many challenges that, by 2050, about 10 billion people in the world will have to face.

¹² The High Level Panel Expert (HLPE) on Food Security and Nutrition, the science-policy interface of the United Nations Committee on World Food Security.

In summary:

- In 2010, the Mediterranean Diet was inscribed on the UNESCO Representative List of Intangible Cultural Heritage. The numerous health benefits come from helping to reduce the factors underlying the onset of chronic-degenerative diseases closely related to nutrition, increasing social well-being and reducing public spending.
- Amongst the social and cultural benefits are the enhancement of the social value and cultural identity of food, greater social inclusion and stronger consumer awareness. Finally come the benefits linked to local economic returns, sustainable territorial development, the reduction of rural poverty and the potential contribution this diet can make in reducing food waste and loss.
- This nutritional pattern is not only good for human health but also for that of the planet, even promoting the economic development of the territories and the social and cultural dimension of Mediterranean populations.

4. Strategies for better nutrition

4.1. Some initiatives

Prevention is key when it comes to safeguarding health. To this end, the school – as a widespread institution throughout the national territory – is the main place in which to exercise and strengthen food education processes as a preventive measure. This diet can guide new generations to develop a good sensitivity that also concerns the issues of personal and collective wellbeing, sustainability and the adoption of proper lifestyles. These are important concepts given the value of food through which you can rediscover a sense of belonging to the community in which food is always part of history and places. These values are also accompanied by multiple virtuous effects such as the protection of production territories, supply chains and food systems, the diffusion of a culture of responsible consumption and the containment of food waste. These issues form the basis of a series of initiatives implemented in recent years by the Ministry of Education and Merit (MIM). For example, with regard to food education and healthy and sustainable lifestyles, the MIM has promoted a school education programme titled “Scuola & Cibo” [72] for the benefit of local educational institutions, in which the Italian food culture, as the founding matrix of the Mediterranean Diet, is proposed as a consolidated and balanced paradigm of reference for food education. In addition, in 2022, the Ministry of Health renewed the Memorandum of Understanding with the Ministry of Health, setting up a new committee organised into working groups on various issues, including lifestyles, food and nutrition [73]. The agreement with the Confederazione Nazionale Coldiretti heads in the same direction, aimed at developing synergies and projects regarding new issues such as the development of the circular economy and the promotion of local food consumption at km0 with the Fondazione Campagna Amica. Thus, promoting a quality food culture means prevention in the interest of health but also enhancing local resources and supporting biodiversity.

The pillar of prevention also renders the healthcare and welfare system more sustainable while a deeply-rooted food culture helps the entire population to make informed choices with a view to health and sustainability.

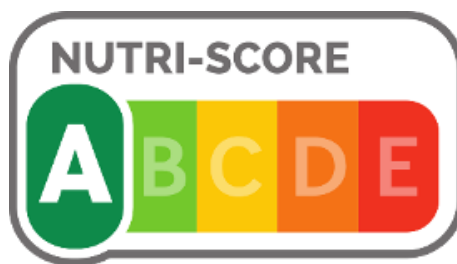
4.2. Transparency, the importance of conscious choices

According to Regulation (EU) 1169/2011, the term “labelling” refers to “any mention, indication, trademark, image, or symbol that refers to food and appears on any packaging, document, notice, label, tape, or band that accompanies or refers to that food”. It is “a key method for informing consumers about the composition of foods ... allowing them to make informed choices when purchasing food products” [74]. The main function of labelling is to provide consumers with essential information about ingredients, storage methods, nutritional information and, when necessary, health warnings. In a reality in which awareness of the link between food and factors such as health, the environment and ethics is constantly growing, labelling takes on an even more significant role, thus also representing a tool for establishing a bond of trust between the producer and consumer. A distinction is made between two types of labelling – the Back-of-Pack Label (BOPL) and Front-Of-Pack Label (FOPL). The first mainly reports information such as the nutritional table and the list of ingredients. In fact, in these cases, we often mistakenly limit ourselves to looking at the caloric intake, regardless of the amount of nutrients. The second has the greatest impact and is where public institutions aim to more effectively communicate with the consumer to induce

healthier behaviour. The Front-Of-Pack Label aims to communicate complex information to consumers in a simple and standardised way to guide them in their food choices and behaviours. But the line between simplifying information and the risk of communicating misinformation is quite blurred. To date, in an increasingly-varied food landscape, there are numerous models developed in order to categorise food products according to different criteria, ranging from nutritional composition to health impacts. The most discussed models to date include the Nutri-Score and the NutrInform Battery.

- Nutri-Score is a labelling model developed and strongly promoted by France which, through the label, intends to show the quality of food with a score from A to E. The score decreases as the content of energy, simple sugars, saturated fats and sodium increases and increases with the content of fruit, vegetables, fibre and protein per 100 grams of food to calculate an overall nutritional score.

Image 4.1.1: Nutri-Score label



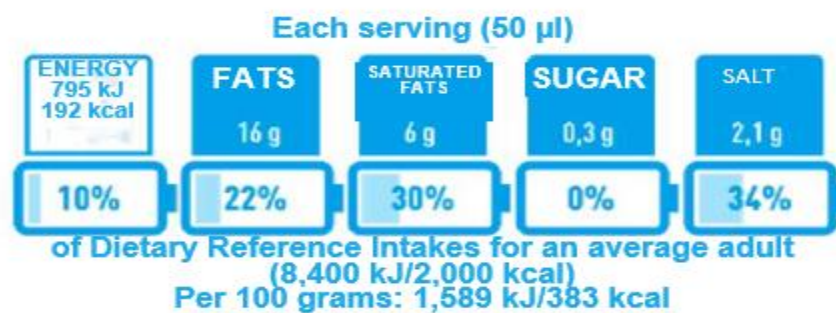
Source: National Public Health Agency (France) - Santé Publique France

Based on this score, the foods are then classified into five coloured categories, associated with letters from A to E, which distinguish products with a higher nutritional quality (dark and light green) from those with a lower nutritional quality (orange and red). The Nutri-Score can be applied to packaged products (with some exceptions) and, to date, uses slightly different algorithms for beverages, fats, oils and cheeses [75]. This model is designed to provide information to help consumers

meet internationally-approved nutritional needs. However, this system still presents several concerns regarding the comparison implemented on 100 grams of product without adequate distinctions and weightings related to recommended daily consumption. One paradoxical example is that of cola produced not with regular sugars but with Non-Nutritive Sugar (NNS) which, according to the latest update of April 2023, has a Nutri-Score of C (yellow). This is on par with extra-virgin olive oil and, worse still, is nutritionally 'better' than Parmigiano Reggiano DOP, classified with a letter D and thus being of "low nutritional quality" [76] [77].

- Another proposed labelling scheme is the NutrInform Battery, which aims to provide information on the nutritional composition of foods through a front labelling system in which the percentage of energy and nutrients consumed compared to the recommended portion of consumption of the food is visually represented. This model, more detailed than the Nutri-Score, offers an evaluation of the ingredients so that consumers may make decisions based on personal nutritional needs [78].

Image 4.1.2: NutrInform Battery label



Source: Ministry of Health (Italy)



BOX 2. Food safety analysis, cross-country comparison

Quality is a multidimensional concept that goes beyond nutritional composition and extends to food safety, understood as the prerequisite linked to the absence of toxic substances such as phytopharmaceutical residues, through to different characteristics such as organoleptic and sensory attributes, shelf-life, health effects and psychological factors. Thus, assessing the overall quality of a food means more than ensuring it provides the right nutrients but it must also be safe for human consumption. According to data from the report on pesticide residues in food, drawn up by the European Food Safety Authority (EFSA) in 2021, overall – out of over 88,000 samples analysed by European States – 3.9% are found to have a pesticide residue beyond the legal limits¹³ with products from non-EU countries having the highest irregularity rates. These pesticides can have harmful effects on humans and, for this reason, at a European level have been defined by the EFSA as Maximum Residue Levels (MRLs)¹⁴ in order to limit consumer exposure and contain adverse effects such as those on the central nervous system, liver or fertility [74] if not carcinogenic in the most dangerous cases. In this regard, it should be noted that the European Production Model and in particular the Italian one, has standards of absolute excellence compared to products imported from other areas of the planet. In this sense, the origin reported on the label can be a discriminating factor that helps the consumer to choose safer products. In fact, about 10.3% of samples of non-EU origin recorded levels of contamination by plant protection products above the legal limits, as much as 5 times higher than those of EU origin (2%) [80].

¹³ Samples with a concentration of pesticide residues in milligrams/kilogram numerically higher than the MRL threshold.

¹⁴ The maximum permissible concentration of pesticide residues in or on food or feed, set in accordance with Regulation (EC) no. 396/2005 and based on good agricultural practices and the lowest level of consumer exposure necessary to protect vulnerable consumers.

In particular, Italian products are the most controlled by the European authorities (with over 11,300 samples analysed), ahead of French (about 10,000) and German (just under 8,700) products, with results that reflect the guarantee of Italian production methods. Ultimately, 99.25% of Italian products do not have pesticide residues beyond the limits of non-conformity [80].

Table Box 2: Top 10 Countries for Non-EU Product Irregularity Rates

Country of origin	Samples analysed	% beyond legal limits
Pakistan	146	24,7%
Uganda	347	22,2%
Vietnam	420	19,1%
Albania	101	18,8%
Turkey	2569	16,1%
Egypt	940	16%
Sri Lanka	191	14,1%
India	1685	14,1%
Thailand	270	14,1%
China	1670	12,9%

Source: Elaboration by Fondazione Aletheia based on EFSA data

In summary:

- Prevention is key when it comes to safeguarding health. In this regard, there are many initiatives that can be implemented to direct production and consumption models towards greater sustainability and health. The school – as a widespread institution throughout the national territory – is surely the main place in which to exercise and strengthen food education processes as a preventive measure. But there are many initiatives.
- In order to promote conscious and healthy consumption models, it is essential to act with a view to transparency in the supply chain and production. In this regard, a central role is assumed by labels that guarantee consumers have essential information about ingredients, storage methods, product origin and, when necessary, health warnings. For this reason, it is beneficial to promote the widespread dissemination of origin labelling for productions worldwide along with a regulatory system capable of guaranteeing transparency and correct information for consumers everywhere. This assumption thus leads to also paying due attention to misleading labelling systems that can lead consumers to make the wrong choices for their health.
- Promoting a quality food culture means prevention in the interest of health but also enhancing local resources and supporting biodiversity. This all contributes to rendering the healthcare and welfare system more sustainable while a deeply-rooted food culture helps the entire population to make informed choices with a view to health and sustainability.

Glossary

Fatty acids

Fat constituents, such as triglycerides. These are composed of chains of carbon atoms with a carboxyl end group, conferring acidic properties. They are distinguished into saturated, monounsaturated and polyunsaturated according to the presence or absence of double bonds between adjacent carbon atoms.

Autotroph (organism)

A plant organism that can perform nutrition function, processing inorganic foods by taking energy from the inorganic world, in opposition to heterotrophic organisms, which can only live saprophytically or parasitically.

Dysbiosis (intestinal dismicrobism)

This term collectively indicates all quantitative and qualitative disturbances/changes at a microbiota level that are inevitably reflected on the state of health.

Incidence

Measures the proportion of new events occurring in a population within a given period of time.

Body Mass Index (BMI)

This parameter is used as an indicator of people's weight compared to the values indicated as optimal. It is calculated by dividing the weight in kilograms by the square of the height in metres.

Hyperglycaemic

A presence of high levels of sugar (glucose) in the blood compared to normal values (between 70 and 100 milligrams/decilitre) after 8 hours of fasting.

Dietary Reference Intakes (DRIs) for nutrients and energy

An all-encompassing term for a set of nutritional values of reference that includes the Average Requirements (AR), the Population Reference Intake (PRI) quantities for the population, the Adequate Intakes (AI) and the Reference Intake (RI) range for macronutrients. These values are a reference for professionals in determining the amount of a nutrient needed to keep individuals or groups of individuals healthy. Dietary Reference Intakes (DRIs) also include the Upper intake Level (UL) of a nutrient that can be safely consumed for an extensive period of time.

Prevalence

This measures the proportion of events (infection, presence of antibodies, pregnancy status) present in a population at a given time.

Diet-Induced Thermogenesis (DIT)

Diet-Induced Thermogenesis represents the energy expenditure for the digestion, absorption and metabolism of food and varies depending on the quality and type of macronutrients contained in the food.



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