Report of the Scientific Committee of the Spanish Agency for Food Safety and Nutrition (AESAN) on sustainable dietary and physical activity recommendations for the Spanish population

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Abstract

Dietary recommendations are developed from the best available scientific evidence on the effect of nutrients and food on health. These recommendations take into account that the effect of food depends not only on its nutritional content but also on the matrix in which is ingested, the alterations during the culinary process, the presence of non-nutrient substances, and the synergies that occur

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between food combinations. In addition, the 2030 Agenda for Sustainable Development and the United Nations Sustainable Development Goals (SDGs) (Moran, 2020) make it clear that a profound change in the way food is produced and consumed must take place in order to increase productivity and sustainability while improving human health. On the other hand, taking into account that Law 17/2011, of July 5, on Food Security and Nutrition, in its article 36 [Strategy of nutrition, physical activity, and prevention of obesity (NAOS)], indicates that nutritional and physical activity targets for the population and those of reduction of the prevalence of obesity will be established, it has been considered appropriate to include in this report an update of the physical activity recommendations published by AESAN (Spanish Agency for Food Safety and Nutrition) in 2015 (AECOSAN, 2015), also aligned with sustainability and the environment, so that the 2030 SDGs can be achieved (Moran, 2020) by promoting physical activity and reducing sedentary behaviour.

In view of the above, and in order to establish and be able to provide the population with the most complete and updated information available on healthy and sustainable dietary patterns and on the importance of physical activity, the Scientific Committee of AESAN has been asked for a new report that updates both the dietary recommendations for the Spanish population, considering the environmental impact of food, as well as recommendations related to physical activity.

The Scientific Committee believes that the adoption by the Spanish population of a varied and balanced diet, healthy and sustainable, can improve their health and well-being, while reducing the environmental impact. To this end, it is recommended to consume at least 3 servings/day of vegetables; 2-3 servings/day of fruits; a moderate intake of potatoes and other tubers; 3-6 servings/day of cereals, depending on the energy needs of each person, and not more than 4 servings/day if caloric intake needs to be restricted, prioritising in any case whole grain cereals and wholemeal products; at least 4 servings/week of legumes up to a daily consumption; 3 or more servings/week of nuts, up to a consumption of 1 daily serving, choosing those without added salt, fats or sugars; 3 or more servings/week of fish, prioritising blue fish and species with less environmental impact; up to 4 eggs/week; a maximum consumption of 3 servings/day of dairy products, avoiding those with added sugars and high salt content, although, due to their high environmental impact, it is suggested to reduce the number of daily servings of dairy products if other foods of animal origin are consumed; a maximum of 3 servings/week of meat, prioritising poultry and rabbit meat and minimising the consumption of processed meat; a daily consumption of olive oil, both for cooking and for seasoning, in all main meals; and drinking as much water as necessary, which is considered the primary beverage of a healthy diet. In addition to these recommendations, a number of general considerations and aspects to be taken into account for a sustainable healthy diet have been included.

Finally, this report also includes physical activity recommendations aimed at different population groups, according to the different stages of life, considering that physical activity can be integrated into work, sports and recreational activities or travel, as well as in daily and domestic chores, and that increasing the number of daily steps is also a good way to improve the health of all people.

Key words

Dietary recommendations, food guides, food, sustainability, environmental impact, physical activity, sedentary lifestyle.

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1. Introduction

Law 17/2011 of July 5 on Food Safety and Nutrition states in Article 36, paragraph 2, that the Nutrition, Physical Activity and the Prevention of Obesity Strategy (NAOS) shall establish the nutritional and physical activity objectives for the population and those for the reduction of the prevalence of obesity. To this end, public health policies are established, including the preparation of dietary recommendations or food guidelines as a key instrument for improving the diet, as well as recommendations for physical activity for the general population.

Dietary recommendations are based on the best available scientific evidence on the effect of nutrients and food on health. In addition, they identify eating habits, healthy uses and habits in the target population. Food guidelines contain relatively easy to follow indications and allow for the transfer of current dietary intakes in each country to recommendations based on food consumption. These recommendations consider that the effect of food depends not only on its nutritional content but also on the matrix in which it is ingested, on the alterations during the culinary process, on the presence of non-nutrient substances, and finally, on the synergies that occur between food combinations. To facilitate observance of the recommendations, food guidelines may include graphic representations (icon, circle, pyramid, plate), which serve to summarise and represent the recommended dietary pattern in a clear, easy and didactic way. Likewise, the physical activity guidelines have been based on the review and gradation of the scientific evidence carried out in 2020 by the WHO (World Health Organization) (WHO, 2020) and published in its Spanish version in 2021 (WHO, 2021a) and provide the recommendations on beneficial physical activity for health.

In addition, the 2030 Agenda for Sustainable Development and the United Nations Sustainable Development Goals (SDGs) (Moran, 2020) make it clear that a profound change must be made in the way food is produced and consumed to increase productivity and sustainability while improving human health. Indeed, achieving a sustainable food system can lead to the achievement of all the SDGs, not only those related to food and social development, but also the environment. The Food system is one of the most resource-intensive and environmentally polluting sectors: it emits a third of greenhouse gases (responsible for climate change), is the most water-consuming and polluting sector, and is the main cause of deforestation and biodiversity loss. According to a recent report by the Ministry of Consumer Affairs (JRC, 2022), food consumption is responsible for more than half of the environmental impact caused by one person, which highlights the need to follow diets with lower environmental impact. Dietary recommendations should therefore consider both human health and the environment.

In this direction, the EAT-Lancet Commission (Willett et al., 2019) proposed the so-called "planetary health diet", in which the dietary recommendations in favour of human health are aligned with the ability of the biosphere to support the main biophysical processes that support life on Earth. It is estimated that such a diet could prevent 11 million deaths globally each year, reduce greenhouse gas emissions and preserve natural resources and biodiversity. As a result, more and more countries are incorporating environmental sustainability criteria in their dietary recommendations. In Spain, in particular, it has been estimated that widespread adherence to a healthy diet that includes environmental impact criteria, would avoid more than 80 000 deaths per year and would reduce the

emission of greenhouse gases by at least 70 %. In addition, the use of various natural resources, such as water, soil, nitrates and phosphates, would be reduced by between 25 and 55 % compared to the current average diet of the Spanish population (Springmann et al., 2020). Therefore, work must be done to achieve healthy and environmentally sustainable diets in our country.

Physical activity recommendations also need to be aligned with sustainability and the environment. In fact, the importance of physical activity in achieving the SDGs is already recognised and, specifically, WHO affirms that measures and investments in policies that promote physical activity and reduce sedentary habits can help achieve the 2030 SDGs (Moran, 2020), in particular the following: good health and well-being (SDG3); quality education (SDG4), sustainable cities and communities (SDG11) and climate action (SDG13), among others.

In summary, the dietary and physical activity guidelines have the following objectives:

- Promote healthy and sustainable eating patterns and physical activity.
- Prevent non-communicable diseases related to an unhealthy dietary pattern and an inactive and sedentary life.
- Helping people maintain and/or improve health.
- Take into account the sum of nutrients, caloric density and the importance of variety, as a key element from the sustainability point of view.
- Establish the recommended amounts of physical activity for each age group throughout life.
- Reduce the consumption of nutrients that are detrimental to health.
- Help people adopt healthier lifestyles.
- Establish healthy global dietary patterns, emphasising the importance of the whole.
- Provide a tool that contributes to the dissemination of clear and simple messages to the population, as part of a complex and multifactorial solution to promote health and reduce risks derived from inadequate nutrition, lack of physical activity and sedentary lifestyle.

In this regard, the Scientific Committee of the Spanish Agency for Food Safety and Nutrition (AESAN) prepared in 2020 a review and update of the Dietary Recommendations for the Spanish population (AESAN, 2020a) in which, once the food guidelines based on internationally available foods were reviewed and discussed, recommendations for food consumption were established for the Spanish population.

This time the aim is to ensure that dietary recommendations are not only healthy, but also sustainable. That is, they must also consider social, economic and environmental aspects.

In recent years, this last dimension, the environmental impact of food, rather than others, has received great attention from the scientific community, as reflected, for example, in other dietary guidelines (SENC-Aranceta-Bartrina et al., 2019) (Willett et al., 2019) (Serra-Majem et al., 2020), with a vast amount of scientific publications on healthy and environmentally sustainable food. In addition, physical activity is a very relevant practice to maintain or achieve a healthy state and reduce the incidence of overweight and obesity of the population. Thus, it has been considered appropriate to include in this report the update of the physical activity recommendations published by AESAN in 2015 (AECOSAN, 2015).

To establish and provide, both to the general population and to food operators, with the most complete and up-to-date information available on healthy and sustainable dietary patterns, in the form of food guidelines, a catalogue of healthy recommendations and graphic representations, the Scientific Committee has been asked for a new report that updates the previous recommendations, reviews the environmental impact of food and also updates the recommendations relating to physical activity.

2. Update of dietary recommendations

A diet is a set of interrelated exposures, including the intake of macronutrients, essential nutrients, and also additives, microbial toxins, inorganic contaminants, and chemical compounds formed during cooking or added in food processing (Willett, 2013). The association between diet and health can be examined at different levels. Traditionally, the impact of dietary components on health has been studied, as malnutrition and nutritional deficiencies represented the main burden of disease in populations. However, this paradigm has changed in most countries, and what is currently observed is that chronic non-communicable diseases are responsible for the majority of mortality and morbidity in these countries (GBD, 2018), a fact that is also confirmed in Spain (Soriano et al., 2018). Specifically, in our country, in 2020, 24.3 % of deaths were caused by circulatory system diseases and 22 % by tumours (INE, 2021). Neurodegenerative diseases are an increasingly important cause of mortality (GBD, 2018) (Soriano et al., 2018) and obesity increases the risk of these diseases and mortality. The dietary determinants of these diseases are, mostly, excessive consumption over the years of certain foods and nutrients, which have a cumulative effect in the body, altering multiple biological mechanisms to produce different chronic pathologies.

The following principles must be considered when preparing food guidelines: a) people choose foods and not nutrients when eating, so recommendations should be based primarily on advising or discouraging specific foods; b) interactions can occur between nutrients that favour or hinder their absorption, so it is interesting to review the scientific evidence of complete foods and not only focus on the effect of nutrients (Astrup et al., 2020); and c) Synergies occur in the different food combinations within a dietary pattern. Therefore, it is considered a priority to identify the healthy dietary patterns existing in a population, in order to put into context, the food guidelines and to favour that people can adhere to them, as part of their idiosyncrasy (Tapsell et al., 2016).

Sustainable diets are those with low environmental impact, which contribute to food and nutrition security and to healthy life for present and future generations. They are also protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources (FAO, 2010). These dietary patterns are characterised by being nutritionally balanced, with a high intake of vegetables, fruits, whole grains, legumes and nuts, a reduced consumption (if any) of foods of animal origin and products with high sugar or salt content, prioritising the consumption of unsaturated vegetable oils over other dietary fats, with minimal food waste (FAO, 2019) (Willett et al., 2019). That is, they are dietary patterns based, fundamentally, on foods of low-processed plant origin, whose composition varies according to the traditions and culture of each region. In addition, the ingredients they contain

must be produced using environmentally friendly techniques and from sources that are fair to all members of the food chain.

In Spain, there are cultural eating patterns that have demonstrated their beneficial effects on health, which can also be considered sustainable. The Mediterranean diet is the best known and studied pattern. It emphasises the consumption of plant-based foods and fish, along with moderate intakes of meat and dairy products, and the use of olive oil as the main fat to elaborate culinary preparations. It has been associated with lower risk of developing cardiovascular disease and cardiometabolic risk factors, cancer, diabetes, neurodegenerative diseases and premature mortality (Dinu et al., 2018). The Mediterranean diet has been associated with healthy aging (Ortolá et al., 2019). Two rigorous clinical trials have also demonstrated the efficacy of this diet in the primary and secondary prevention of cardiovascular disease (Estruch et al., 2018) (Delgado-Lista et al., 2022). On the other hand, several studies point out that adherence to the Mediterranean diet in our environment could decrease the environmental impact of food, reducing greenhouse gas emissions, as well as the use of natural resources (Sáez-Almendros et al., 2013) (Fresán et al., 2018). The Atlantic diet pattern is less known. It is a traditional pattern typical of north-western Spain and northern Portugal, characterised by high consumption of fish, dairy, vegetables, potatoes, wholegrain bread, moderate intake of beef and pork products, and consumption of vegetable fats, with preference for olive oil (Lorenzo et al., 2022). This pattern has been associated with lower risk of all-cause mortality (Carballo-Casla et al., 2021), although evidence on its beneficial health effects is still being studied. Its environmental impact appears to be slightly higher than that of the Mediterranean diet (González-García et al., 2020). Since the Mediterranean diet pattern is predominant in the Spanish population and there is solid scientific evidence supporting its beneficial effect on health, the Spanish dietary recommendations contained in these dietary guidelines are circumscribed in the context of this cultural dietary pattern, although the traditional recipes of the Atlantic dietary pattern are also considered.

For the preparation of these food guidelines, the suggestions proposed by the European Food Safety Authority (EFSA, 2010) have been followed. Thus, recommendations are provided for the different food groups within the framework of a Mediterranean diet pattern. These recommendations are based on the review of the most recent scientific evidence, mostly from 2019, since the publication of the Dietary Guidelines for Americans (DGA, 2020), presented a comprehensive review of scientific knowledge up to the time of its publication, in 2020. In addition, it indicates the recommendations proposed by the 2020-2025 DGA for each food group, together with the recommendations of the EAT-Lancet Commission, for a healthy diet within planetary limits (Willett et al., 2019), among others. It also includes a section of general considerations, which provides additional advice for following a healthy and environmentally sustainable diet.

These food guidelines are aimed at the general population, although the specific needs of the elderly have been taken into account (Fried and Rowe, 2020), an age segment that represents approximately 20 % of the total Spanish population (INE, 2020), and that is expected to continue increasing in the coming years (Kontis et al., 2017). It has also been considered that more than half of the Spanish population has overweight (AESAN, 2019a), so indications are included for situations in which caloric intake needs to be reduced, in line with the proposals of the WHO (2022).

The food groups considered in this guide are the following:

- Vegetables and fruits.
- Potatoes and other tubers.
- Cereals.
- Sources of vegetable and animal proteins.
- Olive oil as the fat of choice for the culinary preparation of food.
- Water as a drink of choice.

2.1 Vegetables and fruits

Vegetables and fruits are foods rich in fibre, essential vitamins and minerals, as well as carbohydrates of low glycaemic index. Vegetables provide 80 % water, a high content of carbohydrates, fibre, sugars or starches, small amounts of protein and even lower content of fats and are the source of a large number of minerals and C and A vitamins. Fruits are rich in vitamins C, A, B2, thiamine, niacin, sugars, iron, calcium, and provide low amounts of protein and calories (Colditz, 2022).

Summarised below is the review of the most recent scientific evidence. It indicates that increased intake of fresh vegetables and fruits is associated with a lower risk of cardiovascular disease, type 2 diabetes, some types of cancer such as breast cancer, and also with a lower risk of premature mortality.

In the case of cardiovascular diseases, there is much evidence on the protection against these diseases entailed by the consumption of fresh fruits and vegetables. Aune et al. (2017) in a meta-analysis of 95 studies observed reductions in the risk of cardiovascular disease and of mortality from all causes, up to an intake of 800 g/day of vegetables and/or fruits. Specifically, inverse associations were observed between the intake of apples/ pears, citrus, green leafy vegetables/cruciferous salads and vegetables (cauliflower, broccoli, cabbage) and cardiovascular diseases, and between green leafy vegetables and cruciferous vegetables and risk of cancer. In another systematic review and meta-analysis of 81 cohorts, Zurbau et al. (2020) also concluded that vegetables and fruits were associated with a beneficial effect on health, preventing the development of cardiovascular diseases. Wallace et al. (2020) conducted a review of clinical trials and observational studies, and concluded that the scientific evidence recommending increasing the consumption of vegetables and fruits for the prevention of cardiovascular disease is strong. The highest results in cardiovascular health were obtained with a non-linear threshold effect with consumption of 800 g/day, that is, about 5 servings/day. The greatest associations with cardiovascular benefit were observed with the consumption of citrus fruits, garlic, carrots, cruciferous vegetables, dark green leafy vegetables and dark-coloured berries.

In the case of cancer prevention, the review of Buja et al. (2020) concluded that vegetables were associated with lower risk of breast cancer. Some nutrients, such as folates, lignans and carotenoids present in plant foods were identified as responsible for the observed association. In addition, Farvid et al. (2021) suggested that a high intake of vegetables and fruits was associated with a reduced risk of post-menopausal breast cancer.

In the systematic review and meta-analysis of prospective studies by Schwingshackl et al. (2017a) a non-linear dose-response association was observed between the consumption of vegetables and

fruits, and the risk of type 2 diabetes. It was observed that there was a 9 % decrease in risk with a consumption of 300 g/day of green leafy vegetables (no benefit was seen above this). Likewise, the risk of this pathology decreased by 10 % with the increase in fruit intake up to 200-300 g/day. These results are supplemented by the publication of Zheng et al. (2020), where an inverse association was observed between plasma biomarkers of vegetable and fruit intake, and the incidence of type 2 diabetes in different European countries.

The review by Wang et al. (2021a) also concluded that there were inverse non-linear associations of vegetable and fruit intake with total mortality and cause-specific mortality attributable to cancer, cardiovascular disease, and respiratory disease. The intake of 5 servings a day of vegetables and fruits, or 2 servings of fruit and 3 of vegetables, was associated with lower mortality, and above that level, higher intake was not associated with further risk reduction. Compared to baseline (2 servings/day), daily intake of 5 servings of vegetables and fruits was associated with risk estimators (95 % CI) of 0.87 (0.85-0.90) for total mortality; 0.88 (0.83-0.94) for cardiovascular disease mortality; 0.90 (0.86-0.95) for cancer mortality; and 0.65 (0.59-0.72) for respiratory disease mortality. A higher intake of most subgroups of vegetables and fruits was associated with lower mortality, with the exception of starchy vegetables, such as maize.

In a systematic review, Głąbska et al. (2020) concluded that vegetables and fruits, and in particular some specific subgroups such as berries, citrus and leafy vegetables, had a positive influence on mental health, reaffirming the recommendation of consumption of at least 5 servings of fruits and vegetables per day.

On the other hand, there is much evidence of the relationship between free/added sugar intake and the risk of metabolic diseases. In its latest report, EFSA (2022) includes that, in fruit and vegetable juices and juice concentrates, "free sugars" are those naturally present. The report concludes that the intake of these sugars should be as low as possible in the context of an adequate diet to decrease the intake of total sugars. Therefore, the consumption of fruit juices should not be a substitute for whole fruits.

Several studies indicate that the environmental impact of vegetables and fruits is low (Poore and Nemecek, 2018) (Clark et al., 2019) (Aguilera et al., 2020). The use of greenhouses for the production of vegetables and fruits increases the emission of greenhouse gases per quantity of product obtained, compared to its production in the open field, especially if the greenhouses require energy to be heated (Clark and Tilman, 2017) (Clune et al., 2017). Other works suggest that the use of soil and water per kg of product could be decreased by the use of greenhouses, as they have greater productivity (Clark and Tilman, 2017) (Springmann, 2019). However, further studies are needed to confirm these differences in environmental indicators other than greenhouse gas emissions.

Despite the great importance of vegetables and fruits in healthy diets with low environmental impact, these foods, together with cereals, generate the most waste in the global food system (FAO, 2013). In this sector, a lot of produce is wasted due to aesthetic defects (size, shape, colour) because it does not meet the quality standards imposed by the market, which means that in some cases they are not harvested, due to their scarce value (FAO, 2011), or that they are discarded once they arrive at the shops. However, products with aesthetic defects are just as healthy as those that are aesthetically perfect.

Among the nutritional recommendations for a healthy diet, none is as firm and accepted as that of promoting a high consumption of vegetables and fruits. WHO recommends as a population target the intake of a minimum of 400 g per day of vegetables and fruits (WHO/FAO, 2003) (FAO, 2020a). However, the consumption of vegetables and fruits by the Spanish population is below these recommendations, as shown in the different nutritional surveys and in the national health surveys (AESAN, 2021a, b).

The DGA 2020-2025 (DGA, 2020) indicates that all types of vegetables and fruits, especially whole, should be consumed. For a diet with a 2000 kcal intake for the general population, it is recommended to consume an amount equivalent to 2.5 servings of vegetables per day in general, and the equivalent of 2 servings of fruit per day. In the infographic they have developed to convey these recommendations to the general population, it is indicated that on each intake ("food plate"), vegetables and fruits must occupy half the amount of food ingested, with a larger proportion of vegetables than fruits. Similarly, the EAT-Lancet Commission suggests the intake of at least 300 g of vegetables (100 g of dark green vegetables, 100 g of red and orange vegetables and 100 g of other vegetables) and 200 g of fruits (Willett et al., 2019). The pyramid of sustainable Mediterranean diet (Serra-Majem et al., 2020) recommends, for the main meals of the day, a daily consumption of 1-2 servings of fruits per meal and, a minimum of 2 servings of vegetables, at least, in one of the main meals of the day; to consume a variety of colours and textures of these products, both raw and cooked, and it is also indicated that preference should be given to fresh, seasonal and minimally processed fruits and vegetables. Previous AESAN food guidelines (2020a) suggested a consumption of 2 to 4 servings a day of vegetables and 3 to 5 servings a day of fruits.

According to the review, it seems advisable to maintain the recommendation of consumption of vegetables and fruits of at least 5 servings per day, and specifically, at least 3 servings of vegetables per day, and 2-3 servings of fruits per day, considering that the consumption of fruit juices is not a substitute for whole fruit.

2.2 Potatoes and other tubers

Starchy roots and tubers such as potatoes and their derivatives contain mainly complex carbohydrates, with 3 or more sugars attached, known as oligosaccharides and polysaccharides, such as starch. In addition, potatoes contain 2 % protein of reasonably good quality; they also contain approximately 15 mg of vitamin C per 100 g, although this amount is reduced during storage and during culinary processes, as well as small amounts of B vitamins and minerals. However, the fibre content of this food is low (FAO, 2002).

It is important to separate potatoes and other starchy tubers from the group of vegetables and fruits due to their different nutritional properties. This type of food has a high glycaemic index, that is, they are rapidly digested and cause significant fluctuations in blood sugar. Consumption of many high glycaemic index foods may increase the risk of type 2 diabetes, obesity and cardiovascular disease (Beulens et al., 2007).

From the point of view of environmental impact, potatoes are one of the foods with the lowest impact (Poore and Nemecek, 2018) (Clark et al., 2019) (Aguilera et al., 2020).

The DGA 2020-2025 (DGA, 2020) includes potatoes within the group of starchy vegetables together with cassava, corn, beans, immature or raw (not dry) peas and plantain. The weekly recommendations are 4 to 8 servings, based on the calories of the diet (5 servings per week for a 2000 kcal diet). The EAT-Lancet Commission (Willett et al., 2019) contemplates tubers within the carbohydrate source group, along with cereals, indicating that the latter are preferable. It is recommended that the consumption of potatoes does not exceed 100 g per day.

Although the consumption of potatoes and tubers is not included in the definitions of the Mediterranean diet commonly used in population studies and in clinical practice (Schröder et al., 2011), potatoes are one of the typical foods of the Atlantic diet and are part of many traditional dishes in culinary preparations in the north-west of our country. However, since other food groups are able to provide carbohydrates with lower glycaemic index and slower digestion, such as whole grains and legumes, it seems advisable to alternate the consumption of potatoes and tubers with the consumption of wholegrain and legumes, as main sources of carbohydrates in the diet. Moderate consumption of potatoes and tubers is recommended, as they are part of traditional recipes of our country.

2.3 Cereals

Wholegrain cereals and by-products, in combination with other foods rich in complex carbohydrates such as legumes, and together with vegetables and fruits, are the basis of an adequate diet and constitute an important source of energy. The most important cereals in our diet are wheat, corn, rice, oats and rye. They can be used to make foods such as bread or pasta, which, when made from wholegrain, are called wholegrain products. Wholegrain cereals, with bran, germ and endosperm, are rich in B vitamins, vitamin E, minerals (iron, zinc, magnesium), proteins, unsaturated fats and phytochemicals (polyphenols and alkaloids). In addition, the intake of wholegrain cereals provides higher fibre content, preventing the rapid absorption of carbohydrates, which classifies these foods as of low glycaemic index. On the contrary, refined cereals are formed only from the endosperm of the grain and have a majority nutritional composition of fast-digestion carbohydrates.

In general, wholegrain exert positive effects through several mechanisms of action: 1) regulating glucose metabolism and lipid metabolism; 2) decreasing inflammatory and endothelial dysfunction processes; 3) restoring the diversity of the intestinal microbiota and increasing intestinal short-chain fatty acids; and 4) acting on regulatory pathways associated with cancerous processes (HSPH, 2022a).

The most recent scientific evidence supports the beneficial effect of wholegrain cereal consumption, as it decreases the risk of developing cardiovascular disease, type 2 diabetes, cancer, and premature mortality. The results of a recent population-based study show that, after 18 years of follow-up, the substitution of refined cereals for whole grains in the usual diet was associated with attenuation of abdominal adiposity, dyslipidaemia and hyperglycemia, thus reducing the risk of cardiometabolic diseases (Sawicki et al., 2021). These results are consistent with a clinical trial conducted in a group of people at risk of developing metabolic syndrome. A dietary intervention with a consumption of whole grains did not alter insulin sensitivity or the gut microbiome, but reduced body weight and low-grade systemic inflammation (Roager et al., 2019).

Higher consumption of whole grains has been associated with lower risk of cardiovascular disease in recent population studies (Capurso, 2021) (Hu et al., 2022). The prospective cohort study PURE, conducted in 21 countries and including more than 130 000 participants with a median follow-up of 9.5 years, examined the association of refined cereal, wholegrain cereal, and white rice consumption with cardiovascular disease, total mortality, blood lipids, and blood pressure. The higher category of refined cereal intake (≥350 g/day or about 7 servings/day) was associated with an increased risk of total mortality and of developing events of severe cardiovascular disease, compared to the lower category of intake (<50 g/day). Higher intake of refined cereals was also associated with higher systolic blood pressure. No significant associations were found between the consumption of wholegrain or white rice and the studied diseases (Swaminathan et al., 2021).

In the evaluation of several prospective studies of large cohorts, with the aim of examining the associations between the intake of foods made with whole grains and the risk of type 2 diabetes, it was found that a larger consumption of whole grains and whole foods, including breakfast cereals, oats, black bread, rice, bran and wheat germ, was significantly associated with a lower risk of type 2 diabetes, compared to the lower consumption, recommending, therefore, the consumption of whole grains to prevent this pathology (Hu et al., 2020). However, a recent review (Gaesser, 2022), which examines the scientific literature regarding the intake of refined cereals, questions these results, suggesting that these conclusions may be due to the fact that some types of refined cereals are used to make foods high in sugars and fats (cakes, biscuits), and that they are also consumed in dietary patterns along with unhealthy foods such as processed meat or sugary drinks. They indicate mother products made from refined cereals, such as bread, breakfast cereals, pasta and rice, have not been associated with an increased risk of diabetes, except for rice consumed in very high quantities, in populations in Asia.

A systematic review, including prospective studies and clinical trials, has also recently been published to examine the effects of fibre intake on glycaemic control and disease progression in diabetic patients. The results indicated that, in population studies, a higher fibre intake was associated with lower mortality by all causes and by cardiovascular disease, with a dose-response relationship. In clinical trials, fibre intake was shown to improve glycaemic control, lipid profile, and other cardiometabolic risk parameters when compared to low-fibre diets in adults with prediabetes, type 1 diabetes, or type 2 diabetes. These benefits were not limited to any type of fibre and were evident at all intake levels, although greater improvements in glycaemic control were observed for those participants who went from low to moderate or high intakes (Reynolds et al., 2020).

Regarding the relationship between cereal consumption and cancer risk, some evidence suggests that the intake of high-fibre cereals is associated with a lower risk of total and gastric cancer. In contrast, the relationship between refined grain consumption and cancer risk is inconclusive (Gaesser, 2020) (Wang et al., 2020).

In general terms, the environmental impact of cereals is low. Among them, rice has the greatest impact, due to its high greenhouse gas emissions (Poore and Nemecek, 2018) (Aguilera et al., 2020). What differentiates rice from other cereals is its special form of cultivation, which requires flooded fields, where the decomposition of organic matter occurs in a situation of hypoxia, emitting methane, a gas

with a global warming potential much higher than that of CO_2. A national study points out that greenhouse gas emissions derived from the production of 1 kg of rice would be 4 times higher than those derived from the production of the same amount of wheat, and even 12 times higher when compared with potatoes (Aguilera et al., 2020). However, carbon footprint of rice, despite being higher than that of other cereals, can be considered moderate, being similar or lower than that of foods such as eggs, and significantly lower than that of different types of meat (Poore and Nemecek, 2018).

At present, the world population feeds primarily on three types of cereals: wheat, rice and corn. The production of these three crops is highly vulnerable in the context of climate change and their nutritional quality is reduced by high concentrations of atmospheric CO_2, decreasing their protein and mineral content (Ben Mariem et al., 2021). It has been noted that restoring the production of ancestral cereals and pseudocereals, such as sorghum, millet, spelt wheat or buckwheat, as well as new, more resistant varieties, could be a good measure of adaptation to climate change, since these crops have demonstrated tolerance to various stress factors such as drought and heat, while increasing biodiversity (Cheng, 2018) (Ben Mariem et al., 2021).

Cereal consumption is recommended in most international food guidelines as one of the food groups that should be eaten in larger quantities and preferably as whole grain cereals. The DGA 2020-2025 (DGA, 2020), for a diet around 2000 kcal, suggests a consumption of 6 daily servings of cereals, of which at least 3 would be whole grain. The EAT-Lancet Commission (Willett et al., 2019) indicates that the amount of carbohydrates to be consumed depends on the individual needs of each person, not exceeding more than 60 % of the calories ingested. In the Spanish food guidelines published by AESAN in 2020 (AESAN, 2020a), a consumption of 4 to 6 servings per day is recommended, preferring whole grains. The sustainable Mediterranean diet pyramid (Serra-Majem et al., 2020) proposes a consumption of 3 to 6 daily servings, recommending the consumption of bread, pasta, rice, couscous or bulgur, preferably wholemeal; foods such as pastries are relegated to sporadic consumption. In addition, in the traditional Mediterranean diet, the consumption of rice is part of the preparation of culinary recipes widely consumed by the population. Eating bread to accompany main meals is a deeply rooted custom in our country.

Since current scientific evidence shows mostly a beneficial effect on health by replacing refined cereals with whole grain cereals and whole products, in these food guidelines it is advised to prioritise whole grains and whole products, minimising the consumption of foods made with refined flours. Consumption of 3-6 servings per day is suggested, depending on energy needs, and no more than 4 daily servings if caloric intake needs to be restricted. Some of these servings can be replaced by legumes, to complete the intake of carbohydrates.

2.4 Protein sources

Daily consumption of protein-rich foods is essential for maintaining muscle mass, strength and physical function (Mangano et al., 2017). Nutritional requirements for protein intake vary depending on age, sex, level of physical activity and demanding physiological situations, such as pregnancy. The average protein intake requirements (recommended dietary allowance) are 0.83 g/kg body weight/day for the adult population, this amount is increased for children under 18 years of age and

pregnant women (EFSA, 2017). In older people, scientific evidence suggests that a higher intake is needed to prevent malnutrition and the development of sarcopenia (Baueret al., 2013) (Cruz-Jentoff et al., 2020). Plant-based sources of protein in the diet are legumes, nuts, whole grains and foods made from soybeans. Sources of animal protein include fish, eggs, milk and dairy products, and meat. Proteins of different food groups vary in their amino acid profile and digestibility. Thus, proteins from animal sources are considered to be of high-quality, due to their high content of essential amino acids and their rapid digestion and absorption. Plant-based proteins can also be of high-quality, as in some legumes like chickpeas, some white beans and soybeans, although this does not apply to most legumes and other plant-based protein sources. This limitation can be solved with combinations of different plant protein sources that are complementary in amino acids. On the other hand, the consumption of protein foods entails the intake of other nutrients, which can determine their overall effects on health. It has been noted that the consumption of plant-based protein foods instead of protein foods of animal origin is associated with a lower risk of developing cardiovascular diseases (Bernstein et al., 2010, 2012) and with a lower risk of developing fragility, cognitive impairment or premature mortality (Huang et al., 2020) (Struijk et al., 2022a, b) (Yeh et al., 2022). Likewise, the different sources of animal proteins have shown differences in terms of their effect on health, regardless of the amount consumed. Later, in each section, the specific scientific evidence of the different foods is reviewed.

There is scientific consensus that the impact on the environment of protein foods of animal origin is greater than that of plant-based foods. This evidence has been seen not only when comparing by product quantity, but also when evaluating by rations, energy and even amount of protein obtained (Poore and Nemecek, 2018) (Clark et al., 2020). It has been observed that the lower the consumption of food of animal origin in the diet, the lower its impact on the environment (Aleksandrowicz et al., 2019). In fact, the United Nations Panel of Experts on Climate Change (IPCC) points out that population adherence to diets high in plant-based proteins and low in meat and dairy is one of the measures to mitigate climate change (IPCC, 2022). In addition, the adoption of plant-based diets would also reduce the use and contamination of natural resources such as water and soil (Springmann et al., 2018). While it is true that vegetarian diets have been shown to have the least impact on the environment, moderate consumption of animal protein is compatible with a diet within planetary limits. The Mediterranean diet can be considered a dietary pattern based on the main consumption of plant-based proteins (legumes and nuts), which also includes a moderate consumption of animal-based protein sources such as fish, eggs, dairy and meat, mostly poultry and rabbit.

2.4.1 Sources of vegetable proteins

2.4.1.1 Legumes

Legumes are the main source of plant-based proteins in the diet. In addition, they provide slow digestion carbohydrates, vitamins (vitamin K and B vitamins), minerals (calcium, magnesium, zinc, iron, potassium), phytochemicals, a high fibre content and non-digestible carbohydrates and resistant starch. This group includes lentils, chickpeas, peas and beans. The consumption of legumes is part of the eating habits of Spain, and they are included in many traditional recipes

of our cuisine.

Regular consumption of legumes has been associated with a lower risk of developing chronic diseases, in particular, cardiovascular disease (Bazzano et al., 2001) (Afshin et al., 2014); with less solid evidence for colorectal cancer (Canani et al., 2011); type 2 diabetes (Villegas et al., 2008) and obesity (Papanikolaou and Fulgoni, 2008). Recent evidence confirms these results.

When the effects of legumes on cardiometabolic risk factors have been examined, a beneficial effect has been found, which corroborates the association found for cardiovascular diseases. Thus, a review of the literature has shown that the daily consumption of 150 g of legumes (as an average of the 20 clinical trials reviewed) was associated with an improvement in lipid profile, blood pressure and body composition, and with a decrease in the concentrations of inflammatory markers in the blood (Ferreira et al., 2021). Another review that included clinical trials and observational studies also concluded that legumes improved lipid profile, glycaemic control, and blood pressure (Lukus et al., 2020). In addition, a review that only focused on the effect of legumes on glycaemic control quantified that, a consumption of 110 g of legumes per day was associated with a 20 % reduction in postprandial plasma glucose levels (Clarke et al., 2022). In a systematic review of 18 clinical trials conducted in participants that were healthy or had diabetes, legume consumption improved glycaemic response only in studies conducted in diabetic patients (Bielefeld et al., 2020). The authors attributed the lack of association in healthy individuals to the existence of confounding factors, such as the use of drugs, differences in the groups of participants between the studies, and variations in the protocols of the comparative trials.

Results of observational studies are less conclusive. A first meta-analysis with 28 cohort studies conducted up to 2019, concluded that the evidence that associated the consumption of legumes with lower cardiovascular risk was of low level of certainty, and that the evidence specifically for coronary heart disease, arterial hypertension and obesity was of very low level (Viguiliouk et al., 2019). In a more recent meta-analysis, which included 4 cross-sectional studies, 2 cohort studies, and 11 case-control studies, the authors concluded that legume consumption was not associated with a lower risk of developing metabolic syndrome. The authors attributed this to several causes: the different way of measuring legume consumption between studies, and the different ways of adjusting for confounding factors (Jiang et al., 2020). In addition, a meta-analysis of 27 population studies in different regions of the world found an association between legume consumption and increased risk of type 2 diabetes: each 20 g/day increase in legume intake was associated with a 2 % increase in risk. However, this association was not homogeneous between the different regions studied; while it was found in Europe (Germany, United Kingdom, and Sweden), this was not the case in the Americas, in the Eastern Mediterranean and in the Western Pacific (Pearce et al., 2021). The authors indicate that a possible explanation for this disparity in results is due to the way legumes are cooked; for example, in European countries, where an increase in risk was observed, legumes are consumed in stews that also include red and/or processed meats. However, this hypothesis has been examined in a study in the Spanish population, where legumes are part of recipes that include different types of meat, and no harmful effect was found in an overall health variable (Caballero et al., 2020). Other possible explanations concerning the context in which legumes are consumed need to be investigated. Finally, in an article reviewing the results of 6 meta-analyses of observational studies, the authors concluded that

there was an association between the consumption of legumes and a decrease in the risk of coronary heart disease and colorectal cancer. However, they indicated that the quality of evidence was limited due to the heterogeneity of the works and the presence of confounding factors in the analyses of the reviewed studies (Martini et al., 2021).

Soy is a legume from South-east Asia, which is increasingly consumed in Spain. Compared to the rest of the legumes, soy provides more iron, magnesium, potassium, as well as folic acid and vitamins such as B1, B2, B3 and B6. In addition, it is one of the vegetable sources of high-quality protein, as it contains the 9 essential amino acids. Foods made from soy can also be fermented, which improves digestibility and nutrient absorption and is considered a probiotic food. On the other hand, soybean and soybean products contain isoflavones, a type of phytoestrogen that is able to bind to human estrogen receptors, causing a mild estrogenic effect or an antiestrogenic activity, depending on the hormonal situation of the consumer of this food; the effect of these isoflavones is controversial (Allred et al., 2001) (HSPH, 2022b).

The effects of soybeans on health have not yet been well characterised, although there is evidence of a beneficial effect, improving the lipid profile. A recent review analysed 46 clinical trials examining the effect of soy products on the lipid profile. The authors observed that these effects were not uniform and depended on the protein and isoflavone content of the soybean product used, as well as the amount ingested and the duration of the intervention (Moradi et al., 2020). In another systematic review of 24 clinical trials, consumption of soy products reduced serum concentrations of inflammatory markers, including C-reactive protein, in post-menopausal women (Bajerska et al., 2022). Observational studies have found that people who consumed tofu on a regular basis had a lower risk of developing coronary disease than non-consumers, with a greater protective effect in pre-menopausal and post-menopausal women without hormonal treatments (Ma et al., 2020). Another recent observational study found that regular soybean consumption of 4 or more servings per week was associated with a 25 % lower risk of cardiovascular mortality than non-consumption (Wang et al., 2021b). The relationship between soy consumption and the risk of developing cancer is inconsistent (Nachvak et al., 2019). Specifically, for breast cancer, the effects of soy are thought to be modulated by menopause status, age of consumption and type of breast cancer (Zhao et al., 2019). Recent observational studies have associated higher soybean intake with 64 % less risk of death from breast cancer in women without disease, and 51 % less risk of death after cancer diagnosis, compared to participants with very low or no soybean consumption (Ho et al., 2021). Clinical trials that have assessed the effect of isoflavone supplementation on breast cancer progression have not been able to demonstrate a beneficial effect (Finkeldey et al., 2021).

The possible beneficial effects of legumes can be explained by the following action mechanisms: 1) slow-digestion carbohydrates improve glycaemic profile; 2) non-digestible components act as probiotics favouring bacterial fermentation processes, whose metabolites are anticancer; 3) minerals and phytochemicals improve immune function and decrease oxidative stress, which could help inhibit tumour growth; and 4) fibre from legumes helps improve lipid profile and increases the feeling of satiety.

In general, protein foods of plant origin have less impact on the environment than those of animal

origin, and, of all of them, legumes are the ones that generate less impact. Thanks to certain bacteria in their roots, with which they coexist in symbiosis, they are able to fix the atmospheric nitrogen, thus reducing the need for fertilisers. It has been quantified that, to obtain the same amount of proteins, legume cultivation emits 50 times less greenhouse gases, compared to beef production; compared to pork, it emits 11 times less; 7 times less in relation to chicken meat and 6 times less in comparison to egg production (Poore and Nemecek, 2018). These benefits have also been noted in relation to other environmental indicators, such as the use of natural resources (soil, water), and acidifying and eutrophying emissions (Poore and Nemecek, 2018).

The DGA 2020-2025 (DGA, 2020) recommends the consumption of this group of foods as a source of healthy proteins, with a recommendation of 1.5 servings per week, for a diet of 2000 kcal. The EAT-Lancet Commission (Willett et al., 2019) recommends consuming at least 1 serving of legumes per day (50 g in dry weight), for all the benefits they bring to health in addition to the additional benefits to replace the consumption of red and processed meat. Soybeans are included in the group of legumes, although a specific recommendation is given for this food, suggesting a consumption equivalent to 25 g of dry soybeans per day, in addition to the amount recommended for the rest of the legumes; it is noted that their consumption is interchangeable with other sources of vegetable protein. The current dietary recommendations in Spain for the consumption of legumes are 2 to 4 servings per week (AESAN, 2020a). The MEDAS (Mediterranean Diet Adherence Screener) index of adherence to the Mediterranean diet pattern suggests a consumption of at least 3 servings per week (Schröder et al., 2011), and the sustainable Mediterranean diet pyramid (Serra-Majem et al., 2020) proposes the daily consumption of legumes as a source of vegetable proteins.

Given the scientific evidence presented in this section on legumes, their high protein and slow-digestion carbohydrate content, and that it is one of the most affordable food groups and with least environmental impact, it is recommended a consumption of at least 4 servings per week until reaching a daily consumption, in order to reduce the consumption proteins of animal origin and of non-whole grains.

2.4.1.2 Nuts

Nuts are foods rich in unsaturated fats (omega-3 fatty acids), proteins, and fibre. They also contain vitamins (folic acid and vitamin E), minerals (selenium and magnesium) and phytochemicals (polyphenols and phytosterols). In Spain, nuts are part of the Mediterranean diet, particularly almonds, hazelnuts and walnuts. Peanuts, although legumes, are usually included in this group.

Their components give them various healthy properties, such as the ability to reduce LDL (Low-Density Lipoprotein) cholesterol levels and to increase HDL (High-Density Lipoprotein) cholesterol levels. In addition, some nuts such as walnuts contain linoleic acid, which is an essential omega-3 fatty acid since it cannot be synthesised in the body. These omega-3 fatty acids are part of the cell membranes and of the metabolic pathways of production of hormones regulating inflammatory processes, coagulation and contraction and relaxation of the arterial walls, so they exert a beneficial function in the cardiovascular system (HSPH, 2022c).

A recent meta-analysis, which included clinical trials conducted in countries of all continents, with healthy participants and also with individuals with cardiometabolic risk factors, found that peanut

consumption was associated with a reduction in plasma triglycerides and LDL/HDL cholesterol ratio (Parilli-Moser et al., 2022). Further, in a narrative review, the authors indicated that nut consumption could have beneficial effects on glycaemic response, lipid profile, oxidative stress, and inflammatory response, although it was unclear what type of nut was most beneficial (Khalili et al., 2022). Two clinical trial meta-analyses found beneficial effects on the lipid profile with pistachio consumption (Hadi et al., 2021) (Gunathilake et al., 2022). Another systematic review with clinical trials in patients with dyslipidaemia concluded that nut consumption improved the lipid profile of these patients (Altamimi et al., 2020). A literature review of observational studies found a beneficial effect of nut consumption on reducing the risk of mortality from cardiovascular disease (Martini et al., 2021). Another review, examining the effect of this food group on the risk of type 2 diabetes, did not find a significant association for nuts as a whole, although an inverse association with peanut butter consumption was observed (Becerra-Tomás et al., 2021). Results of an observational study in a population of diabetic people showed a lower risk of cardiovascular disease in those with higher nut consumption, compared to participants with lower intakes (Liu et al., 2019). Finally, the results of the PURE cohort study, with data from 16 countries worldwide, found that a high consumption of nuts (>120 g/week), compared to a low consumption (<30 g/month), was associated with a 12 % reduction in cardiovascular mortality (de Souza et al., 2020). There is also evidence on the effect of nuts on the risk of developing cancer: 3 recent meta-analyses have identified a dose-response association between increased nut consumption and reduced risk of cancer incidence and mortality from this pathology: an increase of 5 g/day in nut intake was associated with 4 % less mortality (Long et al., 2020) (Zhang et al., 2020) (Naghshi et al., 2021).

The environmental impact of nut production is variable. Cultivation methods that are not environmentally friendly, mainly reported in the cultivation of almonds, can involve a high demand for water, fertilizers and pesticides, generating a great impact on the environment (Poore and Nemecek, 2018). However, tree crops have the capacity to act as carbon sinks and reduce the filtration of phytochemicals, and can contribute to the mitigation of climate change and the reduction of pollution of water bodies, if cultivated using environmentally friendly techniques.

The DGA 2020-2025 (DGA, 2020) recommends the consumption of this group of foods as a source of healthy proteins, with a recommendation of an intake of approximately 140 g/week of nuts, which also includes seeds and soy products. The EAT-Lancet Commission (Willett et al., 2019) suggests an intake of 50 g/day, including peanuts, and makes special mention of their consumption as an alternative to red meat. It points out that it can be exchanged for other vegetable protein sources. The dietary recommendations in Spain for the intake of nuts indicated a consumption of nuts several times a week (AESAN, 2020a). The MEDAS index suggests a consumption of at least 3 servings per week, avoiding the presentations with salt, sugar and fried foods (Schröder et al., 2011). The sustainable Mediterranean diet pyramid (Serra-Majem et al., 2020) recommends a daily consumption of low-salt nuts (1-2 servings) as a healthy snack with high satiating value.

The recommendation of these food guidelines is a consumption of 3 or more servings of nuts per week, up to 1 serving daily, considering that its intake must be balanced with a decrease in the consumption of other foods to maintain a healthy body weight. Nuts should be chosen without added salt, fats or sugars

2.4.2 Sources of animal proteins

2.4.2.1 Fish and seafood

Fish is a food rich in high-quality proteins, vitamin D, iodine and selenium, and low in saturated fats. In addition, oily fish, such as tuna, herring, sardine, anchovy, mackerel, salmon, eel, and bonito, are rich in omega-3 polyunsaturated fatty acids (docosahexaenoic and eicosapentaenoic). Shellfish provide vitamins B1 and B2, and minerals (phosphorus, potassium, iron, iodine, fluoride, and zinc) and are high in protein and low in sodium, saturated fat, and calories.

There is wide evidence of the beneficial effects of fish consumption on health, primarily due to its fatty acid content and lean protein (Jiang et al., 2021). A review of 34 meta-analyses of observational studies has reported that an increase of 100 g/day in fish consumption is associated with an 8 % decrease in the risk of premature mortality, a 25 % lower risk of cardiovascular mortality and a 12 % lower risk of depression (Jayedi and Shab-Bidar, 2020). However, another more recent meta-analysis questions the fact that non-fat fish have cardio-healthy effects, since they only observe a beneficial effect on cardiovascular risk and mortality for fatty fish (it is important to mention that previous meta-analyses did not distinguish between both types of fish) (Giosuè et al., 2022).

A review of metabolic effects associated with fish consumption concluded that this food had a beneficial impact on thyroid function, was associated with maintaining a healthy weight, improved glucose metabolism, decreased blood pressure and helped preserve muscle mass (Mendivil, 2021). However, PURE study, with information from 58 countries, found that the consumption of fish, including oily fish, was associated with a lower risk of cardiovascular disease and mortality in patients with cardiovascular disease, but not in the general population (Mohan et al., 2021). Finally, a beneficial association has also been found between fish consumption and a lower risk of developing colorectal cancer (Caini et al., 2022). This association is also observed with the consumption of canned fish (Franchi et al., 2022).

In 2019, AESAN published a document in which recommended caution in the intake of fish from mercury-accumulating species (swordfish, emperor, bluefin tuna, shark or dogfish and pike) (AESAN, 2019b). This is especially important in vulnerable groups of the population, such as pregnant women or those who are planning a pregnancy, breastfeeding women and infant population from 0 to 10 years old, although there is evidence in Spain that the mercury levels present in fresh and canned fish do not represent a risk to the health of the consuming population (García et al., 2016). Since there are different species of fish that are low in mercury, these vulnerable groups do not need to stop consuming fish, as they would be eliminating from their diet nutrients that are essential for their development (Grandjean et al., 1997) (Hibbeln et al., 2007).

It is understood that a fish comes from a sustainable source when fish are caught as much as needed to meet the demand, but not too much to prevent them from reproducing adequately, renewing themselves continuously, so that future generations can continue to feed from it. Currently, 34 % of fish stocks for human consumption are overexploited and the percentage is much higher in the Mediterranean Sea (FAO, 2020b). In parallel, some fishing techniques involve catching various animals that are not the original target population, including fish species with little or no market value. Therefore, it is advisable to promote the consumption of species that may

not be so common in our environment, to prevent them from being discarded because they have no place in the market.

However, it must be noted that fishing also has an environmental impact through the emission of greenhouse gases and, in the case of fish farms, not only the emission of pollutants (greenhouse gases, nitrogen, phosphorus) but also the use of resources such as water and soil. There is great variability in these environmental indicators between the different types of fish depending on the techniques used and the characteristics of the species considered (Gephart et al., 2021). With regard to wild fishing, some of the most frequently consumed species, like squid, tuna, salmon, cod or hake, have a carbon footprint by edible weight similar to that of chicken, the food with the least environmental impact among the different types of meat. For small pelagic fish that form large banks, such as sardines, herring or mackerel, the carbon footprint is even lower than that of chicken. At the opposite end we find flatfish that do not form banks and that are caught with trawling techniques, such as sole, and crustaceans, like lobster and shrimp, whose carbon footprint is remarkably high. The environmental impact of aquaculture fish is less than other protein sources of animal origin; and in some cases like salmon or trout, or very especially in bivalve molluscs such as mussels, clams, oysters or razor clams, their impact is even less than chicken meat. Aquaculture crustaceans have a very high environmental impact (Gephart et al., 2021).

The DGA 2020-2025 (DGA, 2020) recommends the consumption of fish as a source of quality animal proteins, with a recommendation of 224 g/week (2 servings approximately), for a diet of 2000 kcal. The EAT-Lancet Commission (Willett et al., 2019) suggests consumption of up to 2 servings per week, although it points out that it may be higher if it is in substitution of meat and eggs. Dietary recommendations in Spain for fish indicate a consumption of at least 2 times per week, including oily fish (AESAN, 2020a). The MEDAS index of adherence to the Mediterranean dietary pattern suggests consumption of at least 3 servings per week, without specifying the type of fish (Schröder et al., 2011). The sustainable Mediterranean diet pyramid (Serra-Majem et al., 2020) includes a recommendation of ≥2 servings. Fish consumption also plays an important role in the Spanish Atlantic diet.

Taking into account the scientific evidence presented in this section and the characteristics of traditional Spanish diets, it is recommended to consume at least 3 servings per week of fish, prioritising the consumption of blue fish.

2.4.2.2 Eggs

They are a food of great nutritional interest due to their concentration of proteins of high biological value, vitamins (A, D, B12, B7), minerals (phosphorus, selenium), antioxidants (lutein, zeaxanthin) and moderate fatty acids, mainly mono-unsaturated, poly-unsaturated and cholesterol. Since the cholesterol present in the egg has a modest impact on the blood levels of this lipid in most people, this nutrient is not determinant for the cardiovascular risk of people who consume eggs. However, there are people sensitive to dietary cholesterol intake and their consumption produces a high increase in their blood levels; for them, the consumption of eggs is discouraged (Kratz, 2005).

Observational studies suggest that the consumption of 1 egg per day is not associated with increased cardiovascular risk (Hu et al., 1999), although a higher intake could increase the risk of heart

failure (Djoussé and Gaziano, 2008). The most recent meta-analysis examining egg consumption in relation to cardiovascular disease, with 33 studies included, suggests that moderate consumption (up to 1 egg/day) is not associated with cardiovascular disease, and in Asian cohorts is associated with lower risk (Drouin-Chartier et al., 2020a). However, in another recent meta-analysis, every 1 egg increase in daily consumption was associated with a 14 % increased risk of type 2 diabetes in the American population, but not in the European or Asian population (Drouin-Chartier et al., 2020b). Adjustments by other components of the diet that are consumed simultaneously with the egg may explain these differences, since the consumption of this food in the American population is made as part of an unhealthy "Western" dietary pattern, while the consumption of egg in European and Asian populations is included in elaborate culinary preparations (Dehghan et al., 2020). In Spain, the consumption of eggs is linked to traditional recipes, such as potato omelette or vegetable scramble.

In addition, 2 very recent meta-analyses addressing the association between egg consumption and mortality have been published. The first of these, with 24 observational studies, found that an additional increase of 1 egg/day in habitual consumption was associated with a modest increase (6 %) in the risk of premature mortality, especially in older people, in studies carried out with the United States population (Ma et al., 2022). The second meta-analysis, with 32 observational studies, concluded that egg consumption was not associated with all-cause mortality, cardiovascular or respiratory, but the highest consumption category, compared to the lowest consumption category, was associated with a 20 % higher risk of cancer mortality. The authors suggest low or moderate consumption of this food, up to 1 egg per day (Mousavi et al., 2022).

The environmental impact of eggs, although greater than vegetable protein sources, is among the lowest among foods of animal origin (Poore and Nemecek, 2018).

The DGA 2020-2025 (DGA, 2020) recommends the consumption of eggs as a source of quality animal proteins, with a joint recommendation of consumption of lean meat and eggs of 740 g/week (approximately 7 servings), for a diet of 2000 kcal. The EAT-Lancet Commission (Willett et al., 2019) suggests consumption of up to 91 g per week, which would be equivalent to 1.5 medium eggs. In subsequent documents, to facilitate the transmission of the message, up to 2 servings per week are discussed (Devries and Willett, 2021). Dietary recommendations in Spain for egg suggested consumption of 2 to 4 times per week (AESAN, 2020a).

Since egg is a better option than meat as a source of protein in the diet, being an affordable food and with a relatively low environmental impact, it is suggested to modify the previous recommendation and propose a consumption of up to 4 eggs per week.

2.4.2.3 Milk and dairy products

Dairy products are a variety of foods with different properties, and include milk, ice cream, cream, and fermented products (yoghurt and cheese). They are an important source of proteins of high biological value, calcium and other minerals (phosphorus, potassium, iodine), vitamins A, D, B6 and B12, and saturated fats. Dairy products contain lactose (the fermented ones, in smaller amounts), a sugar that causes digestive problems to people with intolerance to this nutrient (Willett and Ludwig, 2020).

Due to its nutritional composition, dairy consumption provides beneficial health effects. Thus, calcium, vitamin D, and phosphorus are important for bone remodelling and potassium helps lower blood pressure (HSPH, 2022d). There is solid evidence in the literature that supports a beneficial effect of regular milk and yoghurt consumption on decreasing the risk of developing cardiovascular disease. In a recent meta-analysis of 55 observational studies, high dairy consumption, compared to low consumption, was associated with lower risk of hypertension, coronary heart disease and stroke (Chen et al., 2021). In a meta-analysis review of observational studies and clinical trials, the authors concluded that neither whole nor skimmed milk had an adverse effect on cardiovascular risk. On the contrary, estimators were found that suggested a protective effect (Fontecha et al., 2019).

A recent review of meta-analysis on dairy and risk of type 2 diabetes has also been published. The results showed a dose-response association, in which an increase of 1 serving in the consumption of dairy products was associated with a decrease between 3 and 7 % in the risk of developing this pathology. Among the dairy products examined, yoghurt and the group of low-fat dairy products were the foods that were associated with the greatest reduction in risk (Alvarez-Bueno et al., 2019).

Numerous studies have examined the association between dairy consumption and cancer risk, reporting that its consumption is associated with a decreased risk of colorectal cancer, but also with an increased risk of prostate, liver, and breast cancer. A beneficial effect of fermented dairy products has also been observed reducing the risk of total cancer in women (Jin et al., 2020) (Jin and Je, 2021). In addition, the association between dairy and premature mortality was null in the last review of 8 published meta-analyses (Cavero-Redondo et al., 2019). In a recent study that examined dairy consumption in 3 large cohorts, it was observed that the risk of premature mortality associated with dairy consumption depended on the food group with which it was compared; for example, replacing dairy consumption with the consumption of red and processed meat was associated with higher mortality, while replacing dairy consumption with legumes or nuts was associated with lower mortality (Ding et al., 2019).

Evidence of the deleterious effect of saturated fats from dairy is inconclusive (Astrup et al., 2019, 2020). It was observed that a 1 % increase in saturated fat intake from yoghurt or cheese was associated with a lower risk of coronary heart disease, but a similar increase in saturated fat intake from red meat or butter was associated with a higher risk (Steur et al., 2021). However, while this evidence questions the recommendation to consume low-fat or skimmed dairy products, consumption of 3 or more full-fat dairy products would add an amount of saturated fat to the diet that could have adverse health effects (Kris-Etherton and Krauss, 2020).

Dairy products are one of the food groups that generate the greatest environmental impact on the diet. In Spain, its impact is second only to meat (Ministry of Consumers Affairs/JRC, 2022). The environmental impact of the different dairy products varies from one to another. Thus, the more concentrated the food, the greater its environmental impact will be, with cured cheese being one of the foods with the greatest impact (Poore and Nemecek, 2018). It has been quantified that the consumption of cheese is responsible for 7 % of the environmental impact of the diet of Spaniards. In environmental terms, the consumption of whole dairy products is preferable, thus avoiding discarding the extracted fat, or its reintegration into the food system in the form of butter, cream or saturated fat in various products (Willett et al., 2021).

The DGA 2020-2025 (DGA, 2020) recommends the consumption of low-fat dairy products as a source of quality animal proteins and calcium, with a recommendation of 3 servings per day, for a diet of 2000 kcal. The EAT-Lancet Commission (Willett et al., 2019) suggests consumption of up to 1 serving per day. In addition, the preference is indicated for the consumption of whole dairy products and not consuming added fats of dairy origin. The previous dietary recommendations in Spain for dairy products propose a consumption of 2 to 4 servings per day (AESAN, 2020a). The pyramid of the sustainable Mediterranean diet suggests a moderate consumption of dairy products of up to 2 servings per day as part of the traditional Spanish diet, mainly consumed in the form of yoghurt and cheese (Serra-Majem et al., 2020).

Based on the evidence cited, it is recommended to consume a maximum of 3 servings of dairy products per day, as a source of protein and calcium, avoiding dairy products with added sugars and high salt content. However, due to the high environmental impact of these foods, it is suggested to reduce the number of daily dairy servings if other foods of animal origin are consumed.

2.4.2.4 Meat and meat products

Meat and meat products are a group of foods that provide high-quality proteins, vitamins, especially B vitamins, and minerals (haem iron, zinc, potassium, and selenium). Unprocessed meat from the muscles of animals such as beef, veal, pork, lamb, horse and goat is considered red meat. White meat is the meat of poultry and rabbit. Processed meat is meat processed by salting, curing, fermentation, smoking or other processes to improve its flavour or preservation. Most processed meats are pork or beef, but may also include other red meats, poultry, offal or meat by-products (Bouvard et al., 2015).

The consumption of processed meat has been classified as carcinogenic after the evaluation of 800 studies, in which most of the evidence came from its effect on colorectal cancer and, to a lesser extent, stomach cancer (IARC, 2018). In the same study, a deleterious association was also found between habitual consumption of red meat and an increased risk of pancreatic and prostate cancer. These associations can be explained because meat processing adds nitrates and carcinogenic compounds. In addition, cooking meat using high temperature techniques (frying, grilling) produces compounds such as polycyclic aromatic hydrocarbons and heterocyclic amines, which are also carcinogenic. Red meat also contains more haem iron than white meat, and this nutrient facilitates the production of carcinogenic nitrogen compounds.

In 2019, a meta-analysis was published that concluded that the magnitude of the association between the consumption of red meat, processed meat and the risk of mortality and development of cardiometabolic risk factors was very small (Zeraatkar et al., 2019). This work has been highly controversial, as its conclusions contradicted most of the food guidelines and recommendations of scientific societies (HSPH, 2022e). Among other criticisms, it was indicated that the methodology used to carry out the assessment of the included works was inappropriate for the studies examined, mostly cohort studies (Qian et al., 2020). However, the evidence on the detrimental effects of the consumption of processed meat and, to a lesser extent, of the consumption of red meat, is overwhelming, and recent evidence continues to suggest a detrimental effect associated with the consumption of these foods. Thus, a recent meta-analysis of clinical trials indicated that, when

comparing the effects of red meat versus a diet with plant-based proteins in terms of the risk of developing cardiometabolic alterations, the diet with red meat significantly increased the risk (Guasch-Ferré et al., 2019). In addition, analyses of change in meat consumption in relation to the risk of premature mortality indicate that an increase in its consumption (especially processed meat) is associated with a higher risk of premature death; on the contrary, a decrease in its consumption is associated with a lower risk (Zheng et al., 2019). 2 subsequent articles, with data from European and American populations, observed that the decrease in the consumption of red and processed meat, in favour of the consumption of other sources of proteins, was associated with a lower risk of developing type 2 diabetes (Ibsen et al., 2020) (Würtz et al., 2021). In addition, 2 recent cohort studies analysed red meat consumption in relation to the development of coronary heart disease and cancer. The results showed that replacing the consumption of processed or unprocessed red meat with vegetable protein foods decreased the risk of coronary heart disease; on the contrary, increasing consumption was strongly associated with increased risk of colon cancer, although not with other types of cancer (Al-Shaar et al., 2020) (Knuppel et al., 2020). Finally, it has also been published that habitual consumption of processed meat is associated with increased risk of dementia and fragility (Zhang et al., 2021) (Struijk et al., 2022b).

Today there is scientific unanimity regarding the great environmental impact of livestock and the need for widespread adoption of diets with low animal protein content (Poore and Nemecek, 2018) (Springmann et al., 2018) (Clark et al., 2020) (IPCC, 2022). While it is true that the improvements implemented by the livestock sector in recent years have decreased the environmental impact derived from animal husbandry, the absolute environmental impact derived from the livestock sector in Spain has been increasing over time, due to the growth of livestock in our country (Aguilera et al., 2020) (Ministry of Consumer Affairs/JRC, 2022). According to the recent report Sustainability of Consumption in Spain (Ministry of Consumption/JRC, 2022), more than 43 % of the environmental impact of our food is due to the consumption of meat, mainly pork, cow and chicken. In fact, despite the need to continue implementing improvements in livestock to reduce its environmental impact and achieve greater integration with the environment, the adoption of a diet with lower meat and dairy consumption is essential to ensure that, not only the food sector, but the total environmental footprint of consumption in Spain, is within the planetary limits (Aguilera et al., 2020) (Ministry of Consumption, 2022). Among all meats, the impact generated by red meat is greater than that of white meat and, among red meat, that of ruminants, mainly cow and lamb, has a significantly greater impact (Poore and Nemecek, 2018) (Aguilera et al., 2020). Regardless of the type of meat, all parts of the animal should be consumed, not only lean cuts, but also fatty cuts and skin, thus avoiding their discarding (Willett et al., 2021).

According to the DGA 2020-2025 DGA (DGA, 2020), a weekly intake of approximately 740 g of lean meat and eggs is recommended. The Spanish guidelines (AESAN, 2020a) proposed an intake of 2 to 4 servings per week, preferably chicken or rabbit. The EAT-Lancet Commission proposes to consume a maximum of 1 serving of red meat and 2 of white meat per week, being able to replace it with fish or eggs, and avoid the consumption of processed meat (Willett et al., 2019). In the Mediterranean diet, the consumption of red meat is limited, with the consumption of poultry and rabbit meat being preferred.

The sustainable Mediterranean diet pyramid (Serra-Majem et al., 2020) quantifies red meat intake at a maximum of 2 servings/week and processed meat intake at a maximum of 1 serving/week.

These guidelines propose limiting meat consumption to a maximum of 3 servings per week, prioritising the consumption of poultry and rabbit meat and minimising the consumption of processed meat.

2.5 Olive oil

Olive oil is a fundamental food in the Mediterranean diet, which provides mono-unsaturated fatty acids, squalene, terpenoids, phenolic compounds and vitamin E, among other compounds with antioxidant action and a favourable effect on the metabolism of lipoproteins, endothelial function, inflammatory mechanisms and systems that regulate the cell cycle and carcinogenesis. In recent years several studies and meta-analyses have been published that support previous results and add new evidence on the beneficial role of olive oil on health. The most relevant are described below.

A large cohort study in the United States, which included 61 000 women from the Nurses' Health Study and 32 000 men from the Health Professionals Follow-up Study, found that, after 24 years of follow-up and after adjusting for dietary and lifestyle factors, people with a higher intake of olive oil (>7 g/day) had a 14 % decrease in the risk of cerebrovascular disease and 18 % of cardiovascular disease. Substitution of 5 g/day of margarine, butter, mayonnaise or milk fat for an equivalent amount of olive oil was associated with a lower risk of cerebrovascular and cardiovascular disease (5-7 % lower) (Guasch-Ferré et al., 2020). A subsequent publication assessed the risk of mortality from different causes in these same cohorts (Guasch-Ferré et al., 2022), after a 28-year follow-up. People who consumed a greater amount of olive oil (>7 g/day) had a significantly lower mortality than those who never consumed it, with a risk reduction of 19 %. This decrease in the risk of mortality was observed when evaluating different causes specifically: cardiovascular, cancer, neurodegenerative disease and respiratory disease. Substitution of 10 g/day of margarine, butter, mayonnaise or milk fat for an equivalent amount of olive oil was associated with a lower risk of overall and cause-specific mortality, with an 8-34 % decrease. In these studies, no differences were observed when olive oil was compared with other combined oils. In addition, a recent study that examined the consumption of olive oil in 3 Spanish population cohorts in relation to the risk of cardiovascular disease, found a lower risk with a consumption of 20 to 30 g/day, compared to a consumption below 10 g/day. The authors noted that the benefits were greater in people who consumed virgin olive oil than in those who consumed refined olive oil (Donat-Vargas et al., 2022).

In addition to these observational studies, 2 clinical trials have been carried out in Spain to examine the long-term effect (5 and 7 years, respectively) of the consumption of a Mediterranean diet with a high content of virgin olive oil, compared to a diet with a low-fat content, in the primary (Estruch et al., 2018) and secondary (Delgado-Lista et al., 2022) prevention of cardiovascular disease. Both studies have found that the Mediterranean diet with olive oil was superior to the low-fat diet to prevent this disease, with a risk reduction of 30 % in primary prevention and 25 % in secondary prevention.

Olive oil can contribute to the prevention of other chronic diseases, such as type 2 diabetes. In a meta-analysis that included 4 cohort studies and 29 clinical trials, the effect of olive oil on the prevention of this pathology was evaluated, as well as supplementation in patients who already had this disease

(Schwingshackl et al., 2017b). Increased intake of olive oil (15-20 g/day) reduced the risk of developing type 2 diabetes by 16 %, although this ratio was not linear. In people with diabetes, supplementation with olive oil improved metabolic control of the disease. Similarly, a study carried out in Spain observed that an intervention with a Mediterranean diet and supplementation with olive oil (40 g/day) and pistachios reduced the risk of gestational diabetes compared to a control group, after adjustment for other variables, as well as other maternal-foetal complications (Assaf-Balut et al., 2017).

A recently published systematic review and meta-analysis, which included 45 studies (37 intervention and 8 cohort studies, totalling nearly 1 million people), evaluated the effect of olive oil intake on neoplastic disease. A higher intake was associated with a 31 % reduction in the risk of developing any tumour. This benefit was maintained when the risk of certain cancers (breast, gastrointestinal, upper aero-digestive and urinary tract) was specifically assessed (Markellos et al., 2022). This study did not evaluate the minimum intake necessary to produce this beneficial effect. In this same line, another meta-analysis that specifically evaluated the effect of olive oil on breast cancer risk observed a non-significant inverse relationship, with heterogeneity of the studies (Sealy et al., 2021).

The effect of olive oil on body weight was also evaluated in a meta-analysis that included 11 intervention studies, lasting more than 12 weeks. Olive oil supplementation was associated with greater weight loss than the control group, with also significant decrease in waist circumference and Body Mass Index (BMI) (Zamora Zamora et al., 2018). Metabolic liver disease by fat deposition is a complication of obesity and one of the most important causes of liver disease in our environment. A recent intervention study in 60 obese patients treated with hypocaloric diet and olive oil (20 g) or sunflower oil, for 12 weeks, observed a beneficial effect of olive oil on fatty liver severity, regardless of the effect on vascular risk factors (Rezaei et al., 2019).

Extra virgin olive oil provides a greater quantity of polyphenols and other compounds with beneficial properties for health (AESAN, 2021c). A recent meta-analysis has observed that polyphenol-rich olive oil, compared to olive oil with a lower contribution, improves vascular risk factors (total cholesterol, HDL cholesterol, oxidised LDL and malondialdehyde), mediators of inflammation and blood pressure (George et al., 2019). However, for the moment, it has not been shown that extravirgin olive oil, compared to refined olive oil, significantly decreases the risk of cardiovascular disease or other pathologies, or mortality.

There is great variability in olive cultivation methods in Spain, but the trend of recent years towards vast extensions of irrigated monoculture implies a great degradation of the environment, especially in the form of soil erosion, desertification, widespread contamination of water resources, degradation of habitats and landscapes, decrease of biodiversity and overexploitation of the scarce water resources of the cultivation areas (Beaufoy, 2001). However, with proper management, olive cultivation can contribute to the conservation of natural resources and the typical landscape value of the Mediterranean area, as well as to the enhancement of biodiversity.

The EAT-Lancet Commission (Willett et al., 2019) promotes the consumption of unsaturated vegetable oils, mentioning that there is insufficient evidence to establish an upper limit of consumption. The MEDAS index (Schröder et al., 2011) includes up to 3 items related to the consumption of olive oil (being the main fat for cooking food, used for the preparation of frying and consuming at least 4

tablespoons of oil per day). The sustainable Mediterranean diet pyramid (Serra-Majem et al., 2020) includes it as the main source of fats in the diet, indicating that this oil is used in traditional recipes.

Olive oil, for its health benefits, is considered the fat of choice, as a dressing and in food preparation. A daily consumption of olive oil is recommended at all major meals of the day. However, taking into account its high energy density, the amount will have to be adapted depending on the caloric target of each person.

2.6 Water

Water is the most abundant quantitative constituent of the human body and is essential for cellular homoeostasis and life. Total water intake includes drinking water, drinking water, water from culinary preparations and water that is part of food (SENC, 2016).

The water requirement varies between individuals and according to environmental conditions. The EFSA Panel on Dietary Products, Nutrition and Allergies, based on available evidence, establishes appropriate intakes by age groups. In adults over 18 years of age, the general recommendation is 2.5 litres per day for men and 2 litres per day for women (EFSA, 2010). In certain situations, such as performing physical activity, in the face of increased temperature or ambient humidity, the onset of fever or the loss of fluids, it is necessary to increase the water supply. Of particular relevance is the problem of dehydration in the elderly, since as age advances, there are alterations in the perception of thirst and an early satiety before the intake. These effects are more important in older people with cognitive or functional impairment, multi-morbidity or situations of social vulnerability (SEGG, 2011).

Table 1 shows the daily water intakes recommended by EFSA (2010).

Table 1. Daily intakes of water recommended by EFSA (2010)

Age	Water (L/day)	
	Male	Female
6-12 months	0.8-1.0	
1 year	1.1-1.2	
2-3 years	1.3	
4-8 years	1.6	
9-13 years	2.1	1.9
14-17 years	2.5	2
≥18 years	2.5	2

The environmental impact of bottled water is substantially higher than that of tap water. According to a Spanish study, the population intake of bottled water would use 3500 times more resources, and generate an environmental impact 1400 times greater than tap water (Villanueva et al., 2021).

Therefore, the recommendation of these guidelines is that water should be considered the main drink of choice, with a consumption that meets the needs of the person. Whenever possible, tap water or running water should be consumed.

3. Update of physical activity recommendations

3.1 Definitions and terms

- Physical activity: Human movement produced by skeletal muscle contraction resulting in increased caloric expenditure above baseline (Caspersen et al., 1985).
- Muscle strengthening activity: Physical activity and exercise that increases bone muscle strength, potency, endurance, and mass (e.g., strengthening training, endurance training, or muscle strength and endurance exercises) (WHO, 2021a).
- Aerobic physical activity: An activity in which the large muscles of the body move rhythmically for a period of time. Aerobic activity - also called "endurance"- improves cardiorespiratory capacity. Examples: walking, running, swimming, cycling (WHO, 2021a).
- Moderate intensity physical activity: On an absolute scale, intensity between 3 and less than 6 times higher than activity at rest. On a relative scale linked to each person's ability, moderate activity typically scores between 5 and 6 on a scale of 0 to 10 (WHO, 2021a).
- Physical activity on the move: Physical activity carried out in order to move from one place to another, such as walking and cycling or in some other vehicle (using non-motorised means of locomotion, such as scooters, skates, wheelchairs, etc.) (WHO, 2021a).
- Physical activity at home: Physical activity performed at home to carry out domestic tasks (cleaning, raising children, gardening, etc.) (WHO, 2021a).
- Physical activity at work: Physical activity performed during paid or voluntary work (WHO, 2021a).
- Leisure time physical activity: Physical activity performed by a person that is not necessary as an essential activity of daily life, and that is performed at discretion. Examples: participation in sports, conditioning or training through exercises, or leisure activities, such as walks, dancing or gardening (WHO, 2021a).
- Mild physical activity: Mild physical activity is equivalent to between 1.5 and 3 MET (metabolic equivalent), i.e. activities with an energy expenditure of less than 3 times the energy consumption at rest. These include, for example, slow walking, bathing, and other incidental activities that do not result in a noticeable increase in heart rate or breathing (WHO, 2021a).
- Multi-component physical activity: In the case of the elderly, multi-component physical activity is important to improve physical function and reduce the risk of falls or injuries from falls. These activities can be done at home or in a structured group context. Many of the interventions studied combine exercises of all types (aerobic, muscle strengthening and balance training) in one session, which has proven to be successful. A multi-component physical activity program could consist of walking (aerobic activity), lifting weights (muscle strengthening), and incorporating balance training. Balance training can include walking backwards or to the sides or standing on one foot while performing a muscle strengthening activity of the upper body, such as biceps-strengthening exercises using arm push-ups. Dancing also combines aerobic and equilibrium elements (WHO, 2021a).
- Occupational physical activity: See Physical Activity at Work (WHO, 2021a).
- Vigorous physical activity: On an absolute scale, physical activity is performed with an intensity of ≥6 MET. On a relative scale linked to each person's ability, vigorous activity typically scores between 7 and 8 on a scale of 0 to 10 (WHO, 2021a).

- Cardiorespiratory capacity (cardiorespiratory resistance): Component of fitness related to health. Ability of the circulatory and respiratory systems to supply oxygen during periods of continuous physical activity. It is usually expressed in terms of maximum measured or estimated oxygen absorption (VO_2 max) (WHO, 2021a).
- Sport: This term covers a variety of activities carried out according to rules, whether for pleasure or in a competitive spirit. Sports activities consist of physical activities carried out by teams or individuals, sometimes subject to an institutional framework (for example, a sport organization) (WHO, 2021a).
- Physical exercise: Planned, structured and repeated physical activity, whose objective is to improve or maintain one or more components of Fitness (Caspersen et al., 1985).
- Bone strengthening exercises: Physical activity that aims to increase the strength at certain points of the bones of the locomotor system. Bone strengthening activities produce an impact or tension force on the bones that promotes bone growth and bone strength. Examples: running, jumping rope or lifting weights (WHO, 2021a).
- Functional exercises: Exercises that can be integrated into everyday activity to improve lower-body strength, balance and motor performance. Other examples include tandem, one leg standing, squats, static balance with seating, tiptoeing, and stepping over obstacles (WHO, 2021a).
- Balance training: Static and dynamic exercises that are designed to improve the individual ability to withstand challenges from postural sway or destabilizing stimuli caused by self-motion, the environment, or other causes (WHO, 2021a).
- Metabolic equivalent (MET): The metabolic equivalent of a task (MET), or simply the metabolic equivalent, is a physiological measure that expresses the intensity of physical activities. A MET is the equivalent of the energy spent by a person while seated at rest (WHO, 2021a).
- Fitness, physical condition or physical fitness: The ability to carry out tasks with vigour without fatigue and with ample energy to enjoy leisure activities. Includes: cardiorespiratory condition, muscle endurance, muscle strength, muscle power, speed, flexibility, agility, balance, reaction time and body composition. Since these components differ in importance when it comes to Performance-Fitness or Health-Fitness, they have been divided into two blocks (Caspersen et al., 1985). The Health and Fitness report, which concerns us in this report, includes cardiorespiratory condition, muscle strength, muscle endurance, flexibility and body composition.
- Flexibility: Component of the physical form related to health and performance, which corresponds to the scope of possible movements of a joint. Flexibility is specifically linked to each joint, and depends on a number of variables, including the tightness of certain ligaments and tendons. Flexibility exercises enhance the ability of a joint to move through its full range of motion (WHO, 2021a).
- Major muscle groups: Legs, back, abdomen, chest, shoulders and arms (WHO, 2021a).
- Physical inactivity: Insufficient level of physical activity to comply with the present physical activity recommendations (WHO, 2021a).
- Health: Health is a state of complete physical, mental and social well-being, and not just the absence of disease or pathologies (WHO, 1948).

- Sedentary lifestyle: Any behaviour in waking state characterised by an energy expenditure of ≤1.5 MET, whether while sitting, reclining or in lying position. Most office work, driving, and watching television are examples of sedentary behaviours; they also occur in people who cannot stand up, such as those in wheelchairs (WHO, 2021a).
- Recreational screen time: Time spent in front of a screen (television, computers, mobile devices) for non-educational or study or work purposes (WHO, 2021a).
- Sedentary screen time: Time spent watching some hobby on a screen (TV, computers, mobile devices). It does not include active games that involve a screen and require physical activity or movement (WHO, 2021a).

3.2 Importance of physical activity for health

In the child and youth population, since 2014, the international organisation Active Healthy Kids Global Alliance has been working from Canada coordinating the scientific review of the most relevant indicators to promote the practice of physical activity in each country. The indicators analysed are: levels of physical activity; participation in sports; active play; active transport; sedentary behaviour; influence of friends and family; influence of the community and the environment; national and regional policies; and levels of physical condition. Each of these indicators is scored by assigning a comparable grade between countries (GRADE: Grading of Recommendations Assessment, Development and Evaluation). Spain has the reports of 2016 (Román-Viñas et al., 2016) and 2018 (Román-Viñas et al., 2018). The last report indicated that 60-66 % of the population manages to accumulate 60 minutes or more of Moderate-Vigorous Physical Activity (MVPA), at least, 4 days a week; 60-66 % perform an active transport and 27-33 % dedicate a maximum of 2 hours a day to the screen time, the rest exceeds it. This national report highlights the need to reduce sedentary lifestyle and promote physical activity from an early age.

According to the data of the 2019 ALADINO study (Food, Physical Activity, Child Development and Obesity in Spain) of the AESAN in schoolchildren aged 6 to 9 years, the percentage of girls who performed at least 1 hour of physical activity per day was lower than that of boys (65.2 % *versus* 75.4 %). On the other hand, 1 in 4 schoolchildren (25 % of the boys and 23 % of the girls) had sedentary behaviour, that is, they spent 3 or more hours a day, on weekdays and during the weekend, on sedentary activities (reading, doing homework or using electronic devices). Obese schoolchildren were more sedentary than those with normal weight, especially girls (32.5 % of girls and 26.9 % of boys) and performed regular physical activity less frequently (59.1 % of girls and 70.9 % of boys) (García-Solano et al., 2021).

In relation to the adult population, the Survey of Sporting Habits in Spain 2020 (MCD, 2021) showed that 19.5 % of adults practice some type of physical-sports activity on a daily basis, a figure that amounts to 51 % when the frequency considered is at least once a week.

The recommendations for physical activity are aimed at promoting physical activity and reducing sedentary lifestyles, and this is the aim of the current report.

In 2010, WHO published the first recommendations on physical activity and its relation to health (WHO, 2010). In 2013, the Ministry of Health, Social Services and Equality published the Health Promo-

tion and Prevention Strategy in the SNS (National Health System), in which physical activity was included as one of the factors to be addressed (MSSSI, 2014). Within this framework, in 2015 the Ministry prepared national recommendations on Physical Activity for Health, reduction of sedentary lifestyle and screen time for the entire population (MSSSI, 2015). In the same year, 2015, the Report of the Scientific Committee of AESAN (AECOSAN, 2015) was published on recommendations for physical activity in the framework of the NAOS Strategy, fully aligned with the recommendations of the WHO.

More recently, WHO has coordinated the updating of the scientific evidence review by a commissioned committee of experts. As a result of this work, in November 2020 WHO established the new recommendations for physical activity and sedentary behaviours (WHO, 2020), which were published in Spanish in 2021 (WHO, 2021a). In order to establish the existing levels of evidence for the different health variables and in the different population groups, a systematic review of the existing reviews and meta-analyses was carried out, concluding with the following messages on the importance of physical activity for the health of the population:

- Physical activity is good for the heart, body and mind. Regular physical activity can prevent and help manage heart disease, type 2 diabetes, and cancer, which cause nearly three-quarters of deaths worldwide. In addition, physical activity can reduce symptoms of depression and anxiety, and improve concentration, learning, and overall well-being.
- Any amount of physical activity is better than none, and the more, the more, the better. To improve health and well-being, WHO recommends at least 150 to 300 minutes of moderate aerobic activity per week (or the equivalent of 75 to 150 minutes of vigorous activity) for all adults, and an average of 60 minutes of moderate aerobic physical activity per day for the child and adolescent population, performing vigorous physical activity at least 3 days per week.
- Every physical activity counts ("Every Move Counts"). Physical activity can be integrated into work, sports and leisure activities or travel (on foot, by bicycle or in some other road vehicle), as well as in daily and domestic tasks.
- Muscle strengthening benefits all people. Older people (65 and older) should incorporate physical activities that prioritise balance and coordination, as well as muscle strengthening, to help prevent falls and improve health.
- Excessive sedentary lifestyle can be harmful to health. It can increase the risk of heart disease, cancer, and type 2 diabetes. Limiting sedentary time and staying physically active is beneficial to health.
- Everyone can benefit from increased physical activity and reduced sedentary habits, including pregnant and post-partum women and people with chronic conditions or disabilities.

In addition to these general conclusions on the importance of increased physical activity and reduced sedentary lifestyle for population health, the World Health Organization and Pan American Health Organization summarised existing scientific evidence for each population group (PAHO, 2019) (WHO, 2021a):

- In the child population under 5 years of age: Randomised and non-randomised intervention studies maintained that physical activity was associated with better motor, cognitive, and psy-

chosocial development, and better cardiometabolic health. In addition, observational studies showed that physical activity was associated with better motor development, physical state, and bone and skeletal health. Moderate to vigorous physical activity and total physical activity were beneficially associated with various health indicators.

- In children aged 5 years and over and adolescents: Physical activity was beneficial in terms of the following health outcomes: improvement of physical fitness (cardiorespiratory and muscle capacity), cardiometabolic health (tension, dyslipidaemia, glucose and insulin resistance), bone health, cognitive outcomes (academic performance and executive function) and mental health (lower presence of symptoms of depression) and lower adiposity. In addition, it was observed that increased sedentary lifestyle was associated with the following negative health outcomes: increased adiposity; poorer cardiometabolic health, fitness, behavioural conduct/pro-social behaviour; and reduced sleep duration.
- In the adult population under 65 years of age: Physical activity was beneficial in terms of the following health outcomes: decreased risk of all-cause mortality and cardiovascular mortality, the incidence of hypertension, the incidence of cancer in specific organs and the incidence of type 2 diabetes, mental health (reduced presence of symptoms of anxiety and depression), cognitive health and sleep, and possible improvement of indicators of adiposity. In addition, increased sedentary lifestyle was associated with the following negative health outcomes: increased all-cause mortality, cardiovascular mortality and cancer mortality, and incidence of cardiovascular disease, cancer, and type 2 diabetes.
- In the population aged 65 years and over: Physical activity provided benefits in terms of the following health outcomes: decreased risk of all-cause mortality and cardiovascular mortality, incidence of hypertension, incidence of some specific types of cancer and incidence of type 2 diabetes, mental health (reduced presence of symptoms of anxiety and depression), cognitive health and sleep, and possible improvement of measures of adiposity. In the elderly, physical activity serves to prevent falls and falls-related injuries, as well as declines in bone health and functional ability. On the other hand, increased sedentary lifestyle was associated with the following negative health outcomes: increased all-cause mortality, cardiovascular mortality and cancer mortality, and incidence of cardiovascular disease, cancer and type 2 diabetes.

3.3 Physical activity recommendations

In 2019, after systematically reviewing and grading the existing evidence, WHO published the recommendations for physical activity and healthy habits in children under 5 years of age, dividing these recommendations by key stages in this first period of life (PAHO, 2019). Then, in 2021, after a similar process of review and grading of existing evidence, it published its recommendations for the rest of the age groups from 5 years to the elderly (WHO, 2021a). These recommendations, separated by age groups, are as follows:

3.3.1 Infants (under 1 year)

- They must be physically active, several times a day in different ways, especially through interactive play on the ground; the more, the better. For those who are not yet moving, this includes at least 30 minutes in a prone (upside-down) position throughout the day while awake.
- They should not be held for more than 1 hour at a time (for example, in carts, chairs or high chairs or held on the back of a caregiver). Spending time in front of screens is not recommended. In times of inactivity, it is recommended that a caregiver read to them or tell stories.

3.3.2 Children aged 1 to 2

- They must spend at least 180 minutes doing various types of physical activity of any intensity, including moderate to high intensity physical activity, distributed throughout the day; the more the better.
- They should not be held for more than 1 hour at a time (for example, in carts, chairs or high chairs or held on the back of a caregiver) or sit for long periods of time. With regard to the 1-year-old child population, it is not recommended that they spend time in sedentary activities in front of a screen (such as watching TV or videos or playing games on the computer). For the 2-year-old child population, the time spent on sedentary activities in front of a screen should not exceed 1 hour; the less, the better. In times of inactivity, it is recommended that the caregiver read them or tell stories.

3.3.3 Children aged 3-4 years

- They must spend at least 180 minutes performing various types of physical activity of any intensity, including at least 60 minutes of moderate to high intensity physical activity, distributed throughout the day; the more, the better.
- They should not be held for more than 1 hour at a time (for example, in carts or pushchairs) or remain seated for long periods of time. The time spent on sedentary activities in front of a screen should not exceed 1 hour; the less, the better. In times of inactivity, it is recommended that the caregiver read them or tell stories.

3.3.4 Children aged 5 years and over and adolescents

- This population group must perform, at least, an average of 60 minutes of daily physical activity mainly aerobic of moderate to vigorous intensity throughout the week.
- Vigorous-intensity aerobic activities and activities that strengthen muscles and bones should be incorporated at least 3 days a week.
- They should limit the time spent on sedentary activities, especially the leisure time in front of a screen.

3.3.5 Adult population under 65 years of age

- They must accumulate a minimum of 150 to 300 minutes of moderate-intensity aerobic physical activity during the week, or a minimum of 75 to 150 minutes of vigorous-intensity aerobic phy-

sical activity, or an equivalent combination of moderate- and vigorous-intensity activities, in order to obtain significant health benefits.

- They should also perform muscle strengthening activities of moderate or higher intensity to work all large muscle groups 2 or more days a week, as this brings additional health benefits.
- They can exceed 300 minutes of moderate-intensity aerobic physical activity, or 150 minutes of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate-intensity and vigorous-intensity activities each week, in order to obtain greater health benefits.
- They should limit the time they spend on sedentary activities. Replacing sedentary time with a physical activity of any intensity (even mild) translates into health benefits.
- In order to reduce the adverse health effects of a high level of sedentary lifestyle, they should seek to engage in more moderate to vigorous intensity physical activity than recommended.

3.3.6 Population aged 65 and over

- They must be as active as their functional capacity allows and will adjust their level of activity effort to their physical form. Therefore, the general recommendations for physical activity and sedentary lifestyle for this population group are the same as for the adult population aged 18-64 described in the previous section. It is especially important that people in this group begin with small doses of physical activity, to gradually increase their duration, frequency and intensity. The main difference with the recommendations of the population group of 18-64 years, is that, within their weekly physical activity, they must perform varied multi-component physical activities that give priority to functional balance and moderate or higher intensity strength training 3 or more days a week to improve their functional capacity and avoid falls.

3.4 Practical advice for the implementation of recommendations

Physical activity has to be introduced into people's lifestyles and, to achieve this, 3 strategies are proposed: sit less, move more and exercise. There is a direct association between the time a person spends sitting daily and the incidence of mortality from cardiovascular disease and general mortality (Katzmarzyk et al., 2009) (Chau et al., 2013). On the other hand, high levels of physical activity reduce cancer mortality and cardiovascular disease (Sakaue et al., 2020). The risk associated with spending 8 hours or more sitting a day can be offset by 60-75 minutes of moderate physical activity a day (Ekelund et al., 2016) (Figure 1).

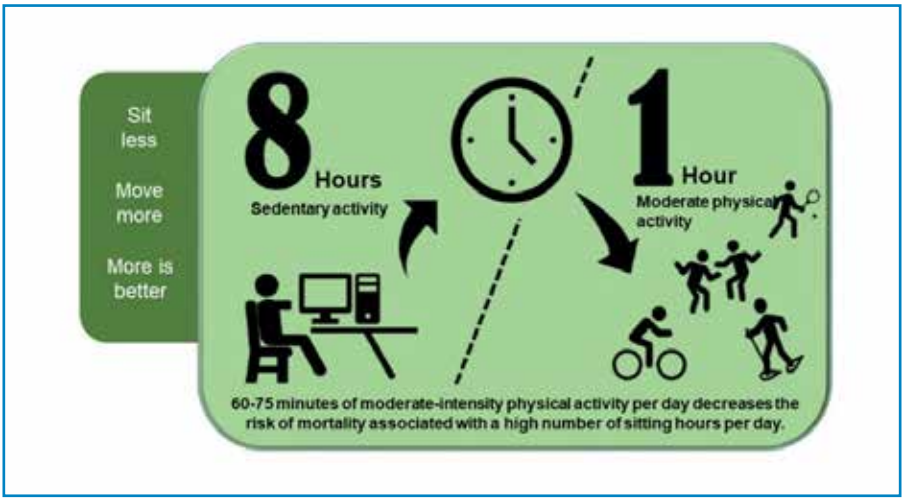

Figure 1. Practical tips for compliance with physical activity recommendations [Own elaboration based on Ekelund et al. (2016)].

To move more, it is advisable to reduce the hours of sitting at work, at home and in the school; increase moderate physical activity, use active transport and practice some physical exercise. Physical exercise is beneficial for preventing and treating multiple pathologies, so it is considered a "polypill" with multisystemic effect and at low cost (Fiuza-Luces et al., 2013).

How many steps do you need to take daily to comply with physical activity recommendations?

Probably many people have ever listened to the recommendation of 10 000 steps a day, but where does this figure really come from? Does it have any scientific basis?

The truth is, it doesn't. In fact, the 10 000 steps come from an advertising slogan of one of the first pedometers to come on the market in Japan in 1965, and it was called Mampo-key, which in Japanese literally means "10 000 steps meter" (Tudor-Locke and Bassett, 2004). The figure of 10 000 steps became popular from that time and has persisted to this day. The leading researcher in this area, for many years, has been Dr. Tudor-Locke, who estimated the first equivalences between the amount of physical activity of the recommendations and the number of daily steps. Approximately, it estimated the recommendations for the adult population of 150 minutes/week of moderate/vigorous physical activity to be equivalent to about 7000-8000 steps per day (Tudor-Locke et al., 2011), while for the child and adolescent population the recommendations would be equivalent to about 10 000-12 000 steps (Adams et al., 2013). Likewise, it has been estimated that walking at a moderate intensity is equivalent to a frequency of 100 steps per minute, being of vigorous intensity when walking at 130 steps per minute (Tudor-Locke et al., 2018). In recent years, several important studies have been published relating the number of daily steps to mortality. The conclusion is that it is age-dependent, so that older people achieve most of the benefits with 7000-8000 steps daily, while younger people will achieve most of the health benefits with 10 000-12 000 steps daily.

Recently, 2 meta-analyses have been published that have quantified the effect of the number of daily steps on mortality reduction (Jayedi et al., 2022) (Paluch et al., 2022). These meta-analyses show unequivocally that what really matters is to add steps to life. That is, each person, depending on their age and condition, starts from an average of daily steps. Each increase of 1000 steps a day is associated with a significant reduction in mortality, and this is the public health goal and message, to increase the average number of steps by 1000 in the first instance, and to continue to increase progressively.

These data coincide with the motto of WHO physical activity recommendations: "Every move counts!", which in terms of steps we could translate as: "Every Step Matters!"

Nowadays, smartphones, bracelets and smart watches inform us our daily steps and although there is a margin of error between devices and with respect to reference methods, they offer an objective data to the general population that can be very useful to become aware of how much he walks per day and try to progressively increase it.

Conclusions of the Scientific Committee

1. Sustainable dietary recommendations

The Scientific Committee considers that the adoption by the Spanish population of a varied and balanced dietary pattern characterised mainly by a greater predominance of foods of plant origin and a lower presence of foods of animal origin, can improve the state of health and well-being, while reducing the environmental impact. The traditional Mediterranean diet pattern meets these characteristics.

- **Vegetables and fruit**

  A minimum intake of 5 servings of vegetables and fruits per day is recommended, which may be distributed in at least 3 servings of vegetables per day, and 2-3 servings of fruits per day. The environmental impact of vegetables and fruits is low. The consumption of fruit juices is not a substitute for whole fruits.

- **Potatoes and other tubers**

  Potatoes and other tubers should be separated from the group of vegetables and fruits due to their different nutritional properties. Although potatoes are one of the foods with the least environmental impact, moderate consumption is recommended, being part of the traditional recipes of our country and prioritising the consumption of whole grain cereals and legumes as sources of carbohydrates of slow digestion.

- **Cereals**

  The recommendation on cereal consumption is set at 3 to 6 servings per day, depending on the energy needs of each person, and no more than 4 servings, if caloric intake needs to be restricted. It is advisable to prioritise whole grain cereals and whole products, minimising the consumption of foods made with refined flours. Some of these servings can be replaced by legumes, to complete the intake of carbohydrates. The environmental impact of cereals is low.

- **Sources of vegetable and animal protein: legumes, nuts, fish, eggs, milk and dairy products, and meat**

  It is recommended to prioritise the consumption of foods of plant origin, as opposed to foods of animal origin, as the main sources of protein in the diet. The consumption of vegetable protein,

mainly legumes, should occupy one of the protein rations of the main daily meals (food and dinner). The other portion can be used to eat fish, eggs, dairy products or meat.

- Legumes

  It is recommended to consume at least 4 servings a week until you reach a daily consumption of legumes, as a source of proteins and also of slow digestion carbohydrates, in order to reduce the intake of animal-based proteins and the consumption of non-whole grains. In general, protein foods of plant origin have less impact on the environment than those of animal origin, and of all of them, legumes are the ones that generate the least impact and are also affordable foods.

- Nuts

  Consumption of 3 or more servings per week is recommended, up to a consumption of 1 serving per day, considering that its energy intake is high and it is necessary to balance it with a lower energy intake of other foods. Nuts should be chosen without added salt, fat or sugar.

- Fish

  Consumption of 3 or more servings per week is recommended, prioritising oily fish over white fish and species with a lower environmental impact.

- Eggs

  Given its high nutritional value, that is an affordable food and has a relatively low environmental impact, consumption of up to 4 eggs per week is recommended.

- Milk and dairy products

  Due to its high nutritional intake and ease of consumption, it is recommended to take a maximum of 3 servings of dairy per day, avoiding those with added sugars and high salt content. However, due to the high environmental impact of these foods, it is suggested to reduce the number of daily dairy servings if other foods of animal origin are consumed.

- Meat

  Consumption should be limited to a maximum of 3 servings of meat per week, prioritising the consumption of poultry and rabbit meat, and minimising the consumption of processed meat. The production of meat, especially beef and lamb, has a great environmental impact.

- **Olive oil**

  A daily consumption of olive oil is recommended at all main meals of the day, both for cooking the food and for its dressing. However, taking into account its high energy density, the amount will have to be adapted depending on the caloric target of each person.

- **Water**

  Water should be considered the main drink in a healthy diet. It is recommended to drink as much water as necessary and whenever possible, drink tap water or running water.

General considerations

In addition, the following should be taken into account:

- Regarding **vegetables and fruits:**
  - Increase the consumption of cruciferous vegetables, dark green leafy vegetables, citrus fruits and red fruits.

  - Give preference to the consumption of fresh vegetables, seasoned with olive oil and vinaigrette, or steamed, this being the culinary technique of choice to preserve nutrients.
  - Consume fresh vegetables and fruits as a snack, avoiding, in this case, fruit and vegetable juices, fruits in syrup and dried.
  - Include vegetables and fruits as part of culinary preparations. Maintain the use of stir-fry as the basis of many culinary preparations.
  - Consume fresh seasonal vegetables and fruits, avoiding the canned. Also consume vegetables and fruits with defects that do not meet aesthetic standards.
  - Vegetables: mix different products both raw and cooked. Serving size: 150-200 g. Examples: 1 plate of assorted salad; 1 plate of cooked vegetables; 1 vegetable cream.
  - Fruits: serving size: 120-200 g of fresh fruit. Examples: 1 medium piece; 1 medium bowl of cherries or strawberries; 2 medium slices of melon or watermelon.
- About **potatoes and other tubers:**
  - Serving size: 150-200 g. Examples: 1 large potato or 2 small potatoes.
- About **cereals:**
  - Expand the type of cereals consumed. Sorghum, millet, spelt wheat or buckwheat are examples of varieties of optimal nutritional quality whose consumption promotes crop diversity, improving the resilience of food systems.
  - Serving size: 40-60 g of bread or 60-80 g of dry pasta or rice. Examples: 3-4 slices or a muffin, 1 normal plate.
- Regarding **legumes:**
  - It is important to increase their consumption little by little if you are not used to frequent consumption, so that they are well tolerated. They can be consumed in traditional recipes of our country, but also in salads, hamburgers or as a garnish.
  - Leaving the legumes soaked for several hours or overnight, changing the soaking water and making prolonged cooking contributes to improving their digestibility and the absorption of their nutrients.
  - If the time allocated to their preparation is inconvenient, they can be cooked in large quantities at once and frozen.
  - The environmental impact of canned and home-cooked legumes is similar. Prefer low-salt preserves.
  - Serving size: 50-60 g dry. Example: 1 single normal plate.
- About **nuts:**
  - Serving size: 20-30 g. Example: 1 handful.
- About **fish:**
  - Canned fish has a nutritional value equivalent to fresh fish, although canned fish with a high salt content should be avoided.
  - Frozen fish has a nutritional value equivalent to fresh fish, although with different organoleptic properties.
  - Also consume unusual varieties to avoid discarding them when they are accidentally fished.
  - Serving size: 125-150 g. Examples: 1 individual steak or several portions of seafood.

- About **eggs:**
  - In situations of high nutritional demand, such as pregnancy, lactation and anorexia associated with aging, the consumption of eggs is highly recommended, due to their high nutritional intake and ease of consumption.
  - Accompany the consumption of eggs with healthy foods. Avoid egg combinations with foods rich in saturated fat and refined flours.
  - Serving size: 1 medium egg (53-63 g).
- About **milk and dairy products:**
  - In situations of deficiency and high nutritional demand, dairy consumption is recommended, due to its high nutritional value and ease of consumption.
  - Consume low-fat dairy products if calorie intake needs to be controlled.
  - Serving size: 200-250 ml milk; 85-125 g fresh cheese; 40-60 g hard cheese; 125 g yoghurt and other fermented milks. Examples: 1 glass/cup of milk, 2-3 slices of cheese, 1 unit of yoghurt.
- About **meat and meat products:**
  - Choose lean cuts of meat if calorie intake needs to be controlled.
  - Serving size: 100-125 g. Examples: 1 medium steak; 1 quarter chicken; 1 quarter rabbit.
- About **olive oil:**
  - Virgin olive oil is that obtained exclusively by mechanical or other physical means which exclude any alteration of the product (EU, 2013). This can be the one of choice because of its flavonoid content. Extra virgin olive oil also provides a higher organoleptic quality.
  - Serving size: 10 ml. Examples: 1 tablespoon of soup.
- About **water:**
  - There are other beverages that can help maintain hydration, such as coffee, tea, herbal teas, and sugar-free carbonated waters.
  - Fresh fruits and vegetables and some culinary preparations, such as gazpacho, soups, consommés, purées, fresh fruit salads or infusions, help to ensure good hydration.
- Aspects to be taken into account in all food groups on their **environmental impact** and other considerations related to **sustainability:**
  - Due to the great variability in the environmental impact of food according to the agricultural techniques used, both in agriculture and in livestock, fishing and aquaculture, the consumption of food obtained using the most environmentally friendly techniques should be favoured.
  - Avoid food that has been transported by air.
  - Promote healthy cooking techniques, as well as the use of appliances with low environmental impact (microwave or pressure cooker) versus those that require more energy (oven) and pay attention to cooking time. To save time and energy, meals be cooked in large quantities and frozen.
  - It is essential to reduce food waste and, in the event of waste, discard it in organic waste containers.
  - Avoid, as much as possible, packaging, especially those that are most harmful to the environment, such as plastics.
  - Obtain food from sources that guarantee fair and dignified working, wages and living conditions for all intermediaries in the food production and supply chain.

– For animal welfare reasons, the consumption of eggs from free-range hens (pastured), as well as meat and dairy products from livestock where the breeding of animals complies with animal welfare standards is recommended.
– The consumption of local food can promote economic development and employment in rural areas of the country.

Other aspects to consider

- Other beverages:
  The consumption of drinks with sugars is associated with a higher weight gain in children and adults and a higher incidence of type 2 diabetes (Malik and Hu, 2019). High consumption of this type of beverage has also been associated with an increased risk of developing cardiovascular disease and suffering premature death (Yin et al., 2021); these associations are explained in part, but not completely, by body weight gain and there is solid evidence to suggest that they are causal associations. In addition, a recent EFSA report indicates that the intake of added or free sugars (added to foods or present freely in fruit juices) should be as low as possible in the context of a healthy diet (EFSA, 2022).
  Energy drinks are those with high caffeine content (>15 mg/100 ml). In addition, they may contain other ingredients such as taurine, L-carnitine, glucuronolactone, *guaraná*, ginseng and B vitamins, and sugar. A recent report by AESAN highlighted the health risks associated with the consumption of these beverages, especially when combined with alcoholic beverages (AESAN, 2021d). Therefore, it is recommended to avoid its consumption in the child population, in adolescents, in pregnant and lactating women, as well as in people with hypertension, cardiovascular problems or with sleep disorders. It is recommended to the general population to reduce the consumption of energy drinks.
- Processed foods high in sugar, fat and salt:
  Many processed foods use unhealthy vegetable fats, such as palm oil, for processing. In addition, these foods often include high amounts of salt and sugar. Existing studies show that the substitution of unprocessed foods in the diet by processed foods generates harmful effects on health, mainly attributable to the ingredients in their composition, and not so much to the processing techniques used (AESAN, 2020b). Therefore, it is recommended to favour the home-made preparations of the recipes, and in case of consumption of processed foods, to choose those with lower content of salt, sugar and fats other than olive oil.
- Butter and other saturated animal fats:
  It is recommended to reduce its consumption.
- Salt:
  The use of salt in preparations has to be moderate and, according to the recommendations of the World Health Organization (WHO, 2014, 2021b), it has to be iodized. This criterion is included in the framework of the new National Plan for the Official Control of the Food Chain (PNCOCA) 2021-2025, approved in December 2020, within the program on control of school menus, vending machines and cafeterias of schools (PNCOCA, 2021-2025).

2. Physical activity recommendations

In section 3.3, the recommendations for physical activity and sedentary behaviours for the different stages of life, separated by age groups, have been detailed.

In summary, we can conclude that, to improve health and well-being, WHO recommends:

- At least 150 to 300 minutes of moderate aerobic activity per week (example: walking at a pace that makes it a little difficult for us to talk, cycling at a calm and flat pace, soft dancing, among others) or the equivalent, between 75 and 150 minutes of vigorous activity (cycling at a fast pace and on a slope, dancing vigorously, climbing fast stairs, swimming and running at a fast pace, playing sports, among others) for the entire adult population and older adult population.
- At least an average of 60 minutes of moderate aerobic physical activity per day for the child and adolescent population. This population must perform, at least, 3 days of vigorous physical activity (for example, running, rope jumping, climbing fast stairs, cycling at a fast pace and/or on a hill, playing sports and martial arts) and perform, at least, 3 days/week activities that stimulate bone growth (those that have impact, jumps, running, games that require carrying their own total or partial body weight, such as the wheelbarrow, rope tractions such as the rope-stretch, carrying the weight of another such as carrying a horse, among others).
- The intensity of physical activity can be measured with the metabolic equivalents. The energy expenditure expressed in metabolic units (MET) is a very illustrative indicator of the intensity of the effort. Activities from 3 to 6 MET are considered moderate and greater than 6 MET, vigorous. There are tables where detailed information for adults can be found (Ainsworth et al., 2011).
- In order to identify and simplify the intensity level for each person we can use the speech test (Webster and Aznar, 2008) to identify moderate and vigorous activities. A person who performs moderate-intensity physical activity should be able to maintain a conversation, with some difficulty, while carrying out the activity. When a person gasps or gasps for breath and cannot easily hold a conversation, the activity can be considered vigorous.
- Muscle strengthening benefits all people. People aged 65 years and older should incorporate physical activities that prioritise balance and coordination, as well as muscle strengthening, to help prevent falls and improve health.
- Everybody can benefit from increasing physical activity and reducing sedentary habits.

We conclude with the motto of the WHO recommendations (2021):

Every move counts! Physical activity can be integrated into work, sports and leisure activities or travel (on foot, by bicycle or in some other road vehicle), as well as in daily and domestic tasks. Increasing the number of daily steps is also a good way to improve the health of everyone.

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