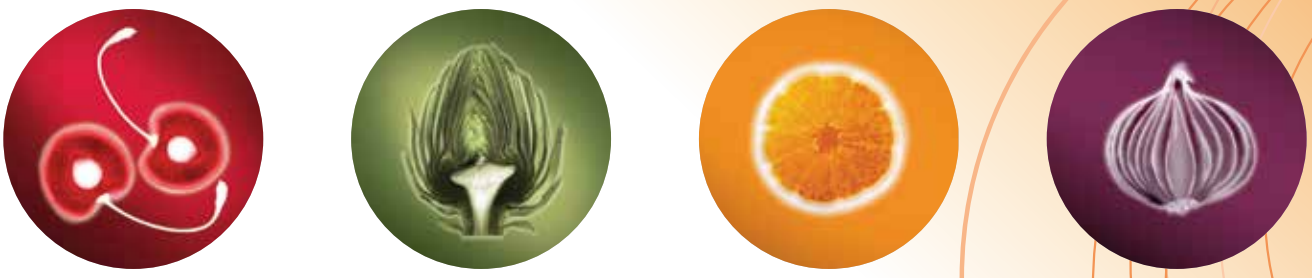

CLOSING MEETING OF THE EU PROGRAM

FRUIT & VEG 4 HEALTH

DOCUMENTS FROM THE EUROPEAN PROGRAM «FRUIT & VEG 4 HEALTH 2018-2020 »

NOVEMBER 5TH AND 6TH, 2020

Les fruits et légumes un choix de vie

Avec l'Europe

CO-CHAIRS

Elio Riboli & Martine Laville

SCIENTIFIC COMMITTEE

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JM. Lecerf (Institut Pasteur Lille, FR)
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As part of the European program FRUIT & VEG 4 HEALTH, Aprifel is organizing a European meeting on November 2020 (5th and 6th). This meeting will allow the program to be assessed and to disseminate its results on a European scale while enhancing the awareness of European doctors.

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SUMMARY

NUTRITIONAL ADVICE:
PRACTICAL TOOLS TO ENGAGE DIALOGUE WITH YOUR PATIENTS

The key role of a healthy diet, rich in fruit and vegetables, is not to be proven anymore. In view of current scientific knowledge, it is imperative to change eating habits and especially to increase fruit and vegetables consumption. Health professionals are key actors to succeed. The European information program « Fruit and Veg 4 Health » 2018-2021, co-financed by the European Union, offers health professionals practical tools to support their action regarding nutritional advice.

EGEA 2018 conference videos « Nutrition and health: from science to practice »

To watch on www.egeaconference.com

▶ A true knowledge unit

- ✓ 50 speakers – scientists and doctors
- ✓ Co-chaired by professors Elio Riboli and Martine Laville
- ✓ Accredited for continuing medical education by the European Counsel of Accreditation for continuing medical education (EACCME®) and Lyon 1 University
- ✓ More than 300 participants

▶ 10 partners

- ✓ French Association of Nutritionists
- ✓ European Childhood Obesity Group (ECOG)
- ✓ Obesity Centre Grenoble
- ✓ European Federation of the Associations of Dietitians
- ✓ European Network for Prevention and Health Promotion in Family Medicine and General Practice
- ✓ Faculty of Medicine Lyon East and Faculty of Medicine and Maïeutics Lyon Sud – Charles Mérieux
- ✓ Pasteur Institute – Lille
- ✓ N8 Agrifood
- ✓ European Union of General Practitioners/ Family Physicians
- ✓ European Society for general practice/ family medicine (WONCA)

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  - · June 19th to 21st 2019 – French society of pediatrics congress, Paris
  - · October 3rd & 4th 2019 – National days of General Practice, Paris

European program Fruit & Veg 4 health

▶ Why this program?

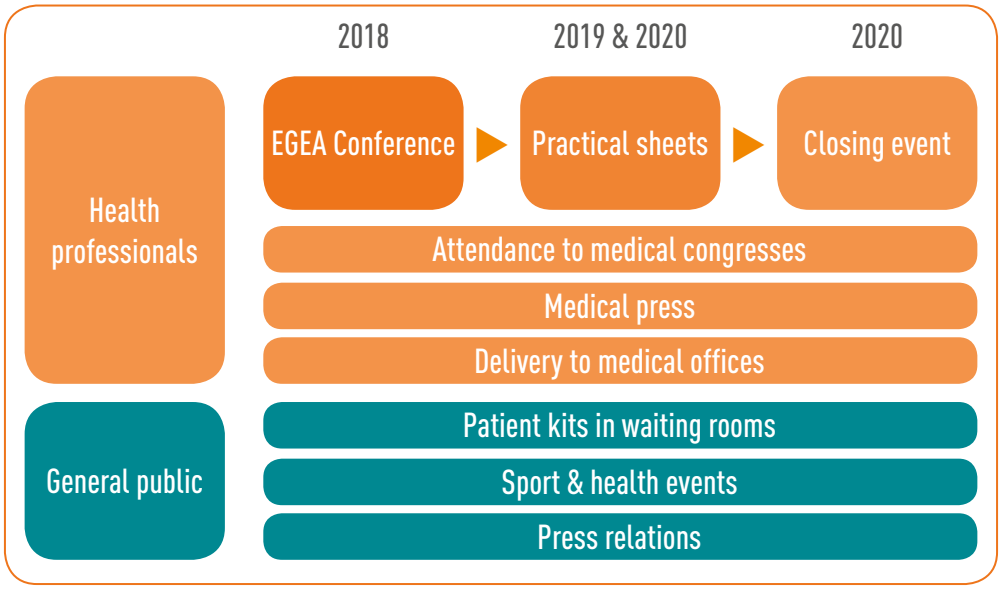
- ✓ A poor nutritional quality diet is one of the main risk factors for health, just like tobacco or alcohol (WHO).
- ✓ In light of their benefits, a consumption of at least 400g (5 portions) of fruit and vegetables per day is an international consensus.
- ✓ However, in 22 member states out of 28, fruit and vegetables consumption is below WHO recommendations.

In 2017, 11 million deaths could be linked to a poor nutritional quality diet, including 3,9 million to an inadequate fruit and vegetables consumption[1].

▶ Health professionals: key actors

- ✓ The patient-doctor relationship is characterized by a high level of trust.
- ✓ Patients want advices from their doctor on their diet.
- ✓ Advices from health professionals are effective.
- ✓ However, nutritional advice remains difficult for doctors (main obstacles: lack of time/ knowledge, lack of impact in the short term, an environment that doesn't facilitate).

Two complementary fields of action:



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EGEA edition 8
International conference

EGEA 2018 STATEMENT

NUTRITION & HEALTH : FROM SCIENCE TO PRACTICE

Scientific Committee

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The World Health Organization defines healthy diets as:

- **Adequate, comprising sufficient food for a healthy life.**
- **Diverse, containing a variety of foods, including plenty of fruits and vegetables, legumes and whole grains.**
- **Low in food components of public health concern such as sugar and salt which should be consumed in moderation, saturated fats that should be replaced by unsaturated fats and trans fats that should be completely eliminated from industrial food products.**

Low consumption of F&V: a universal health issue

Adopting a healthy lifestyle i.e. healthy diet and physical activity, could substantially reduce premature mortality and prolong life expectancy. The energy-balance is a two-sided spectrum in which both nutrition and physical activity should be addressed. However the statement will focus mainly on nutrition.

Despite numerous actions deployed and the prospect of a global obesity epidemic, a high proportion of the world population, mainly in the so-called "Western countries", does not meet the WHO dietary recommendations in terms of F&V consumption. Numerous campaigns have been launched on a global level to promote public awareness of the need for better nutrition, but even so, new initiatives with more innovative methods are needed both to make F&V more accessible and to promote their consumption.

In France, the National Nutrition and Health Program (PNNS), launched in 2001, is a public health plan aimed at improving the health status of the population by acting on one of its major determinants: nutrition. The growing awareness of the health issues of nutrition has led in recent years to strong government mobilization for the establishment of a real nutrition policy, which relies on the action of multiple actors involved in prevention: health care professionals, public institutional partners, associations, media and economic actors. One of the main objectives is to increase F&V consumption to at least 5 portions per day.

Consuming F&V from early age to prevent non-communicable diseases - NCDs

Health authorities are facing significant challenges posed by changes in food availability and eating habits and a parallel increase in the incidence and prevalence of the NCDs, especially those related to diet and obesity. There is a broad cons ensus on the health benefits of regularly consuming F&V: eating F&V daily helps reducing the risk of obesity, heart attack, high blood pressure, stroke, diabetes and numerous cancers and many other chronic diseases as well. So WHO considers low F&V consumption as a modifiable risk factor for population health.

Boosting the consumption of F&V from the earliest possible age is a key pillar of a healthy diet for preventing many NCDs. Evidence shows that a healthy diet is needed in the preconception phase to facilitate early foetal development and growth, and to facilitate optimum growth throughout fetal life. With this in mind, it is crucial to formulate behaviour change approaches for the prevention of non-communicable diseases through public health initiatives to boost health standards in the young as well as adolescents and young adults – a time when they are traditionally less concerned about NCDs.

However, public health authorities alone cannot establish healthy eating habits among EU citizens. We need a health-in-all-policies and multi-stakeholder approach to effectively address the challenges. We need commitment from those sectors and those stakeholders that often have the largest influence on the health of our children. One of those sectors is the agriculture sector. It is vital that we move towards a nutrition sensitive agriculture and towards a food production that is increasingly in line with international and national governmental dietary guidelines.

The United Nations General Assembly has declared the period "2016/2025 – A Decade of Action on Nutrition" as part of efforts to turn their previous commitments into concrete action with a special emphasis on the need for an optimum healthy diet for mothers and babies during the first 1,000 days of life i.e. from conception to 2 years of age.

Parents need assistance for making appropriate consumption choices, particularly in terms of fruit and vegetables intakes: they are facing a perpetual challenge to provide their children with this heathy diet day in, day out, in a remarkably unhealthy marketing and food environment that insidiously promotes inappropriate foods so that children prefer unhealthy foods and shun healthy food, especially F&V.

We already know that maternal risk factors for childhood obesity include excess preconception maternal weight and excessive weight gain during pregnancy as well as the impact of increased birth weight and excessively rapid weight gain before the age of two. So this underlines the need to emphasize prevention throughout all stages of life.

Healthcare professionals have a key role to play

Healthcare professionals and mainly general practitioners and paediatricians are usually in the front line for initiating preventive measures which include practical and specific personal advice and emphasizing the patient's role in promoting healthy nutrition policies - locally at home as well as at school and in the community. Health professionals have a unique role given their confidential and open relationship with their patients.

Patients usually feel that physicians are their most authoritative and credible sources for information on diet and nutrition so this places a great responsibility on health professionals; a recent European meta-analysis showed an increase of 59.3% in fruit and vegetable consumption following the nutritional advice provided by a health professional.

Despite its effectiveness, nutritional counselling remains a difficult topic for doctors to address. The main hurdles are:

- The lack of knowledge, training and confidence of many physicians in advising on healthy dietary patterns,
- The limited time they have with each patient,
- The lack of a visible short-term impact of nutrition changes, given the current sub-optimal European environment of intense marketing with the promotion of inappropriate foods and food systems.

An ideal doctor-patient dialog for prevention and treatment of NCDs should be part of every medical check and would incorporate advice on lifestyle modification, including dietary counselling since this can also often improve the impact and choice of optimal medical therapy.

Personalized, participatory, sustained, information-technologies supported, life style accessible to patients is an innovative approach and research area for the prevention of NCDs, especially during the preconception period, pregnancy and early infancy.

Globally limited nutrition education in medical courses and training

University medical courses globally assign very few hours to nutrition knowledge and still less for nutritional education of patients. Improving the nutritional knowledge of primary healthcare professionals is one of the objectives of the WHO action plan for diet and nutrition policy from 2015 to 2020.

A European study initiated in the framework of EUROPREV evaluated the knowledge and attitudes of European doctors about primary prevention (patient counseling for overweight and tools used for eating practices). 58% of physicians felt they could help only a little or not at all when attempting to assist patients in achieving or maintaining their normal weight even if they were convinced of the relevance of helping patients in this endeavour.

Now some medical schools are changing their policies on nutrition as they become aware of the need for effective nutritional education for medical students. For example, some American medical schools are ensuring that the public health message of "5-9 portions of F&V a day" is followed by more and more doctors themselves. They also recommend actually prescribing F&V for those patients who can then follow the rule that this is "Just what the doctor ordered for themselves".

More medical schools are also advocating the incorporation of practical kitchen teaching into their curricula to help train the next generation of doctors. Medical schools have traditionally had anatomy labs but what about developing teaching kitchens so that doctors understand the practicalities of achieving a nutritious diet?

Teaching nutrition by giving people lists of facts is not the same as inviting students into the kitchen and having a clinician, a dietitian and chef talk to them collectively about how to advise patients about the variety of food choices, appropriate shopping and cooking, plating and portion control

as well as matching the cost constraints of some patients by producing a varied, pleasurable and high nutritional quality meal at affordable cost.

In the United Kingdom, things are beginning to change in some medical schools. University of Cambridge plans to double the amount of core course content on nutrition. Similarly, Bristol medical school has sought input from students to redesign its curriculum.

In France, the French Ministers of Solidarities and Health, and Higher Education, Research and Innovation on February 26th 2018, presented a new project: the establishment of a three-month course in all preventive health issues. The system aims to familiarize future health professionals with prevention issues and will concern 47,000 students in the fall of 2018, and then will be generalized in September 2019. They will intervene particularly in schools and universities, in order to promote healthy behaviors, focusing on priority public health themes, including nutrition.

There are also already internet accessible continuing medical education courses for qualified health professionals e.g. the annual "Healthy Kitchens, Healthy Lives" conference that teams the Harvard School of Public Health with the Culinary Institute of America to help bridge nutrition science, health care, and the culinary arts.

Doctor and dietitian collaboration to be strengthened

Dietitians are educated in nutritional science and its practical details in relation to health and wellbeing. So they are well placed to help make effective interventions or policy decisions to improve nutritional health and wellbeing at local, regional and national level. They work with all age groups and across diverse cultures, socioeconomic conditions, clinically, in public health and in food supply and catering.

GPs usually consider dietitians as a suitable health care provider for the dietary treatment of patients who need a nutritional support as part of the therapy and refer patients when regular contact with a dietitian is needed. However, high costs of dietitian consultations and the limited number of dietitians are often a reasonable barrier for not referring patients for dietetic help and considering other suitable community weight management groups.

Suitable reimbursement systems for medical nutrition therapy vary widely between countries. For example, in the USA, reimbursement for dietetic services depends on the patient's disease and the terms of their medical insurance policy. In Australia, only patients with chronic conditions and complex care needs can claim reimbursement for a limit of five consultations each year with an allied health care professional. Canada also has limitations on reimbursement.

In most European countries, dietician consultations are not reimbursed. In the Netherlands, in 2006, the basic insurance coverage included reimbursement for dietetic treatment in primary health care, and covered up to 4 hours per year on condition that the patient had a medical indication and was referred by a physician.

However, in 2012, insurance with reimbursement was restricted to only include patients with specific chronic diseases (type 2 diabetes, cardiovascular risks, or chronic obstructive pulmonary disease) who are receiving interdisciplinary coordinated care, as part of a disease management program. However, dietetic involvement in these programs is not an absolutely intrinsic component of these care programs. This proved to be a difficult and costly issue so, in 2013, remuneration of dietetic treatment changed again: dietitians are now reimbursed for up to a maximum of 3 hours per year for all medical conditions. On the other hand, the National Health Systems in Portugal and the UK provide dietetic advices by dietitians for all medical conditions within interdisciplinary teams in primary care.

Despite a clear need for new policies to reimburse dietitians, neither insurance companies nor national health systems see nutrition as a preventive and therapeutic tool. To strengthen interdisciplinary collaboration between GPs and dietitians with increased supportive nutritional and dietary advice for patients, the reimbursement could be made either by an insurance system or by local, regional or national authorities.

Current nutrition situation highlights a failed food system which is both unhealthy for humans and for the planet's sustainability

Food systems are continuing to undergo rapid transformation which is affecting our food choices and consumption patterns. Drivers of this transformation include the changing buying power of consumers due to inflation and income inequality, as well as the emergence of digital food marketing techniques that deliver personalized, behaviorally targeted, location-based promotions directly to the individual's smartphone or tablet at the times when they are most vulnerable to the marketing messages. Increased consumption of energy-dense, processed and heavily marketed products is occurring alongside, and contributing to, household food insecurity in families, particularly those of lower socioeconomic status, who do not have consistent access to healthy, nutritious foods. There appears to be growing political and public acceptability of government interventions such as taxes on sugary drinks or restrictions on marketing of unhealthy foods to children.

Currently, signals sent in many food environments do not encourage choices that are consistent with healthy diets and good nutrition outcomes.

In UK, the Government published, in 2013, a recommended voluntary front-of-pack (FOP) nutrition labelling scheme using traffic lights to indicate low, medium or high levels of energy, fat, saturated fat, salt and sugar. In France, the government also proposed in 2017 to use Nutri-Score scheme, a voluntary traffic light FOP labelling providing an overall assessment of the nutritional quality of a product. The nutrition criteria for the scheme are based on the nutrient profile model developed by the Food Standards Agency in the UK for regulating advertisement on television to children of "unhealthy foods". The Finnish Heart Symbol scheme indicates which foods in product categories are healthier in terms of quantity and quality of fat and salt, and, in some product groups, sugar and fiber.

In France, doctors consider campaigns to raise awareness of the need for better nutrition among the general public as a cornerstone of their work as such public campaigns tend to facilitate their own medical efforts to convey the right practical nutritional information.

Unfortunately, national information campaigns (via posters, TV, radio...) highlighting the importance of a healthy diet rich in fruit and vegetables continue to be too sporadic, underdeveloped and lack impact compared with the overwhelming marketing of highly processed foods..

Helping school children eat healthily: Pediatricians and GPs as a vital force for education and impact assessment

Schools should be a protected setting where children can learn and experience healthy dietary habits. A range of tools and measures are available that could be joined up for optimum school food provision. Health-minded food procurement would ensure that school meals meet nutrition standards defined in school food policies. In addition, Member States can enroll in the European Commission-funded school fruit, vegetable and milk scheme designed to help promote the benefits of healthy eating to children and encourage them to increase their consumption of fruit, vegetables and milk. Research shows that successful interventions to promote fruit and vegetable intake in school children combine actions at the educational, environmental and family level, thus creating positive and engaging settings in which the healthy choice becomes the easy choice. As doctors are a trusted source of nutrition information, they can greatly support these educational efforts. Moreover, monitoring and evaluation is key to understanding which practical approaches work best in a given context; general practitioners are a vital force in assessing related health impacts.

Translating science into daily practice

Following this Egea conference, advice sheets based on recommendations issued by stakeholders will be developed and shared with health professionals within the coming two years. These sheets will help them translate science into their daily practice.

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F&V - KEY COMPONENT OF A HEALTHY DIET

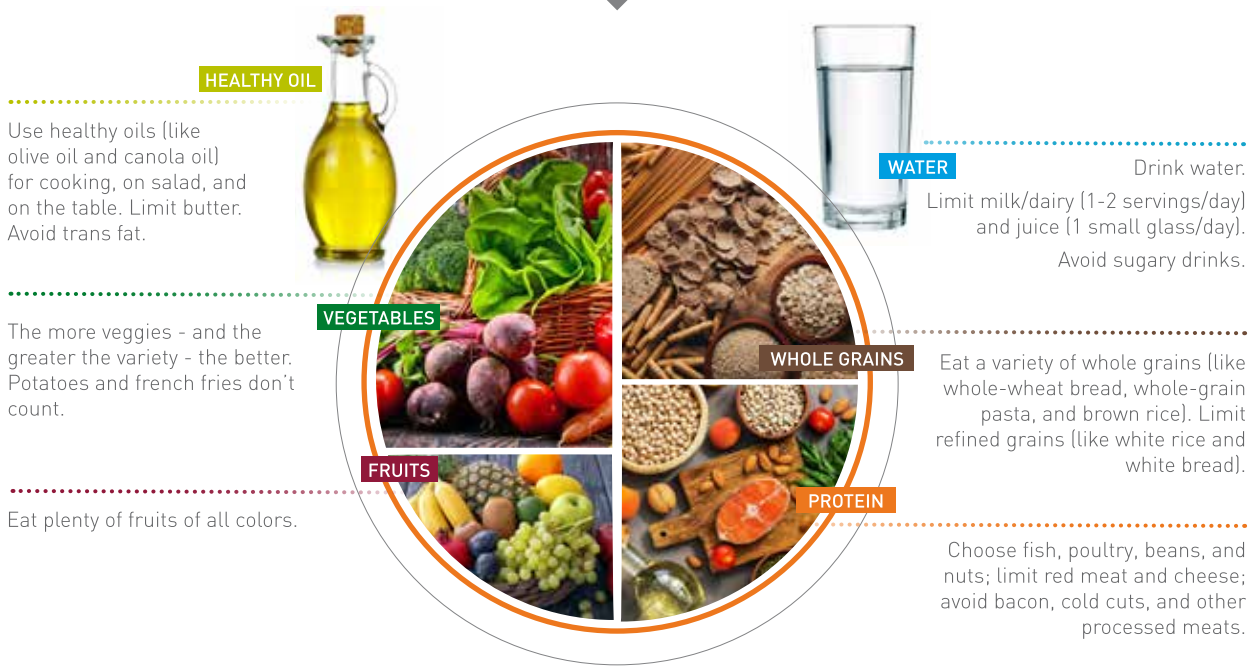
DEFINITION OF A « HEALTHY DIET »

- The World Health Organization defines healthy diets as:
- Diverse, containing a variety of foods, including:
  - Fruit and vegetables (F&V) : >400 g/day
  - Legumes (e.g. lentils, beans), whole grains and nuts.
- Low in food components of public health concern such as:
  - Free sugars : <10% of total energy ~50 g (~12 teaspoons)
    For additional health benefits: <5% of total energy
  - Salt : <5 g/day (~1 teaspoon)
  - Fats: with preference for unsaturated fats[1].

- Basic principles of what constitutes a healthy diet remain the same despite individual characteristic diversity (e.g. age, gender, lifestyle and degree of physical activity), cultural context, locally available foods and dietary customs[1].

- Increased production of processed foods, rapid urbanization and changing lifestyles has led to a shift in dietary patterns. People are now consuming more foods high in energy, fats, free sugars and salt/sodium, and many people do not eat enough fruit, vegetables and other foods rich in dietary fibers such as whole grains[1].

FIGURE 1: HEALTHY EATING PLATE[2]



Adapted from Harvard School of Public Health

Healthy diet and non-communicable diseases (NCDs) prevention

- A **healthy diet helps to protect against malnutrition** in all its forms, as well as NCDs, such as diabetes, heart disease, stroke and cancers[1].

- **NCDs have become the leading cause of death worldwide,** and haven't stopped increasing. In 2016, NCDs caused 71% of all deaths in the world[3].

- There's increasing evidence that the risk of **NCDs begin in fetal life** and continue into older age[4].

- **Unhealthy food** consumption, including inadequate consumption of F&V, is a **major risk factor for obesity and related NCDs**[5].

1. F&V consumption and NCDs prevention

- **Daily consumption of F&V**, one of the cornerstones of a healthy diet and key components of all healthy dietary patterns, is highly **recommended across worldwide dietary guidelines**[6].

- For **every 200 g of F&V** consumed, there's 10% risk reduction of all-cause premature mortality[7].

- Increasing the consumption of F&V from the **earliest possible age** is a key pillar of a healthy diet for preventing many NCDs[8].

There is now a strong consensus that a regular consumption of F&V helps reducing the risk of heart attack, high blood pressure, stroke, diabetes, numerous cancers and many other NCDs.

2. Low consumption of F&V: a universal health issue

- **Insufficient consumption of F&V** is a risk factor for NCDs and for health[9].

- An estimated **3.9 million deaths worldwide** were attributable to inadequate F&V consumption in 2017[9].

- F&V consumption in Europe is below international (at least 400g of F&V a day – WHO) and national (at least 5 portions of F&V a day in France – PNNS) recommendations[10].

- **Only 12% of European**s reach the 5 portions of F&V a day[5]. Almost 35% of Europeans over 15 year-olds do not consume any portion of F&V daily[10].

- This low consumption of F&V is partly due to **food systems** which are continuing to undergo rapid transformation and affecting our food choices and consumption patterns[11].

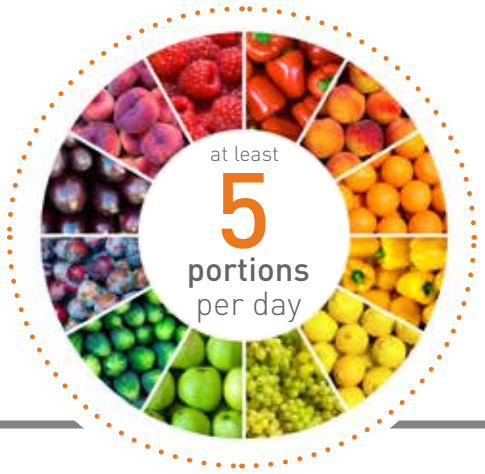
F&V: PRACTICAL ADVICE ON MAINTAINING A HEALTHY DIET

Eating at least **400 g**, or five portions, of F&V per day **reduces the risk of NCDs** and helps to ensure an adequate daily intake of **dietary fiber.**

F&V intake can be improved by:

- always including vegetables in meals;
- eating fruit and raw vegetables as snacks;
- eating F&V that are in season;
- eating a variety of F&V[1].

F&V should be consumed in all their forms: fresh, frozen, canned, cooked, raw, and also in form of compote (home-made and preferably without added sugar), soup ...[12, 13]



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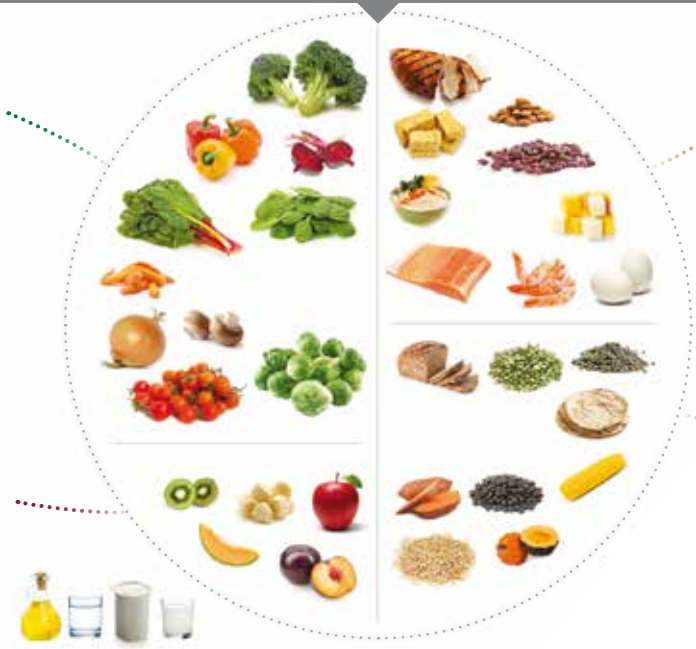
F&V CONSUMPTION DURING PREGNANCY

- Pregnancy is a **unique time in the life course** where the short and long-term health of mother and baby can be influenced. It is the best time to introduce diet and physical activity based interventions effective in reducing gestational weight gain and caesarean section odds[1], as women are **open to change** and very **motivated** by the health of their child[2].
- Inadequate nutrition and excessive weight gain during pregnancy have **negative impacts** on the **duration and outcome of pregnancy** including gestational hypertension and diabetes, preterm delivery, and foetal growth restriction, future health of offsprings by increasing the risk of non-communicable diseases (NCDs)[3].
- Before and during pregnancy, **health professionals are key actors** to deliver clear information for women and their partners about the role of a **healthy diet characterized by high intake of F&V** on the long-term health of the mother and the child.

FIGURE 1: MY PREGNANCY PLATE[4]



- **Choose large portions of a variety of non-starchy vegetables,** such as leafy greens, broccoli, carrots, peppers or cabbage (raw, stewed or made into soup[3]).

  Avoid preserved, salted and deep-fried vegetables[3].

- **Choose a variety of whole fruits.**

  Fruit is great for snacks and desserts, too.

  Limit juice and dried fruits.

- **Choose protein sources** such as poultry, beans, nuts, low-mercury fish & seafood, eggs, tofu or low-fat cheese.

  Limit red meat and avoid cold cuts and other processed meats.

  Avoid fish that may contain high amount of mercury (dogfish, tuna, swordfish, lampry, ...)

- **Choose whole grains,** such as whole wheat bread or pasta, brown rice, quinoa or oats, beans, lentils, sweet potatoes.

  Limit white bread, white rice and fried potatoes.

Adapted from Oregon Health & Science University, by Aprifel

Key recommendations during pregnancy

1. Comprehensive balanced diet

All pregnant women do not require systematic vitamin and minerals supplements with the exception of vitamin D, folic acid, iron and iodine in some cases[3].

A comprehensive balanced diet is one that **includes all product groups**.

- **At least 5 servings of F&V** (400-500g) are recommended per day [3]. The more the mother consumes various F&V during pregnancy, the more her child will accept to try new F&V later in life[5].
- Cereals: with more than half of them **wholegrain products.**
- Dairy products: **low-fat, without sugar** or artificial sweeteners.
- Protein-containing foods: preferably **lean meat, fish** (2 times/week), eggs, and **plant-based foods** such as legumes (beans, lentils, and peas), **nuts** and **seeds**.
- Oils: with sufficient quantities of **mono-unsaturated** fats (olive oil, grapeseed oil) and **ω-3 fatty acids** (colza)[3].

2. Eating well and not more

Pregnant women require only a **slight increase in energy and in body weight (Table 1)**. Energy intake should be increased from **100 kcal/day** during the 1st trimester to **300 kcal/day** during the 3rd [3].

This slight increase in energy can be provided by **adding more F&V** to the meal because they can help in body weight control due to their **low-energy density and satietogenic effect[6].**

F&V are highly recommended during pregnancy because they contain dietary fibers, vitamins and minerals **(Figure 2)**.

Table 1: Recommended weight gain during pregnancy based on pre-pregnancy BMI[3]

PRE-PREGNANCY BMI (KG/M²)*	RECOMMENDED WEIGHT GAIN (KG)
Underweight ‹ 18.9	13 to 18
Normal weight 18.9–24.9	10 to 16
Overweight BMI 25–29.9	7 to 11
Obese › 30	5 to 9

** FDs/GPs are advised to avoid direct reference to BMI category names and to use objective language, such as in the following sentence: **'On the basis of your pre-pregnancy weight, you should aim to gain xx–xx kg for the healthiest pregnancy possible'** [7] **(Table 1)**.*

Also, pregnant women should maintain good glycemic control. There are many **maternal benefits following introduction of the low glycemic index** diet:

1. **Lower glycaemic load** in 2nd and 3rd trimesters.
2. **Less gestational weight gain** of 1.3 kg.
3. **Improved glucose homeostasis.**
4. **Improved nutrient and food intakes**: High fiber intake, with increase of F&V consumption[9].

REGULAR MODERATE PHYSICAL ACTIVITY

Physical activity improve the health of the mother and the child.

It reduces the risks of gestational diabetes and pre-eclampsia, help control weight gain, and promote psycho-emotional health.

Pregnant women should:

- **be active everyday**: routine activities and physical exercise (if there's no medical contraindication);
- **engage in sports involving diverse muscle groups** (e.g. walking, cycling, swimming);

- **avoid sports that could result in trauma or falls** (e.g. combat sports, diving, jumping)[3].

FIGURE 2 : ROLE OF SOME NUTRIENTS THAT F&V CONTAIN

- **Folic acid (vitamin B9)** *(mainly in green-leafy vegetables)* required for:
  - maternal erythropoiesis,
  - DNA synthesis,
  - growth of the placenta
  - development of the fetal spinal cord during the 1st month of pregnancy (*spina bifida* prevention)[3].
- **Dietary fibers,** required to:
  - increase satiety[8],
  - prevent constipation,
  - reduce the risks of gestational diabetes, pre-eclampsia and haemorrhoidal vein disease[3].
- **Vitamin C,** required for:
  - collagen synthesis
  - pre-eclamptic toxemia prevention[3].
- **Pro-vitamin A carotenoids** *(ß- carotene & lutein),* required for:
  - the development of the skin, mucous membranes, skeletal system
  - visual and immune functions[3].

SAFE NUTRITION

During pregnancy, the **immune system is partially suppressed** which increase the risk for food born infections such as *Toxoplasma gondii* (found in uncooked animal-based products, unwashed vegetables and berries) and *Listeria monocytogenes* (found in improperly stored products).

To avoid infections, these recommendations should be followed:

- Avoid **animal-based uncooked products** : raw meat/eggs/fish/seafood, undercooked meat (ham, sausages), smoked fish, unpasteurized milk;
- Avoid **uncooked and sprouted seeds, grain and beans**;
- Avoid **soft cheese** (brie, feta, blue cheese) unless the product was prepared from pasteurized milk;
- **Wash carefully** vegetables, salad leaves and fruits;
- **Consume immediately food** after cooking;
- **Hygiene requirements**: hands washed, food adequately stored, and kitchen utensils separated for cooked and uncooked products[3].

Cases for special attention

Special attention and individualized dietary recommendations should be made to pregnant women in the following cases:

- **Maternal obesity** (BMI>30 kg/m²), associated with higher risks for spontaneous abortion, premature birth, gestational diabetes, and arterial hypertension for the mother and a higher risk for increased body mass, heart disease and neural tube defect for the newborn.
- **Adolescent pregnancy**, often accompanied by a poor diet, alcohol consumption and smoking - main risk factors for mother and child's health.
- **Pregnant women with a vegan, fruitarian or macrobiotic diet** who have risk protein, ω-3 fatty acids, multiple vitamin (especially vitamin B12) or mineral deficiency (i.e. zinc)[3].

For further information:
→ figure 3 of sheet 5 - Glycemic index definition
→ sheet 12 "F&V: energy, nutrients and claims"

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HOW AND WHY F&V PREVENT CVDs ?

- Cardiovascular diseases (CVDs) are the **major cause of death,** representing 31% of all deaths globally and 45% of all death in Europe[1].
- Despite recent progress, CVDs remains the **leading cause of illness and disability** as well with 23% of the years lost to death or disability across the region. More than 85 million people across Europe live with CVDs[2].
- **Most CVDs can be prevented:** 80% of premature heart disease and stroke is preventable by controlling behavioral risk factors such as unhealthy diet, physical inactivity, tobacco use and harmful use of alcohol[1].
- **Dietary risks** are a major contributor to CVDs, responsible for 56% of all the years lost to disability or death from CVDs in the European region[2].
- There is growing evidence about the **importance of nutrition early in life** – before and during pregnancy, infancy and early childhood – on later health outcomes. Healthy infant and young child nutrition is important for the prevention of CVDs (through protection against risk factors such as overweight, obesity and diabetes) later in life[2].

CVDs in the world

> 31 % all of deaths globally

> 45 % all of deaths in Europe

> 80 % all of premature heart disease and stroke is preventable by controlling behavioral risk factors

> 56 % all of the years lost to disability or death from CVD in the European region

FIGURE 1: CARDIOVASCULAR HEALTH-PROMOTING DIET

Cardiovascular health-promoting diet

A plant based diet is evidence established and considered as a cardiovascular health-promoting. Such a diet includes **vegetables, fruit and berries** in abundance. Whole grain products, nuts and seeds, fish, pulses, low-fat dairy products are also important. This everyday dietary pattern also means **limited consumption of red meat, processed meat products** and foods or drinks with low content of vitamins, minerals and dietary fiber and/or a high content of free sugars, saturated/trans fats or salt **(Figure 1).**

Regarding controversies about dietary recommendations there is still robust evidence for the messages to limit **salt consumption and to decrease saturated fat** (if consumed in excess) and to replace them with unsaturated fats or fiber-rich complex carbohydrates **(Table 1)**[2].

Table 1: Dietary recommendations for a cardiovascular health-promoting diet[2, 3]

FOODS AND OTHER RELATED GOALS	
Fruit and vegetables	400-600 g/day
Sugar sweetened- drinks	decrease as much as possible
Body mass index (BMI)	20-25 kg/m^2
NUTRIENTS AND OTHER COMPONENTS	
Proteins	10 to 20% of total calories
Total fat	25-40%
Saturated fat	7-12% of total calories - To partially be replaced by unsaturated fats and fiber-rich complex carbohydrates
Trans fats	‹ 0.5% of calories, of which 0% from industrially-produced trans-fat
Total carbohydrates	45-65% of calories
Fiber	25-30 g/day
Free sugars	‹ 10% of calories
Salt	5-6 g/day (=2-2.4 g of sodium)

F&V and CVDs prevention

The evidence that higher intakes of F&V are protective against premature death, and more specifically, against cardiovascular deaths and the risk of stroke has strengthened in recent years[2].

This **protective effect increases in proportion to higher consumption,** showing that "more is better"[4].

The risk reduction is already at 100 g intake of F&V and continues as well at highest intake levels up to 800 g **(Table 2)**.

Diets supplemented with 4 tablespoon of extra virgin olive oil per day or 30 g of unsalted nuts per day have ~30% risk reduction of CVDs over 5 years[6].

Table 2: F&V intake and risk reduction of CVDs, coronary heart disease and stroke [4, 5]

	100 g/d	200 g/d	500 g/d	800 g/d
CVDs	4 to 10%	8 to 13%	22%	28%
Coronary heart disease	4 to 14%	8 to 16%	16%	24%
Stroke	7 to 14%	13 to 18%	28%	33%

How F&V lower CVDs' risk?

Multiple mechanisms are involved in CVD prevention through F&V consumption.

Because of their **low-energy density** and **satietogenic** effect, F&V intake helps **controlling body weight.** For each daily serving of F&V, there's 240g and 113g of weight loss, respectively[7].

Their high content in micronutrients with antioxidant effect (vitamins, polyphenols, and carotenoids) is protective **against oxidative stress** and **lipid peroxidation**[8].

F&V intake reduces:

- **blood cholesterol** because of their high content **in dietary fiber**[9, 10]. An increase in soluble dietary fibers of 5-10 g/day reduces 5% LDL-cholesterol.

- **blood pressure** because of their high content in potassium which is opposed to the hypertensive effect of sodium. There's a decrease of 3.3 to 2.1 mmHg for a mean increase of 51 mmol/day of potassium[11].

- **plasma homocysteine** due to their **folic acid** content (vitamin B9). A daily consumption of 500 g of F&V containing 228.1 µg reduces by 11% plasma homocysteine[12].

- **inflammation** due to their high content in **dietary fiber and micronutrients with antioxidant effect.** A high consumption of F&V is associated with the lowest high sensitivity C-reactive protein (hs-CRP) ⩽0.15 mg/L, an inflammatory biomarquer[13].

For further information:
→ sheet 12 "F&V: energy, nutrients and claims"

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HOW AND WHY F&V PREVENT CANCERS?

Cancers are the second leading cause of death globally and are responsible for ~1 in 6 deaths.

In high-income countries[a], lung, colon, rectum and breast cancers are the most diagnosed cancers.

In upper-middle income countries[b], it's basically respiratory cancers particularly lung, liver and stomach cancers. For both sexes combined, lung cancer is the most commonly diagnosed (11.6% of the total cases)[1].

FIGURE 1: CANCER PREVENTION RECOMMENDATIONS

Source: World Cancer Research Fund/American Institute for Cancer Research. Diet, Nutrition, Physical Activity and Cancer: a Global Perspective. Continuous Update Project Expert Report 2018. Available at dietandcancerreport.org

F&V and cancer prevention

Many cases of cancers are preventable because a range of modifiable lifestyle and environmental factors can have a strong influence on cancer risk even though, some risk factors, such as inherited mutations, are already fixed.

Not smoking, having an adequate diet, being physically active and maintaining a healthy body weight could reduce the global burden of cancer[2]. Healthy dietary patterns - all characterized by high intake of fruits, vegetables and cereals and low intake of animal foods - are associated with a risk reduction of colorectal and breast cancer[3].

F&V consumption is a key element of World Cancer Research Funds recommendations (WCRF) for cancer prevention **(Figure 1)**. There is strong evidence that F&V are related to the risk of aerodigestive cancers, and there is suggestive evidence of a protective effect for other cancers **(Table 1)**.

Table 1: Evidence* for F&V consumption and protection or increase risk[2]

CONVINCING EVIDENCE OF PROTECTION	
F&V	Aerodigestive cancers (mouth, pharynx, larynx, esophagus)
Foods containing dietary fiber	Colorectal
EVIDENCE OF PROTECTION GRADED "SUGGESTIVE"	
F&V	- Esophagus - Lung (in people who smoke/used to smoke) - Bladder
Vegetables	- Breast - Mouth, pharynx, larynx
Citrus fruits	- Stomach (cardia)
Foods containing carotenoids	- Lung - Breast
Foods containing vitamin C	- Lung (in people who smoke/used to smoke) - Colon
EVIDENCE OF RISK INCREASE GRADED "SUGGESTIVE"	
Low consumption of F&V	Colorectal
Low consumption of fruits	Stomach

[a] *Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Spain, UK, USA, ...*
[b] *Brazil, Bulgaria, Mexico, Romania, Russian Federation, ...*

Also, F&V consumption is associated with:

- **lower level of body adiposity** - intermediate factor in the pathway of developing several cancers;
- **reduced risk** of other chronic diseases, such as cardiovascular diseases[2].

It has been estimated that 6,9 to 8 % of cancers may be avoided if everybody has a consumption of F&V between 500g to more than 800 g of F&V / day[4].

Furthermore, low F&V intake is a risk factor for some cancers **(Table 1)** through multiple mechanisms such as inducing genome instability, reducing apoptosis and increasing cellular proliferation and inflammation[2].

EAT A DIET RICH IN WHOLEGRAINS, VEGETABLES, FRUITS AND LEGUMES[2]

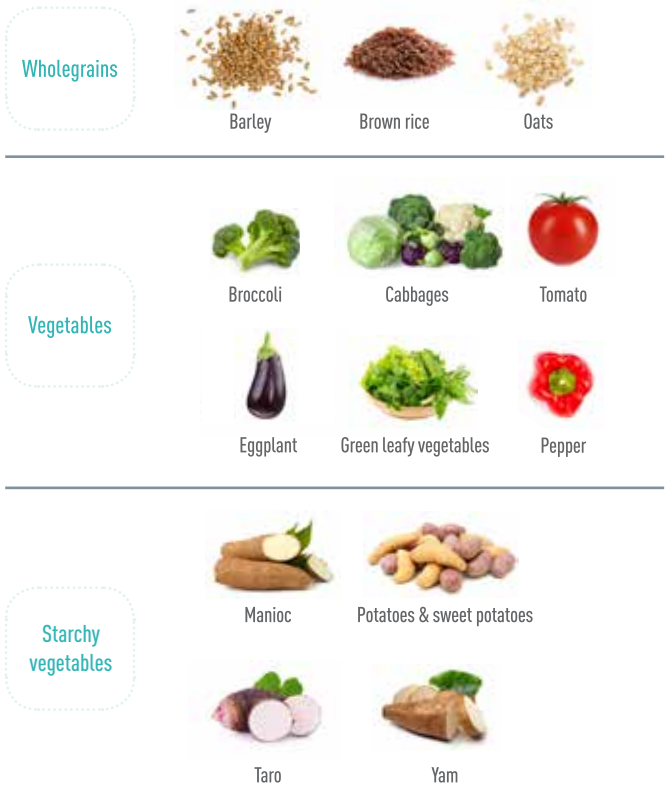
GOALS

1. Consume a diet that provides at least **30 grams per day of fiber** from food sources (i.e. wholegrains, non-starchy vegetables and fruit of different colors), legumes.

2. Include in most meals foods containing **wholegrains, non-starchy vegetables, fruit and legumes** such as beans and lentils.

3. Eat a diet high in **all types of plant foods** including **at least 5 portions** (1 portion ~ 80g) of a **variety of non-starchy vegetables and fruit every day.**

4. If you eat starchy roots and tubers as staple foods, eat non-starchy vegetables, fruit and pulses (legumes) regularly too if possible.



**The WCRF/AICR criteria consider a range of factors including:*

- *the quality, the number and the type of the studies,*
- *whether there is any unexplained heterogeneity between results from different studies or populations,*
- *whether there is a dose–response relationship,*
- *whether there is evidence of plausible biological mechanisms at typical levels of exposure.*

The clearly defined grading criteria enable evidence to be classified as:

- *'strong' ('convincing', 'probable' or 'substantial effect on risk unlikely') or*
- *'limited' ('limited – suggestive' or 'limited – no conclusion').*

Only evidence judged to be strong is usually used as the basis for Recommendations[2].

For further information:
→ sheet 12 "F&V: energy, nutrients and claims"

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HOW AND WHY F&V PREVENT TYPE 2 DIABETES?

Globally, diabetes is the seventh leading cause of death. The number of adults aged between 20 and 79 years old with type 2 diabetes (T2D) has almost tripled during the last two decades with more than 620 million adults estimated to have diabetes by 2045, and 90% of cases are likely to be T2D[1].

In Europe, 58 million people are living with diabetes and the number is estimated to increase by 16% in 2045[1,2].

In France, 1 over 10 subjects has diabetes[3].

The documented prevalence of T2D in children and adolescents ranges from <2/10000 cases per non-Hispanic White population to ~12/10000 cases per American Indian population[4]. However, the incidence of youth-onset T2D (diagnosis of T2D in those ≤25 years of age) is increasing annually by 7.1% in some countries[5].

Diabetes exposes the patient to severe complications by multiplying by:
- 8 the risk of amputation
- 8 the risk of myocardial infarction or stroke
- 9 the risk of dialysis for end-stage renal failure.

Diabetes is also the 1st cause of blindness in adults and can have a dramatic impact on the quality of life and especially in cases of severe neuropathy[3] but is also known to present with multiple comorbidities in juveniles[6].

Diabetes in the world

> 58 million people in Europe

> 1 over 10 persons in France

> 620 million people globally by 2045

Risk factors of T2D

Numerous factors influence the development of type 2 diabetes **(Figure 1)**. The most influential are lifestyle behaviors such as unhealthy diet, low physical activity, overweight, obesity, and smoking.

Up to 80% of type 2 diabetes could be prevented through healthy diet and regular physical activity.

Diabetes is reduced by 58% in people following lifestyle interventions[5] that recommend the following goals to achieve **(Figure 2)**. Their beneficial effects overcome the impact of family history of diabetes or genetic score and also result in a significant reduction in early diabetic retinopathy[9].

FIGURE 1: RISK FACTORS OF T2D[7]

Risk markers	Possibly modifiable risk factors	Modifiable risk factors
• Age	• Sleep deprivation	• Overweight/obesity
• Family history	• Distress and depression	• Abdominal obesity
• Ethnicity	• Persistent organic polluants	• Unhealthy diet
• Genetic markers	• Microbiota	• Low physical activity
• Gestational diabetes		• Smoking
• Delivery of macrosomic baby		
• Low birth weight		
• Metabolic syndrom, etc.		

FIGURE 2: GOALS TO ACHIEVE IN LIFESTYLE INTERVENTION[8,10]

- **Energy restriction** to induce ⩾ 5% weight loss
- **Moderate fat intake** 30-40% of total energy
- **Low saturate fat intake:** <10% of total energy
- **Physical activity:** ⩾30 min/day
- **High fiber intake** from fruits, vegetables, and wholegrains: 25-30 g/day

F&V and T2D prevention

A sufficient intake of F&V is recommended as part of a healthy diet to reduce the risk of T2D. A higher intake of F&V is associated with a 5 to 13% risk reduction of T2D. Also, an increased consumption of green leafy vegetables, cruciferous vegetables, blueberries and yellow vegetables reduce risk of T2D **(Table 1).**

As well, each 100 g increase in fruit consumption per day is associated with:

- **13% lower** risk of developing diabetes related complications affecting large blood vessels (e.g. ischemic heart disease and stroke).

- **28% lower** risk of developing complications affecting small blood vessels (i.e. kidney diseases, eye diseases, and neuropathy)[12].

Table 1: F&V intake and risk reduction of T2D[11]

Increased consumption of	Risk reduction of T2D by
F&V	5 to 13%
Green leafy vegetables	13%
Cruciferous vegetables	18%
Blueberries	25%
Yellow vegetables	28%

How F&V lower T2D risk?

Many constituents and functional aspects of F&V are responsible for the protective effects against T2D.

- Their high content in **dietary fiber** help them improve the ability to delay the absorption of carbohydrates after a meal and thereby decrease the insulinemic response to dietary carbohydrates. This will result in lower postprandial blood glucose and insulin levels. Dietary fiber also increase satiety and reduce the intake of energy-dense foods, resulting in a reduced risk of overweight and obesity, which is an established risk factor of T2D.

- F&V have an important functional aspect wich is their **low glycemic index (GI)** and glycemic load (Figure 3). This also makes them associated with prolonged satiety response and may further help in weight control[13].

- Due to their high content in **polyphenols,** including flavonoids and **anti-oxidant compounds** (carotenoids, vitamin C and E), F&V decrease the risk of T2D by mitigating the oxidative stress that interferes with the glucose uptake by cells. Berries are particularly rich in anthocyanins phenolic compounds that have beneficial effect on glucose metabolism and body weight regulation[11].

- F&V are also rich in **magnesium** which plays an important role in insulin action and hypomagnesaemia that is well recognized in persons with T2D. Hypomagnesaemia may impair insulin secretion and promote insulin resistance in the diabetic patient[14].

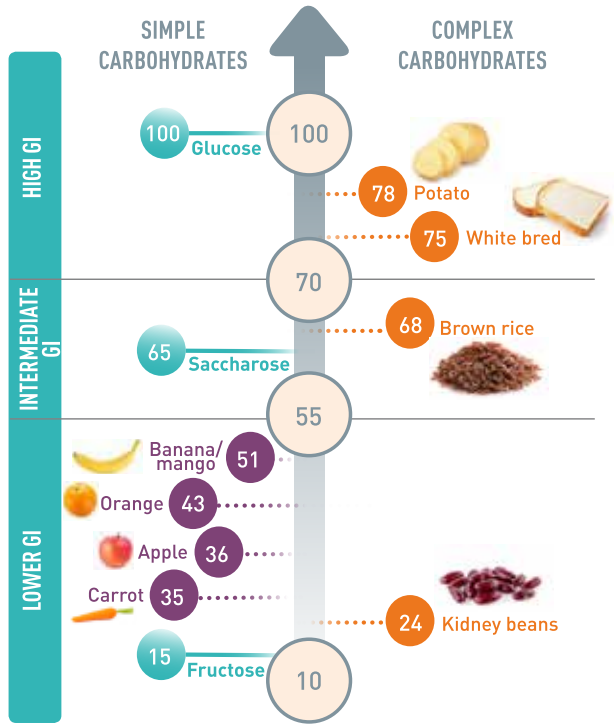
FIGURE 3: GLYCAEMIC INDEX DEFINITION

The GI is a ranking measure of foods based on their acute blood glucose response (GR). It could be influenced by many food aspects:

- nature of the monosaccharide components;
- nature of starch;
- cooking/food processing;
- other food components such as fat and proteins, dietary fiber, organic acids, and antinutrients (e.g. enzyme inhibitors, tannins, lectins and phytates).

The more the carbohydrate in food is digested, absorbed and metabolized slowly, the lower their GI is. Generally, there are 3 categories of foods based on their GI values:

- **High-GI foods (>70):** e.g. white bread, shortgrain white rice, cornflakes, pretzels, etc.
- **Intermediate-GI foods (between 55 and 70):** e.g. whole wheat, rye and pita bread
- **Low-GI foods (<55):** e.g. most fruit, all non-starchy vegetables, legumes and milk[15,16].



For further information:
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HOW AND WHY F&V MUST BE IN COMPLEMENTARY FEEDING?

- Complementary feeding (CF) is a transitional period during which infants over a period of about 2 years gradually consume foods other than human milk or formula milk. WHO recommends to start weaning after 6 months of age[1]. Alternatively, recent recommendations by ESPGHAN* suggests that exclusive or full breast-feeding should be promoted for at least 4 months (17 weeks, beginning of the 5th month of life), but also states that exclusive or predominant breast-feeding for approximately 6 months (26 weeks, beginning of the 7th month) is a desirable goal[2].
- CF period is very important to offer energy and nutrients of quality and quantity suitable for the needs and growth of the infant. It will also help introducing and encouraging the infant to accept new foods with different flavors and textures[3].
- CF also represents a sensitive phase because diet has long-term effects on chronic non-communicable diseases including later obesity via the quality and the quantity of energy intake and nutritional balance[3].
- Parents report to be concerned about the possibility of infants becoming overweight and consider health care providers to be an important source of information on infant weight status[4].

Recommendations for complementary feeding

Food recommendations for CF should be **differentiated between breast-fed and formula-fed infants** since the nutrients content, the taste and the health effects of human milk and formula milk are not the same[2] **(Table 1)**.

Table 1 : Comparison between human milk and formula milk[5-8]

	HUMAN MILK	FORMULA MILK
Nutrient content	Lower protein content than formula milk	Higher protein content as it is suitable for less absorption compared to human milk
	Presence of multiple biological factors of growth regulation and an anti-infectious protection	
	Presence of hormones and peptides regulating the appetite (ex. leptine)	
	Lower content in well absorbed iron (34%)	Higher iron content in starting formula, increasing in the follow up formula
Taste	Different flavors according to food eaten by the mother	Always the same flavor
	Indirect habituation to maternal and family diet and facilitation the introduction of these flavors	
Consistence	Shifts from a watery consistence when starting to suckle to a more nutrient-dense form at the end of the feeding	Constant composition
		Moderate increase in iron and protein intake in second stage formula
Long-term health effects on infants	Promotes the development of subcutaneous adipose tissues as opposed to visceral tissue	Difference in body composition with the possibility of higher BMI
	Partial protective effect on cardiovascular risk and obesity until the end of childhood	
	Small protective effect against hypertension in later life	

As stated above, breast-feeding for approximately 6 months (26 weeks, beginning of the 7th month) is a desirable goal. In any case, with or without personal or family allergic background, **CF shouldn't be started before 4 months** of age due to the risk of allergies, and **not after 6 months** because breast and formula milk can no longer meet alone the nutritional needs and development of the infant. There is no reason to delay diversification for children at risk of allergy beyond 6 months, including food allergens (eggs, fish, wheat, etc.)[9]. In case of food allergy, introduction of CF should be guided by a pediatrician or a pediatric allergology unit. Gradually, the infant becomes able to swallow food from spoon that will be suckled until about 6 months when swallowing movements of the tongue appear. At 9 months appear the chewing movements[1]. That's why parents should start with small amounts of food and increase gradually as the child gets older with a step-wise increase in food consistency and variety, in complement to breastfeeding (≤ 500 ml/d of milk) until 2 years of age or beyond.

It's highly recommended to feed infants slowly and patiently, and encourage them to eat without forcing them. Good hygiene and proper food handling are also required[1].

Foods are usually introduced during lunch[10].

1. Fruit and vegetables

F&V are required because of their high nutritional profile, low-energy density and satietogenic effect (due to their high content in fiber) which is beneficial for both overweight and lean infants[11, 12]. For both breast-fed and formula-fed infants, F&V should be introduced to broaden the perception of flavors since the beginning of CF.

CF should begin with vegetable to ensure their appreciation. After 15 days, fruits are introduced, often preferred by infants due to their sweet flavor[13].

When starting CF, parents can introduce vegetables that are well tolerated by the child by testing them one by one[10] **(Figure 1).**

Infants exposed to a greater variety of vegetables during CF have been shown to also consume a greater variety at 6-year follow-up[14]. During CF, a strong "food learning" process has to take place to develop healthy eating habits. At least 8 repeated exposures to F&V may be necessary in order to accept novelties and acquire preferences. It's preferable to introduce only one fruit or vegetable at a time to let the child get used to the taste, to test the tolerance and adapt the strategy in case of apparent refusal[3, 15]. Importantly, CF is never at the expense of milk: F&V are added to milk which gradually evolves (appearance of dairy products, cheese).

The acceptance rhythm can vary a lot from one child to another[10, 16]. Starting with little pieces of starchy food, facilitates their solubilization and acceptance.

2. Protein foods

High proteins intake in infancy, induces a deleterious high renal workload and seems to be associated with an increased fat mass at different ages and the risk of developing obesity later on[14]. Therefore, scientifically based recommendations for infant formulas and follow-on formulas have been adapted in regard to adequate calcium, vitamins and nutrient contents[17].

3. Fats

Infants and young children have higher needs in lipids than older children and adults. The lipid families must be balanced with one another and provide the fatty acids, including docosahexaenoic acid (DHA), in the recommended proportions. The decrease in lipids intakes will be progressive with the transition to the family diet between 2 and 3 years old. CF, like pregnancy, is a key moment to change habits and adopt a healthy diet for the whole family.

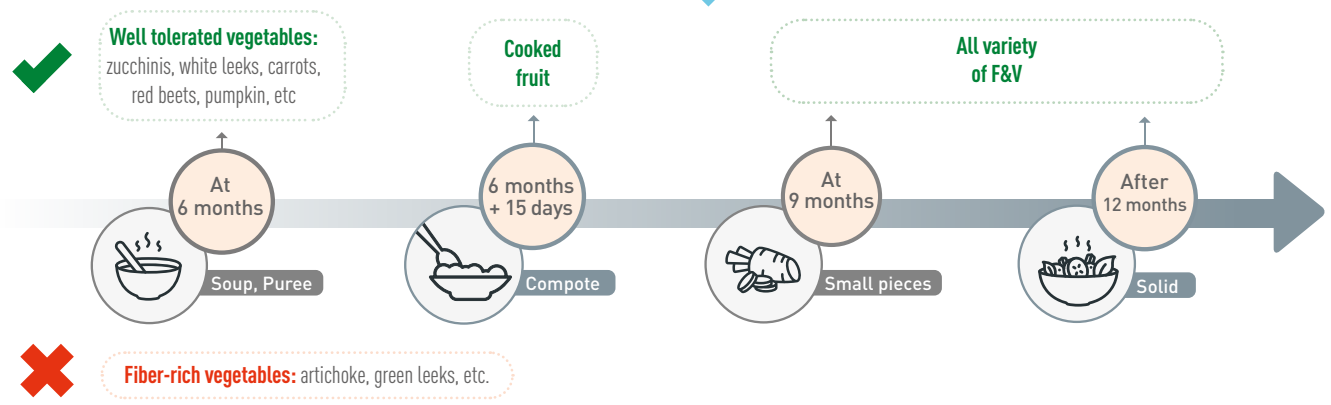
4. Drinks

When new foods are introduced, infants should drink water according to their thirst. Only water is recommended, other sweetened drinks, sodas, fruit juices, vegetable milks and teas are not nutritionally recommended[18, 19].

COW'S MILK

Postponing the introduction of cow's milk until or even beyond the end of the first year is recommended because its composition, in particular in iron, proteins and phosphorus, is unsuitable for young children[20]. Young child formulas overcome this inconvenience[21].

FIGURE 1: RECOMMANDATIONS TO INTRODUCE F&V[10, 16]



Model of complementary feeding: Traditional vs Baby-led weaning

During recent years, another model of weaning has arisen: "baby-led weaning". This model is based on the concept that infants at 6 months choose which foods and how much to eat from a plate of varied finger foods (except foods with obvious danger, like peanuts). It emphasizes on exploring taste, texture, color and smell.

However, data are lacking on whether infants who are fed CF using this approach obtain sufficient nutrients, including energy and iron, or eat a more diverse range of foods[22]. Given this lack of scientific data, baby-led weaning is therefore not recommended[23].

For further information:
→ sheet 12 "F&V: energy, nutrients and claims"

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HOW AND WHY F&V PREVENT OVERWEIGHT AND OBESITY IN ADULTS

- Obesity is a complex, multifactorial, and largely preventable disease[1].
- Worldwide, **overweight and obesity have reached epidemic proportions.** The prevalence has nearly tripled since 1975. In 2016, more than **39 % of adults** aged 18 years and over **were overweight,** and **13 % were obese**[2]. In Europe, **overweight affects 30-70 %** while **obesity affects 10-30 %** of adults[3]. **In France, 17 % of adults** are concerned by obesity[4].
- The main cause of overweight and obesity is a **long-term imbalance between energy intake and energy expenditure** leading to weight gain[1]. In some cases, obesity can be a genetic disorder. However, in most cases, it arises from living in an obesogenic environment that encourages low levels of physical activity, extended sedentary behavior and plentiful consumption of food, especially those rich in energy[5].
- Increased Body Mass Index (BMI)* is a **major risk factor for non-communicable diseases** such as cardiovascular diseases, diabetes, musculoskeletal disorders and some cancers including endometrial, breast, ovarian, prostate, liver, gallbladder, kidney and colon[1,2].

1. Healthy diet and regular physical activity for overweight and obesity prevention

- Overweight and obesity, as well as their related non-communicable diseases, are **largely preventable** by:

  - **limiting the consumption of high-energy-dense products** high in fat and sugar (e.g., sugar-sweetened beverages, processed foods);
  - **increasing the consumption of fruit, vegetables, legumes, whole grains and nuts);**
  - **engaging in regular physical activity** (150 minutes per week for adults)[1, 2].

- Box 1 (see page 2) provides health professionals practical advices that can be given to the patient to prevent overweight and obesity.

2. Fruit and vegetable consumption for overweight and obesity prevention

- F&V consumption is recommended as part of a healthy diet[8] .

- **The WHO recommends to consume more than 5 servings or 400 g of fruit and vegetables per day** for the prevention of chronic diseases, including obesity[9].

- **Increased intake of F&V are associated with weight change over 4 years,** with greater benefits for fruits (regardless of the fiber and glycemic load (GL) content) compared to vegetables, and strongest for apples/pears, berries, cruciferous (broccoli, cabbage, etc.) and green leafy vegetables[10] **(Table 1)**.

- Regarding vegetables, those with higher fiber and lower glycemic load (GL) such as Brussels sprouts, broccoli and string beans, were more strongly inversely associated with weight change compared to lower-fiber and higher-GL vegetables such as carrots and cabbages[10].

3. How fruit and vegetables prevent undesirable weight gain, overweight and obesity?

- Because of their **low-energy density** and **satietogenic effect,** F&V intake helps controlling body weight[11].

Tableau 1 : Weight reduction over 4 years for each increased daily serving of fruit and vegetables[11]

FOR EACH INCREASED DAILY SERVING OF	WEIGHT REDUCTION (G) OVER 4 YEARS
Fruits	
Apple/pears	562
Baies	502
Citrus fruits	122
Total fruits	240
Vegetables	
Cruciferous vegetables	308
Green leafy vegetables	235
Total vegetables	113

- Their satietogenic effect is mainly due to **their high content in dietary fiber which increases satiety and reduces the feeling of hunger.** As a result, this may reduce total energy intake and prevent weight gain[12].

- As F&V have **low GL**, they produce fewer and smaller post-prandial glucose spikes that may decrease subsequent hunger and reduce total energy intake[13]. In addition, diets with low GL or low glycemic index may increase resting energy expenditure[14], promoting weight maintenance.

- Fruit and vegetables also contain **meaningful concentrations of polyphenols**. These may influence insulin sensitivity[15], the gut microbiome[16], or the anabolic state of adipose tissue, which over a long period of time could promote relative weight stability.

**BMI = Weight (kg)/ Height (m^2). For adults, BMI is commonly used to classify overweight (BMI ≥ 25 kg/m^2) and obesity (BMI ≥ 30 kg/m^2). It provides the most useful population-level measure of overweight and obesity as it is similar for both sexes and for all ages of adults. However, it should be considered an approximate indication[1].*

BOX 1: PRACTICAL ADVICES FOR HEALTH PROFESSIONALS TO PREVENT UNDESIRABLE WEIGHT GAIN, OVERWEIGHT AND OBESITY [6,7]

1. Inform the patient about the **importance of not skipping meals**, and especially the **importance of the breakfast**.

2. Give the patient the key advice to **choose small portions by decreasing the size of the serving spoons, plates, bowls, and glasses especially for calorie-dense foods and beverages**.

3. Explain to the patients how to eat **mindfully** by:

- Taking a moment to relax;

- **Sitting down at a table** (no standing or walking) to eat and limiting distraction (television, smartphone, tablet, radio, reading, etc.);

- **Eating slowly and enjoying it, paying attention to the tastes,** flavors and textures of the food. Putting down the knife and fork between bites. Slowing down can help avoid overeating by giving the brain time to tell the stomach when it's had enough food. A sensation of satiety will appear after about 20 min after the beginning of the meal.

- **Stopping to eat when feeling full** and when the pleasure of eating decreases.

4. Encourage the patient to try as often as possible to eat at home: Fast food, restaurant meals, and other foods prepared away from home tend to have larger portions and be less nutritious than the foods we cook for ourselves.

5. When making the **grocery shopping, it could be helpful to:**

- **prepare a shopping list and to follow it;**

- **plan the menus according to the number of guests present; this will help prevent too much food on the table;**

- do your shopping **without being hungry;**

- **read the nutrition fact labels** on each product to check, among other things, the sugar and fat content.

6. Recommend the patient to **manipulate the home environment** to help them make healthier choices by:

- **buying fewer of the foods that are associated with the development of obesity** (e.g. sweetened beverages, high-caloric-density snacks, or sweets) or to reserve them for events. It is preferable to buy them **immediately before the event and to remove them immediately afterward** to decrease the temptation to snack on these items.

- **Making healthy alternatives, such as water pitchers, fruits, vegetables**, and other low-calorie snacks **readily available at all times and placed in plain sight** (e.g. in front of the refrigerator or in large bowls on the kitchen counter or table).

7. Simple advices to **promote physical activity and limit sedentary behaviors in daily life could be to**:

- **Reduce screen time;**

- **walk as often as possible** to go to work for example or to stores or get off at a stop before the destination when taking the bus;

- **use the stairs** instead of the elevator;

- spend more time working in the garden (if there is one) and/or walk the dog (if there is one) more often and longer.

For further information:
→ sheet 8 "How and why F&V prevent childhood obesity"
→ sheet 9 "How to deal with the obesogenic food environment?"

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HOW AND WHY F&V PREVENT CHILDHOOD OBESITY

- Obesity is a **complex, multifactorial, and largely preventable disease**[1] **with prevention having more positive effect when children are younger**[2,3]**.**
- Globally, the prevalence of overweight and obesity among children and adolescents aged 5-19 has risen dramatically **from 4 % in 1975 to over 18 % in 2016:** an estimated **41 million children under the age of 5 years,** and over **340 million children and adolescents aged 5-19 years,** were overweight or obese in 2016[4]**.**
- Over 60 % of children who are overweight before puberty will be overweight in early adulthood[5].
- Obese children are **more likely to develop a variety of health problems as adults** such as cardiovascular disease, insulin resistance, musculoskeletal disorders, some cancers and disability[6].
- Childhood obesity is also strongly associated with **mental disorders,** underachievement in school and lower self-esteem[3].
- Health professionals and particularly general practitioners and pediatricians have an important role in childhood obesity prevention because they are in a unique position to partner with families and patients[7,8].

1. Healthy lifestyle for childhood obesity prevention

- Prevention is based on **behavioral modification** starting from the prenatal age (before birth) by promoting healthy maternal weight, diet and lifestyle beginning in the prenatal period, and appropriate weight gain in infancy, transition to healthier foods with weaning, and parental role modeling of healthy dietary and physical activity behaviors[6, 7, 8].

- **Breastfeeding** has also an important role in childhood obesity prevention. It is associated with a **reduction of 13% in the odds of overweight and obesity.** Also, each additional month of breast-feeding is associated with a 4% reduction in the prevalence of overweight[9].

- **Counseling should be tailored to the child's developmental stage and the socioeconomic, cultural, and psychological characteristics of families.** The whole family should be involved by targeting specific behaviors, such as increasing fruit and vegetables (F&V) consumption and reducing sedentary behaviors[7, 8, 10].

- Specific school food environment policies are suited to improve targeted dietary behaviors including F&V consumption.

- Although further research is needed, some studies showed that the promotion of F&V positively affects the intake[11].

- Below are the lifestyle recommendations to prevent obesity from preschool age to adolescence:

  - **Consumption of F&V** (5 servings or 400 g/day) as well as legumes, whole grains and nuts should be promoted;
  - **High-energy and low nutrient density foods and beverages** (e.g. Sweetened or energizing drinks, fruit juices, fast food, high-energy snacks) should be avoided and reserved for events;
  - **4 daily meals (breakfast, lunch, dinner and a snack)** should be taken, by favoring household consumption of meals[12];
  - **Active play and lifestyle and family - or sports - based moderate** (e.g. walking very brisk, badminton, tennis double, etc.) **to vigorous** (e.g. hiking, jogging, basketball, tennis single, etc.) physical activity for a total of 60 minutes/day should be promoted;
  - **Sedentary behaviors** (i.e. sitting and screen time) should be limited to less than two hours a day[7, 8].

2. The importance of fruit and vegetable consumption in childhood obesity prevention

- **A daily consumption of at least 400 g (5 servings) of F&V,** as recommended by the WHO to prevent chronic diseases including obesity, is indeed one of the cornerstones of a healthy diet. **It is considered as key component of all healthy dietary patterns** and is highly recommended across worldwide dietary guidelines[14].

- F&V are highly recommended in childhood obesity prevention because they have a **low energy and high nutrient density, a high fiber and polyphenols content, and a low glycemic load** *(see sheet 7, part 3)*.

BOX 1 : PRACTICAL ADVICES FOR PARENTS TO ENCOURAGE F&V CONSUMPTION IN YOUNG CHILDREN IN ORDER TO PREVENT CHILDHOOD OBESITY[8,15,16]

1. The first thing to keep in mind is that **10 to 15 taste exposures to a new food item may be needed** for its successful acceptance in preschool-aged children, which is greater than most parents are willing or able to provide[17].

2. **F&V could be provided as snacks,** by keeping them washed, cut up and in plain sight in the refrigerator to be readily and easily available and visible (24-48h). Such environmental manipulations help children and adolescents make healthier choices, because visible and easily available foods are more likely to be chosen than are foods that require an effort to find.

3. **Increase the size of the serving dishes, spoons, plates, bowls, etc. when serving F&V, while decrease those for calorie-dense foods.**

4. Parents are advised to **serve more often vegetables.** To save time, they can buy vegetables prewashed and in sachets, canned or frozen at the supermarket. **At least one leafy green or yellow vegetable** should be included, each day such as spinach, broccoli, winter squash, greens, or carrots. If the child refuses one vegetable, **parents can try to propose another one**: for example, deep-yellow or orange vegetables instead of green vegetables.

5. **Trying out new recipes** recipes of spaghetti, lasagna, chili, etc. by adding more vegetables could be helpful.

6. **A fruit or vegetable must be added as part of every meal or snack.** For example, parents could put fruit on cereal, add a piece of fruit or small salad to the child's lunch, use vegetables and dip for an after-school snack, etc.

7. **Adding eye appeal** could also be very useful, for example cut fruit and vegetables into interesting shapes (i.e. smiley face, etc.).

8. **Involving children in cooking as well as in food shopping** can increase their willingness to taste novel foods and direct their food choices towards foods containing vegetable[18,19]. For a hesitant eater, tasting an unfamiliar food can sometimes be intimidating. Cooking with them can help children explore foods using other senses besides taste.

9. Parents should be advised to follow the rule **"Eat when your body is hungry. Stop when your body is full".** Infants do this naturally when breastfeeding and starting solids. So, it is important to maintain that natural habit throughout toddlerhood to the teen years and to stop engineering how much children eat and let them learn to feel necessities. This skill of responding to natural hunger and normal cues of satiety can be a huge asset for children for their entire lives.

10. As they are children's role model, **parents should eat more F&V themselves and to lead by example.** Ideally, they have **to eat at least one meal together as a family every day** or to try for 3 to 4 times per week.

For further information:
→ sheet 2 "F&V consumption during pregnancy"
→ sheet 6 "How and why F&V must be in complementary feeding"
→ sheet 7 "How and why F&V prevent overweight and obesity in adults"
→ sheet 9 "How to deal with the obesogenic food environment?"

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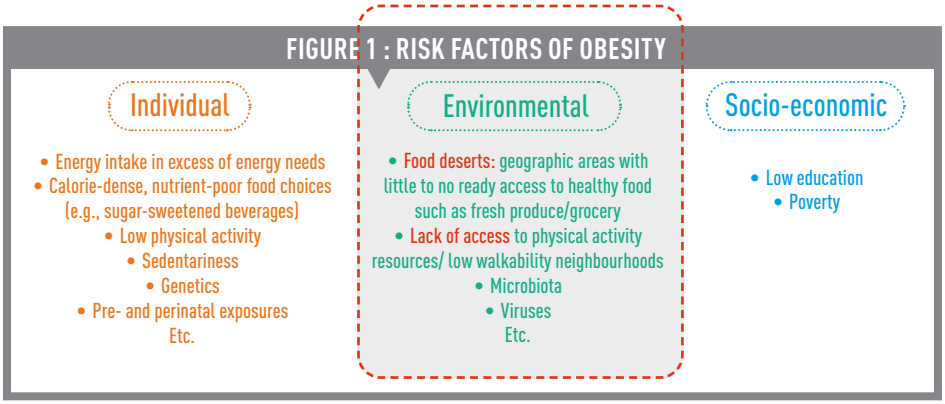
HOW TO DEAL WITH THE OBESOGENIC FOOD ENVIRONMENT?

- An increasing prevalence of obesity is a major health dans le monde entier, concern worldwide, especially in almost every European country and the rest of the industrialized world[1].
- It has been projected that by 2030, **nearly 40 % of the world's population will be overweight and one in five people will be obese[2].**
- Energy balance related behaviours are influenced by a range of determinants:
  - Dietary behavior may be influenced **by access to different foods** through various types of outlets and services.
  - Physical activity levels may be influenced **by access to recreational or sport facilities,** green spaces or parks, as well as transport infrastructure and land use[3].
- **Obesogenic environments** are those that do not enable healthy dietary choices. These environments make it difficult - or impossible - to buy or eat whole foods and healthier prepared and prepackaged options[3].
- Some environments may be more 'obesogenic' than others, such that they are more likely to promote weight gain and obesity in individuals or populations[3].
- The obesogenic environment significantly contributes to **the genesis and the diffusion of the global epidemic of overweight and obesity[4].**
- Better understanding the environmental determinants of obesity allow health professionals **to improve their ability to provide recommendations that are relevant** to patients and their families[5,6].

The environment – a risk factor of obesity

Supportive environments are fundamental in shaping people's choices, **by making healthier foods and regular physical activity the easiest choice** in terms of accessibility, availability and affordability[7]. That is why the environment (including the built environment, school environment, workplace, advertisement, etc.) is considered a risk factor of obesity, along with individual and socioeconomic factors[2] **(Figure 1)**.

FIGURE 1 : RISK FACTORS OF OBESITY



1. The built environment

- **Young children, as compared with adolescents or adults, are more influenced by their immediate environment.** For example, youngsters with limited access to recreational facilities had a 68 % greater chance of being obese[1].

- In urban environments, **a positive relationship** has been reported **between increased availability of healthy foods and better quality diets (i.e. consumption of F&V)[3].**

- Similarly, grocery stores selling a variety of affordable, fresh, whole foods are associated with healthier weights, while an abundance of convenience stores selling less healthy packaged food products are associated with higher rates of overweight and obesity[3].

2. The role of school environment

- The school food environment **refers to all the spaces, infrastructure and conditions inside and around the school premises where food is available, obtained, purchased and/or consumed** (for example tuck shops, kiosks, canteens, food vendors, vending machines); also taking into account the nutritional content of these foods.

- It also includes all of the **information** available, **promotion** (marketing, advertisements, branding, food labels, packages, promotions, etc.) and the **pricing** of foods and food products.

- A healthy school food environment allows and encourages the school community (children, families, school staff, etc.) to make food choices that are consistent with better diets and improved wellbeing[8].

3. The role of workplace environment

- As with school in youth, the **workplace** is very much a microcosm of the adult world-filled with **elements that promote health** as well as elements that squeeze it. This makes the workplace an ideal, focused, and efficient avenue for improving health and tackling many of the key contributors to the obesity epidemic.

- Programs that focus on workplace obesity prevention have been shown to reverse the trends of obesity and its related consequences such as reduced productivity, worsen mobility and self-esteem, and increased healthcare claims, sick days, and occupational injuries[9].

4. The impact of unhealthy foods advertisement on food choices

- **Healthy foods are advertised less than their counterparts**. This has a direct impact on all people's food preferences, although young people are the main targets of food marketing activity and are the most vulnerable to its effects.

- Marketers try **to speak directly to children** by using some techniques such as featuring brand characters, suggesting themes of fun and offering gifts and rewards like toys. **These things would hook children** into that brand and that product but would also **establish associations between that product and positive outcomes.** They will make them later on purchasers not just for themselves but probably for a family of their own[1, 10, 11].

- This has a direct consequence on the development of potentially lifelong unhealthy food preferences associated with the development of obesity and its complications:

- **Children who watch commercial TV for more than 3h/day are:**
  → **More than twice** as likely to pester their parents for junk food;
  → Almost **3 times more likely to buy junk food;**
- Children who use the internet for more than 3h/day will **eat around 3 times less F&V**[12].

BOX 1: SOME PRACTICAL ADVICES

1. The counseling begins in the waiting room: health professionals can expose their patients to healthy choices by putting posters about healthy foods such as F&V and their health benefits[13,14].

2. Eating at home as often as possible, before going out if possible, may be recommended to avoid falling to the temptations of fast foods which tend to have larger portions and be less nutritious[15].

3. If eating in a restaurant, patients should be mindful of two common challenges: 1/ the urge to order more food than one needs and 2/ the impulse to eat every bit of food on the plate — even when the portion size is much too large for one person. **Some practical tips that health professionals could give to their patients for choosing lunch or dinner in a restaurant may be to:**

- Favor the starters based on vegetables or raw vegetables;

- Pay attention to cooking methods by trying to look for these healthy terms: steamed, boiled, and poached[16];

- As soon as satiety is felt, asking to take uneaten food after a meal in a «doggy bag» is an effective strategy to reduce overconsumption from large portions[17].

4. Doing shopping without being hungry could also be very helpful because high-calorie foods may be more tempting than usual when hungry[18].

5. Always having a healthy snack (i.e. fruit, nuts, etc.) in your pocket or bag could be a smart choice in case you couldn't eat before going out to prevent surrendering to cravings[19]. Parents could also **always give their children healthy and easily consumed snacks** for school such as a bag of sliced fruit: apple, banana, orange, grapes, etc..[9]

6. Families should be encouraged to review school menus and provide alternatives if healthy choices at school are lacking. Thus, they should be encouraged to join school wellness committees and suggest to limit the use of unhealthy foods at school parties and celebrations[5].

7. Families should be **informed about the negative impact of food advertising and the digital techniques on food choices, and recommended to:**

- **limit television and newer forms of electronic entertainment or communication** (e.g. phone, tablets, video games, etc.), for children 2 years and older, and

- **exclude** them for children aged less than 2 years[5].

For further information:
→ sheet 7 "How and why F&V prevent overweight and obesity in adults"
→ sheet 8 "How and why F&V prevent childhood obesity"

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HOW TO IMPROVE THE COLLABORATION WITH DIETITIANS?

- Chronic diseases related to nutrition such as obesity, cardiovascular diseases and type 2 diabetes place an increasingly significant burden on population health and health care systems[1].
- **Dietary behavior change is recognized as a first-line approach to optimal prevention** and/or management of chronic diseases given its ability to improve outcomes of chronic disease[2].
- Referral to **'nutrition professionals' can be recommended, in particular Registered Dietitians (RDs),** as they are members of the health workforce specifically trained in facilitating dietary behavior change by providing nutrition care[2].
- The counselling done by a family doctors (FDs)/general practitioners (GPs) or pediatrician with the collaboration of a RD is the most effective policy intervention. The implementation of this intervention in Europe would produce a gain of one year of life in good health in one person out of every ten. The intervention would become cost-effective in about 10 years after its implementation[3].
- Dietetic referral practices are a component of interprofessional collaboration and allow for coordinated care and communication regarding patients' plan of care. Interprofessional collaboration is enforced when **health professionals understand the roles and expertise of allied health professionals[4].**

Why RDs and FDs/GPs/pediatricians need to collaborate?

1. Two complementary areas of expertise

First, they need to collaborate in order to provide patient follow-up and advice adapted in terms of nutrition, as they have specific and complementary areas of expertise (Figure 1).

2. Better health outcomes

Collaboration among doctors and RDs provides the landscape for making the best improvements to the diet and lifestyle for optimal health for patients. **Studies support beneficial patient health outcomes** from access to dietetic services in primary care:

- Patients treated by dietitians in primary health care had significantly improved obesity and diabetes health outcomes compared to patients receiving usual care.

- Dietetic interventions in patients with high risk of progression to type 2 diabetes also demonstrated the efficacy of lifestyle modification interventions.

This indicates that, when dietitians are part of the multidisciplinary team, there are more improved health outcomes in patients with obesity, and diabetes, or at risk of diabetes[13].

FIGURE 1 : THE COMPLEMENTARY BETWEEN RD AND FD/GP/PEDIATRICIANS

GP/FD/PEDIATRICIANS

PLUS-VALUE

- They have a privileged relationship and confidence with the patient because they are the first contact of the patient and follow them on a long-term.
- They are considered by the patient as the most reliable source of nutritional information[5, 6, 7].
- One of their missions consists in promoting health associated with primary prevention[7].
- They are responsible for diagnosing health conditions[7].

Yet, they face some barriers to give nutritional advice:

- Lack of time and knowledge / skills and training;
- Lack of visible effectiveness in the short term;
- Non-facilitating environment (Family, advertising)[10, 11, 12].

THAT IS WHY THE COLLABORATION WITH A RD CAN BE NEEDED

RD

PLUS-VALUE

- They have a scientific knowledge in food and nutrition together with understanding the psychosocial dimension of human health[8].
- They are available and have time to give detailed nutritional and dietetic advices[7].
- They make individualized dietetic counseling taking into account personal and cultural beliefs, preferences, lifestyle and the willingness and ability of the person to change with concrete examples such as menu planning, example of recipes, etc.[9].

Yet, patient referral to RD is underutilized because of these barriers:

- High costs and lack of reimbursement of dietitian consultations*;
- GPs/FDs and pediatricians are not always familiar with the profession of dietitian;
- Geographical distribution is very unequal on the territory. Even if they are available, FDs/GPs/pediatricians do not necessary know them or how to contact them[4, 14, 15].

See below practical advices to face these barriers.

**Some European countries have a reimbursement system by health insurance such as Netherlands (3 hours/year) and Switzerland (only private Health Insurance). In France, some health insurances can reimburse a certain number of consultations.*

Current situation about the collaboration between RDs and FDs/GPs/pediatricians

Currently, the collaboration between RDs and FDs/GPs/pediatricians is not sufficient. However, they usually consider RDs as a suitable health care provider for the dietary treatment of patients who need nutritional support as part of the therapy and refer patients when regular contact with a RD is needed [4, 14, 15].

BOX 1 : HOW TO ENHANCE THE COLLABORATION WITH DIETITIANS TO IMPROVE PREVENTION RESULTS?

1. As one of the barrier of this collaboration is not knowing how to find a RD[15], **a practical tip could be to go check lists of RDs by city available online:**

- For France : www.afdn.org/recherche-dieteticien-liberaux.html
- For other European countries: www.efad.org/en-us/about-efad/membership/full-members/

2. The collaboration should be based on communication and mutual respect and trust to be effective[7]. It is also important to be aware of the **objectives of this collaboration:**

- Ensures consistency of the messages transmitted to the patient, thereby resulting in **better patient compliance**
- Information given by the RD on the evolution of the patient will allow you to target his motivational interviews and advice
- Allows to **exploit and promote the skills of each** in order to share situations, sometimes complex, while avoiding the exhaustion of one or the other[7].

3. As part of a multidisciplinary team, you can provide **the essential diagnosis, initial advice and recommendations and coordinate overall treatment plans,** while avoiding some of the challenges that come with the provision of specialist nutrition-related advice, such as the need for time and specialist knowledge. In this case, a referral to a dietitian is needed[16].

4. Practical tips that may be helpful to enhance this collaboration:

- Writing a **medical prescription** for precise dietary consultations and explicit about medical goals.
- Asking the RD to **provide a written report** of each treatment, with the objectives determined with the patient, the methods used and conclusion[7,17].
- **A first contact (e-mail, telephone)** should be made to ensure the common guideline.
- **A mutual information on the evolution of the patient** is essential, in particular if there are change of objectives or difficulties encountered in the dietary management.
- The creation of an **interdisciplinary meeting** is encouraged.
- **Sharing everyone's knowledge** is highly recommended through discussions, educational documents and recommendations relating to nutrition-related issues[7].

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WHEN AND HOW NUTRITION COUNSELING SHOULD BE ADMINISTERED FOR DISEASE PREVENTION?

PREVENTION:

- is specific, **population-based and individual-based interventions for primary and secondary** (early detection) prevention, aiming to minimize the burden of diseases and associated risk factors[1];
- includes diet or nutrition, exercise and weight loss counseling[1, 2];
- has **long-term effects** and its results are not immediately visible[3].
- Even though patients do not consult their doctor for prevention, **doctors should consider it as a medical act and approach nutrition advice** when patients come for a routine consultation[3].

When nutrition counseling should be administered?

The doctor should take the opportunity of every occasion to talk about healthy diet and lifestyle with the patient. Below seven occasions when nutrition counseling can be provided.

1. Your patient consults for vaccination, prescription renewal, certificate, administrative paper, etc.

• This routine consultation is an opportunity to check his weight, his blood pressure and to start talking about his lifestyle and/or diet.

2. Your patient asks spontaneously about diet and weight

• If you have time and you know the answer, you may answer his queries. → *See sheet 7 "The place of F&V in overweight and obesity prevention in adults" and sheet 9 "How to tranform food environnement from obesogenic to healthy?"*

• If not, you could suggest a later consultation to answer these questions and/or ask the patient to consult a dietitian. → *See sheet 10 "How to improve the collaboration with dietitians?"*

3. Your patient consults for an acute disease (ex. gastro-enteritis, influenza, urinary or pulmonary infection, etc.)

• You could take this opportunity to remind your patient of the importance of a healthy diet and lifestyle in order to avoid recurrence, particularly the role of hydration and of fruit and vegetables. These contain vitamins such as vitamin A, B9 and C that contribute to maintenance of the normal function of the immune system[4-9].

4. Your patient consults because he has, or is at risk of developing chronic diseases such as:

• Cardiovascular diseases → *See sheet 3 "How and why F&V prevent cardiovascular diseases?"*

• Cancers → *See sheet 4 "How and why F&V prevent cancers?"*

• Type 2 diabetes → *See sheet 5 "How and why F&V prevent type 2 diabetes?"*

5. Your patient is pregnant

→ *See sheet 2 "F&V consumption during pregnancy"*

6. Your patient is newborn with his parents

• The doctor should explain to the parents the key role of fruit and vegetables in complementary feeding. → *see sheet 6 "How and why F&V must be in complementary feeding?"*

7. Your patient has queries about the diet of his children and/or adolescents

→ *The sheet 8 "The place of F&V in childhood obesity prevention" and the sheet 9 "How to transform food environment from obesogenic to healthy?" give you keys to answer this type of question.*

BOX 1: 5 TIPS FOR GIVING NUTRITIONAL ADVICES DURING A ROUTINE CONSULTATION[3]

1. Invite your patient to talk about their daily diet by letting him express what he likes, what he eats at the company restaurant, what he would like to change and, conversely, about what he especially does not want to change.

2. Listen first to let him speak openly about his eating habits and be able to identify his motivations and barriers.

3. Keep in mind to **take into account his personal concerns** and his individual context: socio-economic status, family habits, personal constraints, culture, emotions, expectations...

4. Give him advice only if you feel him open to discussion and consider making recommendations very gradually, avoiding injunctions. Too categorical judgment could close quite irreparably the exchange.

5. Nutritional questions often require time: do not hesitate to **offer a specific consultation** or to refer your patients to a dietitian *(cf. sheet 10 «How to improve the collaboration with dietitians»)*

BOX 2: HOW TO ENGAGE THE CONVERSATION? QUESTIONS TO ASK TO THE PATIENT[10]

What kinds of foods and beverages do you eat and drink on a typical day?

This will **give you an idea about the patient's eating habits**, to then suggest to adapt his/her favorite dishes and making them healthier, mostly by increasing fruit and vegetables intake.

Who does the grocery shopping and who cooks in home?

This will let you **to know what the patient is buying and the quantity eaten** to suggest lately new foods to try or cooking more often at home.

Does eating healthy seem hard or unrealistic?

According to the barrier reported by the patient, you have to suggest some workaround **(cf. Box 3)**.

BOX 3: HOW TO OVERCOME COMMON BARRIERS THAT MAKE IT DIFFICULT FOR PATIENTS TO EAT HEALTHILY?

BARRIERS REPORTED BY PATIENTS	SUGGESTIONS THAT YOU CAN PROVIDE
"I can't afford healthy foods." [10]	Highlight that **fruit and vegetables are less expensive** than industrial ready-to-eat meal when comparing the price for kilograms, and in terms of volume in the plate, of taste and of benefits for health.
"I don't have the time to cook healthy meals." [10]	Propose to **cook meals in batches on the weekend,** and to heat up dinners during the week. **It is also important to plan the week menus before grocery shopping**[10]. Propose 2 or 3 quick and easy recipes.
"My kids won't eat anything healthy." [10]	**Suggest to let kids participate** in the grocery shopping to select healthy options and pitch in when cooking.[10]
"I don't listen to the experts— they keep changing their minds about which foods are healthy and which aren't." [10]	**Emphasize that fruit and vegetables are a crucial component of a healthy diet** and their daily consumption is recommended across all dietary guidelines. The best would be to follow National guidelines for each country and the WHO recommendations for a healthy diet[11]. → *cf. sheet 1 "F&V-key component of a healthy diet".*
"I limit my fruit and vegetables consumption because they may contain pesticides." [10]	Explain that **fruit and vegetables consumption have a lot more benefits on health** than eventual risks due to pesticides[12]. Besides, low consumption of fruit and vegetables is a risk factor for non-communicable diseases: An estimated **3.9 million deaths worldwide were attributable to inadequate fruit and vegetables consumption** in 2017[13].

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folate and blood formation (ID 79), homocysteine metabolism (ID 80), energyyielding metabolism (ID 90), function of the immune system (ID 91), function of blood vessels (ID 94, 175, 192), cell division (ID 193), and maternal tissue growth during pregnancy (ID 2882) pursuant to Article 13(1) of Regulation (EC) No 1924/2006 on request from the European Commission." *EFSA Journal 2009;* 7(9):1213. [22 pp.]. doi:10.2903/j.efsa.2009.1213. Available online: www.efsa.europa.eu

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