STUDY

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Current challenges and opportunities for addressing obesity

Policy Department for Economic, Scientific and Quality of Life Policies
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Current challenges and opportunities for addressing obesity

Abstract

This paper presents current developments and challenges in the prevention and management of obesity in the European Union. The analysis provides an overview of the disease, emphasises the importance of designing supportive environments in prevention efforts, and makes an argument to upskill the healthcare provided to persons living with obesity.

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LIST OF ABBREVIATIONS

BMI	Body mass index
EASO	European Association for the Study of Obesity
EC	European Commission
EDC	Endocrine Disrupting Chemicals
EHIS	European Health Interview Survey
EP	European Parliament
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FOPNL	Front-of-pack nutritional label
HFSS	High-fat, high-salt, high-sugar
NCD	Non-communicable diseases
PACE	Physical activity calorie equivalent
PPP	Purchasing power parities
SSB	Sugar-sweetened beverage
WHO	World Health Organization

EXECUTIVE SUMMARY

Background on the study

Obesity is a chronic, complex, and multifactorial disease. The health consequences of obesity are numerous and severe, and the disease is a contributing factor to further serious and fatal affections among European citizens. Its prevalence is growing rapidly, globally and in the European Union, making it a major health concern for public health authorities and policymakers. In parallel, the costs and socio-economic implications associated with obesity are colossal. While the scientific and medical understanding of obesity's causes and the identification of the most effective prevention and management strategies and policies continue to be refined, this in-depth analysis provides an overview over the current situation, main developments, and available options for effective policies against obesity.

Key findings

Definition of obesity. Obesity is a chronic complex multifactorial disease defined by excessive adiposity that represents a risk to health, caused in most cases by the interaction of genetic, metabolic, behavioural (or psycho-social factors), and environmental factors. Obesity bears its own health risks, including musculoskeletal issues, cardiometabolic conditions, and mental health disorders, but it is also a 'gateway' to a wide range of health complications, including major non-communicable diseases such as type-2 diabetes, cardiovascular diseases and many types of cancer. It also raises the risk of severe outcomes and mortality from infections like COVID-19.

Key figures. In 2019, Eurostat's European Health Interview Survey (EHIS) found that 16.5 % of the EU adult population lived with obesity, while 36.2 % were overweight, meaning that weight was an issue for over half of the population (53 %). WHO estimates that in the wider European Region, the prevalence of obesity more than doubled since 1975. Obesity rates increase with age, peaking in the 65 to 74 age group. Socioeconomic determinants like income, education, employment and place of residence play a significant role and contribute to inequalities in the prevalence of obesity, including among children, who are more exposed, and more vulnerable, to obesogenic environments.

Determinants of obesity. The development of obesity is influenced by multiple factors interacting across the life course, including individual factors such as (epi-) genetics, biology, and psychology, and individuals' behaviours such as nutrition, physical activity, and sleep. The individual factors interact with human environments, including food environments, built environments and exposure to environmental chemicals. Commercial determinants, particularly industry strategies promoting certain food products and ideas, can also contribute to shaping environments. Policies and societal determinants impact many aspects of the lives of people living with obesity.

Physiological aspects. Excessive caloric intake and low physical activity are primary risk factors for obesity. Once developed, obesity alters the body's energy regulation and fat tissues' hormonal system, leading *inter alia* to a higher set point of body fat, and leptin resistance. Obesity is also associated with psychological and neurological disorders, creating bidirectional relationships where psychiatric conditions increase obesity risk, and obesity can trigger disorders through immune, metabolic, and endocrine disruptions. Additionally, obesity drives further pathological developments, including increased risks for cardiovascular diseases and various cancers.

Human and economic costs. Obesity imposes significant costs on societies, reducing life expectancy by almost three years in the next three decades, and affecting healthcare systems' financing. OECD countries are expected to spend up to 8 % of their annual health budgets on obesity-related conditions.

It also impacts labour markets e.g. by reducing employment chances. In the realm of education, obesity affects school performance, the recognition of students' performance and mental health. Comprehensive sets of interventions have been shown by the OECD to yield substantial economic benefits for states while improving public health outcomes.

EU and national actions. The EU plays a supportive role in obesity prevention and management, influencing various policy areas such as food safety, agriculture, transport, and education. The European Commission has implemented important strategies such as the 2007 Strategy on Nutrition, which emphasises consumer information, healthy food accessibility, and physical activity. A strong focus was recently given to childhood obesity through the EU Action Plan on Childhood Obesity (2014-2020). The EU also promotes research through Horizon Europe and EU4Health, investigating obesity prevention, food reformulation, and the regulation of unhealthy food marketing.

National actions. This report outlines three interesting national approaches to prevent and manage obesity: taxation, food labelling, and community-based interventions. Taxation, particularly on sugar-sweetened foods and beverages, has been implemented in several countries to reduce consumption and encourage healthier eating. Food labelling, such as the Nutri-Score system, aims to help consumers make informed decisions by providing clear nutritional information. Community-based approaches, like France's EPODE programme and the Netherlands' integrated strategy, involve local communities and public-private partnerships to tackle obesity through tailored interventions that address both environmental and individual factors.

Health-promoting environments. The food environment, defined as the interface between food systems and people's nutrition, influences food choices through physical, economic, policy, and sociocultural factors. These environments are characterised by aspects such as food availability, prices, and marketing. Economic growth and agricultural policies have led to increased consumption of processed and unhealthy foods, contributing to obesity, and other non-communicable diseases (NCDs). Efforts like nutritional labelling (e.g., Nutri-Score), taxation of unhealthy foods to send the right signal, and subsidies for healthier options aim to guide consumer choices and correct market failures. However, structural regulatory actions appear more effective than individual behaviour changes in preventing obesity. Public health experts argue that the EU needs stronger policies. Recommended achievable and priority actions include mandatory and ambitious food composition targets; a complete ban on trans-fats; opening the way to 0 % VAT exemptions on fruit and vegetables in the EU VAT Directive; and a ban on marketing unhealthy foods to children. Civil society organisations also advocate for integrating health-promoting measures into the Regulation for sustainable food systems.

The **digitalisation of the food environments**, including online grocery shopping and meal delivery services, significantly influences food accessibility, desirability, affordability, and convenience. While these digital platforms offer convenience and greater access to food, they also raise concerns about promoting unhealthy dietary habits, especially in socio-economically deprived areas. Research highlights the challenges posed by persuasive online marketing, particularly to children and adolescents, who are vulnerable to the influence of unhealthy food advertisements. These marketing practices often contribute to weight gain and nutrition-related health issues. Policymakers are urged to integrate digital food environments into public health strategies to protect consumers, especially the young, from the negative impacts of these new food environments.

Built environments, including urban design and infrastructure, significantly influence physical activity opportunities and exposure to pollutants, which are linked to obesity. While clear evidence on specific built environment factors in Europe is limited, studies suggest that they can impact physical activity and weight.

Promoting active transport, like cycling, and reducing sedentary time, are crucial for obesity prevention. Access to green and blue spaces also encourages physical activity. Structural measures to improve built environments are essential for both preventing obesity and supporting citizens already living with obesity.

Integrated, multidimensional and patient-centred healthcare. Providing effective healthcare for individuals living with obesity requires recognising the complexity of the disease. Obesity must be addressed through integrated, patient-centred care that includes multidisciplinary approaches, such as behavioural interventions, psychotherapy, pharmacological support, and possibly surgical interventions. The goal is not merely weight management but improving overall metabolic health, quality of life, and managing complications.

Pharmacological and surgical treatments play an important role in the management of obesity, particularly when behavioural interventions alone prove insufficient. Over recent years, the development of new weight-loss medications has shown promising results in reducing weight and improving health outcomes for individuals with obesity. These medications help bridge the gap between behavioural interventions and surgical options. However, these treatments are not without challenges. The very high financial cost of these medications poses a significant threat to healthcare systems, and the need for long-term use to maintain weight management raises questions about their sustainability and accessibility, particularly for low-income patients. The high global demand leads to shortages and disrupts treatment for existing patients. While these drugs can reduce the risks of complications such as type-2 diabetes and cardiovascular diseases, they are not magic bullets. Health technology assessments will play a critical role in determining their place within obesity management strategies. These products may require lifelong treatment to sustain their benefits. Therefore, while pharmacological options are valuable, they must be considered as part of a comprehensive, multidisciplinary approach to obesity care, rather than as standalone solutions.

Upskilling healthcare professionals is vital for delivering patient-centred care. Healthcare providers need training in empathetic communication, understanding obesity's complexities, and avoiding weight stigma. Effective management of obesity also requires a supportive care environment, access to a range of treatment options, and a focus on long-term, sustainable health improvements. Patient engagement, realistic goal setting, and a multidisciplinary care approach are essential for successful obesity management.

1. THE EVOLVING PORTRAIT OF OBESITY

Obesity is a complex multifactorial disease affecting millions of patients, and a growing challenge to modern societies as a whole. At the same time, the scientific and medical understanding of obesity's aetiology, prevention and management continues to grow. The complexity of this disease and its socio-economic implications must be borne in mind when addressing the topic and exploring policy options, to avoid oversimplified diagnostics and solutions. Despite political will to counteract it, the obesity epidemic continues to be one of the most important public health challenges facing Europe and the world today[1]. Considering the many facets of policies around obesity, this analysis aims to provide a brief description of the stakes directly and indirectly linked with the European Union (EU)'s legislation and policies.

1.1. Defining obesity

The World Health Organization (WHO) defines obesity as "a **complex multifactorial disease defined by excessive adiposity that represents a risk to health**" (2022 European Regional Obesity Report)[2]. This definition highlights that obesity is a disease that it is caused by the interaction of genetic, metabolic, behavioural (or psycho-social factors), and environmental factors[3]. For certain persons living with obesity, a single major etiological factor can be discerned. Obesity is listed in the eleventh revision of the International Classification of Diseases for Mortality and Morbidity Statistics (ICD-11), WHO's global taxonomy for diagnostics, statistics, and health information[4], as a "***chronic complex disease** defined by excessive adiposity that can impair health*". In the ICD classification, obesity falls under the "endocrine, nutritional or metabolic diseases", subcategory "overweight, obesity or specific nutrient excesses"[5].

The European and international obesity organisations have conceptions of obesity going beyond the current international classifications and definitions of obesity. The World Obesity Federation (WOF) argues that obesity should be understood as a chronic *relapsing* disease, in the sense that short-term treatments do not change the underlying biology that drives and maintains obesity[6].

Obesity poses **direct risks to human health** (including musculoskeletal complications, mental health disorders, social well-being) and increases the risk of **complications**, as a "gateway" to a wide range of health complications including several major **non-communicable diseases (NCDs)** (cancer, chronic respiratory diseases, metabolic dysfunction–associated steatotic liver disease , chronic kidney disease, cardiovascular diseases, diabetes mellitus)[7]. Overweight and obesity were associated with **higher morbidity and mortality rates due to infections with SARS-CoV-2**.

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1 European Charter on counteracting obesity: WHO European Ministerial Conference on Counteracting Obesity: Diet and physical activity for health: Istanbul, Turkey, 15–17 November 2006.

2 World Health Organization, 'WHO European Obesity Report 2022', Executive Summary, 2022.

3 European Medicines Agency, 'Guideline on clinical evaluation of medicinal products used in weight management', EMA/CHMP/311805/2014, 2014.

4 World Health Organization, 'Family of International Classifications (FIC) - International Statistical Classification of Diseases and Related Health Problems (ICD) 11th revision'.

5 World Health Organization, ICD-11 for Mortality and Morbidity Statistics '5B80 Overweight or localised adiposity'.

6 World Obesity Federation, Obesity: a chronic relapsing progressive disease process. A position statement of the World Obesity Federation, in Obesity Reviews, Vol. 18 Issue 7.

7 WHO Europe, Obesity Report 2022, p.190.

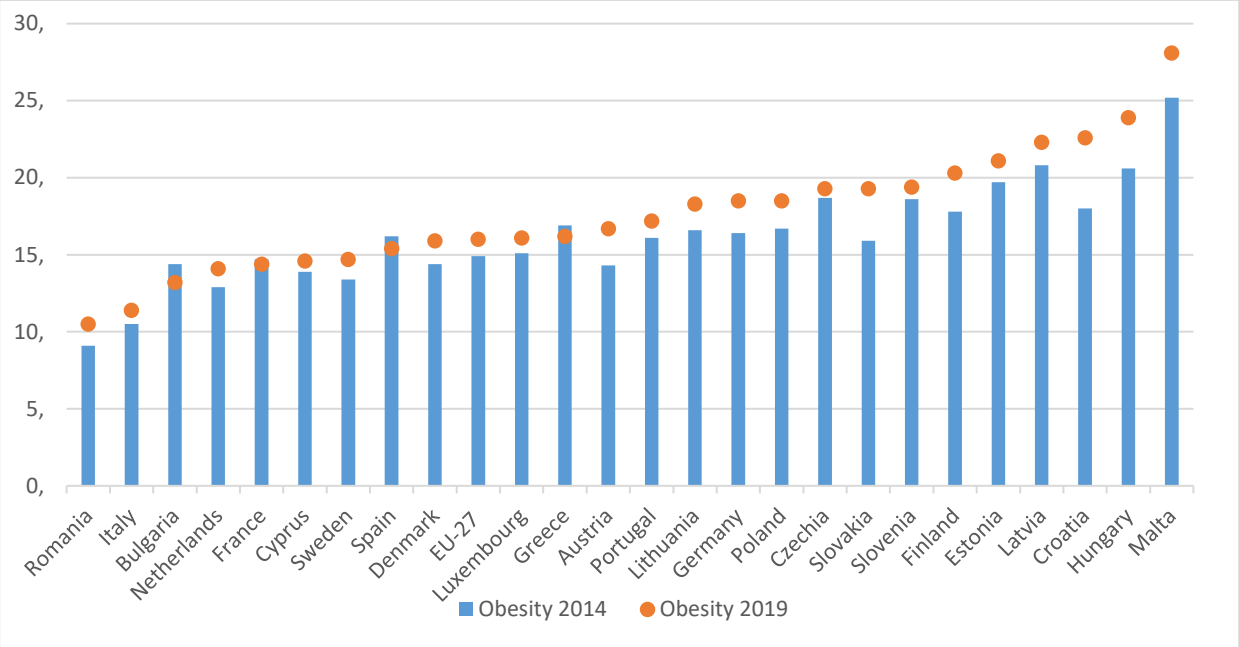
This prevalence is linked with physiological and anatomical characteristics which lead to respiratory and immunological compromise, and other complications (e.g. hypertension, cardiovascular diseases, type-2 diabetes mellitus, and obstructive sleep apnoea)[8].

1.2. European populations affected by obesity

Obesity is commonly measured at **population level** using the Body Mass Index (BMI). It is understood as a surrogate marker of the level of adiposity, which puts a person's weight and height in relation (weight ÷ height^2). The WHO's ICD-11 specifies that the BMI categories for defining obesity vary by age and gender in infants, children and adolescents. For adults, overweight and obesity is defined by a BMI greater than 25 and 30, respectively[9].

The figures on the progression of obesity at population level (measured using the BMI, call for public attention and policy action. As shown in Figure 1, between 2014 and 2019 almost every country but Bulgaria, Spain, and Greece, has seen the prevalence of obesity in the overall population increase, with an EU average of more than 16%. Malta, Hungary, and Croatia were the Member States most confronted with the issue in 2019.

Figure 1: Obesity rate (BMI-based) from 2014 to 2019, people aged at least 15 years old



Source: Eurostat (online data code: HLTH_EHIS_BM1E)

Using BMI as a screening measure for the EU population, Eurostat found via the European Health Interview Survey (EHIS) 2019 that **16.5% of the EU's adult population** lived with obesity, and 36.2% lived with overweight, so that in total, in 2019 **more than half of the EU population (53%) had excess weight**. The most recent figures from the WHO estimate that overweight concern 59% of the population in the WHO European Region (wider than the EU), and obesity concerns 23% of citizens.

[8] WHO Europe, Obesity Report 2022, p 142.

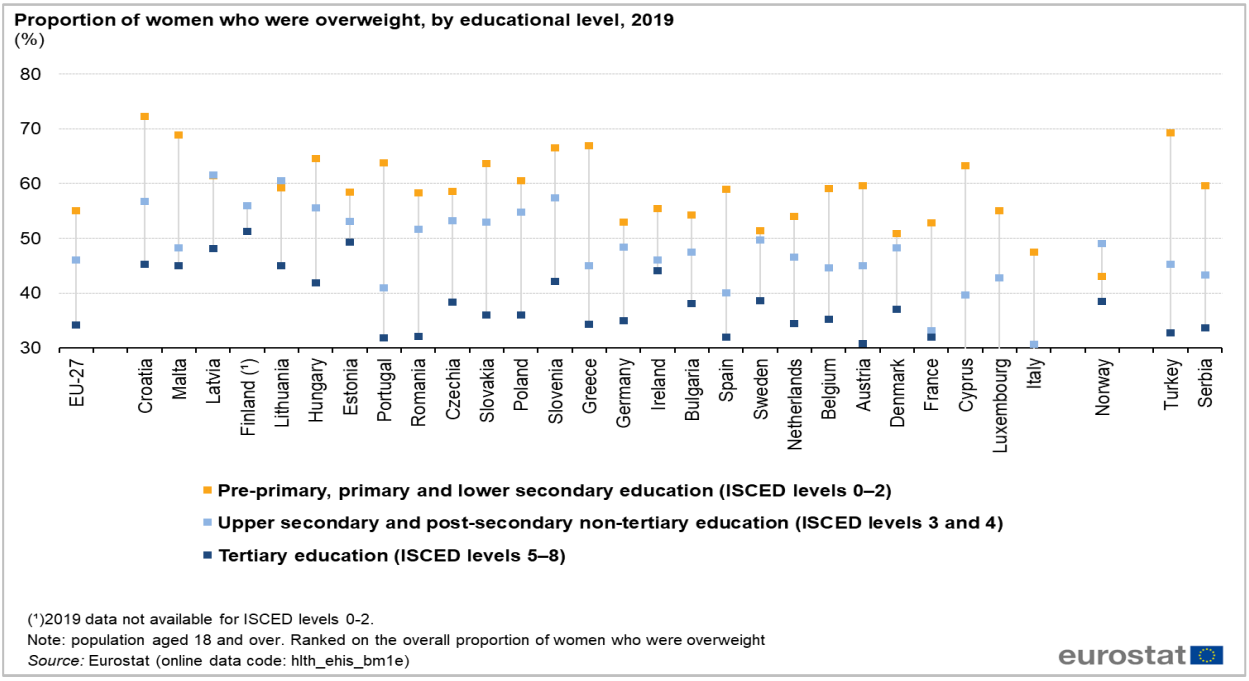
[9] NB: As expressed by the WHO in the 2022 Obesity Report, BMI is a practical approach to screening and population surveillance but is considered **inadequate for individual diagnostics**. Weight alone does not give sufficient indication on the actual health status (incl. level of adiposity) of an individual and should be complemented with a more thorough health assessment of individuals and other indicators (e.g. waist circumference measurements). Thresholds must be adapted to different population groups, e.g. further thresholds have been developed (age, sex, ethnic groups).

This alarming picture is aggravated by the **rapid increase in the share of citizens with overweight and obesity over the last decades** and the apparent incapacity of countries to halt this evolution. The prevalence of obesity in the WHO European Region more than doubled since 1975 (from 10% of the population living with obesity in 1975 to 23% in 2016)[10].

Looking at population subsets, the obesity rate generally **increases with age**, peaking at the 65 to 74 years age group (22.3% of whom have obesity), and is lowest among younger people aged 18 to 24 (6.0%) in the EU. Across EU Member States, variations were found in the prevalence of obesity across **genders** however not along a common pattern (higher share of women in some MS vs higher share of men in other). The picture is clearer for **overweight**, as it is **more prevalent in men** compared to women across all Member States[11].

Socioeconomic determinants such as income, education, employment status and place of residence produce **socioeconomic inequalities in the prevalence of overweight and obesity** in the European population, in particular children[12]. These socioeconomic determinants determine the level of exposure of populations to obesogenic risk factors. Citizens in low socio-economic position groups are, on average, more strongly exposed to unhealthy food and built environments (e.g. access to green spaces and health food), and may have an increased vulnerability to unhealthy environments, as a result of unfavourable factors (such as financial stress)[13]. The socioeconomic determinants appear to have life-long effects on children, as obesity in children is likely to persist in adults, highlighting the **importance of measures targeted against childhood obesity**. For example, the lower educational status of parents is a strong predictor of the prevalence of obesity in children[14].

Figure 2: Proportion of women who were overweight, by educational level 2019



[10] World Health Organization, 'WHO European Obesity Report 2022', 2022.

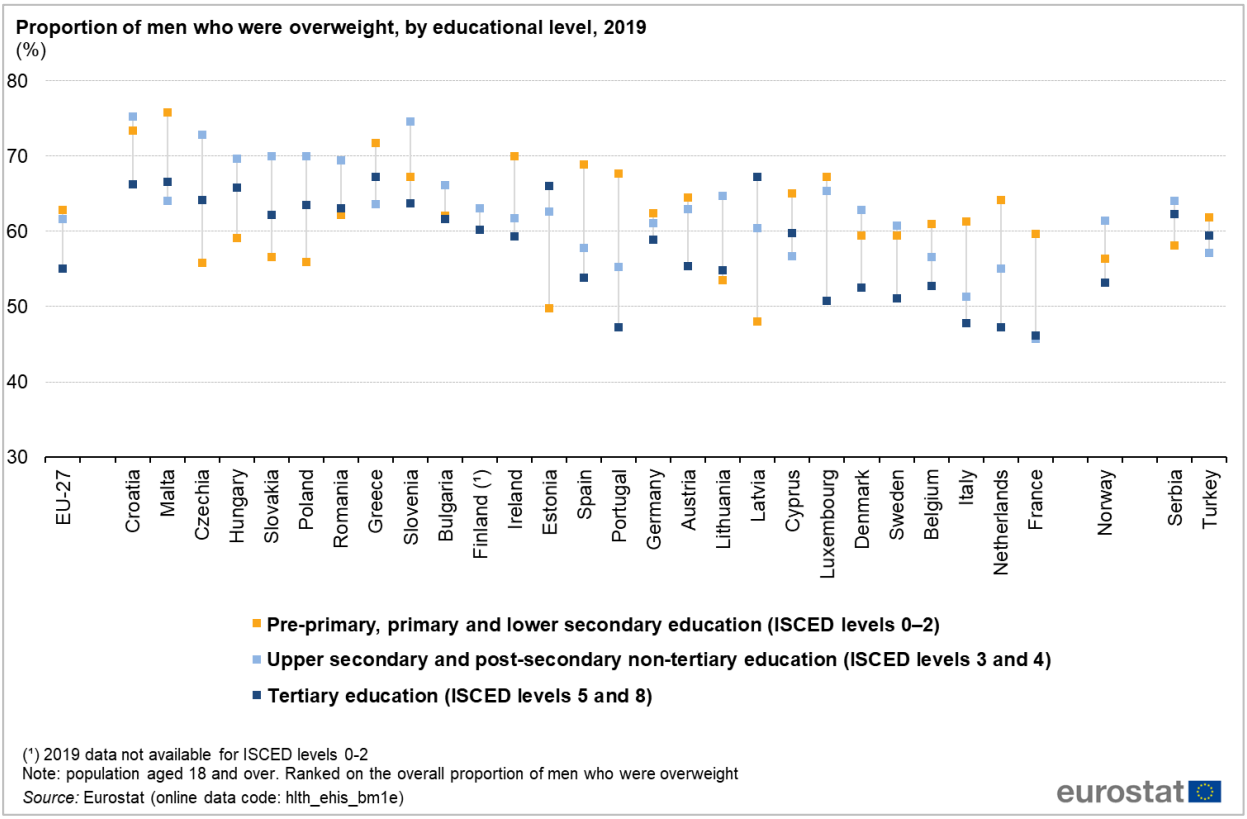
[11] Statistical Office of the European Union (Eurostat), 'Sustainable development in the EU – Monitoring report on progress towards the SDGs in an EU context – 2023 edition', p.75, 2023.

[12] World Health Organization, 'WHO European Obesity Report 2022', p.190, 2022.

[13] Vandevijvere, S., et al, Upstream Determinants of Overweight and Obesity in Europe, 2023.

[14] Buoncristiano M, et al. Socioeconomic inequalities in overweight and obesity among 6- to 9-year-old children in 24 countries from the World Health Organization European region. Obes Rev. 2021:22(suppl 6):e13213. doi: 10.1111/obr.13213.

Figure 3: Proportion of men who were overweight, by educational level 2019



When looking at the correlations between **education level** and overweight, the proportion of **women** who were overweight was significantly lower as the level of educational attainment increases, in high-income countries. This correlation is less evident for men and there is no pattern across the Member States[15] [16]. These are some of the reasons why the WHO recommends providing **support to lower socioeconomic population groups as a priority in obesity prevention**[17].

In the EU28, women and men in the lowest income group are, respectively, 90% and 50% more likely to live with obesity[18]. A 2021 study[19] based on data from 123,487 children aged 6 to 9 in the WHO European Region found an inversely proportional relationship between overweight and obesity rates and parental education in high-income countries. While the focus has been put on the impact of lower socio-economic resources on the prevalence of obesity, it should also be noted that obesity can be associated with lower opportunities on the **labour market**, especially for women who face a higher degree of weight stigma[20,21].

15 Statistical Office of the European Union (Eurostat), 'Sustainable development in the EU – Monitoring report on progress towards the SDGs in an EU context – 2023 edition', p.75, 2023.

16 World Health Organization, 'WHO European Obesity Report 2022', p.190, 2022.

17 World Health Organization, 'WHO European Obesity Report 2022', 2022.

18 OEDC, 2019, The Heavy Burden of Obesity, p.20.

19 Buoncristiano, M., Williams, J., Simmonds, P., Nurk, E., Ahrens, W., Nardone, P., … Breda, J. 'Socioeconomic inequalities in overweight and obesity among 6- to 9-year-old children in 24 countries from the World Health Organization European region', Obesity Reviews, 2021.

20 Kim, T. J. et al. 'Income and obesity: what is the direction of the relationship? A systematic review and meta-analysis' BMJ open, 2018.

21 Averett, S. L. 'Obesity and labor market outcomes' IZA World of Labor, 2019.

1.3. The determinants of obesity: a complex interplay

Obesity is driven by **multiple factors** (determinants) that **interact at various levels across the life course**. The current understanding of the main causes and triggers of the behaviours and of the biology behind obesity can be summarised using the following categories[22].

- **Individual factors**, i.e. (epi-) genetics, biology (incl. endocrinology) and psychology, which affect the predisposition of individuals to develop obesity and/or their metabolism. The context in which these determinants intervene is one of **genetic and biological suitability** of human bodies to food scarcity in the physical environment and to high physical activity;
- **Individual behaviours (incl. nutrition, physical activity, sleep)**, i.e. calory-dense nutrition, lower levels of physical activity, irregular or insufficient sleep. These individual behaviours are highly influenced by the environments which can make the unhealthy choices the easiest choices;
- The **environments** (the 'world we live in'):
    - **Physical and digital food environments**: increasing abundance and accessibility of energy-dense foods and beverages, often processed and nutrient-poor;
    - **Built environments**: the way territories / spaces are designed for people to live in. Important aspects include urban planning, green spaces, walkability and transportation modes (e.g. the distinction between active or passive transportation);
    - Other environmental and chemical exposures throughout the life course, such as endocrine disruptors or medicinal products;

- **Commercial determinants**, i.e. the 'strategies and approaches used by the private sector to promote products and choices that are detrimental to health'.[23] In the case of obesity, their roots are primarily found in the interests, strategies and practices of food and beverages industries as well as marketing actors[24]. These determinants reflect the direct and indirect impacts of economic actors on citizens' health but also the ways they influence public health policies and shape health discourses in a society;
- **Political and societal determinants**. They are the societal structures, processes and outputs impacting the structural determinants of health, with direct or indirect impacts on obesity, including the policies adopted in relation to obesity (e.g. focus on individual vs structural determinants), to the food and built environments, or the regulation of commercial or socio-economic determinants of obesity; and
- **Socio-economic determinants** are the conditions in which people 'grow, live, work and age' determining individuals' environment and relationship with it (e.g. capacity to make healthy choices; health literacy). The determinants include in particular income, education, employment, food security and housing. The social and economic conditions partly determine individuals' dietary intake and quality of nutrition[25].

At the junction of individual factors and behaviours, there is evidence of a correlation between excessive weight gain / obesity of the mother during pregnancy and a higher birth weight and later

[22] Sources: WHO Obesity Report 2022; Vandervijvere S. et al 2023.

[23] https://www.thelancet.com/journals/langlo/article/PIIS2214-109X(16)30217-0/fulltext

[24] WHO Commercial Determinants of noncommunicable diseases in the WHO European Region.

[25] Upstream Determinants of Overweight and Obesity in Europe

increased risk of developing obesity as a child via the mechanism of **developmental programming** (epigenetics).

After birth, a socioeconomic gradient is observed in excess weight during the early infant growth stages. These elements highlight the significance of preconception and gestational stages of life in the development of obesity and calls for **targeted interventions at critical life stages** (from pre-conception all the way to adolescence).

These determinants of obesity can inspire the development of comprehensive and multidimensional prevention policies. The management of the disease, however, requires a separate and complementary approach by health authorities. Once obesity affects an individual, physiological changes in e.g. the functioning of the energy balance (homeostasis) or hormonal disruptions, render the simple population-level prevention actions inadequate to address the needs of individuals living with obesity.

1.4. Key physiological aspects of obesity

While excessive caloric intake and low physical activity (leading to energy imbalance) are main risk factors for developing obesity[26], having developed obesity in turn means that the way food intake is regulated and processed will be affected. In other words, obesity will change the way the **energy homeostasis system** works, the biological process that matches energy intake to energy expenditure over time. Obesity can lead to chronically inflamed fat tissue which fails to emit the hormones needed to regulate satiety, damaging sensitivity to food intake regulation ("leptin resistance")[27]. The body also develops a higher set point of body fat, in other words, a 'new normal' of adiposity, which it maintains by modulating the metabolism and feelings of hunger[28].

Certain endocrine disrupting chemicals (EDCs) bioaccumulate in the adipose tissues and exert obesogenic effects that result in further disturbances in energy homeostasis[29]. Common EDCs are found in pesticides, children's products, food storage materials, personal care products, and textiles[30].

Indeed, understanding obesity requires going beyond a balance of the food intake and the calories burnt and considering the body's reaction to these external factors. Adipose tissue or colloquially **"fat" is a "metabolically active endocrine organ"**. Through hormone signals and receptors in the brain, fat communicates with other organs and the central nervous system to regulate the body's metabolism in many of its essential functions. Adipose tissue maintains energy balance, cushions around soft organs, metabolises sex hormones, insulates from cold and heat, regulates hunger and satiety, regulates glucose and cholesterol, maintains insulin sensitivity, generates thermogenic heat, and affects immunity[31].

Recent research investigates the **associations between obesity and psychological and neurological disorders**. Obesity appears to have significant links with psychological disorders, in particular depression and stress, in bidirectional relationships[32].

[26] Hruby, A & Hu F., 'The Epidemiology of obesity: a big picture' Pharmacoeconomics, 2016.

[27] Boon, M. & Van Rossum, L. 'Fat as a hormone factory' *Fat: the secret organ*, Quercus Publishing, 2020.

[28] Schwartz, M. et al. 'Obesity pathogenesis: an endocrine society scientific statement' Endocrine reviews, 2017.

[29] Yilmaz, B. et al. 'Endocrine disrupting chemicals: exposure, effects on human health, mechanism of action, models for testing and strategies for prevention' Reviews in Endocrine and Metabolic Disorders, 2020.

[30] Endocrine Society Patient resource 'Hormone and endocrine disrupting chemicals: what you need to know', 2022.

[31] Cleveland Clinic 'Adipose tissue (body fat)', 2022.

[32] Rajan, T & Menon, V. 'Psychiatric disorders and obesity: a review of association studies' Journal of postgraduate medicine', 2017.

On the one hand, patients with psychiatric disorders have an increased risk of developing obesity[33]. It is suggested that several disorders (e.g. eating disorders, mood disorders or attention deficit and hyperactivity disorder - ADHD) can be involved in the development of obesity[34].

Stress-related physiological changes affect reward processing in the brain and gut, exacerbated by perceived stigma for being overweight[35].

On the other hand, **obesity can be at the onset of psychiatric disorders**. The alterations of the immune, metabolic and endocrine processes associated with obesity can affect the integrity of the neurological function of the brain via inflammation, or endocrine disorders[36], leading to functional losses. In parallel, nutritional psychiatry explores the impact of nutrition and obesity on brain function and mental illness[37], highlighting that dietary interventions in clinically diagnosed populations provide significant benefit[38]. Specific aspects of nutrition, such as intake of fat, may have an acute effect on mood as well as stimulate inflammation, leading to symptoms of anxiety and depression[39]. In addition, persons living with obesity face bias and discrimination in society, as well as stigma, which are shown to have detrimental psychological effects, being risk factors notably for depression[40].

Obesity in itself can also drive further pathological developments.

E.g., reduced plasticity or malleability of "fat" can drive the progression of **cardiometabolic diseases**[41], with fat cells being deprived of oxygen and causing the accumulation of cells that no longer divide[42]. Obesity is linked to increased risk of **cardiovascular disease**, the most common cause of death in Europe[43].

People who live with obesity are at increased risk of developing several types of **cancer**, including endometrial, breast, colorectal, gallbladder, pancreatic, liver, kidney, gastric and oesophageal, thyroid, ovarian and blood, and the most deadly, metastatic cancer[44].

1.5. The human and economic costs of obesity in the EU

Obesity incurs significant costs, primarily impacting human lives through increased mortality and health complications. It also imposes significant economic burdens on individuals, society, and the healthcare system, while reducing workforce productivity.

Health impacts and healthcare costs. Obesity is expected to **reduce life expectancy in the EU-28 by 2.9 years** over the next three decades[45]. OECD countries are expected to spend up to 8% of their annual health budgets on treating complications of obesity between 2020-2050[46].

33 Weiss, F., et al, Psychiatric Aspects of Obesity: A Narrative Review of Pathophysiology and Psychopathology, J Clin Med 2020, Aug.
34 Weiss, F., et al, Psychiatric Aspects of Obesity: A Narrative Review of Pathophysiology and Psychopathology, J Clin Med 2020, Aug.
35 Tomiyama, J. 'Stress and obesity' Annual review of psychology, 2019.
36 Weiss, F., et al, Psychiatric Aspects of Obesity: A Narrative Review of Pathophysiology and Psychopathology, J Clin Med 2020, Aug.
37 Ahuja, M. et al. 'Obesity, food insecurity, and depression among females' Archives of Public Health, 2020.
38 Marx, W. et al. 'Nutritional psychiatry: the present state of evidence' Cambridge University Press, 2017.
39 Bremner, J.D. et al. 'Diet, stress and mental health'. Nutrients, 2020.
40 Rajan, T & Menon, V. 'Psychiatric disorders and obesity: a review of association studies' Journal of postgraduate medicine', 2017.
41 Sakers, A. et. Al. 'Adipose-tissue plasticity in health and disease' Cell, 2022.
42 World Health Organisation 'WHO European Obesity Report 2022', p.16, 2022.
43 Ibid.
44 World Health Organisation 'WHO European Obesity Report 2022', p.18, 2022
45 Organisation for Economic Cooperation and Development 'The Heavy Burden of Obesity: The Economics of Prevention', p.86, 2019.
46 Ibid., p.23.

Overweight is currently responsible for 70% of treatment costs for diabetes, 23% for cardiovascular disease and 9% for cancers[47]. Treatment of overweight and associated conditions costs on average around USD 195 Purchasing Power Parities (PPP) (approximately EUR 185) annually per citizen in the EU28[48].

Labour market. In addition to healthcare costs, obesity reduces the chance of being hired, the employment rate, and increases absenteeism and presenteeism[49]. It increases the likelihood of **temporary work loss** (predominantly sick leave) and decreases productivity while present at work[50]. Looking at the workforce, the disease is estimated to cost the labour market close to USD 800 PPP (approximately EUR 750) per capita annually between 2020 and 2050 according to the OECD[51]. The organisation further estimates that individuals experiencing a chronic condition linked with obesity are 8% less likely to be employed the next year and, when employed, are 3-4% more likely to be absent or hampered in their productive capacity.

School and education. Obesity impacts **school performance**: the OECD underlines that children with a healthy weight are 13% more likely to have a good school performance than children with obesity[52]. Biological, behavioural and emotional/mental health factors act as intermediaries. In terms of biological factors, it is suggested that obesity impacts cognitive functions and concentration in school. Low levels of physical activity (behavioural) have been shown – independently of obesity - to reduce school performance. Mental health difficulties, caused by the bidirectional relationship between obesity and mental health status, and reinforced by bullying, lower self-esteem and well-being, can further deteriorate academic performance[53].

Students with obesity can also be impacted in their academic results by social stigma and observed grading bias, offering fewer opportunities for development[54], and less recognition for their work[55].

The OECD estimated that every dollar spent on **prevention interventions** creates up to six times higher **economic benefits**.

Most importantly, ambitious and comprehensive policy interventions can lead to yearly gains of millions of disability-adjusted life years (DALYs) and in life years (LYs) for populations in the OECD countries.

The most cost-effective intervention in terms of life years gained is menu labelling. Prevention interventions also lead to a significant reduction in health expenditure of billions of USD PPP (e.g. the policy intervention 'menu labelling' designed by the OECD was estimated to generate savings of up to USD PPP 2.3 billion in Germany by 2050)[56].

47 Ibid, p.15.

48 Organisation for Economic Cooperation and Development 'The Heavy Burden of Obesity: The Economics of Prevention', p.23, 2019.

49 Organisation for Economic Cooperation and Development 'The Heavy Burden of Obesity: The Economics of Prevention'.

50 Goettler, A., Grosse, A., & Sonntag, D. 'Productivity loss due to overweight and obesity: a systematic review of indirect costs' BMJ open, 2017.

51 Organisation for Economic Cooperation and Development 'The Heavy Burden of Obesity: The Economics of Prevention'.

52 These studies are based on an estimation of obesity based on the BMI and not relying on a formal diagnosis.

53 Ibid., p.10

54 Branigan, A. '(How) Does obesity harm academic performance? Stratification at the intersection of race, sex, and body size in elementary and high school', Sociology of Education, 2017.

55 Finn, K. et al. 'Weight bias and grading among middle and high school teachers' British Journal of Educational Psychology, 2020.

56 Organisation for Economic Cooperation and Development 'The Heavy Burden of Obesity: The Economics of Prevention', p. 183-184.

In parallel, the potential impact of new pharmaceutical treatments against obesity on the costs borne by healthcare systems in Europe remains an open question, presenting a **complex cost-benefit scenario**.

On the **benefit side**, obesity significantly affects healthcare budgets and the economy overall, as mentioned above. Innovative treatments could lead to substantial long-term savings by reducing the prevalence of obesity and obesity-linked NCDs, thereby decreasing treatment costs, improving public health outcomes, and enhancing labour market inclusion for people with obesity. However, the **cost side** presents possible challenges, as the widespread adoption of new medicinal products can lead to immense financial costs at the current retail prices[57]. Additionally, affordability for low-income patients is another critical concern. Finally, determining who will bear the cost of these medications – whether public healthcare systems (e.g. taxpayer money), private payments or a combination of both - is critical and has relevant implications for equitable access to treatment.

Currently, **evidence** on the cost-effectiveness of such treatments is relatively scant. Recent studies conducted by the industry (Novo Nordisk)[58, 59] argue that these products are the most cost-effective treatments compared to behavioural interventions under a willingness-to-pay threshold of USD 150,000 per QALY gained over 30 years. The suggestion is that while they incur high costs, the health benefits justify these expenses. Nonetheless, further independent research must be performed to corroborate these early findings, expanding their geographical scope.

In any case, **robust prevention policies**—like sugar taxes, food scoring systems, and initiatives promoting physical activity—are essential to mitigate the onset of obesity, ultimately reducing reliance on costly pharmaceutical interventions, improving the health of the whole population and fostering sustainable healthcare systems across the EU, as the following chapter illustrates.

[57] Novo Nordisk's Wegovy (semgalutide) is expected to cost between EUR 170 – 300 in Germany, as reported by CNBC (source: CNBC. "Obesity drug Wegovy launches in Germany, but costs and waits weigh heavy." *CNBC*, 2023). Assuming a similar cost across all EU countries, the treatment could cost up to 275 billion euros per year (assumptions: 449 mln EU citizens; 17% living with obesity; EUR 300/month per individual).

[58] Kim, N. et al. "Cost-effectiveness analysis of semaglutide 2.4 mg for the treatment of adult patients with overweight and obesity in the United States." *Journal of Managed Care & Specialty Pharmacy*, 2022.

[59] Olivier, AV. et al. "Cost-effectiveness of weight management pharmacoterapies in Canada: a societal perspective." *Int J Obes* , 2022.

2. OBESITY PREVENTION AND MANAGEMENT IN THE EU

The soaring prevalence of obesity and its increasing cost to society call for **comprehensive and structural policies** that address the upstream determinants of obesity and do not solely rely on changing individuals' behaviours[60]. This section describes key actions undertaken by the European Union and the Member States.

2.1. Obesity prevention and management at EU level: Prominent actions and opportunities for action

The Treaties require that a 'high level of human health protection is ensured in all Union policies and activities'. In the field of obesity prevention and management, the EU has a mainly supportive function. Nevertheless, a number of policy areas and actions can have a direct impact, typically financial support. In addition, policy touchpoints and leverages exist in many areas of EU policy (e.g. food safety and regulation, agriculture, transport, research, pharmaceutical legislation, audiovisual media services, education and culture, etc.) and the approaches to **individual policy areas can be mobilised and coordinated** for the EU to support the prevention and management of obesity, as was called for in the European Commission's 2007 Strategy on Nutrition, Overweight and Obesity-related health issues[61].

EU strategies and action plans. The European Commission adopted several strategic approaches to obesity in recent years, in particular the 2007 'Community Strategy for Europe on Nutrition, Overweight and Obesity related health issues'[62] following the 2005 Green Paper "Promoting healthy diets and physical activity: a European dimension for the prevention of overweight, obesity and chronic diseases[63]". The Strategy relies on 1) improving the information of consumers (including nutritional information, media, and advertising practices), 2) promoting accessibility of healthy foods (including direct access, reformulation of manufactured food), 3) encouraging physical activity (including leisure sports, promotion of active transport).

Obesity was highlighted as one of the main risk factors for cancer in the **European Beating Cancer Plan**[64]. The plan calls for a review of the EU school fruit, vegetables and milk scheme and the introduction of mandatory front-of-pack nutrition labelling[65]. Finally, the **EU Action Plan on Childhood Obesity** for the years 2014-2020[66] (currently under ex-post evaluation) aimed to contribute to halting the rise in overweight and obesity in children and young people by 2020.

60 WHO EURO Obesity report 2022

61 European Commission (2007), Strategy on nutrition, overweight and obesity-related health issues.

62 Commission of the European Communities, White Paper on A Strategy for Europe on Nutrition, Overweight and Obesity related health issues, COM(2007) 279 final, https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0279:FIN:EN:PDF.

63 European Commission (2005), Green Paper - "Promoting healthy diets and physical activity : a European dimension for the prevention of overweight, obesity and chronic diseases", https://op.europa.eu/en/publication-detail/-/publication/fb6264c8-c756-47c4-944d-6d10bc9fce10/language-en.

64 European Commission, Communication to the European Parliament and the Council – Europe's Beating Cancer Plan, COM(2021) 44 final, https://eur-lex.europa.eu/legal-content/en/TXT/?uri=COM%3A2021%3A44%3AFIN.

65 ANNEXES to the Communication from the Commission to the European Parliament and the Council Europe's Beating Cancer Plan, List of Actions, Action No. 8, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021DC0044.

66 European Commission, EU Action Plan on Childhood Obesity 2014-2020, https://health.ec.europa.eu/system/files/2016-11/childhoodobesity_actionplan_2014_2020_en_0.pdf.

In its February 2022 Resolution on Strengthening Europe in the fight against cancer[67], the **European Parliament** reiterated the need for a mandatory EU front-of-pack nutritional label (FOPNL) based on sound scientific evidence, to empower consumers in making healthy and sustainable food choices. Member States were encouraged to adopt pricing policies and marketing controls to promote low-saturated fat, low-trans-fat, low-salt, and low-sugar food, and drink, and to further restrict advertising of sugary beverages, and high-fat, high-salt, high-sugar (HFSS) processed foods, with special attention to social media. The Commission was called upon to introduce an EU-wide regulation to prohibit such advertising to minors[68]. In its resolution of November 2022 on diabetes, the European Parliament emphasised the link between obesity and diabetes and reinforced its call for the adoption of a new Childhood Obesity plan supporting the adoption of mandatory EU nutritional labelling[69].

Research and funding opportunities. The European Union is actively supporting the research on obesity prevention. **Horizon Europe's work programme 2023-2024** covers research on the understanding of obesity and its prevention, including for instance a project on the early prevention[70]. In addition, eligible actions of the **EU4Health** fund include 'supporting Member States' actions in health promotion and disease prevention throughout the lifetime of an individual and by addressing health risk factors, such as obesity, unhealthy diets and physical inactivity'. Obesity is framed under the actions on health risk factors to prevent NCDs in the 2022 EU4Health Programme[71]. In 2022, EU4Health financed the recent Evaluation of the EU Action Plan on Childhood Obesity[72].

Recent and ongoing EU-funded research projects, initiatives and funding opportunities cover a variety of topics of interest for policy makers e.g.:

- **Understanding of obesity** and NCDs (Science and Technology in childhood obesity policy - STOP; Horizon Europe's Prevention of obesity throughout the life course), including with the use of **'big data' and artificial intelligence** (BigO programme; Integrated surveillance system to prevent and reduce diet-related NCDs; Trustworthy AI tools to predict the risk of chronic non-communicable diseases and/or their progression);
- **Food reformulation** (EU Reformulation Monitoring EUREMO; Best-ReMap; Joint Action Prevent NCD; Joint Action nutrition and physical activity);
- **Marketing practices** (Best-ReMap; JA Prevent NCD; EU Code of Conduct on Responsible Food Business and Marketing Practices);
- **Public procurement** (Best-ReMap; JA Prevent NCD);
- **Regulation and taxation** of products at the origin of NCDs, including foods and beverages (JA Prevent NCD; Study Mapping of pricing policies and fiscal measures applied to food, non-alcoholic and alcoholic beverages); and
- **Product labelling** (JA Prevent NCD; Food and Beverage Labels explorer).

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67 European Parliament, Resolution of 16 February 2022 on Strengthening Europe in the fight against cancer – towards a comprehensive and coordinated strategy, 2020/2267(INI), https://www.europarl.europa.eu/doceo/document/TA-9-2022-0038_EN.html.

68 European Parliament, Resolution of 16 February 2022 on Strengthening Europe in the fight against cancer – towards a comprehensive and coordinated strategy, 2020/2267(INI).

69 European Parliament, Resolution of 23 November 2022 on prevention, management and better care of diabetes in the EU on the occasion of World Diabetes Day (2022/2901(RSP)).

70 https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2023-2024/wp-4-health_horizon-2023-2024_en.pdf

71 European Commission, 2022, Tackling obesity with the help of Global Obesity Observatory.

72 The European Association for the Study of Obesity (EASO) calls for obesity to be considered as a key non-communicable disease rather than a risk factor for other NCDs for a wider funding of research on obesity prevention and management.

Further EU-level actions and research frameworks support an improvement of EU citizens' health (e.g. the EU Urban Mobility Framework for active mobility[73]; the Health Promotion and Disease Prevention Knowledge Gateway; the Public Health Best practices portal) or address topics relevant for obesity (e.g. Health Equity 2020).

2.2. Obesity prevention and management in the Member States: taxation, food labelling and community-based approaches

This section provides an overview of three main approaches used by Member States to prevent and manage obesity: taxation of unhealthy foods, food labelling, and community-based or locally integrated approaches.

Taxation

Taxation, specifically on **sugar-sweetened beverages (SSBs)**, is a strategy currently used in 10 countries of the European region[74]. Taxes on SSBs can reduce sales[75] and overall consumption[76], incentivise healthier recipes and offer a potential revenue source to be redirected to obesity reduction[77]. **France** adopted a tax on SSBs in 2012 and redesigned it in 2018 with a unique progressive rate by which taxation increases with the quantity of sugar per hectoliter[78,79,80]. A study evaluating the impact of the tax on consumption found evidence of an impact mostly for heavy consumers, whose budgets were affected and who were sensitive to signals about adverse health effects[81]. **Hungary** introduced the **Public Health Product Tax** in 2011, an excise levy based on the content of salt, caffeine and sugar of pre-packaged foods[82]. The tax targets products such as confectionary, salty snacks, fruit jams, sugary soft and energy drinks[83]. The measure had the most impact amongst the lowest income group[84] as the tax redirected consumers towards less unhealthy products[85].

Other regions also have such taxation approaches. In **Mexico**, a tax of 1 peso per litre on all non-alcoholic beverages with added sugar was introduced in 2014[86]. The share of low or non-consumers of sugary drinks increased by 8.3% and 4.7%.

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73 European Commission, Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, The New EU Urban Mobility Framework.

74 World Health Organization 'Sugar-sweetened beverage taxes in the WHO European Region: success through lessons learned and challenges faced' 2022. The countries in question are Belgium, Finland, France, Hungary, Ireland, Latvia, Monaco, Norway, Portugal, and the UK.

75 Andreyeva, T. et al. 'Outcomes following taxation of sugar-sweetened beverages: a systematic review and meta-analysis' JAMA Network Open, 2022.

76 Andrea M. Teng et al. 'Impact of sugar-sweetened beverage taxes on purchases and dietary intake: Systematic review and meta-analysis' Obesity Reviews, 2019.

77 Popkin, B. & Shu Wen Ng. 'Sugar-sweetened beverage taxes: Lessons to date and future of taxation' PLoS Medicine, 2021.

78 For further reference see: Republique Française, 2023, Taxation of beverages. Available at: https://entreprendre.service-public.fr/vosdroits/F32101?lang=en.

79 World Health Organization 'Sugar-sweetened beverage taxes in the WHO European Region: success through lessons learned and challenges faced' 2022.

80 Sarda, B. et al. 'Public perception of the tax on sweetened beverages in France.', 2022.

81 Capacci, S., et al. 'The impact of the French soda tax on prices and purchases. An ex post evaluation. ', 2019.

82 UK Health Forum 'Case study: The Hungarian public health product tax', 2019.

83 Musuwo, N. 'International Policies to reduce childhood obesity – a Health Action Campaign review' Health Action Campaign, 2019.

84 Bíró, A., 'Did the junk food tax make the Hungarians eat healthier?' Food Policy, 2015.

85 Musuwo, N., 'International Policies to reduce childhood obesity – a Health Action Campaign review. Health Action Campaign', 2019.

86 Sánchez-Romero, L. M et al. 'Association between tax on sugar sweetened beverages and soft drink consumption in adults in Mexico: open cohort longitudinal analysis of Health Workers Cohort Study' BMJ (Clinical research ed.), 2020.

In **Berkeley**, California, a USD 0.01 per ounce (approximately 30 ml) excise tax was introduced for SSBs in 2014[87] so that consumption of SSBs decreased by 21% in the city while it increased by 4% in comparison towns. Water consumption also increased more in Berkeley (by 63%) than in comparison cities (by 19%)[88].

Food labelling.

The consumption of foods with a lower nutritional quality is associated with greater mortality, for all causes, for cancer, and diseases of the circulatory, respiratory, and digestive systems, justifying better access to information regarding nutritional composition[89].

One of the increasingly standard food labelling approaches in the EU is the **Nutri-Score**. Launched in 2017 in **France**, it is a voluntary FOPNL system created to help consumers understand nutritional information and to allow them to make informed food choices[90]. The Nutri-Score is based on a nutritional scale of five colours, from dark green to dark orange, to which letters from A to E are assigned. The attribution of the colour and letter is made by calculating a single and an overall score that considers for every 100 g or ml of product the amount of nutrients that should be limited (i.e. energy, saturated fatty, acid, sugars, salt) and of nutrients and foods that should be encouraged (i.e. fibres, proteins, vegetables, pulse, nuts, rapeseed, walnuts, and olive oil)[91]. **Belgium, Switzerland, Germany, Spain, the Netherlands and Luxembourg** followed France's example and decided to recommend the label as well.

Debates on the possible **EU-wide introduction of a FOPNL** have been ongoing for many years while the benefits of introducing the Nutri-Score for public health were evaluated by several studies[92]. As part of the 2020 Farm-to-Fork strategy and of the 2021 Europe's Beating Cancer Plan, the Commission announced a revision of the Regulation on food information to consumers (FIC Regulation), aiming to introduce harmonised mandatory FOPNL and set nutrient profiling criteria to restrict claims made on food[93]. The possibility of employing Nutri-Score as the chosen approach has been debated. Research conducted by the Joint Research Centre concluded that consumers, including those with lower incomes, appear to prefer simple, colourful and evaluative summary FOPNL[94]. In 2021, 419 European scientists and 30 experts' associations signed a call supporting the introduction of Nutri-Score in Europe[95].

Community-based interventions and local integrated approaches.

Community-based interventions on obesity have gained popularity, as they focus on the causes of obesity at the social level. France represents one of the pioneers of community-based approaches,

87 Falbe, J. et al. 'Implementation of the First US Sugar-Sweetened Beverage Tax in Berkeley, CA, 2015-2019.' American journal of public health, 2020.

88 Falbe, J., et al. 'Impact of the Berkeley Excise Tax on Sugar-Sweetened Beverage Consumption.' American journal of public health, 2016.

89 Deschasaux, M. et al. '"Association between nutritional profiles of foods underlying Nutri-Score front-of-pack labels and mortality: EPIC cohort study in 10 European countries." Bmj, 2020.

90 Santé Publique, 2023, Nutri-Score. Available at: https://www.santepubliquefrance.fr/en/nutri-score.

91 Ibid.

92 Van der Bend, D. L. M., et al, The Nutri-Score algorithm: Evaluation of its validation process, Front Nutr., Vol. 9, 2022.

93 European Commission, n.d., *Food information to consumers – legislation.* Available at: https://food.ec.europa.eu/safety/labelling-and-nutrition/food-information-consumers-legislation_en.

94 European Commission, 2022, Evidence on Food Information – Empowering consumers to make healthy and sustainable choices. Available at: https://joint-research-centre.ec.europa.eu/jrc-news-and-updates/evidence-food-information-empowering-consumers-make-healthy-and-sustainable-choices-2022-09-09_en.

95 Nutri-Score, 'Call from European scientist to implement Nutri-Score in Europe, a simple and transparent front-of-pack label with rigorous scientific support, intended to guide dietary choices and thus contribute to chronic disease prevention' 2021.

in particular thanks to the **EPODE** (French acronym for *Together Let's Prevent Childhood Obesity*) methodology launched in 2003[96]. Its design is rooted in a 1992 study conducted in two French towns where a school-based information programme on nutrition was initiated and followed by an increasing commitment of the towns' population in community interventions[97,98].

Research suggested that changes in the prevalence of overweight occurred where measures **involved families and society** at large[99, 100].

EPODE aims to address and improve the health of disadvantaged populations thanks to tailored interventions. It rests on four critical pillars: political commitment; resources; support services; and evidence[101]. EPODE-based programmes seek to change the environment to impact unhealthy behaviours in the long term, without stigmatising any culture, individual, food habit or behaviour. It is characterised by the **involvement of local communities** and a **collaboration between public and private actors**. The partnerships involving private parties help keep public costs down while being subject to an ethical charter. As of 2015, the EPODE approach has been implemented in 42 countries[102].

The Netherlands adopted an **integrated approach** to address obesity, which seeks to connect prevention and care, targeting both the environment and the individual[103]. A fundamental milestone is the **Covenant on Overweight**, set up in 2005 as a public-private partnership aiming at improving health environments in school, work, domestic and recreational settings[104]. In 2010, this covenant was transformed into a national initiative called **Youth on a Health Weight (JOGG)**[105]. Modelled on the French EPODE programme, it is based on five pillars: political and governmental control; cooperation between the public and private sector; social marketing; scientific evaluation and dissemination; and linking prevention and healthcare[106].

The Covenant on Overweight was followed by the establishment of the **Partnership Overweight Netherlands** in 2008. The purpose of the partnership was to facilitate the development and implementation of a national healthcare standard for adults and children based on the multidisciplinary guideline for diagnosis and treatment of adults and children[107]. The Partnership Overweight Netherlands developed to become an umbrella organisation of 20 medical and paramedical associations[108] and led the work to **update the Dutch overweight and obesity guidelines for adults**[109].

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96 European Health Alliance 'EPODE – Together Let's Prevent Childhood Obesity', 2008.

97 Musuwo, N., 'International Policies to reduce childhood obesity – a Health Action Campaign review' Health Action Campaign, 2019.

98 Romon, M., et al. 'Downward trends in the prevalence of childhood overweight in the setting of 12-year school- and community-based programmes.' Public health nutrition, 2009.

99 Ibid.

100 Musuwo, N., 'International Policies to reduce childhood obesity – a Health Action Campaign review' Health Action Campaign, 2019.

101 Borys, J. M., et al. 'EPODE approach for childhood obesity prevention: methods, progress and international development'. Obesity reviews, 2012.

102 Borys, J. M., 'EPODE - A Model for Reducing the Incidence of Obesity and Weight-related Comorbidities'. European endocrinology, 2013.

103 Halberstadt, J., et al. 'The development of the Dutch "National model integrated care for childhood overweight and obesity' BMC Health Services Research, 2023.

104 Ibid.

105 Ibid.

106 Seidell, J. C., & Halberstadt, J., 'National and Local Strategies in the Netherlands for Obesity Prevention and Management in Children and Adolescents' . Obesity Facts, 2020.

107 Halberstadt, J., et al. 'The development of the Dutch "National model integrated care for childhood overweight and obesity' BMC Health Services Research, 2023.

108 European Association for the Study of Obesity, 'Partnership Overweight Netherlands (PON) publishes new guidelines on overweight and obesity in adults', 2023.

109 Overweight Netherlands Partnership, New Overweight and obesity guidelines. 2023.

The new standard is based on a local network approach, characterised by a closer connection between the social and medical domain, developed in cooperation with seven different Dutch municipalities[110].

Another fundamental pillar of the Dutch strategy is the 2018 **National Prevention Agreement**. Overweight is the second pillar of this document, which aims to restore obesity levels to the 1995 rate by 2040.

The measures envisaged to achieve these aims and subobjectives fall under three broader categories: (a) healthier nutrition; (b) more sports and exercise; (c) healthy environment and healthcare. Of note, the agreement includes public and private actors, bringing together the Association of Dutch Municipalities and several businesses, sports and civil society organisations[111].

The City of Amsterdam has also been an active player in addressing childhood overweight and obesity with the **Amsterdam Healthy Weight Programme** set up in 2012[112]. An essential element of the programme is its tailored approach, which focuses both on the social and physical environment and on the personal determinants and motivations[113]. A series of so-called adaptive clustered programme activities are envisaged. Interventions seek to target childhood obesity across different moments and environments: the antenatal period, school, neighbourhoods, food and built environments, families, and support to skilled professionals[114].

[110] European Association for the Study of Obesity, 'Partnership Overweight Netherlands (PON) publishes new guidelines on overweight and obesity in adults', 2023.

[111] Government of the Netherlands, 'The national Prevention Agreement', 2018.

[112] UNICEF, City of Amsterdam, EAT, 'The Amsterdam Healthy Weight Approach: Investing in healthy urban childhoods: A case study on healthy diets for children.', 2020.

[113] Ibid.

[114] Ibid.

3. HEALTH-PROMOTING ENVIRONMENTS

It is understood that a person's environment and the way that a person interacts with its environment plays a key role in the complex mechanisms leading to obesity.

As indirect contributors to the obesity epidemic, and to other diet-related metabolic risk factors, the understanding of **environmental determinants of obesity** and the potential influence of public policy on these environments in a whole-of-system approach, will be briefly described in this section. Unhealthy eating and low levels of physical activity are among the main behavioural risk factors (also sleep, stress, sedentary behaviour) for people to develop obesity. These individual behaviours are in a large part determined by environments, the 'upstream determinants of adult obesity'[115], i.e. environmental characteristics beyond an individual's direct control. These determinants are structural and are elements upon which state actors have leverage[116]. Modifications of the environment can support (or undermine) individuals in their endeavours to act in their own self-interest and to prevent and/or manage obesity and other health conditions[117].

3.1. Developing a favourable nutritional environment

The **food environment(s)**, defined by the FAO as the **interface between food systems and (people's) diets**[118] links the "*collective physical, economic, policy and sociocultural surroundings, opportunities and conditions*" [119] that influence people's acquisition and consumption patterns. A conceptual framework of factors ("dimensions") shaping food environments is a useful instrument to understand, research and regulate, how *inter alia* the commercial, built and digital environments drive food-related choices[120]. Modifications of the environment can support (or undermine) individuals in their endeavours to act in their own self-interest and to prevent and/or manage obesity[121].

Table 1: Simplified classification of key dimensions of the food environments

External domain	Personal domain
Food availability	Physical accessibility
Food prices (economic value)	Affordability
Vendor and product properties	Convenience
Marketing and regulation environment	Desirability
New: digital setting; digital food cultures and communities; interplay physical and digital[122]	

Source: Author's own elaboration

[115] Lakerveld, J., Mackenbach, J., 'The Upstream Determinants of Adult Obesity', Obesity Facts, 2022.

[116] Swinburn, B. A., et al, 'The global obesity pandemic: shaped by global drivers and local environments' 2011.

[117] Roberto, C. A., 'Patchy progress on obesity prevention: emerging examples, entrenched barriers, and new thinking', Obesity, Vol. 385, Issue 9985, 2015.

[118] Food and Agriculture Organization of the United Nations (FAO), 'Influencing Food Environments for Health Diets', 2016.

[119] Turner, C., et al, 'Concepts and critical perspectives for food environment research: A global framework with implications for action in low- and middle-income countries', Global Food Security, Vol. 18, 2018.

[120] Turner, C., et al, 'Concepts and critical perspectives for food environment research: A global framework with implications for action in low- and middle-income countries', Global Food Security, Vol. 18, 2018.

[121] Roberto, C. A., et al, Patchy progress on obesity prevention: emerging examples, entrenched barriers, and new thinking, Obesity, Vol. 385, Issue 9985, 2015.

[122] Granheim, S., et al, 'Mapping the digital food environment: A systematic scoping review', Obesity Reviews, Vol. 23, Issue. 1, 2022.

Globally, for several decades, economic growth and agriculture policies allowed a shift away from staple foods and have led people to consume increasingly larger amounts of processed foods, out-of-home foods, animal source foods, refined carbohydrates, edible oils and SSBs[123]. For instance, the agricultural policy in the EU has shaped the affordability and consumption of meat, dairy and sugar[124].

The link between consumption, increase in energy intake and weight gain has been evidenced[125], as well as the role of ultra-processed foods as drivers of unhealthy eating and diet-related NCDs, including obesity[126]. Obesity is influenced by dietary patterns (and physical activity), and it is thus worthwhile for policymakers to look into these "modifiable behavioural risk factors" as for several NCDs[127].

Food choices are also determined by **'commercial determinants of health'**. This concept describes the interactions between the industrial and commercial environment and citizens' health, looking at both positive impacts and damaging externalities. On the latter, research signals the central role of "unhealthy commodity industries", often large multinational companies, commercialising tobacco, ultra-processed food, fossil fuel and alcohol, in the rise of NCDs[128]. On this basis, it is worth noting that consumers have unequal access to food choices depending on where they live and their income and mobility capacities[129].

An approach to compensate for the complexity of the commercial environment and elevate the individual's capacity for informed consumption is **nutritional labelling**, influencing both consumer behaviours and food producers towards the production of better-scored products. In the EU, the voluntary "Nutri-Score" (mentioned earlier) can provide useful insights to consumers on products' nutritional value. As part of the 'farm to fork strategy', the EC intended to propose a mandatory FOPNL in 2023[130]. Besides Nutri-Score, other designs are available for nutritional labels, such as the physical activity calorie equivalent (PACE)[131].

To reduce the accessibility of HFSS products and/or promote healthier choices, several countries around the world have used **taxation and subsidies**. Such policies allow food prices to "**send the right signal**"[132] and taxing HFSS foods corrects the 'market failure' whereby the costs and burden of NCDs are overlooked by industries[133]. Although health policies require time to show their effects and are difficult to discern, evidence of the cost-effectiveness of obesity prevention policies from a public health and economic perspective, is growing[134].

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123 Turner, C., et al, 'Concepts and critical perspectives for food environment research: A global framework with implications for action in low- and middle-income countries', Global Food Security, Vol. 18, 2018.

124 World Health Organization, WHO European Regional Obesity Report 2022, 2022.

125 Hall, K. D., et al, 'Ultra-Processed Diets Cause Excess Calorie Intake and Weight Gain: An Inpatient Randomized Controlled Trial of Ad Libitum Food Intake', Clinical and Translational Report, Vol. 30, Issue 1, 2019.

126 Sacks, G., et al, 'Benchmarking as a Public Health Strategy for Creating Healthy Food Environments: An Evaluation of the INFORMAS Initiative (2012–2020)', Annual Review of Public Health, Vol. 42, 2021.

127 World Health Organization's Regional Office for Europe, 'Slide to order: a food systems approach to meal delivery apps', 2021.

128 Gilmore, A. B., et al, 'Defining and conceptualising the commercial determinants of health'. The Lancet, Vol. 401, 2023.

129 BEUC, Eurogroup for Animals, European Public Health Alliance, Put change on the menu,, 'The Illusion of Choice – Why someone already decided what you will eat for lunch', 2023.

130 European Parliament, Website: Legislative Train on Proposal for a harmonised mandatory front-of-pack nutrition labelling.

131 Daley, A. J., et al, 'Implementing physical activity calorie equivalent (PACE) food labelling: Views of a nationally representative sample of adults in the United Kingdom', PLoS One, 2023.

132 BEUC, Eurogroup for Animals, European Public Health Alliance, Put change on the menu,, 'The Illusion of Choice – Why someone already decided what you will eat for lunch', 2023.

133 World Health Organization, WHO European Regional Obesity Report 2022, 2022.

134 Sacks, G., et al, 'Benchmarking as a Public Health Strategy for Creating Healthy Food Environments: An Evaluation of the INFORMAS Initiative (2012–2020)', Annual Review of Public Health, Vol. 42, 2021.

Finally, it is worth noting that the body of evidence on the interrelations between food systems/diets and climate change is growing, creating **opportunities and synergies** for bold joint policy actions in particular with the climate and agricultural policies[135].

Regulatory action shaping the structure of the food system and food environments is significantly more effective in creating health-promoting environments than top-down actions to motivate individual behavioural changes or self-regulation by the industry[136,137,138]. Hoping to halt the progression of obesity at the population level via individual behavioural changes in an "obesogenic" or "health-disrupting" environment is unrealistic. Regulation can also have sustainable structural effects on obesity's environmental drivers and ensure more health equity throughout the population[139].

EU initiatives to improve food environments (where the EU has competence) remain insufficient to meaningfully protect citizens from obesity according to public health experts. A study implementing the methodology of the Health Food Environment Policy Index (Food-EPI) to analyse the EU policy domains' strength in influencing food environments concluded that most EU policies remained weak[140]. An expert panel also narrowed down priority policy and infrastructure support actions to create healthy food environments in the EU. Achievable and priority actions recommended at the EU level include mandatory and ambitious **food composition targets**; a complete ban for **trans-fats**; opening the way to 0% **VAT exemptions on fruit and vegetables** in the EU VAT Directive; and a **ban on marketing** unhealthy foods to children. The WHO paves the way for these initiatives[141], which are supported by civil society.

Three **European civil society organisations** (European Consumer Organisation - BEUC, Eurogroup for Animals, and European Public Health Alliance - EPHA) called in 2023 to integrate health-promoting measures into the **Regulation for sustainable food systems** proposed by the European Commission. The measures proposed include various obligations on food supply wholesalers and retailers to improve the accessibility and affordability of healthy foods, including quantified targets and reporting; obligations on food and beverage services, including mandatory calorie information in physical and online points of sale, obligations to align foods and drinks proposed with dietary guidelines (contents, portion sizes); regulation of food marketing and exposure of children, on all diffusion channels; alignment of the EU's support for agrifood products with public health objectives; alignment of public procurement guidelines; requirements towards healthier food by design e.g. regulating food and drinks composition[142].

[135] Fanzo, J. Miachon, L., 'Harnessing the connectivity of climate change, food systems and diets: Taking action to improve human and planetary health', Anthropocene, Vol. 42, 2023.

[136] Djojosoeparto, S. K., et al, 'Strength of EU-level food environment policies and priority recommendations to create healthy food environments', European Journal of Public Health, Vol. 32, Issue 3. 2022.

[137] Lloyd-Williams, F., et al, 'Smorgasbord or symphony? Assessing public health nutrition policies across 30 European countries using a novel framework', BMC Public Health, 2014.

[138] Van Dam, I., Reimes, N., Vandevijvere, S., 'Benchmarking the nutrition-related commitments and practices of major Belgian food companies', Int. J. of Behavioral Nutrition and Physical Activity, 2022.

[139] World Health Organization, WHO European Regional Obesity Report 2022, 2022.

[140] Djojosoeparto, S. K., et al, 'Strength of EU-level food environment policies and priority recommendations to create healthy food environments', European Journal of Public Health, Vol. 32, Issue 3. 2022.

[141] World Health Organization, WHO European Regional Obesity Report 2022, 2022.

[142] BEUC, Eurogroup for Animals, European Public Health Alliance, Put change on the menu,, 'The Illusion of Choice – Why someone already decided what you will eat for lunch', 2023.

3.2. Apprehending the new cues of the digital food environment

The digitalisation of the food environment (in particular online grocery shopping and meal delivery services) has a strong influence on the accessibility, desirability, affordability and convenience of food. Knowledge gaps about the impact of digital food environments on dietary habits and health persist and call for increased political attention[143]. In parallel, further developments have been observed, with their sets of opportunities and drawbacks, such as increased access to nutritional (mis-)information (e.g. nutrition management apps) and digitalisation of grocery store shopping and food outlets (e.g. touch-screen devices to order, scanning devices in retail). The digital food environments constitute both extensions and **transformations of the physical food environments**[144].

Research on the changes brought about by **meal delivery services** to individuals' food environments is ongoing. Key emerging characteristics include increased convenience for consumers, timesaving (eliminating various degrees of planning, purchasing, cooking, storing and cleaning), and extended accessibility to both healthy and highly processed foods[145]. The commercial strategies these services rely upon (e.g. minimum orders, promotional offers, disproportional price difference between portion sizes) can lead to over-ordering and consumption[146]. The design of digital food services (websites, apps, etc.) has a key role to play in users' food choices, as for physical points of sale[147], although the way algorithms function is not public. Many questions arise with regard to machine-learning powered algorithms which can lock users in individualised customer profiles based on history, app usage, location and device[148].

Early research in the UK on **rapid grocery delivery services** shows that they mainly provide HFSS, alcoholic beverages and tobacco products[149]. Thus, the digital food environment appears to distort food environments and restricts consumer choice towards more unhealthy consumer goods. However, interventional studies showed that digital food retail services can become tools in the promotion of nutritionally adequate food choices (information, personalised recommendations)[150].

Generally, the **out-of-home food sector** is growing, boosted by meal delivery services and representing a significant portion of meals/calories consumed in Europe[151, 152]. Out-of-home food is convenient but more energy-dense and nutrient-poor compared to home-cooked meals and linked to

[143] Fernandez, M. A., Raine, K. D., 'Digital Food Retail: Public Health Opportunities', Nutrients, 2021. World Health Organization, 'Digital food environments – Factsheet', 2021.

[144] World Health Organization's Regional Office for Europe, 'Slide to order: a food systems approach to meal delivery apps', 2021.

[145] Fernandez, M. A., Raine, K. D., 'Digital Food Retail: Public Health Opportunities', Nutrients, 2021.

[146] Fernandez, M. A., Raine, K. D., 'Digital Food Retail: Public Health Opportunities', Nutrients, 2021.

[147] Granheim, S., et al.

[148] World Health Organization's Regional Office for Europe, 'Slide to order: a food systems approach to meal delivery apps', 2021.

[149] Rinaldi, C., D'Aguilar, M., Egan, M., 'Understanding the Online Environment for the Delivery of Food, Alcohol and Tobacco: An Exploratory Analysis of 'Dark Kitchens' and Rapid Grocery Delivery Services', Int. J. Environ. Res. Public Health, 2022.

[150] Fernandez, M. A., Raine, K. D., 'Digital Food Retail: Public Health Opportunities', Nutrients, 2021.

[151] World Health Organization, 'The out-of-home food sector – exponential growth in an unregulated market', 2021.

[152] BEUC, Eurogroup for Animals, European Public Health Alliance, Put change on the menu,, 'The Illusion of Choice – Why someone already decided what you will eat for lunch', 2023.

NCDs (type 2 diabetes, obesity)[153]. Fast-food restaurants and chains can now significantly increase their outreach[154], creating so-called (digital) 'food swamps'[155].

Meal delivery apps also significantly increase people's visual exposure to unhealthy foods[156]. Groceries and meal delivery services additionally promote sedentary behaviours[157].

According to the WHO's Regional Office for Europe, the role of out-of-home consumption including meal delivery apps is understudied, and current **policy and legal frameworks do not always fully apply to digital food environments** or are underregulated (e.g. mandatory nutritional information)[158, 159]. Socio-economic disparities are also reflected here, as these food environments tend to be the unhealthiest in the most deprived areas[160].

The digital food environment also exhibits **opportunities** for positive change, such as the mitigation of food deserts in some contexts, via **accessibility** to a wider range of products (bearing in mind the limitation of the digital divide, which reflects socio-economic disparities) or the facilitation of parallel food networks (e.g. farm to consumer schemes)[161].

While the share of **online food marketing** is growing[162], (unfortunately) the WHO acknowledges that exposure to unhealthy food marketing leads to weight gain and an increased risk of overweight and obesity[163]. The products advertised are rarely in line with official dietary recommendations. Exposure to unhealthy food marketing on television was found to have particularly detrimental effects on children's nutritional habits[164]. It has been found that the majority of marketing on social media apps experienced by children and adolescents concerns HFSS foods and beverages compared to other food groups[165], while food-related posts on social media may disrupt viewers' satiety clues[166]. This marketing **significantly** impacts different diet-related outcomes of children[167].

Online advertising practices use persuasive methods[168]. Food marketing can involve "influencers" on **social media**, which children and adolescents can rely on for their consumption choices and the involvement of role models limits their ability to actively resist the influence of an advertisement.

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153 World Health Organization's Regional Office for Europe, 'Slide to order: a food systems approach to meal delivery apps', 2021.

154 Skovgaard, R. E., Flore R., Oehmen. J., 'The digital foodscape and non-communicable diseases: analysis of the risk factors of meal delivery applications in Denmark', DTU Skylab Foodlab.

155 By reference to 'food deserts', food swamp designates a food environment where the number of fast / junk food outlets, and convenience stores outnumber stores with healthy food options. World Health Organization's Regional Office for Europe, 'Slide to order: a food systems approach to meal delivery apps', 2021.

156 World Health Organization's Regional Office for Europe, 'Slide to order: a food systems approach to meal delivery apps', 2021

157 Ibid.

158 Ibid.

159 Fernandez, M. A., Raine, K. D., 'Digital Food Retail: Public Health Opportunities', Nutrients, 2021. World Health Organization, 'Digital food environments – Factsheet', 2021.

160 BEUC, Eurogroup for Animals, European Public Health Alliance, Put change on the menu,, 'The Illusion of Choice – Why someone already decided what you will eat for lunch', 2023.

161 Granheim, S., et al.

162 Granheim, S., et al.

163 World Health Organization, WHO European Regional Obesity Report 2022, 2022.

164 Kelly B., et al, 'Television advertising, not viewing, is associated with negative dietary patterns in children', Pediatric Obesity, Vol. 11, Issue 2.

165 Mc Carthy, C. M., de Vries. R., Mackenbach. J. D., 'The influence of unhealthy food and beverage marketing through social media and advergaming on diet-related outcomes in children—A systematic review', Obesity Reviews, Vol. 23, Issie 6. 2022.

166 Granheim, S., et al.

167 Mc Carthy, C. M., de Vries. R., Mackenbach. J. D., 'The influence of unhealthy food and beverage marketing through social media and advergaming on diet-related outcomes in children—A systematic review', Obesity Reviews, Vol. 23, Issie 6. 2022.

168 Jenkin, G., et al, 'A systematic review of persuasive marketing techniques to promote food to children on television', Obesity Reviews, Vol. 15, Issue 4.

Children and adolescents are still developing their personalities and are highly **vulnerable to marketing** due to their cognitive and developmental immaturity[169], in particular in the face of neuromarketing techniques and sophisticated algorithms, which potentially limit the role of advertising literacy[170]. Interestingly, children are also conditioned by advertisement to simplistic ("corporate-friendly") conceptions on health and obesity prevention and management, focused on individual good/bad behaviours, drawing attention away from complex determinants of health[171].

Despite the establishment of a minimum age for users to use certain **online platforms** (e.g. YouTube), very young children are exposed to advertisements of HFSS foods[172], directly influencing their calorie intake[173]. The legal framework (Audiovisual Media Services Directive)[174] on commercial communications on such platforms in the EU relies on co- and self-regulation, which has its limitations.

Further techniques and hybrid contents blur the line between content and marketing. For instance, **advergames** (videogames developed for the purposes of advertising a brand-name product) containing food cues have been found to lead to an increase in caloric intake, as well as influence marketing[175]. Marketers aim for a reinforcement of brand-consumer engagement[176], a field which is not always covered by food marketing regulations. Even if strictly regulated by the EU's General Data Protection Regulation, the commercial use of **personal data** places users in digital advertising bubbles, with personalised advertisements and price promotions. This personalisation makes it more difficult to monitor and regulate[177].

Creating **healthogenic environments**, where healthier food choices are facilitated, should be a central policy objective, including in the Commission Proposal for a legislative Framework for Sustainable Food Systems[178]. It is also urgent for policymakers to fully integrate digital food environments in public health and NCD-prevention policies to extend offline protections to the online realm. Some research suggests that digital technologies can have a beneficial effect on patients' self-management[179]. Apps have even been used for the prescription of pharmaceutical products in the UK[180], and AI-powered chatbots can provide a relay in therapeutic interactions[181].

169 Boyland, E., 'Is it ethical to advertise unhealthy foods to children?' Proc. Nutr. Soc., 2023.

170 World Health Organizations' Regional Office for Europe, 'Tackling food marketing to children in a digital world: trans-disciplinary perspectives', 2016.

171 Powell, D., 'Needs of Children, not Big Food, must win out', NZ Herald, 2017.

172 World Health Organization, 'Digital food environments – Factsheet', 2021.

173 Coates, A., et al, 'Social Media Influencer Marketing and Children's Food Intake: A Randomized Trial', Pediatrics, Vol. 142, Issue 4.

174 Directive 2010/13/EU of the European Parliament and of the Council of 10 March 2010 on the coordination of certain provisions laid down by law, regulation or administrative action in Member States concerning the provision of audiovisual media services.

175 Coates, A., et al., 'Social Media Influencer Marketing and Children's Food Intake: A Randomized Trial', Pediatrics, Vol. 142, Issue 4

176 Folkvord, F., et al, 'Promoting Fruit and Vegetable Consumption for Childhood Obesity Prevention', Nutrients, 2022.

177 World Health Organization, 'Digital food environments – Factsheet', 2021.

178 European Commission, 'Legislative framework for sustainable food systems'.

179 Bennett, G. G., et al, 'Effectiveness of an app and provider counseling for obesity treatment in primary care', American journal of preventive medicine, 55(6), 777-786.

180 Collis, H., UK to offer weight-loss drugs via app-based prescriptions, Politico, 2023.

181 Stephens, T. N., et al, 'Feasibility of pediatric obesity and prediabetes treatment support through Tess, the AI behavioral coaching chatbot', Transl. Behav. Med. Vol, 9. Issue 3, 2019.

3.3. Encouraging dynamic behaviours in the physical environments

Built environments, i.e. the human-made modifications to one's living surroundings, influence citizens' opportunities to perform transport- or leisure-related physical activities, as well as their exposure to pollutants in the air[182] or everyday items[183], which were associated with obesity by recent studies. Beyond the study of their role in obesity prevention, the WHO recognises that **active lifestyles** have many benefits of a social, environmental and economic nature[184].

Clear and robust indications of the role of individual characteristics of the **built environment** in developing risk factors for obesity remains scarce in Europe. Common definitions and methodological standards (e.g. departing from BMI-based analyses), including the modelling of the multiplicity of factors and complexity of (combined) interactions between individuals and environments, are insufficient[185] but a few studies provide interesting guidance. Urban sprawl and low land use mix were positively associated with weight status (North America)[186], and intersection density, residential density and access to public transport and recreation facilities with more physical activity[187]. Where active transport is made possible (e.g. commute to schools), a correlation is seen with physical activity of children (Australia)[188]. The link between the built environment and obesity-related indicators is more evident in **intermediating individual behavioural factors**[189]. Transport-related physical activity, i.e. walking and in particular cycling, have been found to be associated with lower weight, waist circumference and percentage body fat (France)[190]. Neighbourhood walkability appears to be associated with a lower BMI and waist circumference (Canada)[191].

Well-thought-out **urban design and planning** has the capacity to increase active transport and recreation in populations[192]. Although the link with obesity prevention remains difficult to measure empirically, certain **parameters of the physical environment** (e.g. bike lanes) or **targeted policies** (e.g. bike subsidies)[193] effectively promote physical activity. Regular and planned physical activity in patients with obesity is an integral part of management strategies and has benefits for cardiometabolic health[194]. The recent years have seen a momentum for cycling in Europe, and the very recently adopted European Declaration on Cycling should sustain the trend[195].

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182 De Bont, J., et al, 'Ambient air pollution and overweight and obesity in school-aged children in Barcelona, Spain', Environment International, Vol. 125, 2019.

183 Research on the role of endocrine disruptors in the development of obesity is at its infancy. However, it is observed that synthetic chemicals have entered every aspect of humans' lives and causative links with fat accumulation have been identified with several chemicals (e.g. most recently, per- and polyfluoroalkyl substances - PFAS). In this context, endocrine disrupting chemicals can be called environmental obesogens, which alter homeostasis, promote accumulation of fat tissues, or disrupt metabolic homeostasis.

184 World Health Organization, WHO European Regional Obesity Report 2022, 2022.

185 Lam, T. M., et al, 'Associations between the built environment and obesity: an umbrella review', Int. J. Health Geographics, 2021.

186 Mackenbach, J. D., 'Obesogenic environments: a systematic review of the association between the physical environment and adult weight status, the SPOTLIGHT project', BMC Public Health, 2014.

187 World Health Organization, WHO European Regional Obesity Report 2022, 2022.

188 Timperio, A., Reid, J., Veitch, J., 'Playability: Built and Social Environment Features That Promote Physical Activity Within Children', Economy and Environment, 2015.

189 Frank, L. D., Andresen, M. A., Schmid T. L., 'Obesity relationships with community design, physical activity, and time spent in cars', Amer. J. Preventive Medicine, Vol. 27, Issue 2, 2004.

190 Menai, M., et al, 'Differential Associations of Walking and Cycling with Body Weight, Body Fat and Fat Distribution - the ACTI-Cités Project', Obesity Facts, 2018.

191 Frank, L., et al, 'Built environment influences on healthy eating and active living: The NEWPATH study', Obesity, Vol. 30, Issue 2.

192 World Health Organization, WHO European Regional Obesity Report 2022, 2022.

193 Ibid.

194 Muller, M. J., 'Reports of the EASO physical activity working group: Diverse insights, evidence-based recommendations, and future perspectives', Obesity Reviews, 2021.

195 European Commission, Proposing a European Declaration on Cycling, COM(2023) 566.

Great variations exist in each individual's environment (e.g. heterogeneity across neighbourhoods; rural-urban divide), which should be looked at specifically. **Social inequality** has also been evidenced as both a cofounder and modifier for the association between physical built environmental factors and obesity and independently associated to obesity itself develop[196], highlighting the need for an intersectional approach which includes socio-economic status.

Reducing sedentary time, estimated to account for 80% of waking hours in European adolescents, promoted by the growing proportion of on-screen time, appears essential to combat a wide range of adiposity-related health risks. There are opportunities to consider this additional notion in prevention policies[197], to promote wellbeing, in particular in workplace and school routines. These risks can also be mitigated by the promotion of **active transportation means** and limitation of screen time amongst children/adolescents. Incentives to limit sedentary time appears to also play a part in a comprehensive and individualised management of obesity, but specific recommendations are needed[198]. Accessibility to **green and blue spaces** is associated with higher physical activity[199]. Neighbourhoods with green areas and sheltered from traffic appear to lead to more outdoor play and physical activity[200].

The prevention of obesity at population level requires structural measures to create the conditions of healthier nutrition, increased physical activity and less sedentarity. As a secondary benefit, creating health-promoting environments supports persons already living with obesity in implementing the behavioural interventions recommended by the medical environment.

[196] Lam, T. M., et al, 'Associations between the built environment and obesity: an umbrella review', Int. J. Health Geographics, 2021.

[197] Julian, V., et al, 'There Is a Clinical Need to Consider the Physical Activity: Sedentary Pattern in Children with Obesity - Position Paper of the European Childhood Obesity Group', Ann Nutr Metab, 2022.

[198] Ibid.

[199] World Health Organization, WHO European Regional Obesity Report 2022, 2022.

[200] Clark, H., et al, 'A future for the world's children? A WHO-UNICEF-Lancet Commission', Lancet Commissions Vol. 395, Issue 10224.

4. APPROPRIATE HEALTHCARE FOR CITIZENS WITH OBESITY

Providing appropriate healthcare for persons living with obesity requires a consideration of the complexity of the disease and going beyond simplistic lifestyle injunctions. To assert or assume that obesity is solely the individual's responsibility is 1) contrary to the complexity of the disease and its physiological mechanisms, and 2) ignores the environments in which citizens evolve. The 2022 WHO European Regional Report on Obesity confirms that the **narrative which only considers obesity to be a responsibility of the individual is a barrier to effective policy implementation**[201].

European citizens who live with obesity must have access to **appropriate holistic and individual support** to improve their health and quality of life, sustain the behavioural adaptations required, and manage their disease and the complications of the disease. The sections below highlight some key aspects in relation to the healthcare required for persons living with obesity.

4.1. Integrated, multidimensional and patient-centred healthcare

Persons living with obesity can be better helped through **multidisciplinary care** as there is little evidence for a single effective approach[202]. This includes the provision of individual support in the implementation of the required **individual behavioural interventions** and can be completed by **adjunctive therapies** in the form of **psychotherapy**, **pharmacological** support or **surgical** interventions. Ideally, the individual care plan should be designed and monitored in a multidisciplinary setting. Behavioural weight management interventions result in improvements of both physical and mental health outcomes[203].

Obesity is not defined exclusively by a person's weight, and reaching a weight considered as 'healthy' – although reducing the risk of complications – does not mean overcoming the disease. The **health and care objectives for patients living with obesity are manyfold**, including the restauration of the energy balance, a reduction of weight gain, improvements of the body composition, physical function and quality of life, and the prevention/management of complications (including cardiovascular diseases, cancers, psychiatric disorders, etc.).

The 2022 WHO European Regional Report on Obesity advocates for improved **patient-centred health objectives**. Addressing obesity in patients thus means **focusing on the improvement of physical and mental health outcomes** for patients (including the prevention of complications), and their quality of life.

4.2. Medicinal support and surgical interventions

In the past decades, the medical approach to treat obesity, when behavioural and psychological interventions had failed, relied primarily on surgical interventions. The resort to **metabolic and bariatric surgery**, in particular among young people, is supported by the severe and numerous health outcomes of obesity and related NCDs, severely diminishing life expectancy and health status. In the right individual context and conditions, bariatric surgery in adults and youth has been found to reduce BMI, cardiovascular risks, hypertension, type-2 diabetes, dyslipidaemias, and to improve persons' quality of life[204]. In the recent years, pharmaceutical research has developed effective weight-loss medicines.

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201 World Health Organization, WHO European Regional Obesity Report 2022, 2022

202 World Health Organization, WHO European Regional Obesity Report 2022, 2022

203 Jones, R. A., et al, The impact of adult behavioural weight management interventions on mental health: a systematic review and meta-analysis, Obes Rev. 2021 Apr 1; 22(4): e13150.

204 https://iris.who.int/bitstream/handle/10665/353747/9789289057738-eng.pdf?sequence=1

If appropriate to an individual's situation, pharmacological options can play an **important supportive role in addition to behavioural interventions in the treatment and management of obesity**, and in the prevention of complications (e.g. type 2 diabetes mellitus, hypertension). The use of medicinal products is recommended by the WHO on the basis of an individual medical assessment, starting from adolescence, together with an intensive behavioural intervention (nutrition, physical activity, behavioural change)[205]. The **main positive physiological effects** of the obesity pharmacopeia include reducing energy intake and increasing energy expenditure; reducing weight gain; improving body composition, physical function and quality of life; and preventing/mitigating obesity-related complications. Although they can bridge the gap between behavioural interventions and surgical interventions, they are no 'silver bullets' in the prevention and management of obesity. Their extensive financial cost at society-level (see Section 1.5. above) also constitutes a serious limitation to their added value.

The only available medicine for long-term paediatric obesity treatment until 2015 was Orlistat, a **lipase inhibitor** (i.e. limiting the absorption of fat by the body). It was approved by the European Medicines Agency (EMA) for patients with a BMI higher than 28; a half-dose product has been available without prescription since 2009. Liraglutide, sold under the brand names Victoza and Saxenda, is a glucagon-like peptide-1 **(GLP-1) receptor agonist** and was approved by the EMA in 2009. A combination of naltrexone and buproprion was also approved and is understood to act on the brain's receptors for food intake and energy balance.

Described as game-changers, the newest molecules in the pharmacopeia include several GLP-1 receptor antagonists with diabetes and obesity indications, such as semaglutide and tirzepatide. Semaglutide is sold under the names of Ozempic, Wegovy and Rybelsus by Danish pharmaceutical company Novo Nordisk and tirzepatide as Mounjaro by the US company Eli Lilly. Semaglutide and tirzepatide are **GLP-1 receptor agonist accumulating in the brain** to modulate appetite and limit the absorption of glucose. Ozempic was authorised in 2018 by the EMA for the treatment of type-2 diabetes. The weight-loss formula Wegovy was authorised EU-wide in 2022 for people with obesity or people with overweight associated with health complications. It is currently only available on prescription in Denmark and Germany. Mounjaro was also authorised by EMA in September 2022 as a dual-use product for the treatment of diabetes and obesity/overweight with medical complications. The stocks of these medicine are limited, while the demand is very high globally (including "excessive off-label uses"), leading to **shortage**, disrupting patient's current treatments and limiting the possibility for new patients with obesity to start treatment[206].

Pharmacovigilance will be needed as pharmaceutical treatments of obesity may have some short- and long-term side-effects, as shown by withdrawals of several obesity treatments[207]. In the past decades, several products did not pass the approval of the EMA's Committee for Medicinal Products for Human Use on the basis of the risk-benefit principle. In addition, as with other chronic disease treatments, certain medicinal products such as semaglutide can require **lifelong treatment** for sustained weight-loss results, as the weight loss can be reversed upon discontinuation of the treatment.

A **careful assessment** of the new generation of pharmaceutical products will need to be carried out by Member States, taking into consideration their added value via health technology assessments, the

[205] World Health Organization 'WHO European Regional Obesity Report 2022'.

[206] https://www.ema.europa.eu/en/news/eu-actions-tackle-shortages-glp-1-receptor-agonists

[207] Cawthorne, M. A., 'Opportunities and challenges for the development of pharmacological therapies for obesity treatment', Obesity Review, 2007.

costs on national health systems, and evidence on the benefits for persons with obesity in the long run and of their broader impacts, e.g. reduction of direct and indirect costs of the disease on society.

The progress in the understanding of obesity in national health systems may be indirectly affected by the national discussions on reimbursement strategies.

The development of **precision medicine tools** takes full account of the heterogeneity of *obesities* and can optimise the diagnostic (beyond BMI, waist circumference and fat percentage analyses) and therapeutical benefits, as well as limit the occurrence of side effects. Research on the identification of suitable biomarkers is crucial in this regard[208, 209].

[208] Frühbeck G., Kiortsis D. N., Catalán V., Precision medicine: diagnosis and management of obesity,

[209] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9534386/

4.3. Upskilling the healthcare professionals

A person living with obesity is an active "patient", who needs support to sustainably and effectively deliver the behavioural adaptations necessary to live with the chronic disease. **Self-management** is **a dynamic, interactive, and daily process** in which individuals engage - in conjunction with family, community, and healthcare professionals- to manage a chronic illness; treatments; behavioural changes; and psychosocial, cultural, and spiritual consequences[210, 211].

A patient-centred approach requires healthcare providers and managers to talk with patients living with obesity and agree on realistic expectations, person-centred treatments and sustainable goals for behavioural change and health outcomes[212]. **Short-term body weight management is not considered the priority,** and importance should be given to psychological aspects and quality of life[213]. Care at all levels prioritises keeping the patient as **metabolically healthy** as possible[214]. Setting person-specific goals focused on decreased adiposity and better physical condition[215] reduces the weight bias internalisation which would normally make the patient susceptible to avoiding healthcare settings as they anticipate stigmatising and discriminatory treatment[216].

A major impediment to managing the condition effectively is the silence that surrounds obesity as a medical condition. The health workforce generally lacks **systematic education on obesity**[217] and how to engage with patients to begin a conversation which they fear may interrupt their therapeutic relationship[218]. Weight stigma needs to be addressed continuously in healthcare, moving towards health-focused, weight-inclusive approaches, by mixing increased causal information, empathy evocations, and education[219]. Obesity stigma can also affect the quality of care for patients with obesity, ultimately leading to poor health outcomes and increasing risk of mortality[220]. This begins with asking consent to start an informed conversation on body weight and health[221].

Patients experience the complexity of their disease and expect substantive conversations[222]. They reject banal advice and unfounded assumptions about their lifestyle[223], and are highly motivated to engage in incremental change for weight management when given appropriate support[224].

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210 Schutz, DD et al. 'European practical and patient-centred guidelines for adult obesity management in primary care' Obesity Facts, 2019.

211 Hampl, S. et al. 'Clinical practice guideline for the evaluation and treatment of children and adolescents with obesity' American Academy of Pediatrics, p. 59, 2023.

212 Wharton, S. et al. 'Obesity in adults: a clinical practice guideline' Canadian Medical Association Journal, 2020.

213 Schutz, D. D., et al, European Practical and Patient-Centred guidelines for Adult Obesity Management in Primary Care, in Obesity Facts, Vol. 12, Issue 1.

214 Schutz, DD et al. 'European practical and patient-centred guidelines for adult obesity management in primary care' Obesity Facts, 2019.

215 Canadian Medical Association Journal 'Obesity in adults. A clinical practice guideline', 2020.

216 Puhl, R. et al. 'The roles of experienced and internalized weight stigma in healthcare experiences: Perspectives of adults engaged in weight management across six countries.' PLoS ONE, 2021.

217 Mastrocola, M.R. et al. 'Obesity education in medical schools, residencies, and fellowships throughout the world: a systematic review' International journal of obesity, 2020.

218 Albury, C. et al. 'The importance of language in engagement between health-care professionals and people living with obesity: a joint consensus statement' The Lancet Diabetes and Endocrinology, p.6, 2020.

219 Talumaa, B. et al. 'Effective strategies in ending weight stigma in healthcare' Obesity reviews, 2022.

220 World Health Organization. Regional Office for Europe. (2017). Weight bias and obesity stigma: considerations for the WHO European Region. World Health Organization. Regional Office for Europe.

221 Torti, J. et al. 'The 5As team patient study: patient perspectives on the role of primary care in obesity management.' BMC family practice, 2017.

222 Torti, J. et al. 'The 5As team patient study: patient perspectives on the role of primary care in obesity management.' BMC family practice, 2017.

223 Ananthakumar, T. et al. 'Clinical encounters about obesity: systematic review of patient's perspectives' Clinical Obesity, 2020.

224 Caterson, I. et al. 'Gaps to bridge: misalignment between perception, reality and actions in obesity' Diabetes, Obesity and Metabolism, 2019.

Language that recognises the underlying causes of obesity and emphasises collaboration is essential[225]. Educational curricula and their supervision should be suitable to assess, not only the healthcare professional's attitude and confidence in dialogue but also measurable skills such as empathy-related behaviours and questions[226].

Sustained weight management is significantly supported by advice for interventions[227], so a brief referral by a general practitioner to a specialised intervention is highly cost-effective[228]. High-intensity counselling after referral to proper behavioural interventions produces the most consistent and long-lasting results[229]. The physical care environment should also be better equipped to swiftly accommodate for all body sizes[230]. Referrals and reimbursements for psychologists, dieticians, and other healthcare professionals as critical members of the care team are essential components of effective care[231]. A person living with obesity should be given access to the whole array of treatment options: nutrition and exercise, psychological and behavioural interventions, pharmacotherapy, and , bariatric surgery[232].

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5. SUMMARY OF THE ANALYSIS

Obesity is an increasingly significant public health challenge both globally and within the European population. The disease **affects at least 16.5% of the EU's adult population**[233] (that is approximately 60 million people in 2019[234]) with a rapid progression in the recent decade. Countries currently appear incapable of halting this rise. Obesity is expected to reduce the European population's life expectancy by almost 3 years in the next 30 years. It is a gateway to a wide range of complications and non-communicable diseases (e.g. cancer, cardiovascular diseases, diabetes). Populations with a less favourable **socioeconomic position** (income, education, residence) are more affected by obesity and are more exposed to unhealthy environments and stress. These disparities also impact children, and obesity often persists into adulthood, highlighting the need for targeted interventions for vulnerable populations and at critical stages of life from preconception to adolescence, to break the 'inter-generational cycle of obesity'.

Beyond public health concerns, obesity has a **high impact on the economy, labour markets and healthcare systems**. Obesity has manifold detrimental effects on the participation and opportunities given to persons living with the disease in the **labour market**, and it affects the **school** performance of children. In terms of **public health expenditure**, 8% of annual health budgets will be dedicated to treating complications in OECD countries between 2020 and 2050. Several arguments and estimates have been made, highlighting the high **cost-effectiveness of prevention interventions**, both in terms of (healthy) human lives and public health expenditure.

Obesity is a "**complex multifactorial disease defined by excessive adiposity that represents a risk to health**" caused by the interaction of genetic, metabolic, behavioural of environmental factors. Determinants of obesity are multiple and interact with each other over the life course and their confluence is at the core of understanding obesity. They include **individual factors** rooted in genetics, biology and psychology, **individual behaviours** in terms of nutrition, physical activities and sleep, which interplay and are **influenced** by the food **environments** and built environments, **commercial determinants** and **political and societal determinants**. These determinants do play a role as early as the pre-conception and gestational stages of life. Acknowledging that the physical and digital food environments are shaped by commercial interests rather than public health considerations is central to policymakers, in a context of efforts of the multinational food industry to 'prevent, delay, or weaken regulatory policies'.

The **EU plays a key supportive role in obesity prevention and management**, with potential for significant impact through financial support (Horizon Europe, EU4Health) and policy fields across various areas such as food safety, agriculture, transport, research, and education. These policy touchpoints can be effectively mobilised and coordinated, internally in a Health in all policies perspective, and with the Member States, to enhance obesity prevention and management efforts. **Member States actions** documented in this analysis include taxation of HFSS foods and beverages, food labelling requirements (cf. Nutri-Score) which could be implemented at the EU level, and multidimensional community-based interventions and local approaches to the prevention and management of obesity.

[233] Eurostat (2019). Body mass index by sex, age and educational attainment level, **hlth_ehis_bm1e.**

[234] Milieu's calculation based on: Eurostat (2019) Population on 1 January by age and sex, demo_pjan.

Opportunities for structural prevention policies. While the European Union and its Member States have respectively taken several steps to combat obesity, structural and comprehensive efforts are required.

Reports such as the OECD's *Heavy Burden of Obesity* and the WHO's 2022 *European Regional Obesity Report* clearly highlight that existing policies are insufficient. These reports underscore the need for a **comprehensive strategy** that goes beyond isolated interventions, as **no single intervention can address the complexities of obesity on its own**. Moving forward, it is essential to implement coordinated, sustained efforts that create environments conducive to healthier choices, ultimately reducing the burden of obesity (and other diseases) across Europe. Implementing obesity prevention policies yields significant societal benefits and helps reduce long-term healthcare costs, making it a strong counter to arguments against action due to obesity's complexity.

Policies should strive to create **structurally health-promoting environments**, addressing the upstream determinants of obesity, to incite rather than dictate individual behaviours and make the healthy choice the easiest choice. Policy options should move away from solely individualistic approaches and **address the structural drivers of obesity**. Member States have various policy tools to prevent and control obesity, although their design and implementation can be challenging due to the complexity of obesity and political factors. The **most promising whole-of-population strategies** according to the WHO European Regional Office include taxing sugar-sweetened beverages and sugar in processed foods, restricting the promotion and visibility of unhealthy foods, banning (online) advertising of unhealthy foods to children, and limiting takeaway outlets in low-income neighbourhoods. Creating health-promoting environments also benefits individuals living with obesity by supporting their efforts to sustain behavioural changes recommended by medical professionals. Addressing environmental and commercial factors through population-wide policy interventions is likely to be the most effective way to reverse the obesity epidemic, and **creates synergies** to reduce socio-economic inequalities, and contribute to achieving environmental objectives.

Management and care. A key to understanding obesity is to distinguish discussions on effective prevention policies from the needs of persons living with obesity in terms of disease management and care. Appropriate and considerate healthcare must be ensured for persons living with obesity. The required **multidisciplinary care** includes the provision of individual support in the implementation of individual behavioural interventions, and possibly adjunctive therapies in the form of psychotherapy, pharmacological support or surgical interventions. Appropriate care also requires providing resources and training to the **health workforce** on understanding obesity to focus on patient-centred health-based objectives.

A nexus of prevention policies on the one hand and disease management and care objectives on the other hand, is attainable. For this purpose, the WHO strongly advocates for a multifaceted approach to obesity that includes health promotion, disease prevention, accurate diagnosis, effective treatment, and ongoing management.

The **opportunity and the impact of recent weight-loss pharmaceutical treatments** on European healthcare costs is complex. While these treatments could reduce long-term costs and improve public health, they also present challenges, in particular very high initial prices potentially, a major challenge for the sustainability of health systems. While industry studies suggest that new obesity treatments are more cost-effective than behavioural interventions despite their high costs, further independent research is essential to confirm these findings and evaluate their broader applicability.

Determining if and how to finance these treatments - through public funding, private payments, or a mix – relies on the underlying understanding which is made of obesity but also of a reality check on the **financial viability**. In any event, the debate on the reimbursement of these drugs should not slow down the societal recognition of obesity as a disease.

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This in-depth analysis presents current developments and challenges in the prevention and management of obesity in the European Union. The analysis provides an overview of the disease, emphasises the importance of designing supportive environments in prevention efforts, and makes an argument to upskill the healthcare provided to persons living with obesity.

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