NOTHING IN LIFE IS TO BE FEARED, IT IS ONLY TO BE UNDERSTOOD.
NOW IS THE TIME TO UNDERSTAND MORE, SO THAT WE MAY FEAR LESS.

~ MARIE CURIE

VINCIABLE PANDEMICS
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Abstract

Harm reduction approaches addressing the pandemic-scale health and economic impact of socially-acceptable risk behaviours.

This VINCIBLE PANDEMICS Report is a product of a diverse team of experts with varying expertise and perspectives, including molecular biology, epigenetics, toxicology, pharmacology, psychology and health economics, yet united in their belief in the key importance of taking action to inform and promote harm reduction approaches related to modifiable risk behaviours. Harm reduction approaches have the potential to effectively reduce the damage to individual and public health resulting from historically persisting harmful habits, such as smoking, alcohol abuse and overuse, bad diets and unhealthy foods, as well as from new fast penetrating habits related to excessive use of digital devices and screens, where and when prohibitions do not produce results or may cause more harm than good to people and societies. Numerous international, European and national reports have outlined these as top risk factors worldwide and with extremely high prevalence in Bulgaria. Therefore, as these risk behaviours are modifiable, this Report aims at raising awareness and facilitating the understanding on the ways to limit their negative implications on the individual and public health. The harm reduction approaches vary due to the nature of the respective harmful behavior and due to the differences in people and societies. Although not exhaustive this report, provides proven scientific data and offers principle recommendations for entailing harm reduction concept in future policies relevant to improving public health.
Ladies and Gentlemen,

PanEuropa Bulgaria represents the values and principles of the International Paneuropean Union, encouraging peace and well-being of citizens, protecting human rights and freedom, promoting scientific and technological progress, and enhancing the idea of European integration and solidarity. We aim to build an optimistic future for Bulgaria through active EU citizenship. PanEuropa Bulgaria provides solutions where and when society needs them, as it gathers like-minded people to promote ideas and possible ways to respond to modern challenges.

The last two years were marked by the world’s most severe health crisis of our times – the COVID-19 pandemic, leading to PanEuropa Bulgaria’s imminent response and shift of focus towards endorsing the values of protecting human life and improving the health of citizens going forward.

- It was already in April 2020, shortly after the outburst of COVID-19 pandemics, that a Pan-European team of statesmen and scientists coordinated by the Atlantic Club of Bulgaria launched the Health Shield Europe Initiative (#HeShEu), envisaging an EU/NATO common strategy towards preventing and reducing the risk of future pandemics (https://adn.bg/en/health-shield-europe).

- In August 2020, because of the pandemic, a new Pan-European Commission on Health and Sustainable Development by the WHO Regional Office for Europe was convened to rethink health policy priorities in the COVID-19 context. After identifying and reviewing the relevant evidence and lessons from how different countries have responded to it, in September 2021, the Report: “Drawing light from the pandemic: A new strategy for health and sustainable development” (https://www.euro.who.int/__data/assets/pdf_file/0015/511701/Pan-European-Commission-health-sustainable-development-eng.pdf) was issued by the Pan-European Commission, containing recommendations on investments and reforms to improve the resilience of health and social care. The Report emphasizes that people and governments must focus on own local and regional measures to deal with potential future health threats. Therefore, it is essential to identify and address why the effects of the crisis are linked to local situations, trends and national specificities that existed even before the COVID-19 pandemic and how they have amplified them. Furthermore, the working group that prepared the Report proposed that, after the acute phase of the crisis, national dialogue should be held to compile experiences and create a shared understanding of the crisis and its impacts on people’s lives and health status in the countries. In this public debate, political leaders can significantly influence what needs to be changed. Two critical conclusions from the Report were drawn. They emphasized (i) the need to protect citizens from misinformation and disinformation and (ii) the requirement for new policy recommendations and sustainable solutions backed by robust scientific evidence, highlighting science’s central role in identifying the root cause of societal issues.
• In January 2022, at the Conference of the Pan-European Union in Hungary, Budapest, a key takeaway was outlined, among many others addressing political and economic challenges, that the post-pandemic time ahead of us is another health crisis “to which we must provide a sustainable response”.

Even before the COVID-19 pandemic, Bulgaria was among the least-performing EU Member States regarding life expectancy and preventable mortality rates. The pandemic further reversed years of progress and dramatically influenced Bulgarian citizens’ life expectancy, highlighting the need for better preparedness for the health system. (Country Health Profiles 2021 - OECD - [https://www.oecd.org/health/country-health-profiles-eu.htm]). In light of the above-mentioned unprecedented circumstances, Bulgaria can and should right now build back a better foundation and response to health challenges as we go forward. Therefore, The PanEuropa Bulgarian team sincerely hopes our national governments and political leaders should join forces with scientists and public opinion leaders, as well as private and non-governmental sectors, to do the COVID-19 aftermath carefully. We recognize new practical approaches are necessary in the journey to minimize the impact of health risk factors and encourage a healthier lifestyle in regard to dietary habits, physical (in)activity, sleep hygiene, sensation-seeking, alcohol consumption, tobacco smoking, substance abuse, sexual risk behaviours, gambling, stress, etc.

For that reason, it is a pleasure to present the Report VINCIBLE PANDEMICS - an initiative of PanEurope Bulgaria, uniting the collaborative efforts of a team of esteemed scientific researchers and experts. All of them work in diverse professional areas, yet they share common views on the lessons learned from the COVID-19 pandemic in our country and the need for new practical approaches to harm reduction of some of the most prevalent risk factors related to long lasting social, behavioural and cultural characteristics of the population - unhealthy diet and sedentary lifestyle, alcohol abuse, smoking and problematic use of digital devices, all of them being preventable and modifiable. Such new approaches aim to assess the risk spectrum of these risk factors and suggest ways to reduce the level of harm they cause to health, as well as to weigh down the economic burden these risk factors levy in Bulgaria.

I thank every member of this impressive team of science lovers for their collaborative efforts resulting in offering understanding and pragmatic approaches to harm reduction of the risk factors while at the same time respecting human rights for personal choices. This joint initiative further calls on industries to embrace ESG goals and criteria as standards in their business strategies for sustainable development.

Idea and execution: PanEurope Bulgaria

Photos, images, graphs: with sources’ references, legitimate use from Shutterstock and own authorship
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Detelina Stamenova is a psychotherapist, psychologist, sociologist, author, and editor of books and articles. Her professional interests are behavioural addictions, eating disorders and mental health programs in the workplace. She is a member of the Bulgarian Psychological Society and an early member of the Steering Committee and online activists group of the World Eating Disorders Action Day.

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Arkadi Sharkov is a macroeconomist at the Expert Club For Economics and Politics (ECEP) with experience in the public and private sectors. His expertise lies in health economics, sustainable development, and tax policy. He holds a Master’s degree in Public Policy from the Maastricht University and the United Nations University. Currently, he is a PhD student at Sofia University “St. Kliment Ohridski”. He has worked on projects related to the pricing of clinical pathways and medicines and optimization of public spending in the healthcare field, as well as related to the sustainable development of the industry in Bulgaria. He is a member of the Advisory board of the Bulgarian Medical Association and also a participant and member of the public council of the “Hospital index.”
“PRIMUM NON NOCERE”
FIRST, DO NOT HARM

is one of the principles of Medicine and is believed to be articulated in the original
Hippocratic oath in AD 245.

“I WILL RESPECT THE HARD-WON
SCIENTIFIC GAINS OF THOSE PHYSICIANS
IN WHOSE STEPS I WALK, AND GLADLY
SHARE SUCH KNOWLEDGE AS IS MINE
WITH THOSE WHO ARE TO FOLLOW”.

is one of the modern secular statements
included in the oath obligations of the
healthcare community nowadays.
Definitions of “good health” and “disease” are dynamic over time, as good health is not just the absence of disease. Due to its multi-aspect nature, the need for practicable but effective disease prevention and timely intervention strategies for maintaining relatively good health has frequently been discussed among different professions.

“Health is not a “state of complete physical, mental, and social well-being”. And nor is it “merely the absence of disease or infirmity”, researchers in The Lancet stated in 2009 (https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(09)60456-6/fulltext).

There is a visible tendency nowadays to worsen human health globally, as it is well known that humans worldwide undertake risk behaviours that directly or indirectly negatively affect health. Especially now that we are recovering from the unexpected COVID-19 pandemic, the lessons we have learned come as immediate and imperative to act upon. This „bombshell“ COVID-19 came even though humans made huge progress in their history in the last century, defined as the golden age of technological, medical, scientific and social progress. We now develop modern technological and scientific breakthroughs. We design precision medicines, and we travel in Space. Regrettably, fundamental problems like the worsening of human health are expanding. The COVID-19 pandemic rang the alarm and reminded us of other ongoing „pandemics“ like the high incidence of socially significant chronic diseases. They include cardiovascular diseases, diabetes mellitus, mental disorders, and oncologic and lung diseases, also designated as noncommunicable diseases (NCDs). These diseases 41 million deaths yearly, equivalent to 71% of all non-accidental deaths globally. The annual deaths from NCDs are projected to escalate to 52 million by 2030. The concurrence of COVID-19 with these diseases resulted in the unforeseen COVID-19 high death rates, especially among people diagnosed with comorbidities.

Recently, the World Health Organization (WHO), on 12 April 2022, welcomed the setting up of a new Heads of State and Government Group to get the world back on track to reduce premature deaths from socially significant NCDs by a third and to promote mental health and well-being. The urge comes from these “hidden pandemics” killing seven out of ten people globally from risk factors like smoking, alcohol abuse, unhealthy diet, physical inactivity, and air pollution (Figure 1).

![Figure 1](https://www.who.int/news/item/12-04-2022-who--ghana-and-norway-agree-to-accelerate-actions-to-save-lives-in-first-international-strategic-dialogue-on-noncommunicable-diseases-and-the-sustainable-development-goals)

Recently, to complement these basic risk behaviours, the digital stress, internet addiction and gaming disorders were also classified as significant health risk factors (Fischer, Reuter, and Riedl 2021). Gaming disorder was even incorporated into the International Classification of Diseases (ICD-11) in 2021. The situation in Bulgaria is not optimistic at all. Comparing coronavirus deaths in 210 countries relative to their population, the reported deaths per million due to COVID-19 brings the country to 2nd place after Peru (Statista, 2022) (Figure 2).
NCDs cause more than 95% of all deaths, thus again placing our country in the alarming health statistics (Figure 3) (WHO, Causes of death).

These striking tendencies in human health decline and mortality call for urgent countermeasures with solid scientific proof of effectiveness and success. Science is definite that the physical well-being of man and society depends on many interrelated factors. Among them, lifestyle accounts for about 60% of health potential (Fortunka 2020).
The “Global Burden of Disease” is one of the measuring tools that quantify the financial cost of mortality and morbidity and is often used to support a thesis for improving disease prevention and better health promotion policies. Both mortality and morbidity contribute towards lower GDP growth due to the years lived with disability and other factors of missing or inactive workforce. And one of the standard quantifiers aggregating the overall outcome of the burden of disease is the DALY (Disability-Adjusted-Life Year). One DALY equals approximately one year of healthy life lost. Numerous health-economic studies confirm a correlation between mortality, morbidity and economic development (Bloom, Kuhn, and Prettner 2019), demonstrating that high mortality and morbidity levels lead to a higher number of DALYs, which affects the conditions for sustainable financial development of a country, such as labour growth productivity, education, fertility rates, etc.

Consequently, with the united efforts of specialists in different fields of science (Genetics, Epigenetics, Pharmacology, Psychology and Economics), we prepared an updated description of behavioural health risk factors and their risk spectrum, that impact the health status and healthspan. The Report is entitled “The (in?)vincible Pandemics” and attempts to describe the main challenges these health risk factors pose globally in Europe and Bulgaria. The report also comes as a natural continuation of the aftermath of the COVID-19 pandemic, during which solid scientific data have been accumulated, highlighting the relationship between non-communicable diseases (NCDs) and infectious diseases like COVID-19. Furthermore, it identifies those recent drivers of deteriorated human health, delivers an understanding of the effects of harmful habits like unhealthy diet, alcohol abuse, smoking and problematic screen use – all of these related to change in life style during COVID-19 lockdowns. Further, we elaborate on these modifiable health risk factors according to the level of harm and the ways to change these levels. Finally, it provides recommendations to reduce the damage to health caused by these risk behaviours.
Unhealthy eating, overweight and obesity

KEY FACTS
(World Obesity Day, 4th March 2022)

- Global obesity has nearly tripled since 1975;
- Overweight and obesity kill more people than underweight;
- 800 million obese people reported worldwide as of 2022;
- Childhood obesity is expected to increase by 60% over the next decade, reaching 250 million by 2030;
- The medical consequences of obesity will cost over $1 trillion by 2025;
- People living with obesity are twice as likely hospitalized if tested positive for COVID-19 or any other infectious disease.

“If your DNA profile puts you at a higher risk of developing obesity, that doesn’t mean it’s your fate. You can take control of the environmental side of the equation and reduce your overall lifetime risk by a lot.”

~ David Agus
Unhealthy eating, overweight and obesity

Excessive weight gain and subsequent obesity have become a global problem. Both are classified as common and severe conditions and, even as diseases themselves - “costly” and chronic. Moreover, they increase the risk of other diseases and health problems, such as heart disease, diabetes, high blood pressure and certain cancers (Figure 1) (Finucane et al. 2011, Bray et al. 2017). Therefore, they are among the most significant risk factors (Keramat et al. 2021). Obesity is a complex condition involving also many factors that worsen the overall health status - genetic, environmental, biological, epigenetic, other behavioural and environmental factors. Those with the highest impact include nutrition and physical activity patterns, biology and genetics, external effects, such as marketing and advertising of unhealthy food products, particularly to children, increased urbanization, sedentary lifestyles and the proliferation of online computer and video gaming, that preempt long sedentary lifestyle and digital screen use, insufficient sleep and others. These factors interact in a manner that is unique to each individual and create a human interface for the regulation of energy balance by establishing a set point for an equilibrium body weight (Garvey, W.T, 2022).

According to the World Obesity report (https://www.worldobesityday.org/), published on the 4th of March, 2022 and the new WHO European Regional Obesity Report 2022, posted on the 3rd of May, 2022, these risk factors are proven to be among the main culprits of the worsening situation with obesity and overweight among children and adolescents. Scientists and specialists are definite that bad nutrition forms an acute risky exposure from gestation to death that impacts our health by influencing epigenetic phenomena. Poor diets in all their forms are unacceptably high worldwide, creating one of the world’s most significant health and societal challenges, reaching epidemic levels.

**Figure 1**
Obesity, underlying biochemical changes and comorbidities (the World Obesity Federation) (Keramat et al. 2021, Xie et al. 2020)
The obesity epidemic significantly burdens national economies with its high medical care cost. It exerts an enormous economic burden on many countries’ already stretched healthcare systems. It is associated with a nearly 40% increase in health provision spending and more than 70% in treatment. Obesity is a crucial issue attributed to more DALYs worldwide and is connected directly also to problematic use of screen time and low physical activity. Its relationship to poor health outcomes and higher risk of development of non-communicable disease is well established and represented in numerous health-economic studies. Each year around 2.8 million people die from a cause attributed to being overweight or obese, and it is estimated that 35.8 million or 2.3% of DALYs are caused by those factors (Obesity, WHO 2022). Insufficient physical activity is the fourth leading risk factor for mortality worldwide. Therefore, it is no surprise that the overall deaths attributed to it are very close to those from obesity. Physical inactivity is responsible for approximately 3.2 million deaths and 32.1 million (2.1%) DALYs each year (Physical inactivity, WHO 2022). According to other studies (Afshin et al. 2017), in 2015, approximately 4 million deaths worldwide (7.1%) were attributed to high Body Mass Index (BMI), which resulted in 120 million DALYs (Figure 2).

Figure 2
The results showed that the leading cause of death due to cardiovascular diseases accounted for 2.7 million deaths and 66.3 million DALYs in 2017. And diabetes was the second leading cause contributing to 0.6 million deaths and 30.4 million DALYs. More recent studies (Dai et al. 2020, Afshin et al. 2017) suggest that a high BMI is the cause of a total of 5.1 million deaths and 147.7 million DALYs worldwide.

Statistical data indicate death rates per 100 thousand people of the population (100K), https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Being_young_in_Europe_tod...#Causes_of_death, attributed to high BMI in the EU and Bulgaria (Figure 3). As the average EU deaths per 100K are gradually declining and reaching 113 in 2019, the death rate for Bulgaria for the same year has increased steeply, reaching 327. In absolute terms, this results in approximately 583 thousand deaths attributed to high BMI in the EU for 2019 and 22 741 for Bulgaria. In terms of DALYs in the EU, the average is slowly decreasing, reaching 2842 per 100K in 2019 and increasing to 7974 per 100K for Bulgaria. In absolute terms, this results in 14.6 million DALYs for the EU and 550 thousand for Bulgaria.

There is more research studying the association between age and the death rates per 100K attributed to high BMI (Vidra, Trias-Llimós, and Janssen 2019, Ghith and Rakovac 2017). The results show that the EU death rate due to obesity drops to 50 per 100K while in Bulgaria it remains almost constant, slightly increasing to 159 in 2019. For the EU it is decreasing, reaching 1554 on average in 2019 compared to the Bulgarian one, which has slightly increased to 4242. Another earlier study (Müller-Riemenschneider et al. 2008) suggests that obesity-related healthcare burdens in Europe were up to 10.4 billion euros, and relative economic weight ranges between 0.09% and 0.61% of each country’s GDP. However, those numbers are highly underestimated due to the historical accumulation of the period analyzed.
Data are available for the death rates per 100 thousand people of the population (100K) attributed to low physical activity in the EU and Bulgaria (The global health observatory). The average number of EU deaths per 100K is gradually increasing and reaching 24 in 2019; the average death rate for Bulgaria for the same year has risen steeply, reaching 35 per 100K. In absolute terms, this results approximately in 125 thousand deaths attributed to low physical activity in the EU for 2019 and 2440 for Bulgaria. The EU’s DALYs are slowly increasing, reaching 368 per 100K on average in 2019 and rising to 510 per 100K for Bulgaria. In absolute terms, this results in 1.9 million DALYs for the EU and 35 thousand for Bulgaria (Figure 4).

An estimation has been made that physical inactivity costs the EU 80.4 billion euros per year through non-communicable diseases such as coronary heart disease, diabetes, colorectal and etc.

**Figure 4**
Comparison between death rates per 100 thousand people of the population (100K), which are attributed to low physical activity in the EU and Bulgaria

### European data on obesity

Obesity reaches pandemic levels in Europe, with its rates increasing every year (Figure 5) and is among the leading causes of death and disability in Europe. Estimates suggest obesity and overweight cause more than 1.2 million deaths annually, corresponding to more than 13 per cent of total mortality in the region, according to the European regional obesity report by the WHO Regional Office for Europe (https://www.who.int/europe/publications/i/item/9789289057738). The report reveals that overweight and obesity rates are escalating, with none of the Member States currently meeting the WHO Global Non-communicable Disease (NCD) target of halting the rise of obesity by 2025. Recent disruptions in retrieving obesity management services appeared due to the COVID-19 crisis.
Meanwhile, it is expected that the “unfavourable shifts” in food consumption and physical activity patterns during the pandemic will affect health in the years ahead. It will require significant efforts to reverse this trend. The latest evidence presented in the report also highlights how vulnerability to unhealthy body weight in early life can affect a person’s tendency to develop obesity later on. Data for the European region show that to date, the percentages of obese women and men are 23% and 20%, respectively, with forecasts showing a jump of over 50% in 2030 (Figure 5) (WHO/Europe | Home). In some countries, such as Belgium, the COVID-19 pandemic has contributed to 25% of those surveyed weight gain.

Obesity increases the risk of non-communicable diseases (NCDs), including 13 types of cancer, cardiovascular diseases, and type 2 diabetes (https://www.cdc.gov/). It is likely to be directly responsible for at least 200,000 new cancer cases annually across the region, and this figure is set to rise further in the coming years. According to Monique Goyens, Director of BEUC (European Consumer Organization), on the occasion of the adoption of the European Commission EU Beating Cancer Plan in February 2021, poor diets are linked with an increased risk of cancer: “with as much as 30% of all cancer cases are linked to poor diets, the EU can make a big difference supporting consumers in eating more healthily”. Furthermore, the COVID-19 pandemic has disproportionately affected overweight people and those living with obesity (Muscogiuri et al. 2022). The WHO also points out that patients with obesity are more likely to develop complications that lead to death from COVID-19 (Data & Statistics | Overweight & Obesity | CDC).
The obesity risk in Bulgaria is calculated as high (8/10), according to The World Obesity Federation – a complex composite ‘obesity risk’ score (out of 10 being the highest risk) based on obesity prevalence, rate of increase, likelihood of meeting the 2025 target, treatment indicator, recent growth in obesity prevalence on a compound annualised basis for men and for women, an indicator of the availability of relevant health coverage for obesity, based on diabetes deaths per 1000 cases (Scorecards - Obesity: Missing the 2025 targets). Bulgaria's composite obesity risk is highest in Europe, equals only with Turkey, while countries, like Romania, Serbia, Greece, N. Macedonia score 7/10, Austria, Belgium, France, UK, Baltic states score between 5.5 and 6/10.

This problem predominantly affects the older population. While in people between the ages of 18 and 24, the percentage of overweight people is about 30% in men and 10% in women, each subsequent age category is characterized by an increase in the rates. The most significant increase is observed in people over 65 years, with a percentage of about 53% for men and about 48% for women. It is worrisome that men between the ages of 45-64 have a significant rate of obesity (BMI > 30) - about 20%. The statistics are terrifying (Figure 6).

One can see that expectations for 2025 are a leap in the percentage of obese Bulgarians with a feeble chance to meet the global obesity targets of the United Nations.

Let’s examine the Bulgarian population and try to evaluate the burden of obesity as a health risk. We shall observe that the unhealthy eating habits of the Bulgarian population play a significant role in the increasing rate of obesity. For example, there is very low consumption of fruit in adults, as three out of five adults do not consume any fruit daily. Similarly, about 49% of adults do not eat vegetables daily (OECD and Union 2020). Also, the consumption of legumes and cereals is too low, according to the Global Nutrition Report (https://globalnutritionreport.org/resources/nutrition-profiles/europe/eastern-europe/bulgaria/). Another aspect is the so-called “emotional eating”, which 53% of Bulgarians say they do, although with a varying frequency (Bulgaria eats: Insights into eating habits). Physical activity is an essential obesity-related aspect in which Bulgaria lags, especially among adults. Data show that physical activity in adults is lower than the European average, with only 58% of Bulgarian adults exercising moderately daily.
Harm reduction approaches

There is a need to move fast towards harm reduction approaches, as already moderate overweight before puberty is associated with a significantly increased risk for type 2 diabetes and cardiovascular disease in midlife. These steps should imply systemic change, and although that may take time, they are worth taking as well as long-term weight loss is achieved among the population. Significant lifestyle changes are needed to tackle the global and local problem of obesity (Cena and Calder 2020).

Healthy eating, moderate but regular physical activity, enough sleep and coping with stress are the obligatory steps to increasing well-being and health. Moreover, they bring long-term implications for the next generations’ health (Tiffon 2018).

Here, we propose practical and reasonable strategies for addressing the risk of unhealthy eating consumption, including harm reduction approaches:

- Reducing the fat, sugar and salt content of processed foods; while unprocessed foods should prevail over ultra-processed foods intake;
- Ensuring that less harmful nutritious choices are available and affordable to all consumers;
- Differentiating and less restricted marketing of food products with lower or no sugars, salt and fats – more restricted marketing of foods high in sugars, salt and fats, especially those foods aimed at children and teenagers;
- Higher industry investments and government stimuli towards ensuring the availability of less harmful and healthier food choices;
- Support by the industry and by the governments on regular physical activity practices and programs;
- Communicating the risk/benefit paradigm and promoting harm reduction and mindful choices for individual and family diet;
- Education on the health risks related to foods and their content;
- Differentiated regulation of products that are higher in harmful components, such as free sugars, vs. products with low contents, including fiscal measures of foods and beverages that are higher in risk for human health vs lower risk;
- Labelling foods according to their nutritional scores, salt and sugar content.

Several systems described in the literature classify foods based on the way and stage of processing. The NOVA system ranks food according to the extent and purpose of its industrial processing (Monteiro 2009).

The IARC system was established in Europe by the International Agency for Research on Cancer (IARC) using the methodology designed for the European Prospective Investigation into Cancer and Nutrition (EPIC), also classifying foods according to their level of processing (Chajès et al. 2011).
The IFIC system was developed by the International Food Information Council Foundation (IFIC) in the United States (US), in which classifying criteria are based on the increasing complexity of food processing and chemical composition (Eicher-Miller, Fulgoni III, and Keast 2012). NOVA is the most popular system to classify processed foods (Monteiro et al. 2018, Monteiro 2009). It lists four categories detailing the degree to which a food is processed (Figure 7).

**GROUP 1** - Unprocessed or minimally processed foods (fruit, vegetables, nuts, fish, meat, milk, etc.).

**GROUP 2** - Foods processed in the kitchen with the aim of extending their shelf life. In practice, these are ingredients to be used in the kitchen such as olive oil, some fats, herbs, honey and others.

**GROUP 3** - Processed foods. These are the foods obtained by combining foods of groups 1 and 2 to obtain the many food products for domestic use (bread, jam, cheese, some low alcohol drinks and others) made up of a few ingredients.

**GROUP 4** - Ultra-processed foods. They are the ones that use many ingredients including food additives that improve palatability, processed raw materials (hydrogenated fats, modified starches, etc.) and ingredients that are rarely used in home cooking such as soy protein or mechanically separated meat. These foods are mainly of industrial origin and are characterized by a good pleasantness and the fact that they can be stored for a long time.

**Figure 7**
The NOVA system for classification of processed foods (developed by the Public Health Faculty of the University of Sao Paulo, Brazil)

In 2014 the NutriScore (ScC) grade was also established worldwide (Figure 8). It was developed for the Front-of-Pack nutrition Labels (FoPLs) initiative, introduced in the UK in 2013 and determined the amount of healthier and unhealthier contents in food. It appears on the label of a limited number of food products and brands in some countries for the time being, but it can be computed for all products of all nations, and the application can be downloaded from Open Food Facts.

**Negative points:** energy, saturated fat, sugars, sodium (high levels are considered more harmful or unhealthier)

**Positive points:** the proportion of fruits, vegetables and nuts, olive oil, colza and nut oils, fibres and proteins (high levels are considered less harmful or healthier)

Grading of foods in NutiScore is carried out according to the following method (Figure 8):
Since the introduction of NutriScore on the market, the Scientific Committee of the Nutri-Score (ScC) meets regularly to report on the success of the proposed algorithm underlying the scoring. In 2021, the ScC identified several areas of potential improvement, for which literature reviews were conducted, and possible modifications to the algorithm are under scrutiny. The main aim was to improve the scoring system for plant-based oils with favourable nutritional profiles, fish and seafood, improving discriminating power for whole-grain products and beverages, and allowing a better alignment with recommendations referring to highly sugary or salty products (Egnell et al. 2020).

Among the more harmful substances in food, sugars stay on top of the risk spectrum of diet choices. WHO guideline on “Sugars intake for adults and children” provides global, evidence-informed recommendations on the intake of free sugars to reduce harm to health and, respectively, the risk of NCDs in adults and children, with a particular focus on the prevention and control of excessive weight gain and development of dental caries (Guideline: sugars intake for adults and children). This is in recognition of the rapidly growing epidemic of overweight and obesity around the globe and its role as a risk factor for NCDs. In addition, dental caries is a ubiquitous NCD, and the cost of treatment places a heavy burden on healthcare budgets in many countries. Policy-makers can use the recommendations in the WHO guideline and programme managers to assess current levels of free sugar intake in their countries relative to a benchmark. Although not entirely risk-free, there are many replacements for sugar, including natural sugars, such as agave, coconut sugar and honey, that are all proven to reduce the harm caused by the refined sugar version (Chupeerach et al. 2018). These natural sugar substitutes are a better way for consumers to replace refined sugar in baking and cooking at home (Asghar et al. 2020).

Besides sugar intake, benchmarks have also been established for salt and fat intake.
According to WHO guidance [http://www.emro.who.int/nutrition/reduce-fat-salt-and-sugar-intake/index.html](http://www.emro.who.int/nutrition/reduce-fat-salt-and-sugar-intake/index.html) on reducing harm levels to the human organism by reducing the overall and daily intake of sugar, salt and fat, since entirely avoiding is neither realistic, not recommended as part of the meaningful diet, the estimated recommended limits are:

- **SALT** < 5 grams/day
- **SUGAR** < 5% of total energy intake
- **FAT** < 30% of total energy intake

Processed foods have become a way of life in the modern world. Processing allows for a more consistent and global supply of nutrition and increases consumer convenience. However, although processing generally improves the quality and safety of foods, it can decrease nutrient levels and bioavailability and produce chemical and physical changes resulting in chemical hazards (Jackson and Al-Taher 2022 [https://www.sciencedirect.com/science/article/pii/B9780128160114000215](https://www.sciencedirect.com/science/article/pii/B9780128160114000215)). Therefore, excessive intake of ultra-processed foods should be avoided or limited.

The clear-cut risk spectrum of all food products is indeed impossible. Moreover, the most suitable diet for each individual should ultimately be in the hands of professional nutritionists and medical care experts. Yet, the everyday eating habits and choices for successful obesity risk harm reduction should include regular and more intake of less harmful products in the diet and avoiding as much as possible those regarded as dangerous. An example of such food is indicated in the simple foods risk spectrum diagram (Figure 9).

![Figure 9](image.png)

**Figure 9**
Relative risk spectrum of foods

The challenges related to dietary choices require systemic changes to improve the individual and public health status long-term. Government, non-government, private sectors, subject matter experts and opinion leaders should reflect on a wide range of policies and provide knowledge to facilitate understanding on the level of risk of food products, thus gear forward the nutritional choice of less harmful products among the population.
Unhealthy eating, overweight and obesity
Alcohol abuse

KEY FACTS:

- Alcohol abuse is a risk factor in more than 200 disease and injury conditions;
- 3 million (5.3% of all) deaths per year worldwide result from alcohol abuse;
- 5.1% of the global burden of disease and injury is attributable to alcohol, as measured in disability-adjusted life years (DALYs);
- Alcohol abuse causes death and disability relatively early in life;
- In people aged 20–39 years, approximately 13.5% of total deaths are attributable to alcohol abuse;
- There is a causal relationship between the harmful use of alcohol and a range of mental and behavioural disorders, NCDs and injuries;
- The amount of pure ethyl alcohol (ethanol) in “standard drinks” is relatively equal in one beer, one glass of wine, and one drink of spirit, hence the level of harm posed is comparable;
- The risk of developing alcohol-related diseases is higher in countries where a “standard drink” is established at a higher level of pure ethyl alcohol. For example, Bulgaria – 20 gr pure ethyl alcohol vs the UK and many others (8 – 10 gr). This drives divergence in serving units: BG – 50 ml spirit is a standard servicing size “small drink”, while in the UK and other EU countries, a typical serving size is 30/40 ml.

"First, you take a drink, then the drink takes a drink, then the drink takes you."

~ F. Scott Fitzgerald
Excessive alcohol use led to more than 140,000 deaths and 3.6 million years of potential life lost (YPLL) each year in the United States from 2015 – 2019, shortening the lives of those who died by an average of 26 years. Further, excessive drinking was responsible for 1 in 10 deaths among working-age adults aged 20-64 (Alcohol Use and Your Health).

Alcohol is a causal or contributory factor to heart and liver diseases, high blood pressure and cancer, alcohol-related crime, and lost productivity due to job loss or sickness (Piano 2017). Moreover, there is a complete lack of understanding of the harm alcohol consumption does to human bodies in terms of obesity. Both risk factors are interconnected as alcohol is heavy in calories. For example, pure alcohol has about 7kcal/gram (more than the equivalent amount of protein and carbs and only about 25% less than fat). Combining that with all the grains already in a 500 ml beer can contain over 200 kcal (https://www.nhs.uk/live-well/alcohol-advice/calories-in-alcohol/).

Alcohol consumption above one drink per day for women and 1.5 drinks per day for men leads to premature deaths in people between ages 30 and 70 according to the WHO definition (Premature Mortality report WHO, 2018). Precisely, the predictive modelling in the information forecasts that in case of no change in drinking patterns, an additional 1.1 million people will die early due to diseases caused by drinking per year in the 52 countries analyzed. On average, across OECD (The Organisation for Economic Cooperation and Development) countries, 24 people per 100 000 population will die prematurely each year due to alcohol consumption above 1/1.5 drinks per day (Figure 1).

In addition, the impact of alcohol consumption above the 1/1.5 drinks per day cap on population health can also manifest itself in shorter life expectancy (Figure 2).
Figure 2
The effect of alcohol consumption above the 1/1.5 drinks per day cap on years of healthy life expectancy (HALEs)

Figure 3
The impact of alcohol consumption on disease-related health expenditures
On average, the treatment of diseases caused by alcohol consumption above one drink per day for women and 1.5 drinks per day for men increases per capita medical spending by about USD PPP 61 annually in OECD countries, which accounts for about 2.4% of the overall annual health expenditure across OECD countries in 2020, including both public and private spending on health (Figure 3).

In Figure 4, the death rates per 100 thousand people of the population (100K) are presented, which are attributed to alcohol in the EU and Bulgaria (https://knowledge4policy.ec.europa.eu/health-promotion-knowledge-gateway/alcoholic-beverages-deaths-men_en).

The average mortality rates per 100K are gradually declining in EC and reaching 62.1 deaths in 2019, the rate for Bulgaria for the same year has increased steeply reaching 117.3 per 100K. In absolute terms, this resulted in approximately 319 thousand deaths attributed to alcohol in the EU in 2019 and 8139 in Bulgaria. In terms of DALYs in the EU, they are slowly decreasing, reaching 1896 per 100K in 2019 and increasing to 3415 per 100K for Bulgaria. In absolute terms, this results in 9,7 million DALYs for the EU and 236 thousand for Bulgaria. Although data dates back 10 years ago, there are studies that suggest (Laramée et al. 2013) that the treatment costs in Europe for a single alcohol-dependent patient are between 1591€ and 7702€ per hospitalization, and the annual total direct costs account for 0.04-0.31% of an individual country GDP. And, indirect costs account for a higher percentage, approximately 0.64% of GDP per country in Europe.

![Deaths, rate per 100k](image1)

![DALYS (Disability-Adjusted Life Years), rate per 100k](image2)

- Bulgaria, both sexes, all ages, all causes, risk: alcohol use
- European Union, both sexes, all ages, all causes, risk: alcohol use

**Figure 4**
Comparison between death rates per 100 thousand people of the population (100K), which are attributed to high alcohol consumption in the EU and Bulgaria
II. European data of alcohol consumption

Statistical data show that in 2019, one in twelve people in the EU consumed alcohol daily, and one in five of those who drink alcohol had an episode of heavy drinking at least once a month. In 2019, 8.4% of the EU population aged 15 and over reported having an alcoholic drink daily, compared to 28.8% of weekly alcohol consumers and 22.8% of monthly alcohol consumers (Table 1 and Figure 5). The distribution of everyday alcohol drinkers between the sexes was 13.0% males and 4.1% females (Figure 5). 28.8% of the people consumed alcohol at least once per week, and almost the same percentage was reported for alcohol drinkers once per month. In contrast, slightly more than one-quarter of Europeans (26.2%) have not consumed alcohol during the twelve months before the survey or have never had an alcoholic drink.

**Figure 5**
Frequency of alcohol consumption in the EU, 2019

**Daily alcohol consumption in the EU by age**

<table>
<thead>
<tr>
<th>Age</th>
<th>Percentage</th>
</tr>
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<tr>
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**Daily alcohol consumption in the EU by gender**

- **Female**: 4.1%
- **Male**: 13.0%

*Figure 5*  
Frequency of alcohol consumption in the EU, 2019 (*Eurostat, Alcohol consumption statistics*)
Table 1.
Distributions of persons aged 15 and over according to the frequency [%] of alcohol consumption, 2019 (Eurostat)

<table>
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<th>Country</th>
<th>Everyday</th>
<th>Every week</th>
<th>Every month</th>
<th>Less than once a month</th>
<th>Not in the last 12 months</th>
<th>Never</th>
<th>Never or not in the last 12 months</th>
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Alcohol consumption in Bulgaria

Bulgaria has one of the highest levels of alcohol consumption – 12.7 litres of pure alcohol per capita per year, roughly equivalent to 2.6 bottles of wine or 4.9 litres of beer per week per person aged 15 and over (https://data.worldbank.org/indicator/SH.ALC.PCAP.LI?locations=BG) (Figure 6). In addition, some population groups in Bulgaria are at higher risk than others. 33.4% of adults drink excessive quantities one occasion for a short period of time at least once a month (https://www.oecd.org/countries/bulgaria/Preventing-Harmful-Alcohol-Use-Key-Findings-BULGARIA.pdf), i.e. more than 80% of a bottle of wine or 1.5 litres of beer per occasion. In addition, 43% of Bulgarian women are more inclined to excessive drinking if they have a higher education. About 2.3% of Bulgarians are alcohol-dependent, and 6.9% have alcohol use disorders, according to a report by the World Health Organisation. Alcohol consumption pattern in Bulgaria is: 43% spirits, 39% beer and 17% wine. The report also showed a slight increase in alcohol consumption in Bulgaria, comparing 2016 with 2010. Males over 15 drink 26.6 litres of pure alcohol per capita per annum, and women drink 9.2 litres. Among drinkers, heavy episodic drinking adds up to 65.9% of drinking population (https://cdn.who.int/media/docs/default-source/country-profiles/substances-abuse/bgr.pdf?sfvrsn=f08a4c72_3&download=true).

**Figure 6**
Yearly alcohol consumption (liters pure alcohol per capita over 15y)
(https://www.reddit.com/r/bulgaria/comments/gsoou9/alcohol_consumption_in_europe/)
Most jurisdictions around the world, follow WHO guidelines for the standard size, defining 10 gr of pure ethanol content in total volume of a beverage as a „standard drink“. The European Code of Cancer has defined the standard drink as 10-12 gr. However, many countries public health authorities determine higher ethanol content in a drink as standard (Mongan and Long 2015). According to the WHO Global Health Observatory data repository, the standard drink in the US and Canada is 14 gr. of pure ethanol content, in Japan, it is 20 gr; in Europe and most countries, it is 10 gr. Still, others have established a much higher limit as a standard, i.e. Austria and Bulgaria - 20 gr, Hungary - 17 gr, The Czech Republic - 16 gr, Germany - 15 gr, Portugal - 14 gr (https://apps.who.int/gho/data/view.main.56470).

It is well known among alcohol industry experts, health care professionals, and the general population that the alcoholic strength of the different alcoholic beverages varies as it represents the ethanol amount (pure alcohol) in a container expressed in a percentage of the total volume of a drink. The larger the total volume of the drink, the lower the alcoholic strength is. As the pure ethanol amount is comparable across volumes, reduced harm in the use of lower alcoholic beverages compared to higher alcoholic drinks may be achieved by distributing the time of intake of one beverage in accordance with the total volume of the liquid. (Figure 7).

```
ALCOHOLIC STRENGTH – ABV% *

MOST BEER
(4% - 7%)

MOST WHITE AND RED WINE
(12% - 15%)

SAKE, SHERRY, FORTIFIED WINES,
LIQUEUR, COCKTAILS, GIN
(25% - 38%)

MOST WHISKEY, VODKA, RAKIA, RUM
(40% - 43%)

0%  5%  10%  15%  20%  25%  30%  35%  40%  45%

Lower risk击入
The higher the ABV%, the stronger the alcohol.
Water is with 0% ABV, pure alcohol is 100% ABV

Higher risk

* ABV (alcohol by volume) is a measure of alcoholic strength - the amount of pure alcohol (ethanol) in a container as a percentage of the total volume of the beverage.
```

Figure 7
Alcoholic strength of the most common alcoholic beverages

Regulators and health authorities use the concept of the „standard drink“ to further recommend serving sizes or sales units for the various types of alcohol depending on the strength - concentration of ethanol pure ethyl alcohol in the liquid expressed as a volume per cent [%] or degree of alcohol). Industries have conveniently developed respective serving glasses adjusted to the standard drink to facilitate consumers and alcohol-serving establishments to measure alcohol consumption. While, generally, health guidelines specify low to high risk as per the grams of pure alcohol/ethanol per day, week, or a single occasion, the type of alcohol and serving sizes are also essential to understand in order to control
Harmful alcohol consumption is often thought of mainly in the context of excessive drinking, respectively subject to regulatory policies - on preventing drinking when driving and minimum drinking age. Yet, practical and successful harm reduction approaches combine several aspects - **quantitative, qualitative, drinking patterns and behavioural**.
Here, we propose practical and reasonable strategies for addressing the risk of alcohol consumption, including harm reduction approaches:

- Zero-tolerance to any consumption by minors and before driving is mandatory. Alcohol control regulatory measures should persist, such as restrictions on trade/sales to underage in entertainment outlets and stores, severe penalties for driving when drinking, etc.;

- The risk spectrum of drinking and the steps to reduce harm need to be communicated broadly in a scientific manner with solid proof and vivid examples;

- An educational approach to the harm caused by alcohol on the human body and strategies to reduce it should be included in the overall public health and government approach to minimizing this risk factor;

- An emphasis and communication on how much people drink before they start drinking and to develop communication materials on this topic is a must;

- Industry engagement and including the entertainment facilities’ staff to be actively involved in supporting their clients to control the number of drinks they order;

- Companies could be involved in educational campaigns informing consumers of the level of ethanol in the alcoholic drinks they offer to increase awareness of the level of harm of each type of drink for comparison purposes;

- Non-alcoholic drinks /alcohol-free alternatives/ are the most apparent first suggestion, such as non-alcoholic beer, wine, or a soft drink. They serve as a healthier substitute without the adverse effects of alcohol;

- Food eases the pace of alcohol entering the bloodstream, so it does less harm. In addition, eating something before/while drinking protects your liver and stomach lining;

- Check the labels and try beer with lower alcoholic content – the same total quantity, the same drinking time;

- Drink at your speed. Every person has individual capacities and preferences, and they don’t feel pressured by others to pick up or catch up to others’ pace;

- Think about any medications that you are taking or have taken. Combining medicine with alcohol may have adverse effects or neutralize the result of your medication. The best is always to avoid those combinations.
Smoking and other forms of tobacco or nicotine use

KEY FACTS

- In 2020, 22.3% of the global population used tobacco, 36.7% of men and 7.8% of women;

- Tobacco kills more than 8 million people each year;

- More than 7 million of those deaths are the result of direct tobacco usage;

- Around 1.2 million deaths are the result of non-smokers being exposed to second-hand smoke;

- Children exposed to second-hand smoke are at increased risk of acute respiratory infections, severe asthma and slower lung growth;

- The number of tobacco users globally slightly declines, i.e. from 1.32 billion in 2015 to 1.30 billion in 2021. According to the Fourth WHO global tobacco trends report, that number is expected to drop. Still, the pace is plodding – WHO estimates the drop is to 1.27 billion by 2025;

- All forms of tobacco use are risk factors for several diseases: cardiovascular, cancer, pulmonary, and metabolic, but the highest risk is associated with the most widely spread form of tobacco use, which is smoking.

“We are what we repeatedly do. Excellence, then, is not an act, but a habit.”

~ Aristotle
I. Health and economic impact of smoking

The scale of the negative health and economic impact of tobacco use is extremely serious (Goodchild et al. 2018, Ekpu and Brown 2015) and cigarette smoking remains the predominant form of tobacco use worldwide, representing the primary cause of smoking-related diseases, hence the most significant challenge that needs to be addressed. People use tobacco for the need of nicotine, because it has addictive nature (https://www.cancer.org/healthy/stay-away-from-tobacco/why-people-start-using-tobacco.html). However, it is critical to note it is not the nicotine that is the main cause of smoking-related diseases. It is the plethora of harmful substances produced de novo during tobacco combustion and they are contained in the smoke. The Royal College of Physicians (RCP) Tobacco Advisory Group reports that most of the harm caused by smoking arises not from nicotine, but from other components of tobacco smoke (Royal College of Physicians Tobacco Advisory Group). Cigarette smoke is reported to contain more than 7000 chemical constituents, which are formed during chemical reactions in the combustion process of tobacco (Figure 1), among which WHO and FDA have acknowledged the presence of more than 100 harmful constituents in tobacco smoke that are classified as dangerous (Bentley et al. 2020). In order to minimize the risk of developing cardio-vascular, respiratory, oncological and...
other diseases people should not smoke and should not use tobacco, but if they do, they should be familiar with the levels of exposure of the human organism to harmful substances and aim to discontinue or, if not, to chose forms of tobacco use with lower exposure to harm.

Besides the health risk, there is economic cost that include high healthcare costs for treating the diseases caused by tobacco smoking and the lost human capital resulting from tobacco-attributable morbidity and mortality. According to the World Bank, the price each country’s health system pays to fight the consequences of tobacco use is between 0.1% and 1.1% of their GDP. For example, Bulgaria pays over EUR 500 million. According to the European Cancer Code, tobacco use is among the most significant risk factors together with air pollution, but the highest health risk is posed by those forms of tobacco consumption that produce smoke. This is because most of the toxicants and carcinogenic substances are formed as artefacts of combustion and are present in the smoke that smokers inhale and to which non-smokers are exposed.

Although the prevalence of smoking as a form of tobacco use decreases, the decline is slow and insignificant. Besides, there is a steady increase in the overall number of smokers in line with the world population growth. In 2015, approximately 6.4 million deaths were attributed to smoking worldwide, which resulted in 148.6 million DALYs (2017). By 2019 smoking accounted for 7.7 million deaths per year, which resulted in 200 million DALYs worldwide (2021) (Figure 2).
Smoking and other forms of tobacco or nicotine use

In 2019, smoking accounted for **7.7 million deaths**

Without intervention, deaths attributable to smoking will increase over the coming decades

Figure 2
Prevalence of smoking per 2019
(https://linkinghub.elsevier.com/retrieve/pii/S0140673621011697)

Figure 3
Comparison between death rates per 100 thousand people of the population (100K), which are attributed to tobacco in the EU and Bulgaria

- Bulgaria, both sexes, all ages, all causes, risk: tobacco
- European Union, both sexes, all ages, all causes, risk: tobacco

Read the full paper: GBD 2019 Tobacco Collaborators. Spatial, temporal, and demographic patterns in prevalence of smoking tobacco use and attributable disease burden in 204 countries and territories, 1990–2019: a systematic analysis from the Global Burden of Disease Study 2019. The Lancet 2021; published online May 27
In Figure 3, we can see the death rates per 100 thousand people of the population (100K) attributed to tobacco use (mainly smoking mainly for the period) in the EU incl. Bulgaria. In 2019 the average EU mortality per 100K is gradually declining and reaching 176 deaths, the same rate for Bulgaria has increased steeply, reaching 328 per 100K. In absolute terms, this resulted approximately in 859 thousand deaths in the EU in 2019 and 20 638 in Bulgaria. In terms of DALYs in the EU - a slowly decreasing trend is reported, reaching 4304 per 100K on average in 2019 and increasing to 8890 per 100K for Bulgaria. In absolute terms, this results in 22.1 million DALYs for the EU and 616 thousand for Bulgaria.

An estimation has been made for direct and indirect costs of tobacco use for the EU/EFTA countries - 97.7 billion euros, of which half – 49.83 billion – direct costs (https://www.euro.who.int/data/assets/pdf_file/0009/402777/Tobacco-Trends-Report-ENG-WEB.pdf). The yearly cardiovascular disease cost estimation for the EU economy is 192 billion euros or around 400 euros per capita. For lung disease, the financial burden is approximately 100 billion euros. Other studies claim that Europe's total economic cost of smoking-attributable conditions is around 616 billion dollars or 2.5% of the GDP (Goodchild et al. 2018). Studies for Bulgaria based on the financial burden of a DALY suggest that changing habits that bring to harm reduction from smoking can lead to saving 1.4 billion euros for 2019, both direct and indirect economic costs (Panchev and Sharkov, 2021).

II European data on smoking

The European Commission Eurobarometer survey on smoking and tobacco use patterns in the EU was published in 2021 (https://europa.eu/eurobarometer/surveys/detail/2240). The average smoking prevalence in the Union is 25% (EU+UK - 23%). The Report outlines that the average smoking prevalence in the EU has declined by only 2% in the last three years since the 2017 survey was carried out. The proportions of smokers vary widely across countries, ranging from Greece (42%), Bulgaria (38%) and Croatia (36%) to only 7% in Sweden, 12% in the Netherlands and the United Kingdom, and 15% in Finland (Figure 4). It is also worth noting that the proportion of daily users follows a very similar pattern - ranges from nearly all in Greece (98%) and Bulgaria (97%) to less in Luxembourg (70%), Ireland (74%) and the Netherlands (77%). Similar is the pattern of the average number of cigarettes per day. In Greece, the average smoker has 18.7 cigarettes daily, followed by Croatia (18.3) and Bulgaria – 15.7. (Figure 5).
According to the available aggregated Eurostat data published in November 2021, in 2019, 18.4% of the EU population aged 15 years or older reported daily cigarette smokers. 12.6% of the EU population consumed fewer than 20 cigarettes daily, while 5.9% consumed 20 or more. According to Eurostat data for 2019 across the EU Member States, the countries with the most significant shares of daily cigarette smokers were Bulgaria (28.7%), Greece (23.6%), Latvia (22.1%), and Germany (21.9%) and Croatia (21.8%). In contrast, the countries with the minor shares of daily smokers were Sweden (6.4%), Finland (9.9%), Luxembourg (10.5%), Portugal (11.5%) and Denmark (11.7%). Among the EU Member States, only in Croatia did heavy smokers make up the majority of daily smokers; heavy smokers were also in the majority in Turkey and Serbia. By contrast, less than one in five daily smokers in the Netherlands and Sweden were heavy smokers. In 2019, around one in eight persons aged 15 years and over in Bulgaria were heavy smokers (Figure 5).

Figure 5
Daily cigarette smokers in Europe, reported for 2019
Smoking prevention is and should remain the first and utmost goal of society as a whole. Yet, according to WHO projections, this phenomenon will remain significant worldwide for years. According to the Royal College of Physicians’ harm reduction is an effective strategy used in medicine and social policy to reduce harm to individuals and wider society from risk behaviours or practices that cannot be prevented entirely or ceased (https://www.rcplondon.ac.uk/projects/outputs/nicotine-without-smoke-tobacco-harm-reduction).

Therefore, a key target should be to address the current high smoking prevalence and aim at sustainable decline through harm reduction from smoking when cessation cannot be realized. Scientific societies and medical experts recommend a stepwise approach to support smoking cessation, as well as to reduce harm. (Piepoli et al. 2016).

Here, we propose practical and reasonable strategies for addressing the risk of smoking, including harm reduction approaches:

- Education on the harms of smoking and increasing health literacy;
- Pharmacological treatment with cytisine, varenicline, or bupropion;

Unfortunately, these pharmacological modalities are associated with limited long-term efficacy and significant side effects. Therefore, second-line therapies might include a combined preparation of bupropion and naltrexone;
In the tobacco area, harm reduction strategies usually mean substituting the most harmful tobacco products with certain other less harmful ones that pose lower exposure to toxicants, carcinogens and other harmful constituents (Cox and Dawkins 2018). Such substitutes might include types of products whose consumption excludes smoke formation from a burning process (e-cigarettes, heated tobacco, oral nicotine products), in which it is significantly demonstrated that they emit fewer toxicants and other dangerous chemicals than cigarette smoke (National Academies of Sciences and Medicine 2018). A report commissioned in 2018 by Public Health England (PHE) said that although the long-term impact of nicotine delivered by e-cigarettes on lung tissue is not yet thoroughly studied when compared to tobacco cigarettes (McNeill, 2018), their overall risk of harm is less than 5% of that from smoking tobacco. In addition, the risk of cancer is less than 1% of that caused by smoking tobacco. PHE’s vaping evidence update published in 2021 found that >50 000 people who would otherwise have continued to smoke cigarettes stopped with the help of e-cigarettes in 2017. It also said that smoking cessation strategies that included vaping products had the highest success rates - between 60% and 74% in 2019 and 2020 (McNeill et al., 2021).

Recently, the German Federal Institute for Risk Assessment (BfR) conducted two consecutive analyses of the new non-combusted tobacco use, heating tobacco. They concluded that heating and burning tobacco products deliver a similar amount of nicotine, but the first one delivers appr. 80–90% fewer aldehydes, 97–99% fewer volatile organic compounds and levels of significant carcinogens were markedly reduced (Mallock et al. 2018). Another recent study examined the effect of the use of heated tobacco on indoor air quality compared to cigarette smoke (Lüdicke et al. 2019). Research is ongoing on comparing the ambient air quality in closed premises during smoking and the usage of electronic cigarettes or heated tobacco. A recently published report in 2022 analyzed and compared the concentrations of nicotine, propylene glycol, and vegetable glycerine to the levels of volatile organic compounds, aldehydes, nanoparticles, and particulate matter (Yu et al. 2022) during indoor usage. The results showed that the range of nicotine levels transferred by heated tobacco products was lower than · Psychological interventions with proven efficacy should complement the medical/pharmacological interventions;

· Individual counselling, group therapy and programmes specifically aimed at groups such as pregnant women, young people or people living with health conditions such as chronic obstructive pulmonary disease, cardiovascular disease, etc., are recommended;

· Approaches for substituting cigarettes or other smoking products with different types of nicotine or tobacco use without combustion that pose lower exposure to toxicants, carcinogens and other harmful constituents are proposed;

· Substitution of smoking with smoke-free/non-combusting products will remove second-hand smoke. Second-hand smoke, like mainstream smoke, contains thousands of chemicals, many of which are toxic;

· Risk-based regulation of marketing and labelling of products, including fiscal measures targeting types of products according to the level of risk they pose.
those from cigarettes. In addition, the content of vegetable glycerine levels emitted by heated tobacco products was higher than those from cigarette smoke. Although various kinds of VOCs, aldehydes, nanoparticle or particulate matter were detected during heating tobacco, the amount generated was much smaller than those from smoking conventional cigarettes.

The harm associated with various tobacco and nicotine product usage is mainly related to the way of use and their content – whether containing tobacco or not, they both are designed to deliver nicotine. As nicotine is addictive, its consumption poses risks, hence the intake of NRP by prescription should be controlled by health care and medical experts. Yet, prescribed nicotine intake is used as a smoking cessation medical instrument, since nicotine is not the primary cause of the risk of developing diseases. In this respect, nicotine replacement therapeutics would be positioned at the lowest spectrum of the risk spectrum diagram, as shown in Figure 6. At the same time, cigarettes and other tobacco for smoking would stay in the highest risk spectrum, being the most harmful.

**Figure 6**
Risk spectrum of nicotine and tobacco products

Numerous scientific studies are ongoing on tobacco and nicotine usage, but the large majority of accumulated evidence and published scientific literature confirm that replacing cigarettes with non-combustible alternative products - either containing tobacco or only nicotine - represents a science-based harm reduction approach that provides the opportunity to reduce the risk of smoking-related diseases and for achieving a reduction in smoking prevalence.
Smoking and other forms of tobacco or nicotine use
The problematic overuse of screen/digital devices

**KEY FACTS**

- The average screen time for teenagers has doubled during the pandemic, which is 7.7 hours per day;
- More than 50% of adults have increased screen time on at least two devices;
- Generation Z spends nine hours a day in front of a screen;
- People spend around five hours in front of their laptops each day;
- People spend about 145 minutes on social networking;
- Snapchat users spend roughly 25 to 30 minutes a day on the app;
- Limiting social media screen time to 30 minutes per day improves well-being and reduces depression.

“The earlier we introduce screens the more it affects the child’s brain development and the more likely they will have trouble managing their addiction to screens and technology later in life.”

~ Dr. Laura Markham
Health and economic impact of problematic screen use

Problematic screen use (PSU) encompasses internet addiction and screen dependency disorders. PSU represents a non-exhaustive list of human behavioural conditions such as internet addiction disorders; internet gaming disorder; inappropriate internet use; compulsive internet use; pathological video game use; video game addiction; pathological technology use; online game addiction; mobile phone dependence; social network site addiction; problematic smartphone use; binge watching; porn dependence – the list is non-exhaustive, since these are relatively new human behaviours and habits and they are subject to further clarification and assessment as the field is new for research (Figure 1). In 2015 the World Health Organization recognized Problematic Mobile Phone Use as a public health concern. One year later, the American Academy of Paediatrics’ recommended screen use limits for kids. In addition, gaming Disorder was included in the International Classification of Diseases (ICD-11) in 2021 and the Diagnostic and Statistical Manual of Mental Disorders (DSM-V) in 2013 (https://www.who.int/standards/classifications/frequently-asked-questions/gaming-disorder).

Smartphones use is drastically increasing, placing it as the major risk factor for increased overall PSU. The UK’s Office of Communications (Ofcom) recently reported a third (34%) of pre-schoolers (aged 3-4) own their own electronic devices – i.e. as a tablet or games console. Medical concerns regarding children’s screen use include overuse, misuse and premature use (under age 2) (Sigman 2017). Increased screen time is associated with inattentiveness and self-regulation problems among preschool children, leading to a higher risk of adverse outcomes affecting children over...
time, such as their executive function, even after controlling for covariates such as verbal ability (Tamana et al. 2019). Blue light exposure in the evening suppresses melatonin production, affecting sleep initiation and reducing sleep duration. While children are the most enthusiastic users, adolescence is a critical period for the onset of addictive behaviours (Pivetta et al. 2019). Sleep is paramount for child development, and there is evidence that increased daily screen time is associated with shorter sleep per night (Durham et al. 2021). Extensive research is increasingly finding evidence that adolescents and young adults with problematic screen use exhibit microstructural and volumetric differences in, or abnormalities of, both grey and white matter compared to healthy controls. Differences in brain structure and function are observed in many of the same brain regions implicated in drug addiction (Sigman 2017). Myopia is another rising problem worldwide, mainly due to reasons like PSU. Currently, almost 50% of the young adults in Europe and 80% to 90% of the young adults in urban areas of East Asia are myopic. Early onset of myopia results in higher degrees of myopia in adulthood. This can lead to visual impairment and even blindness resulting from retinal complications later in life. Myopia is projected to reach 49.8% globally in 2050 (Huang et al. 2021).

Figure 2
Risk factors for PSU

Many risk factors for PSU, both modifiable and non-modifiable, are summarized in Figure 2. Risk factors include the gender (particularly female) (Servidio 2019), lower age (Csibi et al. 2021), early start of exposure. Repeated early screen exposure is connected to non-drug rewards and can alter neural plasticity in brain regions affected by drug abuse via epigenetic processes. Parental attachment type (lower level) predisposes young adults to maladaptive use of screens (Zhang, Tan, and Lei 2019). When parents provide secure attachment, and emotional needs are met, self-esteem is stable. Individuals mainly concerned with their relationships may be more at risk of developing fears and anxiety, including about not being sufficiently in touch with the people they care about (Pivetta et al. 2019). Childhood emotional maltreatment is directly associated with problematic use, transforming into a post-traumatic stress coping mechanism (Emirtekin et al. 2019). Poverty is also a risk factor for family abuse (Kushima et al. 2022). For comparison, post-traumatic stress disorder (PTSD) symptoms in cases of family abuse show the same traits as problematic smartphone use.
The internet serves as the backbone from which practically all cases of technology addiction statistics spring. While technology development portends “great things” for businesses, organizations, institutions, and individuals everywhere, it also comes with a caveat of its own: the rising cases of addiction around the internet and video gaming, “omnipresent” mobile phones, and social media that it procreated. A quick industry evolution overview explains why we need to discuss internet addiction statistics today. The global internet services industry is a vast sector. In 2020, the total market value of the worldwide internet services industry was estimated at 450.1 billion USD dollars. By 2027, it is estimated to reach to 632.4 billion dollars at a CAGR of 5% over the 2020-2027 period. (Research and Markets, 2020).

II. Global and European data

Global mobile device use reached 5.27 billion in July 2021. In comparison, at the end of 2011, just over 2 billion people worldwide were using the internet (around 30% of the global population), growing by 9% annually (Figure 3). The primary screen devices people use are our mobile devices – 90.9% of users access the internet. Smartphones make up 89.6% of Internet use, and the average time spent with the internet on mobile devices is 3 hours and 37 minutes. In addition, there are 4.55 billion active social media users (56.7% of the world population). In November 2021, each Internet user’s average daily time spent using the internet was 6 hours and 58 minutes, which is over ten times more than 10 years ago. In 2021 social media is a significant reason for the growth of time spent online– appr. one-third of the world’s total internet time. Another reason for the time spent online is the acceleration of internet speed over the past decade. Video gaming (online and offline) is another major issue, as 85% of internet users play games, and 33% do that daily. Younger people are more likely to play video games, but more than 2 in 3 internet users aged 55 to 64 also identify as gamers (https://datareportal.com/reports/digital-2021-october-global-statshot).

![Figure 3](Global mobile device use as per 2021)
The COVID-19 pandemic boosted the problem as lockdowns worldwide cut time spent outside and activities people enjoyed. Online-based education and work drastically raised screen time, created new habits for shopping, entertainment, and social networking online. Children and young adults have never been exposed to such extended screen time and it was not only educational but also others of unnecessary character, especially with kids under 7 years old, with no online schooling requirements. The consequences of the increased screen exposure due to the COVID-19 pandemic on children’s early development and also adults reveal a new outlook on families’ habits and a need to analyze the effect of screens.

## Problematic screen use in Bulgaria

In 2012 Bulgaria had high rates of screen time for 4–6-year-olds with 60–240 min of TV time daily, similar to Belgium and Poland and significantly more than that of Germany and Spain with 20–30 min (Bergmann et al. 2022). In the same year, Livingstone et al., 2011 reported that four in five 9-16-year-old Bulgarian children use the internet daily, and 44% of them report experiences associated with excessive internet use “fairly” or “very” often. Recent research from the WHO (WHO Regional Office for Europe 2022) on children’s screen time in Bulgaria revealed that 50% of 11-year-olds spend two or more hours at a computer. The exact duration share is 68% for 13 years old and 69.5% for 15 years old. Another research from 2016 shows that Bulgarian children start using the Internet at the age of 8, one year earlier than in 2010.

Around 97% of Bulgarian children and teenagers were active online users in 2016, while in 2010, the same age group reported 81% of online activities (UNICEF, 2022). A recent study on online education during lockdowns reported that 82% of households have access to devices suitable for kids’ class attendance, and 79% of the students use their own devices (Christova et al., 2020). During the pandemic parents bought laptops (22,4%), smartphones (10,5%) and tablets (8,8%).

Online-based research on parental behaviour and attitudes toward screen time reported that among 1427 respondents, 15% of the kids 0-6 months have their screen time in front of the TV, and 2% in front of a smartphone (Stamenova, D, 2022, Figure 4). In the next age group (6-12 months), 28% are in front of the TV, and 10% are on a smartphone. Among 1-3 year-olds, 39% are watching TV, 33% are watching/using smartphones and 18% - are on tablets. Parents have mixed feelings towards screen use, describing positives (educational) and negatives (mood changes).
In “Spotlight on adolescent health and well-being: Findings from the 2017/2018 Health Behaviour in School-aged Children (HBSC) survey in Europe and Canada” (Huang et al. 2021), it was concluded that in Bulgaria, the prevalence of bullying is higher with adolescents than the average for all age groups. In addition, Bulgarian children are more likely to admit they have been bullied online than their parents (Livingstone et al, 2011).

IV. Harm reduction approaches

Research shows possible long-term changes in health and behaviour, it is now the time for careful use of harm-reducing policy for educating adults in their role as parents, paediatricians, and tech companies because of the content promotion methods and practices:

Here, we propose practical and reasonable strategies for addressing the risk of overuse of screens consumption, including harm reduction approaches:

- Parental education via media and other communication channels, as well as paediatric recommendations, has scientifically proven effects on screen time in children. Lower average parental educational attainment was significantly associated with a higher likelihood of infant exposure to screens by six months olds (Wiltshire et al. 2021). Encouraging parents use of applications limiting screen time on smart phones/laptops would create healthier digital habits in family environment;

- Paediatricians’ education on screen time exposure in infancy and early childhood;

- Regular screenings of kids and adolescents for myopia, obesity and spinal problems provoked by sedentary life and screen overuse are also crucial for public awareness and developing guidelines for parents to promote screen time awareness;
The problematic overuse of screen/digital devices

- Another harm reduction policy is encouraging sustainable weekend family activities and habits via social campaigns to promote “quality time together” with less screen time for kids and parents;

- Campaigns among (young) drivers for phone/scrolling/chatting free driving is another topic to be discussed;

- Careful education digitalization in schools and hybrid learning according to actual needs depending on the student’s age. For example, more teamwork, projects, and “old school activities” such as plays, arts and group discussions may help socializing, self-esteem and emotional regulation;

- Promoting mindfulness-based interventions at schools. Mindfulness practices are linked to reduced tendencies for addictive behaviours, anxiousness, and craving. Mindfulness practices are linked to reduced tendencies for addictive behaviours, anxiousness, and craving. Mindfulness may also work similarly for problematic smartphone use (Regan et al. 2020);

- Programs that encourage and promote physical activity may reduce screen time among youth. People performing aerobic exercises are reportedly less likely to use and abuse drugs. Physical activity is viewed as non-pharmacological therapy for treating substance use disorders (Marrero-Cristobal et al. 2022). Park has reported a negative association between the level of physical activity and risk of problematic Internet use, concluding "physical activity may be helpful to improve adolescent mental health." (Park 2014);

- Encouraging physical activities means building spaces, parks, and alleys for cycling and running, more physical activities at public schools, restricting junk food sales in and next to them, and adequately labelling calories. A secondary effect is lowering obesity-related diseases. In addition, less time on screens and more physical activity was positively associated with adolescents’ mental well-being and overall life satisfaction;

- A clear policy on notification formulas and non-paid and paid content promotion methods of social media companies;

- Implementation of functions such as “nudge” by Meta for regulating time spent on addictive subjects for given groups such as body appearance, weight etc.;

- Creating a “bottom” when scrolling (social media currently offers a never-ending feed); warning on screen (“take a break”) after a prolonged stay on social media or when binge-watching; note on images when they were processed/filtered;

- Gaming: Along with the PEGI (Pan European Game Information), the game developer needs to stop the game after a certain period on the application passes, with a focus on non-educational games and children under a certain age.
Summary

“Excellence is never an accident. It is always the result of high intention, sincere effort and intelligent execution; it represents the wise choice of many alternatives - choice, not chance, determines your destiny.”

~ Aristotle
Epidemiological population data are categorical that there is a clear and direct association between the high prevalence of the above-discussed behavioural risk factors for developing NCDs, and also for manifestation of severe symptoms associated with infectious diseases, such as COVID-19. While complete prevention of neither NCDs, nor infectious diseases at the population level can be guaranteed, it is reasonable to admit that timely lifestyle improvement by implementing harm reduction strategies in addressing the risk factors are crucial to improving health status and preparedness for future pandemics. The epidemiologic overlap between NCDs and infectious diseases, such as COVID-19, has motivated our team to focus on ways to reduce the harm of the risk factors that lead to developing NCDs, alongside focusing on the recognition that investments in science and innovations may lead to enhancing our country response to public health crises long-term.

With the world economic globalization, for example, we observe increased alcohol abuse (The globalization of alcohol abuse, Abderhalden I; Medicus Mundi Schweiz (2022)), growth of unhealthy diet (Mas 2016), more time sedentary lifestyle and overuse of screen time (Alturki, Brookes, and Davies 2020), including in children and young adults. At the same time, although tobacco smoking as a risk factor is gradually, but rather slowly and insignificantly declining, all above risk factors account for the development of cardiovascular diseases, endocrine conditions, cancers, musculoskeletal, etc. Modern science, advanced technology and easier access to numerous better alternatives should be utilized to reduce the harm of all risky behaviours for the benefit of health and health-related cost saving.

The (in?)VINCIBLE PANDEMICS report raises awareness of these prevailing health risk factors, offers a scientific outlook on their mechanisms for worsening human health and further proposes recommendations for HARM REDUCTION. It spotlights a valuable momentum in the post-COVID-19 era. It urges society to undertake immediate improvements to their lifestyle and general health status by addressing risk factors and applying harm reduction approaches by those who do not cease practising harmful habits.

Moreover, it further highlights the economic value and financial burden on healthcare systems and GDP and the benefits of reasonable and pragmatic actions toward harm reduction for healthcare systems' cost saving. Initiatives that advance harm reduction strategies can be instrumental for such preparedness and can also serve to weigh down the economic burden associated with NCDs, thus contributing to improving countries’ capacity, particularly Bulgaria, for effective response to potential health crises.

Bulgaria's health expenditure per capita has doubled overall since 2005. However, it remains much lower than the EU in absolute terms and as a share of GDP. Still, the public financing of the health system accounted for 61% of health spending in 2019 and out-of-pocket spending (38%), driven mainly by outpatient pharmaceutical costs, which was more than 2.5 times the EU average.

The available scientific data and our scientific literature review proved that raising awareness among society, public health experts and policymakers through initiatives like our collaborative effort on this report lies at the heart of developing a new perspective on preventative and harm reduction approaches for the benefit of society. This report is a pilot project, and we shall invite the Pan-European community to contribute further. In this respect, it remains open, and we welcome scientists and experts to add to it by sharing more professional knowledge and insights to gain even further relevance in light of any emerging infectious diseases that have the potential to challenge humanity in new and unpredictable ways.
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