GLOBAL TRENDS IN OBESITY: SOCIO-ECONOMIC AND REGIONAL INFLUENCES

Stanislav Tymochkin, Maria Bayliak

Abstract. Obesity and its metabolic complications are global health concerns with rising prevalence worldwide. These conditions are influenced not only by biological and lifestyle factors but also by socio-economic determinants, which contribute significantly to their onset and progression. This study explores the multifaceted impact of socio-economic, cultural, and environmental factors on the risk of developing obesity and its complications, with a particular focus on the Ivano-Frankivsk region of Ukraine. Using data from global and national sources, we examine trends in obesity and diabetes 2 type prevalence, highlighting differences in risk profiles between urban and rural populations and across various socio-economic strata. Special attention is given to oxidative stress as a key biological mechanism linking obesity and diabetes. Oxidative stress exacerbates inflammation, disrupts insulin signaling, and impairs mitochondrial function, creating a vicious cycle of metabolic dysfunction. Our findings reveal that socio-economic disparities, such as income inequality, limited access to healthcare, and lower health literacy, amplify the burden of these metabolic diseases. In Ukraine, traditional dietary habits and physical labor in rural areas provide some protective effects, but urbanization and the adoption of Western lifestyles are driving increased prevalence rates. The study underscores the urgent need for integrated strategies combining public health policies, community-based interventions, and education to mitigate these risks. By addressing socio-economic and oxidative stress-related factors, this research offers valuable insights for developing targeted approaches to reduce the incidence of obesity and diabetes, particularly in regions undergoing socio-economic transitions

Keywords: obesity, Type 2 diabetes mellitus, socio-economic factors, oxidative stress, public health, Ukraine.

1. INTRODUCTION

Obesity is a medical condition characterized by an excessive accumulation of body fat that may impair health. It is typically defined using the body mass index (BMI), a measure of body mass relative to height. According to the World Health Organization (WHO), a BMI of 30 or higher indicates obesity, whereas a BMI of 25–29.9 indicates overweight, which is a precursor to obesity (Table 1) (WHO, 2011).

Table 1. Cut-off points proposed by a WHO expert committee for the classification of overweight

BMI (kg/m²)	WHO Classification	Popular Description
< 18.5	Underweight	Thin
18.5–24.9	—	'Healthy', 'normal', 'acceptable'

25.0–29.9	Grade 1 overweight	Overweight
30.0–39.9	Grade 2 overweight	Obesity
≥ 40.0	Grade 3 overweight	Morbid obesity

In addition, the WHO provides detailed guidance on waist circumference (WC) as a simple and practical anthropometric measure for assessing the risk of metabolic complications such as obesity, type 2 diabetes mellitus, and cardiovascular diseases (Table 2).

Table 2. Waist circumference and risk of metabolic complications

	Increased risk	Substantially increased risk
Men	≥94 cm	≥102 cm
Women	≥88 cm	≥88 cm

To date, obesity is one of the most significant medical and social issues. The WHO has considered obesity a global health issue since at least the late 1990s, describing it as an epidemic in its reports.. The epidemic nature of obesity is evidenced by the fact that it has tripled worldwide since 1975 (WHO, 2011). Obesity is not only a cosmetic problem. There is established the pathological link between obesity and type 2 diabetes (Roman et al, 2012), arterial hypertension, vascular diseases (Haslam et al, 2005), dementia, osteoarthritis, obstructive sleep apnea (Poulain M., 2006), and certain types of cancer (i.e. colon, prostate and breast) (Calle et al, 2003). Obesity is also associated with social issues and reduced work capacity. Despite extensive research on obesity, there are still numerous unresolved questions and conflicting viewpoints on obesity causes, mechanisms and treatments. In this study, we analyzed current data on obesity prevalence worldwide and in Ukraine in connection with social, cultural, economic and demographic factors in different countries. The main focus was to identify the key socio-economic factors affecting the risk of obesity and diabetes development in the Ivano-Frankivsk region and whether these factors differ from those observed in Ukraine and globally.

2. OXIDATIVE STRESS AS A KEY PLAYER IN THE PATHOPHYSIOLOGY OF OBESITY

Obesity is the result of excessive fat accumulation in the body due to an imbalance between calories consumed and energy expended. The main hallmarks of obesity are oxidative stress and inflammation (Bayliak et al., 2019). Oxidative stress results from the increase in the steady-state levels of reactive oxygen species (ROS) followed by increase in oxidative damage to biomolecules (Lushchak, 2014).

There is increasing evidence that oxidative stress plays a crucial role in both obesity progression and obesity-related complications, like atherosclerosis and type 2 diabetes like (Bayliak et al., 2019; Vatashchuk et al., 2022; Bayliak et al., 2022). Below we analyze the key mechanisms through which oxidative stress may provoke pathological conditions.

First of all, oxidative stress leads to the increased production of ROS, which can damage lipids, proteins, and DNA. This disrupts cellular functions and can lead to cell death or structural changes. Pancreatic beta cells, responsible for insulin production, and adipose tissue cells, which regulate lipid metabolism, are particularly sensitive to these effects (Bayliak et al., 2019; Lenzen et al., 2022). Due to oxidative damages of pancreatic beta cells and adipocytes, oxidative stress, which is exacerbated in obesity, contributes to the development of insulin resistance—a condition in which

the body's cells respond poorly to insulin. This is a key factor in the onset of type 2 diabetes. Elevated ROS levels impair insulin signaling pathways, disrupting glucose regulation (Ivanochko et al., 2024). Moreover, oxidative stress activates inflammatory processes in the body. High levels of pro-inflammatory cytokines (such as TNF-α and IL-6) are associated with obesity and insulin resistance, which in turn contribute to the development of diabetes. Under oxidative stress, adipose tissue increases the production of pro-inflammatory molecules and reduces the secretion of adiponectin—a hormone that regulates glucose and lipid metabolism and has anti-inflammatory properties. This can promote fat accumulation and increase the risk of obesity.

Mitochondria, the primary energy producers in cells, are also the main producers of ROS. At the same time, mitochondria are highly sensitive to oxidative stress. Their dysfunction results in reduced energy production and the increased generation of free radicals, exacerbating insulin resistance and impairing lipid metabolism. The metabolic dysfunction in type 2 diabetes further exacerbates ROS production, creating a vicious cycle (Dmytriv et al., 2024).

Although the mechanisms of oxidative stress influencing the development of obesity and type 2 diabetes are similar across all population groups, we can observe varying prevalence rates among different demographic groups.

3. PREVALENCE OF OBESITY AND OBESITY-RELATED COMPLICATIONS WORLDWIDE AND IN UKRAINE

In the EU, the proportion of people aged 16 and over who were considered overweight in 2022 ranged from 31.3% in Italy to 56.7% in Latvia for women and from 51.5% in France to 69.4% in Croatia, Malta and Slovakia for men (Eurostat, 2024). According to the World Health Organisation (WHO), worldwide adult obesity more than doubled between 1990 and 2022. In 2022, 43% of people aged 18 years or over were overweight and 16% were obese. In 2022, an estimated 828 million (95% credible interval [CrI] 757–908) adults (those aged 18 years and older) had diabetes, an increase of 630 million (554–713) from 1990. From 1990 to 2022, the age-standardised prevalence of diabetes increased in 131 countries for women and in 155 countries for men with a posterior probability of more than 0·80. The largest increases were in low-income and middle-income countries in southeast Asia (eg, Malaysia), south Asia (eg, Pakistan), the Middle East and north Africa (eg, Egypt), and Latin America and the Caribbean (eg, Jamaica, Trinidad and Tobago, and Costa Rica). Age-standardised prevalence neither increased nor decreased with a posterior probability of more than 0·80 in some countries in western and central Europe, sub-Saharan Africa, east Asia and the Pacific, Canada, and some Pacific Island nations where prevalence was already high in 1990; it decreased with a posterior probability of more than 0·80 in women in Japan, Spain, and France, and in men in Nauru. The lowest prevalence in the world in 2022 was in western Europe and east Africa for both sexes, and in Japan and Canada for women, and the highest prevalence in the world in 2022 was in countries in Polynesia and Micronesia, some countries in the Caribbean and the Middle East and north Africa, as well as Pakistan and Malaysia. In 2022, 445 million (95% CrI 401–496) adults aged 30 years or older with diabetes did not receive treatment (59% of adults aged 30 years or older with diabetes), 3·5 times the number in 1990. From 1990 to 2022, diabetes treatment coverage increased in 118 countries for women and 98 countries for men with a posterior probability of more than 0·80. The largest improvement in treatment coverage was in some countries from central and western Europe and Latin America (Mexico, Colombia, Chile, and Costa Rica), Canada, South Korea, Russia, Seychelles, and Jordan. There was no increase in treatment coverage in most countries in sub-Saharan Africa; the Caribbean; Pacific Island nations; and south, southeast, and central Asia. In 2022, age-standardised treatment coverage was lowest in countries in sub-Saharan Africa and south Asia, and treatment coverage was less than 10% in some African countries. Treatment coverage was 55% or higher in South Korea, many high-income western countries, and some countries in central and eastern Europe (eg, Poland, Czechia, and Russia), Latin America (eg, Costa Rica, Chile, and Mexico),

and the Middle East and north Africa (eg, Jordan, Qatar, and Kuwait) (Zhou et al, 2024). The proportion of the elderly people (65 years and over) in 2019 was 9%, and it is projected to double by 2050. The overall aging of the population is an upward trend worldwide, especially in countries with a high standard of living (UN, 2019) The aging process is closely linked to the emergence of a greater number of diseases that can pose life-threatening risks (North B.J. et al, 2012). Obesity is the main biological risk factor for unhealthy aging, as excess adipose tissue is an important predictor of the development of many chronic diseases, including fatigue and cardiovascular disease (Powell-Wiley T.M. et al, 2021). The prevalence of obesity among the elderly is increasing, and this rate is higher among women (Wharton S. et al, 2020).

The data presented in Tables 1 and 2 reflect data derived primarily from epidemiologic studies in developed countries. Preliminary information from developing countries indicates that lower cut-offs for both BMI and waist circumference (see Table 2) are needed for certain populations that are at particular risk due to relatively moderate degrees of overweight.

Conducting community-based research is an effective method to identify the prevalence of diseases such as obesity, type 2 diabetes, prediabetes, and other associated conditions. Only two fifths (39.6%) of the population in Ukraine had normal weight (BMI 18.5–24.9 kg/m2). Almost three fifths (59.1%) were overweight (BMI≥25 kg/m2), including a quarter of the population (24.8%) who were obese with age: overweight from 36.5% among 18–29-year-olds to 73% among 60–69-year-olds; obesity from 10% among 18–29-year-olds to 38.8% among 60–69-year-olds. Obesity was more prevalent among women (29.8%) than men (20.1%), especially in the oldest age group (women: 46.4%; men: 28.2%). Prevalence of overweight and obesity was higher among women living in rural settlements than urban ones (overweight in rural settings: 66.9%, in urban settings: 55.4%; obesity in rural settings: 35.9%, in urban settings: 25.4%) (Health Index. Ukraine, 2020).

Lushchak et al. (2023) reported that in the Ivano-Frankivsk region, 23% of adults were overweight, and 15% suffered from obesity. Among children, 9.9% were overweight, and 8.7% suffered from obesity (Lushchak V.I. et al 2023) . The percentage of visceral fat in adults was positively associated with a 10-year risk of developing type 2 diabetes.

Disability-adjusted life years (DALYs) are a measure of overall disease burden, expressed as the number of years lost due to ill-health, disability, or early death. It was developed in the 1990s as a way of comparing the overall health and life expectancy of different countries. DALYs have become more common in the field of public health and health impact assessment (HIA). They include not only the potential years of life lost due to premature death but also equivalent years of 'healthy' life lost by virtue of being in states of poor health or disability. In so doing, mortality and morbidity are combined into a single, common metric (WHO, 2020).

In Figure 1, the DALYs indicator worldwide for 2021 is shown for all age groups and both genders. Type 2 diabetes holds a central position with a value of 2.73% with annual positive change 3.05% (GBD, 2024). We have the following information regarding DALYs for type 2 diabetes mellitus by gender: men - percentage: 2.58% of total DALYs, annual % change: 3.58%; women - percentage: 2.92% of total DALYs, annual % change: 3.58%: 3.14%; women - percentage: 2.92% of total DALYs, annual % change: 2.97%.
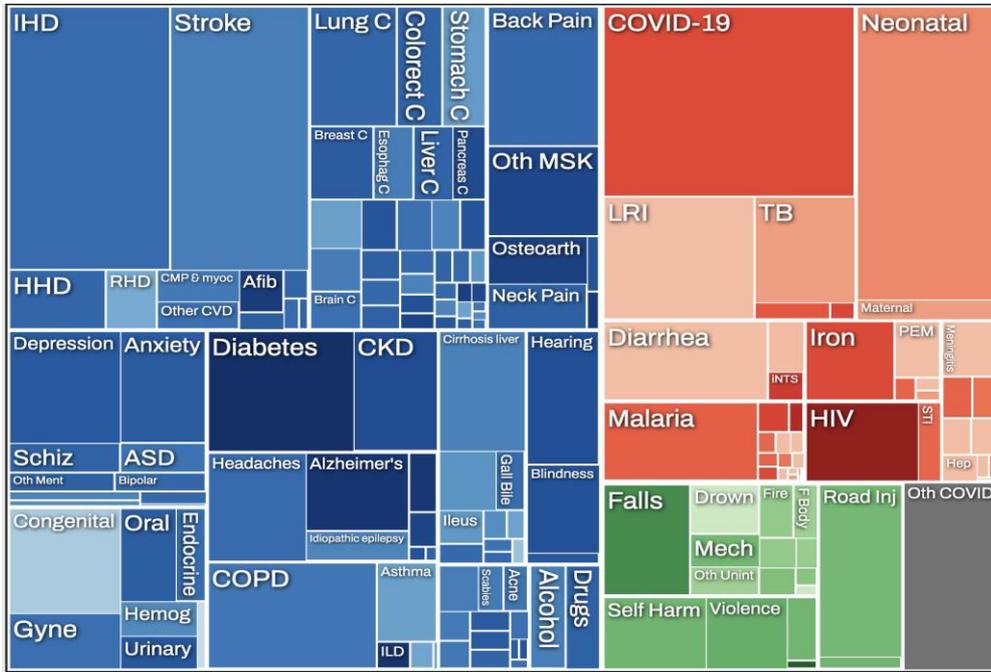
Figure 1. Global trends in Disability-adjusted life years (DALYs), both sexes, all ages, 2021

It is well known that obesity not only leads to the development of type 2 diabetes but also contributes to cardiovascular diseases and digestive system disorders. Analyzing causes of mortality in European countries, we can observe significant mortality threats caused by type 2 diabetes, obesity, and its consequences (Fig. 2).
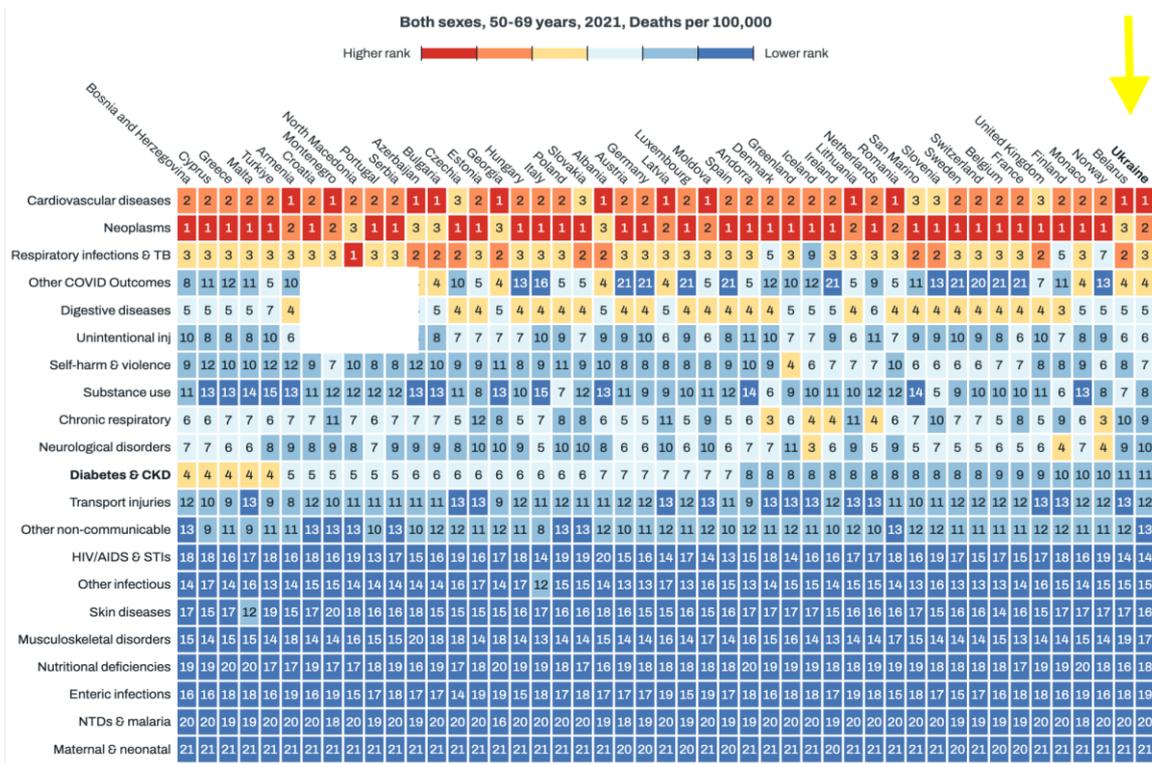

Figure 2. Causes of death statistics in 2021. Both sexes, 50-69 years, causes of death per 100,000 (GBD, 2024)

Analyzing the statistics on the dynamics of obesity prevalence across the European continent, countries were selected with the lowest and highest rates of prevalence and Ukraine for comparison (GBD, 2024). The graph in Fig. 3 reflects the 10-year trend from 2006 to 2016. The lowest prevalence was observed in Tajikistan, while the highest was in Turkey. Ukraine is positioned in the middle, but its rate is higher than the EU average (Fig. 3A).

We compared the prevalence of obesity in Ukraine with geographical neighboring countries that are mentally and socio-economically similar to Ukraine (such as Bulgaria, Belarus, Poland, Romania and Slovakia) and found an almost complete overlap of the graphs (Fig 3.b). Except for Slovakia, which, despite bordering Ukraine, demonstrated a trend closer to the average across EU countries.
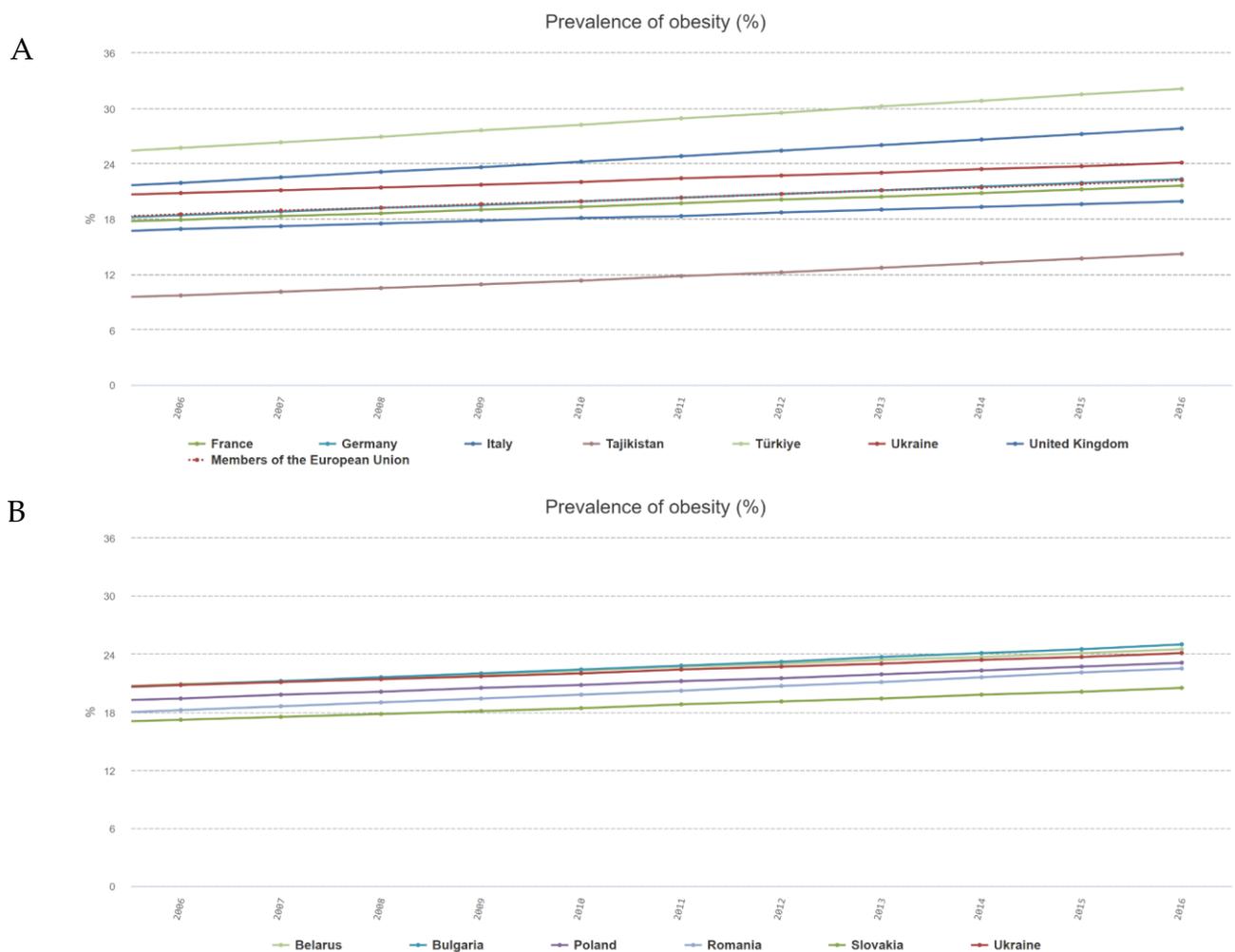

Figure 3. Prevalence of obesity (%) during 2006-2016 comparing (A). Ukraine and European countries, (B) Ukraine and European neighboring countries. (GBD, 2024)

4. FACTORS THAT INFLUENCE THE LARGE SCALE SPREAD OF OBESITY

General trends in obesity prevalence in the countries shown in Fig. 3.a, are the result of various factors that can be divided into several key groups: socioeconomic, cultural, eating habits, physical activity levels, and access to health care.

4.1. Level of economic development and urbanization

In developed countries, such as United Kingdom, Germany or France, high obesity rates are often linked to urbanization, the availability of processed, calorie-dense foods, and reduced physical activity. Modern lifestyles are frequently associated with sedentary behaviors, long working hours, and reliance on technology that replaces physical labor (Bhurosy and Jeewon, 2024). In the UK,

obesity surpassed 25% in 2016, primarily due to high consumption of fast food and sugary drinks. In France, despite a similar level of urbanization, obesity frequency is lower (around 20% of people), potentially due to cultural dietary habits (more balanced diets and traditions of "slow eating").

In developing countries such as Ukraine and Tajikistan, low obesity rates are tied to lower income levels, where diets often include more natural foods, and physical labor is common. However, a gradual increase in obesity rates in these countries indicates lifestyle transformations, particularly the adoption of Western dietary habits. In addition, the low income level of a significant portion of the population in developing countries limits the ability to choose quality food, access sports activities, or preventive healthcare. The lack of preventive programs and unequal access to medical services in urban and rural areas significantly impacts mortality rates.

4.2. Dietary habits and dietary changes

Western European countries, in particular United Kingdom and Germany, are characterized by high consumption of simple carbohydrates, fatty foods, and processed meals, that all contributes to obesity growth. These countries have developed food industries that make calorie-dense foods cheaper and more accessible (Popkin et al, 1995).

Countries with traditional diets including Ukraine and Tajikistan, have diets that include more grains, vegetables, and minimally processed foods, leading to lower obesity rates. However, increasing availability of industrially processed foods may gradually impact these figures. Turkey exemplifies a transitional economy where traditional cuisine (rich in vegetables and legumes) remains important, yet rising popularity of Western dietary habits leads to increased obesity levels (Phelps et al, 2022).

4.3. Physical activity

In developed countries, sedentary lifestyles are prevalent in urban settings due to the dominance of office work, cars, and public transport. Even in countries with a strong fitness culture like Germany or France, this does not always counterbalance the overall decline in everyday physical activity. In developing countries, like Tajikistan and Ukraine, a larger portion of the population engages in physical labor (e.g., agriculture), which partly explains lower obesity rates. However, urbanization is gradually altering this trend (Phelps et al, 2022). According to the study of the majority of Ukrainian urban adolescents are characterized by a sedentary lifestyle. Only 30.8% of Ukrainian urban adolescents (45.4% of boys and 21.4% of girls; $p < 0.001$) meet the recommended level of moderate or vigorous activity (at least 60 minutes per day). The chances of adhering to the recommended level of moderate to vigorous activity are almost 5 times higher in the group of adolescents who exercise on their own free will rather than at the direction of their parents (Yelizarova et al. 2020). Also, the Ukrainian population has a low awareness of the risks of obesity, the benefits of balanced nutrition, and physical activity. Most people do not realize the impact of obesity on mortality from cardiovascular diseases, diabetes, and other illnesses. Programs promoting sports, creating sports infrastructure, and encouraging active lifestyles can have a significant impact.

4.4. Cultural and social factors

In European countries and the USA, social factors, such as easy access to food and aggressive marketing of unhealthy products, influence consumer behavior. In the countries of Latin America and Asia, obesity often correlates with lower education or income levels, as cheaper but less healthy foods are more accessible to disadvantaged populations. In Tajikistan, Turkey, and to some extent Ukraine, traditional dietary habits (e.g., family meals, natural foods) still play a significant role. These helps maintain lower obesity levels, although urbanization and globalization are shifting the balance (Ley et al, 2014).

4.5. Healthcare policies

Developed countries such as France and Germany implement state programs promoting healthy lifestyles, such as sugar taxes and campaigns advocating for balanced diets and physical activity. These measures help slow the growth of obesity rates. In developing countries, such programs are often underfunded or not implemented effectively. However, these nations can leverage the experience of Western countries to prevent a significant rise in obesity levels.

The dynamics of obesity prevalence reveal disparities between developed and developing countries. High obesity rates in Western countries result from urbanization, dietary changes, and modern lifestyles. In developing countries, rates remain lower but are slowly increasing due to similar factors. These trends suggest that combating obesity requires an integrated approach, addressing cultural, economic, and healthcare aspects.

5. OBESITY AS A RISK FACTOR FOR INCREASED MORTALITY

For comparison of mortality rates due to obesity and related issues, Ukraine and countries with a high GDP (gross domestic product - a standard measure of the value added created through the production of goods and services in a country during a certain period) per capita were selected (Fig. 4). As we can see, Ukraine is a country leader in mortality from obesity and its complications. High rates of obesity are also recorded in the USA. The lowest death rate from obesity is observed in Japan.
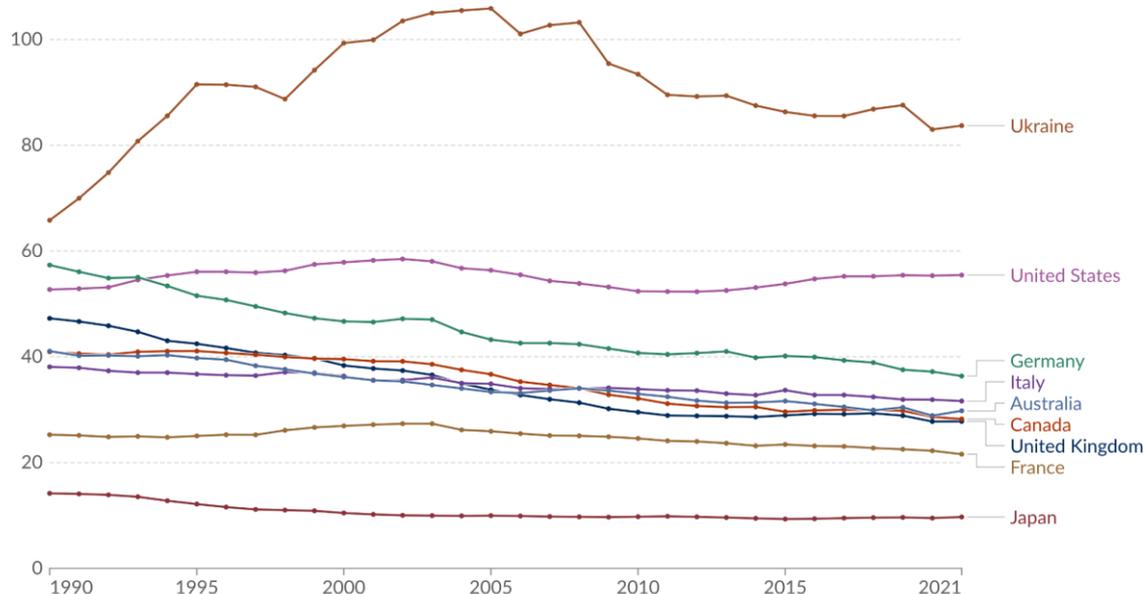

Figure 4. Death rate from obesity from 1990 to 2021 in different countries. Estimated annual number of deaths attributed to obesity per 100,000 people (GBD, 2024)

Globally, average life expectancy increases by one year every four years, and Ukraine follows this trend. In the countries listed in Figure 5, the median life expectancy is as follows: 78 years in the USA, 79 years in Germany, 80 years in Italy, 81 years in Australia, 79 years in the UK, 81 years in France, 82 years in Japan, and 68 years in Ukraine (CIA - The World Factbook, 2009).

Based on Figures 4 and 5, the following conclusions can be deduced for Ukraine in comparison to other countries. First, life expectancy in Ukraine is the lowest among the represented countries. The life expectancy graph shows that Ukraine significantly lags behind developed countries such as Japan, France, or Australia, where the average life expectancy exceeds 80 years. In Ukraine, this figure is approximately 67–68 years.

Second, the mortality rate from obesity in Ukraine is high but shows a declining trend. On the obesity mortality graph, Ukraine occupies leading positions, especially during the period 1990–2010, when the mortality rate exceeded 90 deaths per 100,000 people. However, after this period, the figure

began to decline and reached about 60 deaths per 100,000 by 2021. This remains higher than in most developed countries, such as Japan, France, or Germany.

Third, the mortality rate from obesity in Ukraine exceeds the rates in countries with high life expectancy. In Japan, where life expectancy is the highest (over 84 years), the mortality rate from obesity remains very low (less than 20 deaths per 100,000). This highlights the significant role of a healthy lifestyle and nutrition in maintaining longevity.
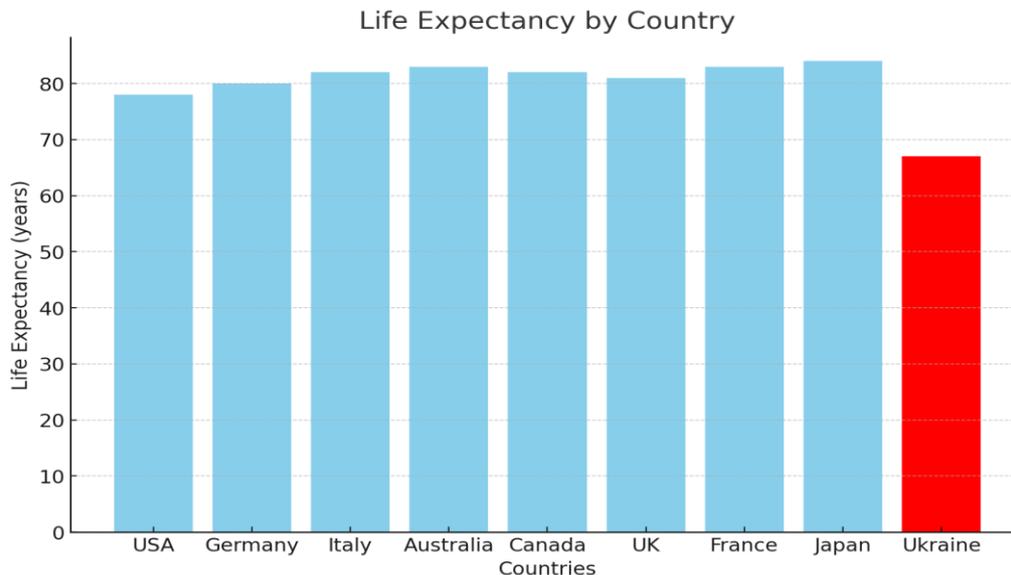

Figure 5. Life expectancy in different countries in 2021 (CIA - The World Factbook, 2009).

Ukraine is an example of a country with a double burden of health issues. Low life expectancy and a high obesity mortality rate indicate the presence of both socio-economic and medical problems, including limited access to quality healthcare, insufficient implementation of preventive measures, and low public awareness of the risks associated with obesity. Trends indicate gradual improvement. Despite the high mortality rate from obesity, the decline in this indicator during 2010–2021 may point to certain positive changes, such as increased access to information about healthy lifestyles or improved treatment of comorbidities.

4. Conclusions and perspectives

Ukraine is in a vulnerable position compared to other countries due to high obesity-related mortality and low life expectancy. This underscores the need for a comprehensive approach to addressing obesity, including social, educational, and medical measures. For Ukraine, several key factors can be identified that have varying significance in addressing obesity and increasing life expectancy. The most important factors affecting obesity spread in Ukraine are socio-economic level and access to healthcare, educational level and awareness, change in traditional eating habits and systematic lack of physical activity. These aspects should be the focus when developing government programs and initiatives in the field of public health. Less important factors are cultural specifics, western influence and globalization, and genetic factors.

Data availability

Data supporting this study are openly available from Institute for Health Metrics and Evaluation (IHME) (2021). GBD Compare Data Visualization; IHME, University of Washington, Seattle, WA, USA at https://vizhub.healthdata.org/gbd-compare and from Public Health Center of the Ministry of Health of Ukraine, 2024 at https://phc.org.ua

REFERENCES

World Health Organization. WHO Obesity and overweight: fact sheet. Geneva: World Health Organization; 2011. Access at https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight

Roman A.A., Parlee S.D. & Sinal C.J. Chemerin: a potential endocrine link between obesity and type 2 diabetes. Endocrine 42, 243–251 (2012). https://doi.org/10.1007/s12020-012-9698-8

Haslam D.W., James W.P. (2005). Obesity. Lancet. 366 (9492): 1197—209. doi:10.1016/S0140-6736(05)67483-1.

Poulain M, Doucet M, Major GC та ін. (April 2006). The effect of obesity on chronic respiratory diseases: pathophysiology and therapeutic strategies. CMAJ. 174 (9): 1293—9. doi:10.1503/cmaj.051299.

Calle E.E., Rodriguez C, Walker-Thurmond K, Thun MJ (April 2003). Overweight, obesity, and mortality from cancer in a prospectively studied cohort of U.S. adults. N. Engl. J. Med. 348 (17): 1625—38. doi:10.1056/NEJMoa021423

Kumar V.; Fausto N.; Abbas A.K.; Cotran R.S.; Robbins S.L. (2005). Robbins and Cotran Pathologic Basis of Disease (вид. 7th). Philadelphia, Pa.: Saunders. c. 1194—1195.

Lushchak V.I., Covasa M.A., Oleksandra B.,Mykytyn T.V., Tverdokhlib I.Z., Storey K.B.; Semchyshyn H. Risks of obesity and diabetes development in the population of the Ivano-Frankivsk region in Ukraine. Leibniz Research Centre for Working Environment and Human Factors (2023). doi:10.17179/excli2023-6296

United Nations. World Population Prospects 2019. United Nations; 2019.

North B.J., Sinclair D.A. The intersection between aging and cardiovascular disease. Circ Res. 2012; 110(8): 1097-1108. doi:10.1161/circresaha.111.246876

Powell-Wiley T.M., Poirier P, Burke L.E., et al. Obesity and cardiovascular disease: a scientific statement from the American Heart Association. Circulation. 2021; 143(21): e984-e1010. doi:10.1161/cir.0000000000000973

Wharton S, Lau DCW, Vallis M, et al. Obesity in adults: a clinical practice guideline. Cmaj. 2020; 192(31): E875-E891. doi:10.1503/cmaj.191707

Powell-Wiley, Tiffany M., Paul Poirier, Lora E. Burke, Jean-Pierre Després, Penny Gordon-Larsen, Carl J. Lavie, Scott A. Lear, et al. "Obesity and Cardiovascular Disease: A Scientific Statement from the American Heart Association." Circulation 143, no. 21 2021. https://doi.org/10.1161/cir.0000000000000973

Global Burden of Disease Collaborative Network. Global Burden of Disease Study 2021 (GBD 2021). Seattle, United States: Institute for Health Metrics and Evaluation (IHME), 2024. Available from https://vizhub.healthdata.org/gbd-results/

CIA - The World Factbook 2009. Life expectancy at birth. https://www.cia.gov/

Bayliak M. M., Abrat O. B., Storey J.M., Storey K.B., Lushchak V. I. Interplay between diet-induced obesity and oxidative stress: Comparison between Drosophila and mammals. (2019) Comparative Biochemistry and Physiology -Part A: Molecular and Integrative Physiology. DOI: 10.1016/j.cbpa.2018.09.027

Yelizarova O, Stankevych T, Parats A, Antomonov M, Polka N, Hozak S. Specific Features of the Ukrainian Urban Adolescents' Physical Activity: A Cross-Sectional Study. J Environ Public Health. 2020 Apr 9;2020:3404285. doi: 10.1155/2020/3404285

Bhurosy T, Jeewon R. Overweight and obesity epidemic in developing countries: a problem with diet, physical activity, or socioeconomic status? ScientificWorldJournal. 2014;2014:964236. doi: 10.1155/2014/964236. Epub 2014 Oct 14. PMID: 25379554; PMCID: PMC4212551.

WHO methods and data sources for global burden of disease estimates 2000-2019. December 2020. https://cdn.who.int/media/docs/default-source/gho-documents/global-health-estimates/ghe2019_daly-methods.pdf?sfvrsn=31b25009_7

Dmytriv, T. R., Duve, K. V., Storey, K. B., & Lushchak, V. I. (2024). Vicious cycle of oxidative stress and neuroinflammation in pathophysiology of chronic vascular encephalopathy. Frontiers in physiology, 15, 1443604. https://doi.org/10.3389/fphys.2024.1443604

Vatashchuk, M. V., Bayliak, M. M., Hurza, V. V., Storey, K. B., & Lushchak, V. I. (2022). Metabolic Syndrome: Lessons from Rodent and Drosophila Models. BioMed research international, 2022, 5850507. https://doi.org/10.1155/2022/5850507

Lushchak V. I. (2014). Free radicals, reactive oxygen species, oxidative stress and its classification. Chemico-biological interactions, 224, 164–175. https://doi.org/10.1016/j.cbi.2014.10.016

Vatashchuk, M. V., Bayliak, M. M., Hurza, V. V., Storey, K. B., & Lushchak, V. I. (2022). Metabolic Syndrome: Lessons from Rodent and Drosophila Models. BioMed research international, 2022, 5850507. https://doi.org/10.1155/2022/5850507

Bayliak, M. M., Vatashchuk, M. V., Gospodaryov, D. V., Hurza, V. V., Demianchuk, O. I., Ivanochko, M. V., Burdyliuk, N. I., Storey, K. B., Lushchak, O., & Lushchak, V. I. (2022). High fat high fructose diet induces mild oxidative stress and reorganizes intermediary metabolism in male mouse liver: Alpha-ketoglutarate effects. Biochimica et biophysica acta. General subjects, 1866(12), 130226. https://doi.org/10.1016/j.bbagen.2022.130226

Lenzen, S., Lushchak, V. I., & Scholz, F. (2022). The pro-radical hydrogen peroxide as a stable hydroxyl radical distributor: lessons from pancreatic beta cells. Archives of toxicology, 96(7), 1915–1920. https://doi.org/10.1007/s00204-022-03282-6

Eurostat, 2024. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Overweight_and_obesity_-_BMI_statistics

Dereń, K., Nyankovskyy, S., Nyankovska, O. et al. The prevalence of underweight, overweight and obesity in children and adolescents from Ukraine. Sci Rep 8, 3625 (2018). https://doi.org/10.1038/s41598-018-21773-4

Boutari C, Mantzoros CS. A 2022 update on the epidemiology of obesity and a call to action: as its twin COVID-19 pandemic appears to be receding, the obesity and dysmetabolism pandemic continues to rage on. Metabolism. 2022 Aug; 133:155217. doi: 10.1016/j.metabol.2022.155217. Epub 2022 May 15. PMID: 35584732; PMCID: PMC9107388.

Zhou B. et al. Worldwide trends in diabetes prevalence and treatment from 1990 to 2022: a pooled analysis of 1108 population-representative studies with 141 million participants. The Lancet, Volume 404, Issue 10467, 2077 - 2093, (2024)

Health Index. Ukraine – 2019: Results national research. Kyiv: Health Index Ukraine (2020) (http://health-index.com.ua/HI_Report_2019_Preview.pdf)

Popkin, B.M., Paeratakul, S., Zhai, F. and Ge, K. (1995), A Review of Dietary and Environmental Correlates of Obesity with Emphasis on Developing Countries. Obesity Research, 3: 145s-153s. https://doi.org/10.1002/j.1550-8528.1995.tb00457.x

Phelps, Nowell H et al. Worldwide trends in underweight and obesity from 1990 to 2022: a pooled analysis of 3663 population-representative studies with 222 million children, adolescents, and adults.

The Lancet, Volume 403, Issue 10431, 1027 - 1050 (2022).

Ley, SH · Hamdy, O · Mohan, V · et al. Prevention and management of type 2 diabetes: dietary components and nutritional strategies. Lancet; 383:1999-2007 (2014)

Sobal, J. and Stunkard, A.J., 1989. Socioeconomic status and obesity: a review of the literature. Psychological bulletin, 105(2), p.260.

McLaren, L. (2007). Socioeconomic status and obesity. Epidemiologic Reviews, 29(1), 29-48. https://doi.org/10.1093/epirev/mxm001

Nyamdorj, R., Pitkäniemi, J., Tuomilehto, J. et al. Ethnic comparison of the association of undiagnosed diabetes with obesity. Int J Obes 34, 332–339 (2010). https://doi.org/10.1038/ijo.2009.225

Williams, E.D., Tapp, R.J., Magliano, D.J. et al. Health behaviours, socioeconomic status and diabetes incidence: the Australian Diabetes Obesity and Lifestyle Study (AusDiab). Diabetologia 53, 2538–2545 (2010). https://doi.org/10.1007/s00125-010-1888-4.

Ball K., Crawford D. (2005) Socioeconomic status and weight change in adults: a review. Social Science & Medicine, Vol 60, Issue 9, p.987-2010, https://doi.org/10.1016/j.socscimed.2004.08.056.

Lantz, P. M., House, J. S., Mero, R. P., & Williams, D. R. (2005). Stress, Life Events, and Socioeconomic Disparities in Health: Results from the Americans' Changing Lives Study. Journal of Health and Social Behavior, 46(3), 274-288. https://doi.org/10.1177/002214650504600305.

Purslow, L.R., Young, E.H., Wareham, N.J. et al. Socioeconomic position and risk of short-term weight gain: Prospective study of 14,619 middle-aged men and women. BMC Public Health 8, 112 (2008). https://doi.org/10.1186/1471-2458-8-112.

Stelmach-Mardas, M., Rodacki, T., Dobrowolska-Iwanek, J., Brzozowska, A., Walkowiak, J., Wojtanowska-Krosniak, A., Zagrodzki, P., Bechthold, A., Mardas, M., & Boeing, H. (2016). Link between Food Energy Density and Body Weight Changes in Obese Adults. Nutrients, 8(4), 229. https://doi.org/10.3390/nu8040229.

Volaco, A., et al. (2018). Socioeconomic Status: The Missing Link Between Obesity and Diabetes Mellitus? Current Diabetes Reviews, Vol.14, N.4, 2018, pp. 321-326(6) https://doi.org/10.2174/1573399813666170621123227.

Hill, J. O., et al. (2005). Obesity and the environment: where do we go from here? Science, 307(5708), 375-379. https://doi.org/10.1126/science.1109853.

Stanislav Tymochkin, PhD student, Department of Biochemistry and Biotechnology, Vasyl Stefanyk Precarpathian National University, Ivano-Frankivsk, Ukraine;
ORCID ID: 0009-0005-3787-0987

Mariya Bayliak, Professor, Doctor of science, Department of Biochemistry and Biotechnology, Vasyl Stefanyk Precarpathian National University, Ivano-Frankivsk, Ukraine;
ORCID ID: 0000-0001-6268-8910

Address: Stanislav Tymochkin, Mariya Bayliak, Vasyl Stefanyk Precarpathian National University, 57 Shevchenko Str., Ivano-Frankivsk, 76018 Ukraine.
E-mail: stanislav.tymochkin.24@pnu.edu.ua, maria.bayliak@pnu.edu.ua

_____

Станіслав Тимочкін, Марія Байляк. Глобальні тенденції ожиріння: соціально-економічні та регіональні впливи. *Журнал Прикарпатського університету імені Василя Стефаника*. Біологія. Том 11 (2024), С.66-С77.

Анотація. Ожиріння та його метаболічні ускладнення є глобальною проблемою охорони здоров'я, поширеність якої зростає у всьому світі. На ці стани впливають не лише біологічні фактори та спосіб життя, але й соціально-економічні детермінанти, які значною мірою сприяють їх виникненню та прогресуванню. Це дослідження вивчає багатогранний вплив соціально-економічних, культурних та екологічних факторів на ризик розвитку ожиріння та його ускладнень, з особливим акцентом на Івано-Франківській області України. Використовуючи дані з глобальних та національних джерел, ми досліджуємо тенденції поширеності ожиріння та діабету 2 типу, висвітлюючи відмінності у профілях ризику між міським та сільським населенням, а також між різними соціально-економічними верствами. Особлива увага приділяється окислювальному стресу як ключовому біологічному механізму, що пов'язує ожиріння та діабет. Окислювальний стрес посилює запалення, порушує сигналізацію інсуліну та погіршує функцію мітохондрій, створюючи замкнене коло метаболічної дисфункції. Наші результати показують, що соціально-економічні диспропорції, такі як нерівність доходів, обмежений доступ до охорони здоров'я та низький рівень медичної грамотності, посилюють тягар цих метаболічних захворювань. В Україні традиційні харчові звички та фізична праця в сільській місцевості мають певний захисний ефект, але урбанізація та прийняття західного способу життя призводять до зростання рівня поширеності цих захворювань. Дослідження підкреслює нагальну потребу в комплексних стратегіях, що поєднують політику громадського здоров'я, втручання на рівні громад та освіту для зменшення цих ризиків. Розглядаючи соціально-економічні фактори та фактори, пов'язані з оксидативним стресом, це дослідження пропонує цінну інформацію для розробки цілеспрямованих підходів до зниження захворюваності на ожиріння та діабет, особливо в регіонах, що перебувають на етапі соціально-економічних перетворень.

Ключові слова: ожиріння, цукровий діабет 2 типу, соціально-економічні фактори, оксидативний стрес, громадське здоров'я, Україна.