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OBESITY AS A THREAT TO HEALTH SECURITY

ABSTRACT: The aim of this article is to present the impact of the increase of body mass index (BMI) on the health security of a specific population. The paper presents an analysis of the collected statistical data, which clearly indicate a significant increase in the number of obese people in the world in recent decades (illustrated on the basis of data from the USA, Poland, Germany, the UK, Sweden, Norway). The author presents the trends and threats resulting from the increase in the number of obese people in the societies of individual countries and regions. An obvious consequence of the outlined problem is a significant burden on health care systems and an increase in their maintenance costs. The observations presented lead to conclusions that confirm the hypothesis on the need to implement effective programs aimed at combating the growing problem.

KEYWORDS: obesity, BMI, healthcare, security

OTYŁOŚĆ ZAGROŻENIEM BEZPIECZEŃSTWA ZDROWOTNEGO

ABSTRAKT: Celem niniejszego artykułu jest przedstawienie wpływu wzrostu wskaźnika body mass index (BMI) na bezpieczeństwo zdrowotne określonej populacji. Praca prezentuje analizę zebranych danych statystycznych, które dobitnie wskazują na zdecydowany wzrost liczby osób otyłych na świecie w ostatnich dziesięcioleciach (zobrazowano na podstawie danych z USA, Polski, Niemiec, Wielkiej Brytanii, Szwecji, Norwegii). Problemem badawczym są wyraźne trendy oraz zagrożenia wynikające ze wzrostu liczby ludzi otyłych w społeczeństwach poszczególnych krajów i regionów. Ewidentną konsekwencją nakreślonego problemu jest znaczne obciążenie systemów opieki zdrowotnej i wzrost ich kosztów utrzymania. Przedłożone obserwacje prowadzą do wniosków potwierdzających hipotezę dotyczącą konieczności implementacji skutecznych programów ukierunkowanych na walkę z narastającym problemem.

SŁOWA KLUCZOWE: otyłość, BMI, opieka zdrowotna, bezpieczeństwo

INTRODUCTION

According to the World Health Organization (WHO)¹, overweight and obesity are defined as abnormal or excessive fat accumulation that presents a health risk. A body mass index (BMI) greater than 25 is considered overweight, greater than 30 is obese, and if the value is more than 40 we can talk about morbid obesity.

¹ World Health Organization, *Health security*, https://www.who.int/health-topics/obesity#tab=tab_1 (15.02.2023).

Obesity is an extremely important problem that health care systems must address, especially in the countries of the Global North. It is an issue that has evolved from a disease of rich countries to a problem that affects virtually all countries in the world (except parts of sub-Saharan Africa and Asia²) and all social groups. According to the World Health Organization (WHO), since 1975 the problem of obesity has almost tripled. In 2016, 1.9 billion adults (approximately 39% of the world's population) were overweight, of which 650 million (13% of the world's population) were obese. Most of the world's population lives in countries where overweight and obesity have caused far more deaths than malnutrition³.

The issue has reached epidemic proportions, with more than 4 million people dying each year as a result of being overweight or obese in 2017 according to the global burden of disease. According to the database Our World in Data⁴ and The Global Burden of Disease⁵ (published in the medical journal The Lancet, being the dominant source of comprehensive data and analysis of global health trends, presenting worldwide research on the causes and risk factors of disease and death), this number raised more than 5 million people around the world in 2019. For comparison, this number was more than four times higher than deaths caused by road accidents (1.2 million) and about six times higher than the number of people who died due to HIV/AIDS (about 864,000)⁶.

OBESITY IN SELECTED STATES

In this chapter, we will take a closer look at some of the statistics concerning obesity in chosen countries: USA, Poland, Germany, UK, Sweden, Norway. Figure 1 shows the percentage of overweight adults in the whole society. In all countries, we can observe a steady, almost linear increase in people with too high BMI from 1975 to 2016. In all countries being analyzed, more than 55 % of adults are overweight or obese, the number reaching 64% for the United Kingdom and 67% for the United States. It is worth noting at this point that there have been studies showing a correlation between increased BMI and increased medical costs in society⁷.

² World Health Organization, *Obesity and overweight*, June 9, 2021, <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight> (19.01.2023).

³ *Obesity and overweight*, <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight> (19.01.2023).

⁴ Our World in Data, *Deaths by risk factor*, World, 2019, <https://ourworldindata.org/grapher/number-of-deaths-by-risk-factor?time=latest> (21.01.2023); Our World in Data. https://en.wikipedia.org/wiki/Our_World_in_Data (21.01.2023).

⁵ *Global Burden of Disease*, The Lancet, 2019, <https://www.thelancet.com/gbd> (14.03.2023).

⁶ *Our World in Data*, <https://ourworldindata.org> (14.03.2023).

⁷ Z.J. Ward, S.N., Bleich, M.W., Long, et al., *Association of body mass index with health care expenditures in the United States by age and sex*, "PloS one" 2021, 16(3); S. Kent, F. Fusco, A. Gray, S. A. Jebb, B.J. Cairns, & B. Mihaylova, *Body mass index and healthcare costs: a systematic literature review of individual participant data studies*, "Obesity reviews: an official journal of the International Association for the Study of Obesity" 2017, 18(8), pp. 869-879; K. Seamus, et al., *Hospital costs in relation to body-mass index in 1.1 million women in England: a prospective cohort study*, "The Lancet Public Health" 2017, 2(5), pp. 214-222.

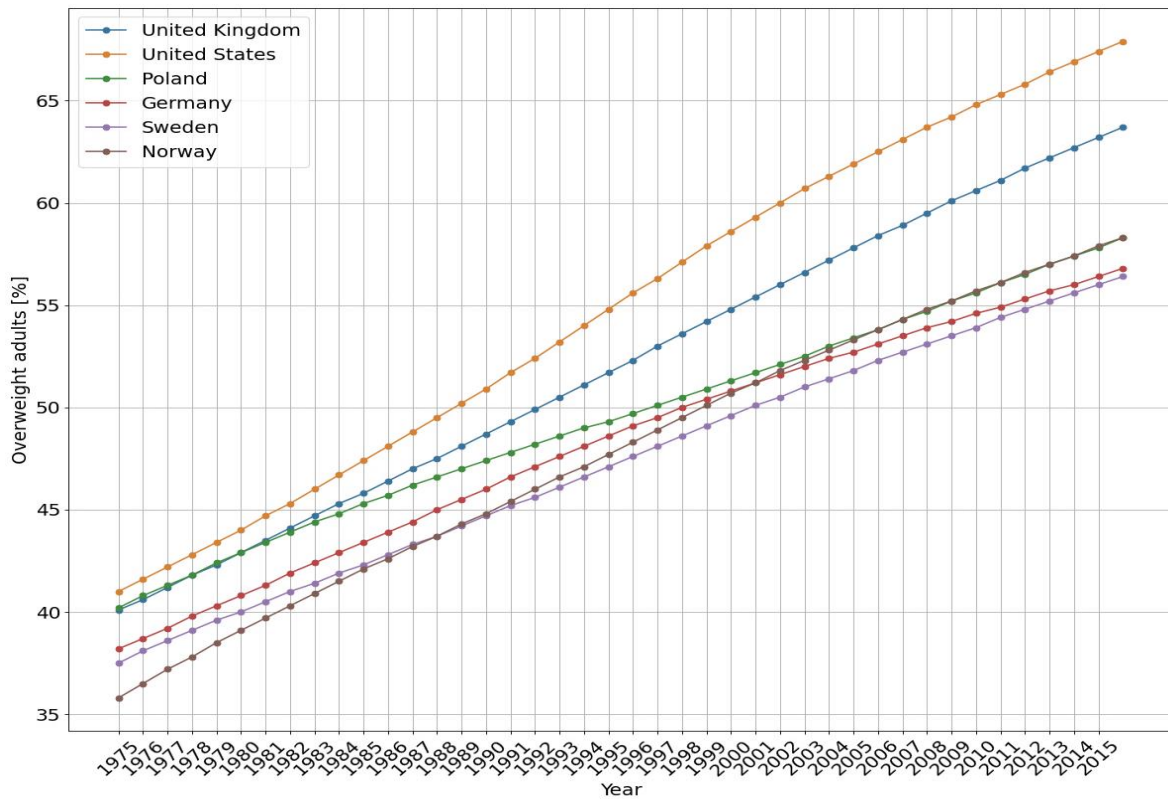


Figure 1. Prevalence of overweight among adults in Germany, Norway, Poland, Sweden, the United Kingdom, and the United States.

Source: H. Ritchie, M. Roser, Obesity, Our World in Data, 2019, <https://ourworldindata.org/obesity> (01.02.2023).

Figure 2 shows the percentage of adults with obesity that, in 2016, ranged from 22% (lowest) in Norway to 37% (highest) in the United States. In addition to the above statistics, Table 1 presents the percentage of deaths attributed to obesity in 2019. We can see that a high body mass index is the cause of a very significant number of deaths and cannot be marginalized.

Table 1. Share of deaths attributed to obesity.

Country	Germany	Norway	Poland	Sweden	UK	US
Share [%]	10.81	6.62	13.77	9.21	9.11	12.97

Source: H. Ritchie, M. Roser, Obesity, Our World in Data, 2019, <https://ourworldindata.org/obesity> (01.02.2023).

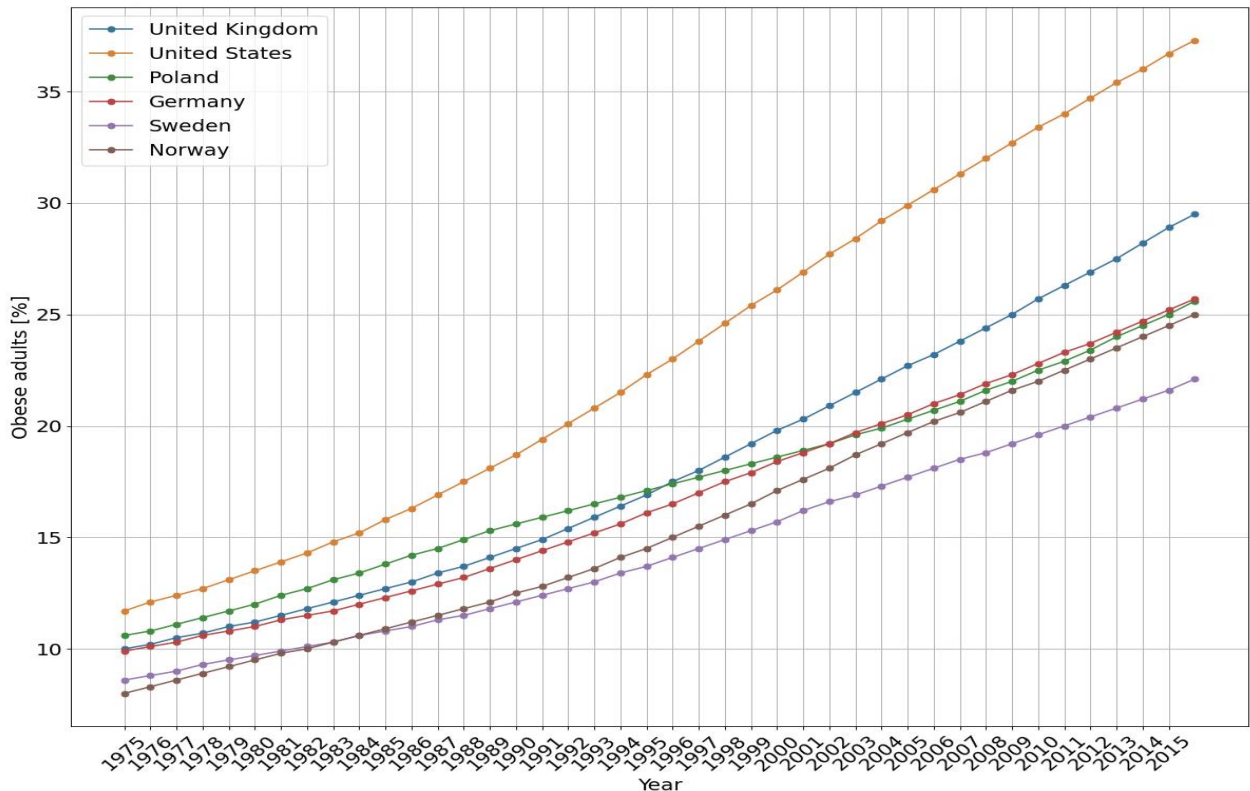


Figure 2. Prevalence of obesity among adults in Germany, Norway, Poland, Sweden, the United Kingdom, and the United States.

Source: H. Ritchie, M. Roser, Obesity, Our World in Data, 2019, <https://ourworldindata.org/obesity> (01.02.2023).

The growing number of overweight and obese people in society is a challenge for the healthcare systems, whose expenditures are constantly growing due to (among others) diseases caused by obesity, e.g., cardiovascular disease, diabetes, cancer, osteoarthritis, liver and kidney disease, depression⁸. There have been a lot of research in the area of the influence of obesity on the healthcare systems in terms of increasing costs.

In 2016 the cost of obesity for the healthcare system in Sweden was estimated at EUR 2.7 billion. This converts to EUR 377 per inhabitant aged 25 years and older⁹, with the total health expenditure per capita in 2016 in Sweden being EUR 5140¹⁰. The total economic cost (including factors like permanent sick leave, premature death, temporary sick leave) of obesity is estimated to be USD 1031¹¹ per capita, and the total economic cost constitutes 1.94% of the GDP.

In 2019 in Norway, the total cost associated with obesity was estimated to be NOK 70 billion (approximately USD 6.8 billion), which is 1.73% of Norway's GDP. The estimated total

⁸ X. Pi-Sunyer, *The medical risks of obesity*, "Postgrad Med" 2009, 121(6), pp. 21-33.

⁹ E. Andersson, B. Eliasson, K.S. Carlsson, *Current and future costs of obesity in Sweden*, "Health Policy" 2022, 126(6), pp. 558-564.

¹⁰ *Health spending*, "OECD Data" 2022, <https://data.oecd.org/healthres/health-spending.htm> (18.03.2023); *Total health expenditure per person*, "Our World in Data" 2019, <https://ourworldindata.org/grapher/annual-healthcare-expenditure-per-capita> (22.03.2023).

¹¹ Global Obesity Observatory, *Economic impact of overweight and obesity*, Sweden, <https://data.worldobesity.org/economic-impact-new/countries/#SE> (01.03.2023).

economic cost of obesity per person is approximately NOK 13 000 (USD 1280), and the healthcare cost per person reached NOK 2300 (USD 225)¹².

In 2016 in Germany, the total annual expenditure related to obesity was estimated to be equal to EUR 63 billion, which was approximately 1.4% of Germany's GDP¹³. In 2019 the total economic cost was estimated at 2.61%¹⁴. The total economic cost reached USD 101.5 billion, which is equivalent to USD 1215 per person.

In 2019, the total economic costs of overweight and obesity reached USD 15.45 billion, which is USD 407 per person. Total costs represented 2.6% of Poland's GDP¹⁵.

In the USA direct and indirect costs were estimated to be equal to USD 705.7 billion, giving 3.3% GDP. The cost of obesity and overweight per person in 2019 was USD 2145. Medical costs were estimated at the level of USD 304 billion¹⁶. In 2016 direct medical costs were estimated to be USD 260.6 billion¹⁷.

In the UK, the total direct and indirect costs of obesity and overweight exceeded USD 60 billion, giving USD 890 per person. According to different sources, only the medical costs for the National Healthcare System were estimated to be equal to USD 21.8 billion¹⁸, GBP 6.7 billion¹⁹ or GDB 6.1 billion²⁰.

OBESITY AND SAFETY

From Figure 3 it can be seen that obesity is the risk factor that causes the highest number of early deaths; obesity is on the fifth position. However, it should be noted that obesity is very often a cause of high blood pressure²¹ and high blood sugar²². This indicates that the number of

¹² A. Wasskog Aamo, L. Hallvard Lind, A. Myklebust, K. Stormo, E. Skogli, *Overvekt og fedme i Norge: omfang, utvikling og samfunnskostnader*, Norway 2019.

¹³ T. Effertz, S. Engel, F. Verheyen et al, *The costs and consequences of obesity in Germany: a new approach from a prevalence and life-cycle perspective*, "Eur J Health Econ." 2016, 17: 1141-1158.

¹⁴ Global Obesity Observatory, *Economic impact of overweight and obesity, Germany*, <https://data.worldobesity.org/economic-impact-new/countries/#DE> (02.03.2023).

¹⁵ Global Obesity Observatory, *Economic impact of overweight and obesity, Poland*, <https://data.worldobesity.org/economic-impact-new/countries/#PL> (02.03.2023).

¹⁶ Global Obesity Observatory, *Economic impact of overweight and obesity, United States*, <https://data.worldobesity.org/economic-impact-new/countries/#US> (01.03.2023).

¹⁷ J. Cawley, et al., *Direct medical costs of obesity in the United States and the most populous states*, "Journal of Managed Care Specialty Pharmacy" 2021, 27(3), pp. 354-366.

¹⁸ Global Obesity Observatory, *Economic impact of overweight and obesity, Great Britain*, <https://data.worldobesity.org/economic-impact-new/countries/#GB> (01.03.2023).

¹⁹ Public Health England, *Guidance. Health matters: obesity and the food environment*, March 31, 2017, <https://www.gov.uk/government/publications/health-matters-obesity-and-the-food-environment/health-matters-obesity-and-the-food-environment--2> (11.03.2023).

²⁰ C. Baker, *Obesity statistics*, England 2019.

²¹ S. Oparil, M.C. Acelajado, G.L. Bakris, et al., *Hypertension*, "Nature reviews. Disease primers" 2018, 4; S. Singh, R. Shankar, G.P. Singh, *Prevalence and Associated Risk Factors of Hypertension: A Cross-Sectional Study in Urban Varanasi*, "International Journal of Hypertension" 2017.

²² Y. Wu, Y. Ding, Y. Tanaka, et al., *Risk factors contributing to type 2 diabetes and recent advances in the treatment and prevention*, "International Journal of Medical Sciences" 2014, 11(11): 11851200; A. Jan, A. Khan, S. Khan, et al., *Causes Complications and Management of Diabetes Mellitus*, "Chronicle Journal of Food and Nutrition" 2017, 1, pp. 1-3; R. Pratley, *The Early Treatment of Type 2 Diabetes*, "The American Journal of Medicine" 2013, 126, pp. 2-9.

people who die from obesity could be even higher than the data. Obesity might not be a direct cause of any of the above conditions, but it can significantly increase the likelihood of their occurrence. The health consequences of obesity are an increased risk of premature death and various types of serious chronic diseases that lead to a decrease in quality of life.

According to the WHO, global public health security is defined as a set of activities, both proactive and reactive, aimed at reducing the danger and impact of public health threats that have international scope and pose a risk to the health of societies in different geographic regions²³.

The balance of the microbial world is currently disturbed by the following factors:

- increase in the world population;
- intensive urbanization;
- degradation of the natural environment;
- misuse of antibiotics.

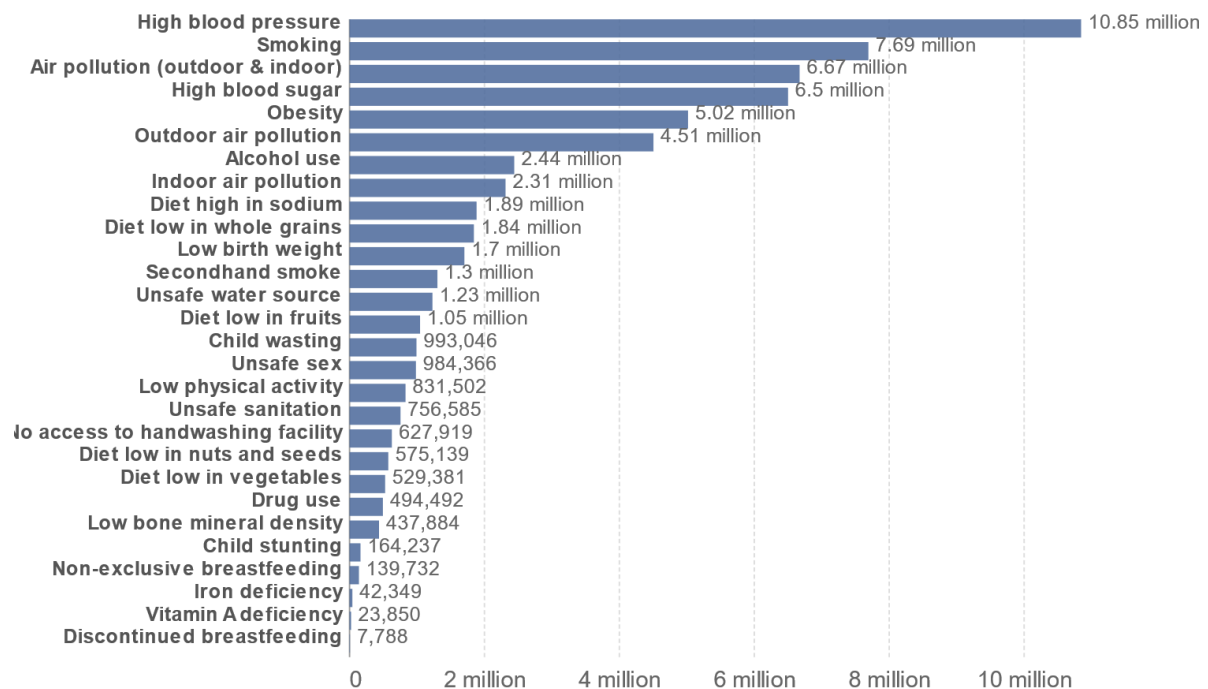


Figure 3. Number of people dying of different causes in 2019.

Source: Our World in Data, <https://ourworldindata.org> (01.02.2023).

New diseases such as COVID–19 are emerging at an unprecedented rate, affecting people's health and causing social and economic impacts. Every year, more and more passengers travel long distances by air, which has a significant impact on increasing the possibility of rapid transmission of infectious pathogens on a global scale. Humanity has become more dependent on chemicals. Awareness of potential threats to health and the environment, such as progressive climate change or environmental pollution, has increased.

²³ World Health Organization, *Health security*, https://www.who.int/health-topics/health-security#tab=tab_1 (11.03.2023).

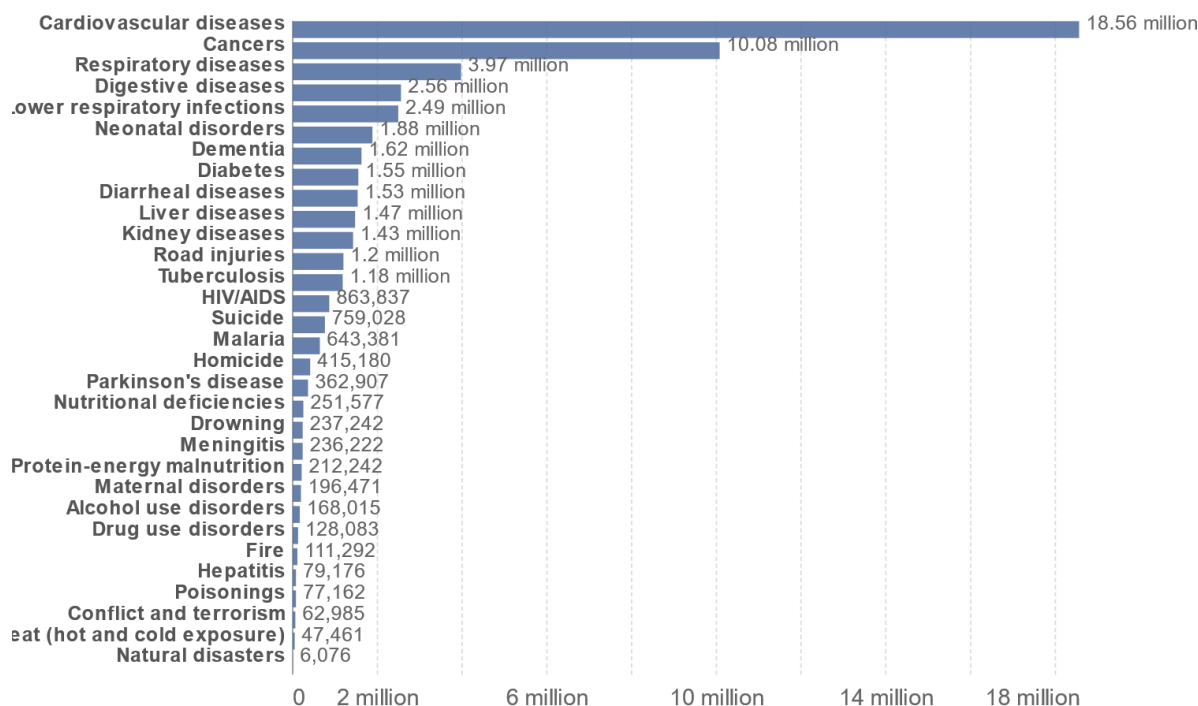


Figure 4. Number of deaths by cause, World, 2019.

Source: *Total health expenditure per person*, Our World in Data, 2019, <https://our-worldindata.org/grapher/annual-number-of-deaths-by-cause?time=latest> (01.02.2023).

Pandemic outbreaks, emergencies, and underinvested health systems not only result in an increase in mortality, but also pose a significant threat to the global economy²⁴. They also cause a reduction in the level of health safety, which, according to the author, is defined as a set of actions aimed at minimizing the danger and consequences of harmful events that threaten health.

The COVID-19 pandemic has clearly highlighted the problem of infectious diseases as a factor that has a decisive impact on the level of health security and a possible increase in mortality. However, it is impossible not to notice that it is the epidemic of non-communicable diseases that leads to incomparably more deaths every year, which is clearly visible in Figure 4.

The ongoing process of globalization and increased consumption are the reason for lifestyle changes and are manifested in various forms of activity and behavior of individuals or social groups. Technological progress and civilization development force the population to engage in activities that may increase the risk of addictions, especially behavioral ones²⁵. An example of this type of behavior are e.g.: excessive consumption, improper eating habits, and poor diet selection, which usually result in various types of eating disorders. Obesity is a direct result of the listed issues²⁶.

²⁴ Ibidem.

²⁵ C. Guerreschi, *New addictions. Le nuove dipendenze*, San Paolo 2005.

²⁶ A. Dworak, *Globalizacja a zagrożenie bezpieczeństwa zdrowotnego wyzwaniem dla edukacji zdrowotnej XXI wieku*, „Studia Edukacyjne” 2022, 64, pp. 147-161.

In many middle-income countries, especially in Eastern Europe, Central Asia, North Africa, and Latin America, more than 17% of deaths in 2019 were attributed to obesity. This is mainly due to the increasing prevalence of obesity in these regions, but also much weaker health systems compared to high-income countries with similar levels of obesity. Premature deaths due to obesity account for 8 to 10% in rich countries, which is about half the average in middle-income countries. Among the most developed countries, Japan and South Korea deserve attention (3.92% and 5.85%, respectively, in 2019), which clearly have much more favorable statistics in this area. In most developing and low-income countries, especially in Central and Eastern Africa and South and Southeast Asia, obesity accounts for less than 5% of deaths (e.g. Mali 4.92%, Niger 3.75%, Chad – 3.4, Central African Republic – 2.82%, Democratic Republic of the Congo – 4.89%, Ethiopia – 3.76%, Somalia – 1.82%, Nepal – 4.39%, Bangladesh – 4.66%, Cambodia – 4.39%)²⁷.

According to L. Imbrogno, obesity can affect the health care system (and thus also the level of health security of the population) by:

- increased in the number of bariatric patients;
- the need to take into account the increase in the cost of maintaining the health care system;
- forcing changes in health security management;
- putting pressure on the economy²⁸.

The increase in the level of obesity in society forces a revision of existing plans and creates an additional burden for the institutions responsible for financing the treatment of patients. Insurers, both public and private, are grappling with the rising cost of health care for overweight and obese people. Increased medical costs have an impact on the population, as they lead to higher health premiums for all insured persons.

The need to spend more funds on the care of obese patients also has an impact on the state budget. Allocating more available funds to the treatment of bariatric patients may lead to certain shortages in other areas of managing the health security of citizens, e.g. limiting expenditure on preventive examinations or limiting the financing of the maintenance of infrastructure used in crisis situations.

The main burden of financing health care costs lies with entrepreneurs and taxpayers. Employers are forced to pay health insurance premiums for their employees, which, in turn, must be reflected in the prices of goods and services. In recent decades, healthcare spending has grown much faster than inflation. It is the increasing rate of obesity that results in an acceleration of the increase in the cost of maintaining the health security of the population. This trend is emphatically described in the words of Warren Buffet, according to whom “General Motors is a health and benefits company with an auto company attached”. In fact, it spends more on

²⁷ H. Ritchie, M. Roser, *Obesity, Our World in Data*, 2019, <https://ourworldindata.org/obesity> (23.03.2023).

²⁸ L. Imbrogno, *4 Ways Obesity is Impacting the Healthcare System*, “Bariatric Centers of America”, June 9 2022, <https://bcofa.com/4-ways-obesity-is-impacting-the-healthcare-system/> (23.03.2023).

medical care than it does on steel for production, as does Starbucks, for which the cost of benefits and health insurance exceeds the spending on coffee beans²⁹.

In addition to the problems mentioned above, related to the costs of doing business, which obviously translate into prices offered to customers, employers are struggling with increased absenteeism caused by obesity-related diseases. The consequence of this is reduced productivity and higher labor costs. Furthermore, it should be emphasized that the productivity of obese employees and those with various diseases resulting from excess body weight is much lower than that of healthy people³⁰.

COUNTERACTING OBESITY EPIDEMIC

In the previous section, it was shown that direct and indirect costs of obesity are a huge challenge for the economy in developed countries. Some research papers offer prognosis with different techniques and predictive models to estimate the future costs of obesity and overweight. Despite the different techniques, all research agrees that these costs will continue to rise:

- In Sweden, the prevalence of obesity in 2030 (compared to 2016) will increase by 9% and costs will increase by 38%³¹.
- In the US, the excess prevalence of total adult obesity in 2050 (compared to 2020) will increase by approximately 3000%, whereas the total economic cost will increase by more than 260%³².
- In the UK, the costs connected to high BMI will increase by approximately 1900% (worst-case scenario) to 850% (best-case scenario) by the year 2050 (compared to 2004)³³.
- In Poland, the direct cost of obesity will increase by 0.3% GDP by 2070³⁴.
- In Norway, in 2050 (compared to 2020), total direct costs will increase by 300%, whereas indirect total costs will increase by approximately 285%³⁵.

Clearly, from the perspective of national healthcare system security, it is crucial to address this issue. There are a variety of different methods to address the problem of obesity and overweight in society:

²⁹ D. Chase, *You Run a Health-Care Business Whether You Like It or Not*, “CFO”, November 7 2017, <https://www.cfo.com/corporate-finance/2017/11/run-health-care-business-whether-like-not/> (23.03.2023).

³⁰ L. Imbrogno, *4 Ways Obesity...*, op. cit.

³¹ E. Andersson, B. Eliasson, K.S. Carlsson, *Current and future costs of obesity in Sweden*, “Health Policy” 2022, 126 (6), pp. 558-564.

³² Ibidem.

³³ B. Butland, S. Jebb, P. Kopelman et al., *Foresight. Tackling Obesities: Future Choices – Project Report*, UK Government, UK 2007.

³⁴ M. Kalbarczyk, J. Mackiewicz Łyziak, D. Mycielska, *Long-term care costs and obesity – projections for Poland*, „Journal of Economic Behavior & Organization” 2022, 203, pp. 235-245.

³⁵ The Global Obesity Observatory, *Economic impact of overweight and obesity*, Norway, <https://data.worldobesity.org/economic-impact-new/countries/#NO> (23.03.2023); G. Bjørnelv, V. Halsteinli, B. Kulseng, et al., *Modelling Obesity in Norway (The MOON Study): A Decision-Analytic Approach – Prevalence, Costs, and Years of life Lost*, “Medical Decision Making” 2021, 41, pp. 21-36.

- introducing food policies, urban planning policies, transport policies to influence behavioural changes in the society³⁶;
- school based interventions promoting physical activity, healthier nutrition patterns³⁷;
- social marketing and campaigns promoting a healthier lifestyle³⁸.

There is evidence of the effectiveness of campaigns against obesity in western societies. J. Kite et al.³⁹, in their survey, analyzed 14 different campaigns that were targeting the issue of obesity and overweight, mainly in Australia, the UK, and the US. One of the conclusions of the study is that such campaigns can positively influence the awareness and attitude of society towards a healthier lifestyle.

It should be noted that there may not be enough quantitative evidence to support the effectiveness of different methods in reducing obesity. The main reason for this is that obesity is reasonably ‘young’ problem in our civilization and it could take time to gather and analyze enough data to draw more definitive conclusions.

CONCLUSIONS

Obesity is undoubtedly one of the most serious civilizational hazards of the 21st century. It not only affects the deterioration in quality of life of people affected by this problem but also constitutes a significant threat to the health security of certain populations. Failure to implement effective methods to combat the growing problem will result in an increase in the cost of maintaining health care systems and a decrease in the productivity of certain social groups affected by obesity or obesity. Well-planned social campaigns aimed at increasing awareness can undoubtedly have a positive impact on the trend presented. The fight against obesity should become one of the key elements of the health prevention of states. The obvious conclusion is that there is a need for further scientific work. The aim of this article is to create a kind of foundation

³⁶ G. Sacks, B. Swinburn, M. Lawrence, *Obesity Policy Action framework and analysis grids for a comprehensive policy approach to reducing obesity*, “Obesity Reviews” 2009, 10, pp. 76-86; A.M. Fox, C.R. Horowitz, *Best practices in policy approaches to obesity prevention*, „Journal of health care for the poor and underserved” 2013, 24(2 Suppl), pp. 168-192; R.S. Chan, J. Woo, *Prevention of overweight and obesity: how effective is the current public health approach*, „International journal of environmental research and public health” 2010, 7(3), pp. 765-783; S.L. Gortmaker, B.A. Swinburn, D. Levy, et al., *Changing the future of obesity: science, policy, and action*, „Lancet” 2011, 378(9793), pp. 838-847.

³⁷ H.S. Yuksel, F.N. Şahin, et al., *School-Based Intervention Programs for Preventing Obesity and Promoting Physical Activity and Fitness: A Systematic Review*, „International journal of environmental research and public health” 2020, 17(1), p. 347; S. Haghani, H. Shahnazi, A. Hassanzadeh, *Effects of Tailored Health Education Program on Overweight Elementary School Students’ Obesity-Related Lifestyle: A School-Based Interventional Study*, „Oman medical journal” 2017, 32(2), pp. 140-147.

³⁸ M. Jane, M. Hagger, J. Foster et al., *Social media for health promotion and weight management: a critical debate*, “BMC Public Health” 2018, 18(1), p. 932; W.D. Evans, K.K. Christoffel, J.W. Necheles, et al., *Social Marketing as a Childhood Obesity Prevention Strategy*, “Obesity” 2010, 18, pp. 23-26; A.C. Bell, L. Wolfenden, R. Sutherland et al., *Harnessing the power of advertising to prevent childhood obesity*, „The International Journal of Behavioural Nutrition and Physical Activity” 2013, 10, p. 114.

³⁹ J. Kite, A. Grunseit, E. Bohn-Goldbaum et al., *A Systematic Search and Review of Adult-Targeted Overweight and Obesity Prevention Mass Media Campaigns and Their Evaluation: 2000-2017*, „J Health Commun” 2018 23(2), pp. 207-232.

for further research in this area because accurately developed strategies can have measurable effects in the future.

REFERENCES

- Andersson Emelie, Eliasson Björn, Carlsson Katarina S. 2022. “Current and future costs of obesity in Sweden”. *Health Policy* 126 (6): 558-564. <https://doi.org/10.1016/j.healthpol.2022.03.010>
- Baker Carl. 2019. *Obesity statistics*. England: House of Commons Library.
- Bell Andrew C., Wolfenden Luke, Sutherland Rachel et al. 2013. “Harnessing the power of advertising to prevent childhood obesity”. *The International Journal of Behavioural Nutrition and Physical Activity* 10: 114. <https://doi.org/10.1186/1479-5868-10-114>.
- Bjørnelv Gudrun, Halsteinli Vidar, Kulseng Bård et al. 2021. “Modelling Obesity in Norway (The MOON Study): A Decision-Analytic Approach – Prevalence, Costs, and Years of life Lost”. *Medical Decision Making* 41: 21-36. <https://doi.org/10.1177/0272989X20971589>.
- Butland Bryony, Jebb Susan, Kopelman Peter et al. 2007. *Tackling Obesities: Future Choices – Project Report*, UK Government. UK: Foresight Programme. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/287937/07-1184x-tackling-obesities-future-choices-report.pdf.
- Cawley John, Biener Adam, Meyerhoefer Chad, et al. 2021. “Direct medical costs of obesity in the United States and the most populous states”. *Journal of Managed Care Specialty Pharmacy* 27(3): 354-366. <https://doi.org/10.18553/jmcp.2021.20410>.
- Chan Ruth S., Woo Jean. 2010. “Prevention of overweight and obesity: how effective is the current public health approach”. *International Journal of Environmental Research and Public Health*, 7 (3): 765-783. <https://doi.org/10.3390/ijerph7030765>.
- Chase Dave. 2017. *You Run a Health-Care Business Whether You Like It or Not*. CFO. In <https://www.cfo.com/corporate-finance/2017/11/run-health-care-business-whether-like-not/>.
- Dworak Alina 2022. “Globalizacja a zagrożenie bezpieczeństwa zdrowotnego wyzwaniem dla edukacji zdrowotnej XXI wieku” [Globalization and the threat to health security as a challenge for health education in the 21st century]. *Studia Edukacyjne* 64: 147-161. <https://cse.amu.edu.pl/wp-content/uploads/2022/07/64.pdf>.
- Effertz Tobias, Engel Susanne, Verheyen Frank, et al. 2016. “The costs and consequences of obesity in Germany: a new approach from a prevalence and life-cycle perspective”. *The European Journal of Health Economics* 17: 1141–1158. <https://doi.org/10.1007/s10198-015-0751-4>.
- Evans W. Douglas, Christoffel Katherine K., Necheles Jonathan W. et al., 2010. “Social Marketing as a Childhood Obesity Prevention Strategy.” *Obesity* 18: 23-26. <https://doi.org/10.1038/oby.2009.428>.
- Fox Ashley M., Horowitz Carol R. 2013. “Best practices in policy approaches to obesity prevention”. *Journal of Health Care for the Poor and Underserved* 24(2 Suppl): 168-192. <https://doi.org/10.1353/hpu.2013.0097>.
- Global Obesity Observatory. *Economic impact of overweight and obesity*. Germany. In <https://data.worldobesity.org/economic-impact-new/countries/#DE>.

- Global Obesity Observatory. Economic impact of overweight and obesity. In Global Obesity Observatory. Economic impact of overweight and obesity. Great Britain
In <https://data.worldobesity.org/economic-impact-new/countries/#GB>.
- Global Obesity Observatory. Economic impact of overweight and obesity. Norway.
In <https://data.worldobesity.org/economic-impact-new/countries/#NO>.
- Global Obesity Observatory. Economic impact of overweight and obesity. Poland.
In <https://data.worldobesity.org/economic-impact-new/countries/#PL>.
- Global Obesity Observatory. Economic impact of overweight and obesity. Sweden.
In <https://data.worldobesity.org/economic-impact-new/countries/#SE>.
- Global Obesity Observatory. Economic impact of overweight and obesity. United States.
In <https://data.worldobesity.org/economic-impact-new/countries/#US>.
- Gortmaker Steven L., Swinburn, Boyd A., Levy David, et al. 2011. “Changing the future of obesity: science, policy, and action”. *Lancet* 378(9793): 838–847.
[https://doi.org/10.1016/S0140-6736\(11\)60815-5](https://doi.org/10.1016/S0140-6736(11)60815-5).
- Guerreschi Cesare. 2005. *New addictions. Le nuove dipendenze*. San Paolo: San Paolo Editions.
- Haghani Sharareh, Shahnazi Hosseini, Hassanzadeh Akbar. 2017. “Effects of Tailored Health Education Program on Overweight Elementary School Students’ Obesity-Related Lifestyle: A School-Based Interventional Study”. *Oman Medical Journal* 32(2): 140–147.
<https://doi.org/10.5001/omj.2017.25>.
- Imbrogno Lou. 2022. “4 Ways Obesity is Impacting the Healthcare System. Bariatric Centers of America”. In <https://bcofa.com/4-ways-obesity-is-impacting-the-healthcare-system/>.
- Jan Aftab, Khan Alamgir, Khan Salahuddin, et al. 2017. “Causes Complications and Management of Diabetes Mellitus”. *Chronicle Journal of Food and Nutrition* 1: 1-3.
- Jane Monica, Hagger Martin, Foster Jonathan et al. 2018. “Social media for health promotion and weight management: a critical debate”. *BMC public health* 18(1): 932.
<https://doi.org/10.1186/s12889-018-5837-3>.
- Kalbarczyk Małgorzata, Mackiewicz Łyziak Joanna, Mycielska Dagmara. 2022. “Long-term care costs and obesity – projections for Poland”. *Journal of Economic Behavior & Organization* 203: 235-245. <https://doi.org/10.1016/j.jebo.2022.09.014>.
- Kent Seamus, Fusco Francesco, Gray Alastair, et al. 2017. “Body mass index and healthcare costs: a systematic literature review of individual participant data studies”. *Obesity reviews: an official journal of the International Association for the Study of Obesity* 18(8): 869–879. <https://doi.org/10.1111/obr.12560>.
- Kent Seamus, Green Jane, Reeves Gillian, et al. 2017. “Hospital costs in relation to body-mass index in 1.1 million women in England: a prospective cohort study”. *The Lancet Public Health* 2(5): 214-222. [https://doi.org/10.1016/S2468-2667\(17\)30062-2](https://doi.org/10.1016/S2468-2667(17)30062-2).
- Kite James, Grunseit Anne, Bohn-Goldbaum Erika. 2018. “A Systematic Search and Review of Adult-Targeted Overweight and Obesity Prevention Mass Media Campaigns and Their Evaluation: 2000-2017”. *J Health Commun.* 23(2): 207-232.
<https://doi.org/10.1080/10810730.2018.1423651>.
- Lightwood James, Bibbins-Domingo Kirsten, Coxson Pamela. 2009. “Forecasting the future economic burden of current adolescent overweight: an estimate of the coronary heart disease policy model”. *American journal of public health* 99(12): 2230–2237.
<https://doi.org/10.2105/AJPH.2008.152595>.

- OECD. 2022. Health spending. In <https://data.oecd.org/healthres/health-spending.htm>.
- Oparil Suzanne, Acelajado Maria C., Bakris George. 2018. "Hypertension". *Nature Reviews. Disease Primers* 4: 18014. <https://doi.org/10.1038/nrdp.2018.14>.
- Our World in Data. 2019. Deaths by risk factor, World. In <https://ourworldindata.org/grapher/number-of-deaths-by-risk-factor?time=latest>.
- Our World in Data. 2019. Total health expenditure per person. In <https://ourworldindata.org/grapher/annual-healthcare-expenditure-per-capita>.
- Our World in Data. https://en.wikipedia.org/wiki/Our_World_in_Data.
- Our World in Data. <https://ourworldindata.org>.
- Pi-Sunyer Xavier. 2009. "The medical risks of obesity". *Postgrad Med.* 121(6): 21-33. <https://doi.org/10.3810/pgm.2009.11.2074>.
- Pratley Richard. 2013. "The Early Treatment of Type 2 Diabetes". *The American Journal of Medicine* 126: 2-9. <https://doi.org/10.1016/j.amjmed.2013.06.007>.
- Public Health England. 2017, Guidance. Health matters: obesity and the food environment. In <https://www.gov.uk/government/publications/health-matters-obesity-and-the-food-environment/health-matters-obesity-and-the-food-environment--2>.
- Ritchie Hannah, Roser Max. 2019. Obesity. Our World in Data. In <https://ourworldindata.org/obesity>.
- Sacks, G., Swinburn, B., Lawrence, M. 2009. "Obesity Policy Action framework and analysis grids for a comprehensive policy approach to reducing obesity". *Obesity Reviews* 10: 76-86. <https://doi.org/10.1111/j.1467-789X.2008.00524.x>.
- Singh Shikha, Shankar Ravi, Singh Gyan P. 2017. Prevalence and Associated Risk Factors of Hypertension: A Cross-Sectional Study in Urban Varanasi". *International Journal of Hypertension* 2017: 1-10. <https://doi.org/10.1155/2017/5491838>.
- The Lancet. 2019. Global Burden of Disease. In <https://www.thelancet.com/gbd>.
- Ward Zachary J., Bleich Sara N., Long Michael W. et al. 2021. "Association of body mass index with health care expenditures in the United States by age and sex". *PloS one* 16(3). <https://doi.org/10.1371/journal.pone.0247307>.
- Wasskog Aamo Alexander, Hallvard Lind Lars, Myklebust Anders, et al. 2019. Overvekt og fedme i Norge: omfang, utvikling og samfunnskostnader. Norway: Menon Economics.
- World Health Organization. 2021. Obesity and overweight. In <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>.
- World Health Organization. Health security. In https://www.who.int/health-topics/health-security#tab=tab_1.
- Wu Yanling, Ding Yanping, Tanaka Yoshimasa, et al. 2014. "Risk factors contributing to type 2 diabetes and recent advances in the treatment and prevention". *International Journal of Medical Sciences* 11(11): 1185–1200. <https://doi.org/10.7150/ijms.10001>.
- Yuksel Hidayet. S., Şahin Fatma N., Maksimovic Nebojsa, et al. 2020. "School-Based Intervention Programs for Preventing Obesity and Promoting Physical Activity and Fitness: A Systematic Review". *International Journal of Environmental Research and Public Health* 17(1): 347. <https://doi.org/10.3390/ijerph17010347>.