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FINANCIAL IMPACT OF OBESITY: A SYSTEMATIC LITERATURE REVIEW

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Abstract

Aim. Obesity is a chronic, relapsing progressive disease, influenced by numerous biological, social and environmental factors. The rising prevalence of obesity in the past decades represents an important matter of concern all over the World. The assessment of the financial impact of obesity can be useful in providing recommendations for policy makers. This systematic review is aimed to assess the costs of obesity.

Methods. The current literature review was carried out between October 2022-March 2023, according to the PRISMA standards, searching for studies in PubMed, Web of Science and Google Scholar databases. In the screening stage we included cost-of-illness studies calculating the cost of obesity in a study population aged ≥ 18 years with obesity, as defined by a body mass index of ≥ 30 kg/m². The time frame for the analysis was January 2013 to October 2022. The initial search retrieved 2395 titles, the articles were analysed by their titles and abstracts for relevance.

Results. The 23 studies included in qualitative synthesis reported a substantial financial impact of obesity in both developed and developing countries. Obesity is being responsible for the 0.62% increase in the total tax pressure, measured as primary government income as a share of GDP but also affects personal budgets of individuals. Obesity also puts pressure on personal budgets, the excess weight being responsible for the 0.62% increase in the total fiscal pressure, measured as primary government income as a share of GDP. The Organisation for Economic Co-operation and Development (OECD) estimates the economic impact of obesity-related healthcare spending out of total national health spending per region worldwide. Differences are observed between countries as regards the costs of providing health services. The economic impact of obesity projected for Romania until 2035, according to Obesity Atlas 2023, will translate in to an increase in the prevalence of obesity is directly proportional to the increase in the level of direct costs (medical expenses and other expenses for maintaining the state of health), as well as indirect ones (premature death, absenteeism, presenteeism). At the same time, it is reported an economic impact on excess weight in 2020, amounting to MDL 977 million. USD which can reach up to 1 685 mil. USD until 2035

Conclusions. Health expenses is a cause for concern around the world for both public and private budgets, but also among personal budgets. In this regard, evaluations and projections of the financial impact caused by various conditions are constantly needed.

Keywords: Obesity; health care cost; cost-of-illness; economic burden.

Introduction

Obesity is a complex disease determined and maintained by multiple factors. The rate of obesity has increased in all ages and in both sexes, regardless of geographical location, ethnicity or socioeconomic status, although the absolute prevalence rates of overweight and obesity vary quite a lot (Chooi, Ding & Magkos, 2019).

Indicators on the number of people suffering from morbid obesity has increased significantly in recent years, while the number of underweight people has decreased (Harris et al., 2023). At the level of the individual, the correlation between prosperity and BMI experienced a paradigm shift during the twentieth century, if in the past obesity was reserved for people with high economic potential, and people with a low standard of living were weak, today these living conditions are no longer a condition for association with BMI (Weir, 2022). The impressive development of the food industry has caused the emergence of the phenomenon of obesity among people with a low standard of living. Paradoxically, poverty significantly increases the likelihood of being obese and having a high BMI in both men and women. The results of studies show that poor people are 10 to 20% more likely to be obese than people who are not poor (Salmasi & Celidoni, 2017). One possible explanation would be that people with low economic possibilities buy cheap and high-calorie foods, which they consume in excess (Hruschka, 2012). The upward secular trend of overeating and overweight is observed equally among people with higher education, who are supposed to have a high standard of living, as well as among people with secondary education (Strulik, 2014; Ruhm, 2010; Neve & Isaacs, 2021).

Often, people rather rely on comparison with their peers to assess where they stand in terms of body weight (Elboim-Gabyzon, Attar & Peleg, 2020; Hens et al., 2018). Given that obesity has become the norm within low-income groups, the existence of such effects implies that people on lower incomes tend to be less concerned about overweight, strengthening the relationship between obesity and income (Okunogbe et al., 2021). It is estimated that overweight men with high incomes are 15% more likely to recognize their status as overweight than overweight men on low incomes, and overweight men with high incomes are 10% more likely to try to lose weight (Johnston & Lordan, 2014).

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Europe is facing a new and unprecedented threat to public health in terms of obesity, which until recently was underappreciated, undervalued and not fully recognised as a strategic governance problem, which can have significant economic repercussions, and even though European countries have made significant progress to slow the growth of obesity (Stefan et al., 2013), the prevalence of overweight people is still a cause for concern, especially among young people (Chrissini & Panagiotakos, 2022). People suffering from obesity have significant health-related costs, being more likely to suffer from diabetes, cardiovascular diseases, hypertension, stroke, various types of cancer and many other diseases (Field et al., 2001; Shirazi et al., 2023).

Health spending is a cause for concern around the world for both public and private budgets, but also among personal budgets (Ogden et al., 2013). In this regard, evaluations and projections of the financial impact caused by various conditions are constantly needed.

Batscheider and collaborators estimated in 2014 that in Germany, the total annual direct medical costs of healthcare were on average EUR 368 per child. In children whose BMI had a higher BMI during the first five years of life, the direct medical costs were double compared to the other groups included in the study. This was mainly due to a greater need for hospitalization and rehabilitation in the hospital. These high costs were not also recorded in children whose rapid growth of BMI did not continue after the age of 2. In addition, in children, the higher the BMI, the lower the school performance. On average, normoponderal boys and girls are 13% more likely to perform well in school compared to their obese peers (Cecchini & Vuik, 2019; *Body Mass Index (BMI) by Sex, Age and Educational Attainment Level*, 2022).

In 2022, Ferrari et al. described the situation in Brazil, where the increase in the prevalence of obesity led to higher direct health care costs related to non-communicable diseases, amounting to USD 654 million annually. The values recorded were higher in women than in men, and by categories of conditions: cardiovascular diseases resulted in the highest costs attributable to obesity (USD 289 million), followed by chronic respiratory diseases (USD 110 million), neoplasms (USD 96 million), digestive diseases (USD 60 million), musculoskeletal disorders (USD 44 million), diabetes and kidney disease (USD 31 million), diseases of the sense organs USD 22 million) and neurological disorders USD 11 million).

The pandemic generated by the worldwide spread of SARS-COV2 infection, which the entire planet has faced since 2020, and the periods of isolation that have been imposed have also had a major impact on the increase in body mass at all ages. This was, for the most part, the consequence of the fact that the possibilities of movement to which they are added were limited to the extreme and the fact that in stressful periods people tend to eat more. A meta-analysis that synthesized 38 studies conducted in 17 countries around the world indicated that periods of isolation led to the accumulation of about 1.5 kg of body weight in adults and adolescents aged 16 years (Bakaloudi et al, 2021). In China, a study of more than 10,000 young Chinese adolescents and adults concluded that the lockdown period in early 2020 increased the prevalence of obesity from 10% to 12.5% and the prevalence of excess weight from 21% to 25% (Yang et al, 2020).

Research by the World Obesity Federation shows that people suffering from obesity encounter a number of barriers to maintaining their health status: since obesity cannot be classified as a disease, they often cannot receive a correct medical diagnosis, and in order to receive adequate medical treatment they are forced to incur substantial expenses from their own pocket for accessing the treatment they need and turning to health professionals (informed and properly trained in the treatment of obesity).

The long-term reduction in the financial impact of the obesity epidemic can be achieved by implementing weight control programs alongside complementary strategies that cumulatively target the determinants of obesity (Ahern et al., 2022).

Despite the policies and action plans already put in place by countries globally, overweight continues to be a pressing public health problem and one of the key drivers of non-communicable diseases in OECD countries and beyond (Cecchini & Vuik, 2019).

In the absence of personalised and effective prevention programmes, in the short and long term, the extent of overweight and obesity translates indirect costs related to these conditions beyond healthcare (Goettler et al., 2017; De Oliveira et al., 2015; Black et al., 2012).

Our research aims to identify the costs of maintaining health in overweight people by assessing the financial impact caused by the prevalence of obesity worldwide and nationally. Health spending is a cause for concern around the world for both public and private budgets, but also among personal budgets. In this regard, evaluations and projections of the financial impact caused by various conditions are constantly needed. The increasing levels of overweight among the population are also accompanied by a hidden burden of costs, caused by a decrease in productivity.

Methods

The current literature review was developed between October 2022 and March 2023 searching for studies in the PubMed, Web of Science and Google Scholar databases in accordance with the PRISMA criteria. The search formula had the following form:

- PubMed: (obesity) OR (excess weight) OR (over weight) AND (costs) OR (cost-of-illness) OR (health care cost) OR (economic burden).
- Web of Science: (obesity) AND (costs) AND (financial impact) OR (economic burden).
- Google Scholar: (obesity) AND (cost-of-illness)

The records identified from the databases were retrieved using the review management program E-PPI, that also narrowed the selection by deleting the duplicate articles and excluding the articles that did not fit best to our criteria. Our design included: systematic reviews, meta-analyses, case-control studies, cross-sectional studies, literature reviews, and case reports, and we excluded expert opinions, letters to the editor, and conference reports.

The initial search retrieved 2395 titles, the articles were analysed by their titles and abstracts for relevance, of which 2 were considered duplicates and were automatically removed. Next, in order to have an updated meta-analysis, we excluded articles older than January 2013. The remaining 2107 articles were included in the screening stage that narrowed our final list to 23 articles that best fit our criteria. In the screening stage we included cost-of-illness studies calculating the cost of obesity in a study population aged ≥ 18 years with obesity, as defined by a body mass index of ≥ 30 kg/m². Figure 1. Study selection flowchart based on PRISMA criteria represents the complete PRISMA diagram.

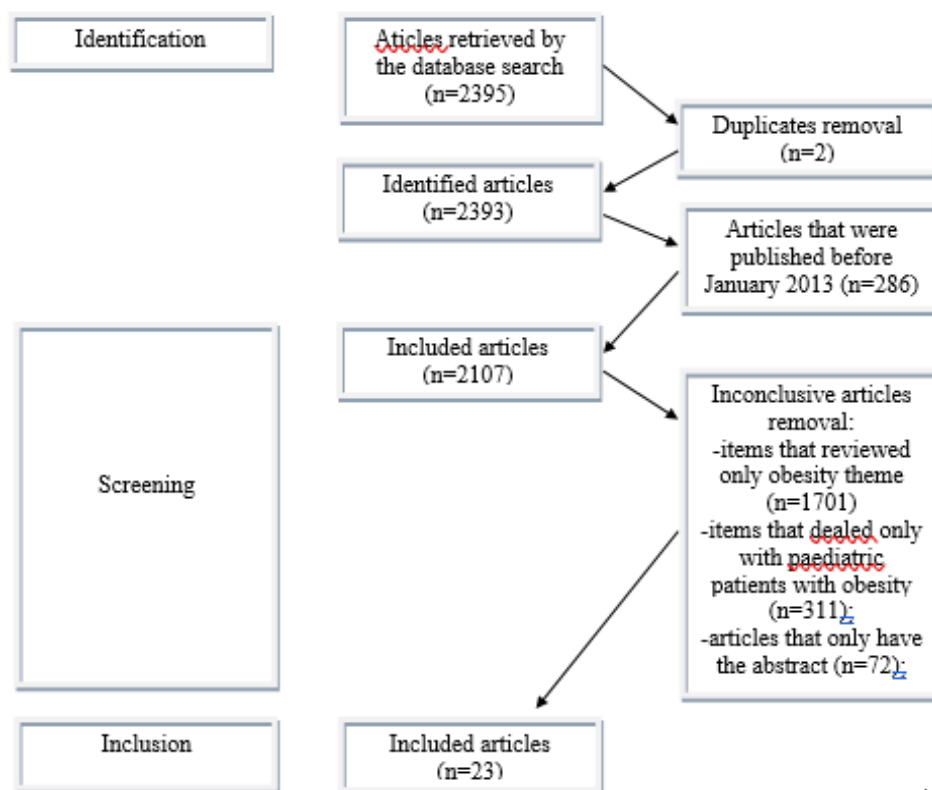


Figure 1. Study selection flowchart based on PRISMA criteria

Results

Worldwide, over the past 300 years, BMI values are ascending. Obesity as an epidemiological phenomenon is the result of the long-term steps that people have taken to protect themselves from hunger and adapt to the environment, which has caused the increase in height and body weight (De Lorenzo et al., 2016; Dee et al., 2014).

To track the relationship between body size and productivity, economist R. Fogel collected data from the early 1700s, taken from populations considered healthy, from economically evolved countries: Scandinavian countries, France, Great Britain (Fogel & Grotte, 2011). In 2019, Caballero summarizes the data processed by Fogel to which he also adds data processed by the American National Center for Disease Control, thus he finds that in the year 1705, the average BMI of the population studied was below WHO standards, as shown in Figure 2. The average trend of BMI for the period 1705-1975 at populations in economically advanced Western countries (Caballero, 2019; Deurenberg et al., 1999). Subsequently, in 2014, the average BMI in the US was 27.8 kg/m², exceeding the values considered by the WHO to be normal.

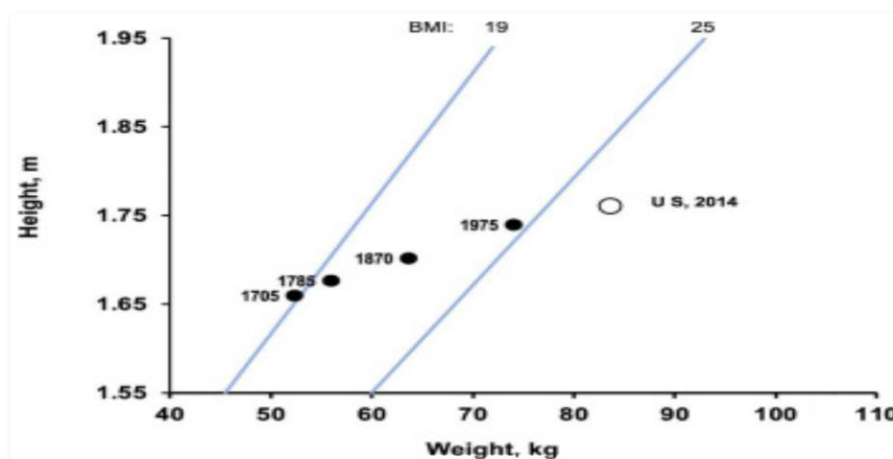


Figure 2. The average trend of BMI for the period 1705-1975 at populations in economically advanced Western countries (Caballero, 2019)

The measures initiated immediately after the Second World War by the establishment of the FAO, which involved the ultra industrialization of the food sector and the emergence of foods with high caloric potential, were aimed at increasing the energy balance per capita among the populations affected by poverty, but over time this style of nutrition became harmful by the fact that hyper-caloric foods are increasingly cheaper and accessible for people with incomes small in developed countries. Sure, we are still talking about famine in some parts of the world, but most experts believe that this is caused by limited access to food.

The Organisation for Economic Co-operation and Development (OECD) estimates the economic impact of obesity-related healthcare spending out of total national health spending per region worldwide. Differences are observed between countries as regards the costs of providing health services, the types of services available and the share of the population having access to services, and some countries with relatively low levels of prevalence of obesity may, however, have a high level of the impact of obesity on health expenditure (Norway, the Netherlands), and others with high levels of prevalence of obesity may still have a low level of impact on health spending (Russian Federation). Overweight is responsible, on average, for 70% of all treatment costs for diabetes, 23% of treatment costs for cardiovascular disease and 9% for cancer. (OECD, 2019). At the macroeconomic level, over the next 30 years the excess weight of the average population will reduce GDP by 3.3% on average, both in the OECD countries and in 23 EU Member States as shown in Figure 3. The impact of excess weight on GDP (OECD, 2019).

At the same time, obesity also puts pressure on personal budgets, the excess weight being responsible for the 0.62% increase in the total fiscal pressure, measured as primary government income as a share of GDP. Among the countries where overweight has a significant impact on the tax burden are the US, Belgium, Denmark and Ireland (Pijl, 2011).

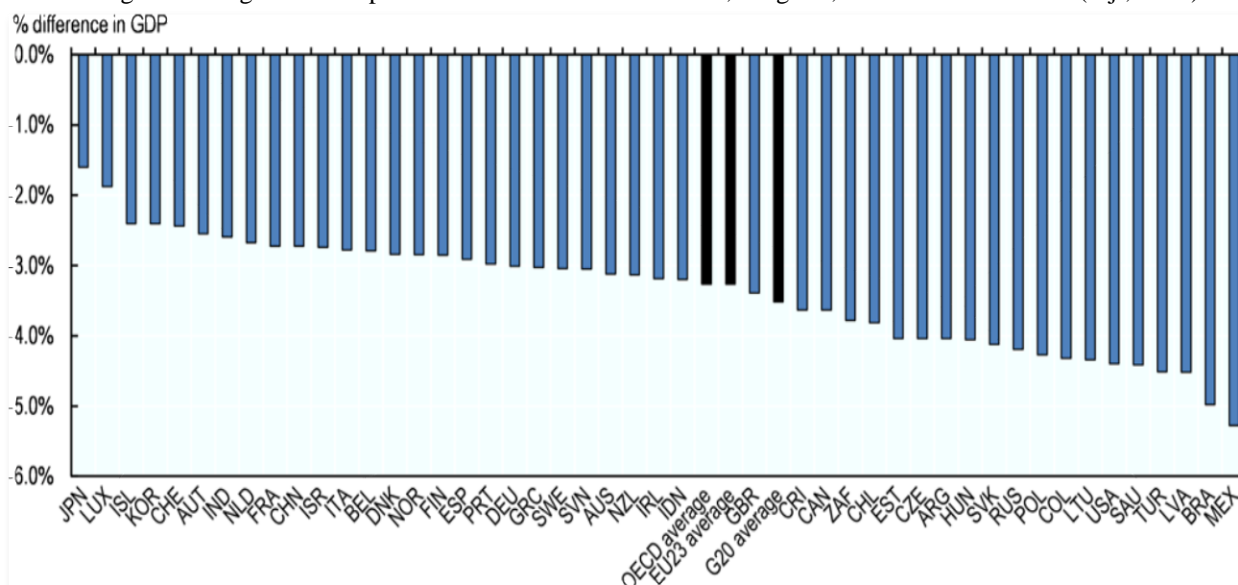


Figure 3. The impact of excess weight on GDP (OECD, 2019).

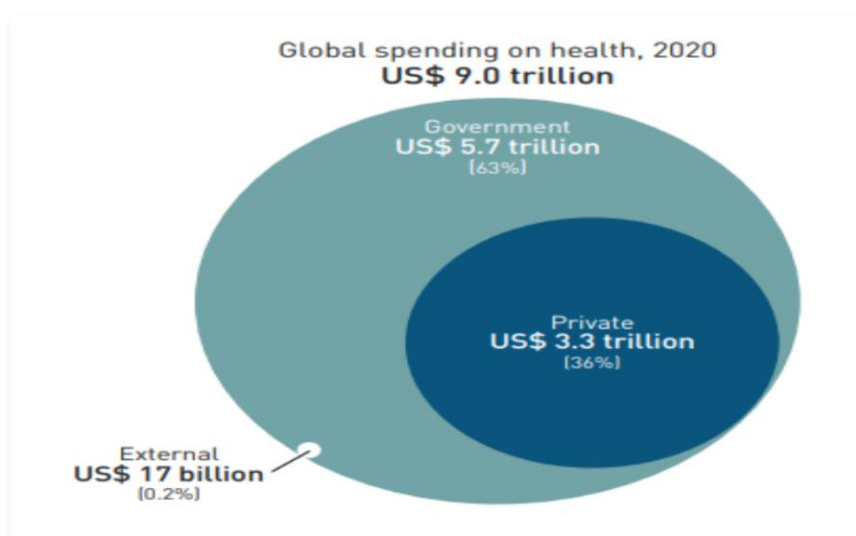


Figure 4. Global health spending in 2020 (GHED, 2022)

The rapid global emergence and spread of COVID-19 has defined the year 2020. In addition to being a public health emergency of international concern, the pandemic triggered a global economic crisis, as countries around the world were forced to in a period of severe and synchronized economic constraints, as a result of which global GDP fell by 3.4% in 2020 (World Health Organization, 2022).

The World Obesity Federation published, in March 2023, the fifth paper entitled World Obesity Atlas, which provides reports and forecasts on the prevalence of obesity in men, women and children for the period 2020-2035. It also presents a country-wide index that measures the level of response of public health systems to non-communicable diseases and their commitment to the implementation of obesity prevention policies. This ranking gives an indication of how well or how poorly countries are prepared to address the increasing prevalence of obesity and how they can cope with its consequences. The atlas is complemented by a series of national scorecards for more than 180 countries globally, presenting current estimates and projections of obesity, economic impact and national response level.

With regard to the breakdown by geographical region, unless programmes are involved in adjusting the upward trend in terms of the increase in the incidence of obesity worldwide, information on the annual economic impact projected to be achieved by 2035 is summarised below, in Table 1. Annual economic impact of BMI high, estimated by 2035 (Obesity Atlas 2023).

Table 1. Annual economic impact of BMI high, estimated by 2035 (Obesity Atlas 2023)

Region	Economic impact (USD at 2019 value)	Impact as a proportion of total regional GDP expected
African Region (Sub-Saharan Africa)	50 billion	1,6%
Region of the Americas (North, Central and South America)	1.5 trillion	3,7%
Eastern Mediterranean region (North Africa and Middle East)	160 billion	>3%
European region	>800 billion	2,6%
Southeast Asia region	>250 billion	>2%
Western Pacific Region	>1.5 trillion	3%

For our country (Figure 5. The economic impact of obesity projected for Romania until 2035, Obesity Atlas 2023), the estimated increase in the prevalence of obesity is directly proportional to the increase in the level of direct costs (medical expenses and other expenses for maintaining the state of health), as well as indirect ones (premature death, absenteeism, presenteeism). At the same time, it is reported an economic impact on excess weight in 2020, amounting to MDL 977 million. USD which can reach up to 1 685 mil. USD until 2035 (Table 2. Economic impact on overweight for the period 2020–2035 in Romania, Obesity Atlas 2023). For the population of Romania, based on these data, we can calculate, for 2020, an estimated average monthly cost of USD 50.47 per capita, only for direct expenditures for maintaining health, correlated with BMI.

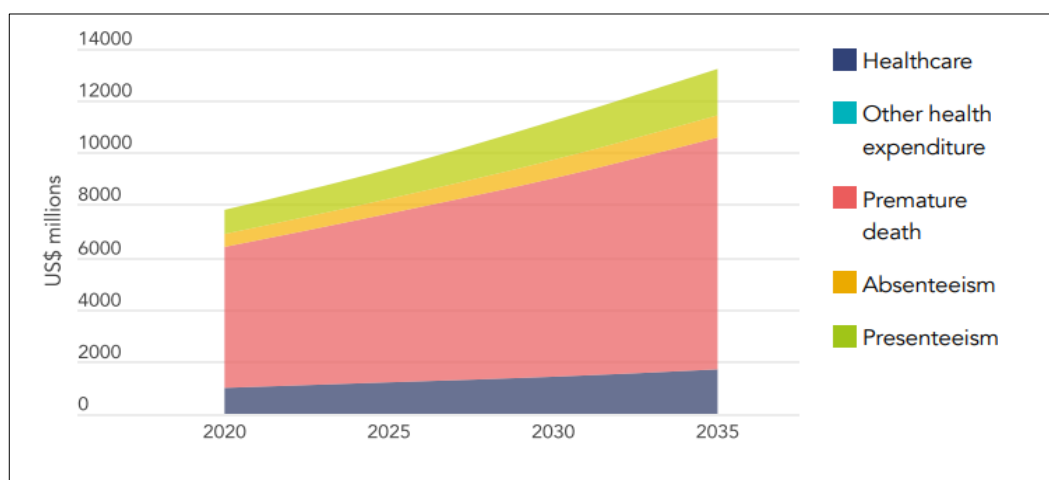


Figure 5. The economic impact of obesity projected for Romania until 2035 (Obesity Atlas 2023)

Table 2. Economic impact on overweight for the period 2020–2035 in Romania (Obesity Atlas 2023)

	Impact of BMI on health ≥ 25 kg/m ² , million USD	Total economic impact of BMI ≥ 25 kg/m ² , million USD	ESTIMATED GDP billions USD	Impact of BMI ≥ 25 kg/m ² on GDP
2020	977	7 817	241	3.3%
2025	1 179	9 381	289	3.2%
2030	1 431	11 216	331	3.4%
2035	1 685	13 251	370	3.6%

The World Health Organisation has set up a global health expenditure database (GHED²) that provides country-wide data on health funding, health spending, demography, economic conditions and health for more than 190 WHO member states since 2000, with open access to the public. Consulting this database, in the profile of our country there is an upward trend for health expenditures per capita, in 2020, for example, 809.59 USD was spent to finance health, both from private sources and from sources financed by the State Budget, representing 6.27% of GDP. Reducing this value to a monthly value, it is estimated at 312 lei the amount needed to finance health, Figure 6. Public health expenditure expressed as a percentage of current health expenditure (GHED).

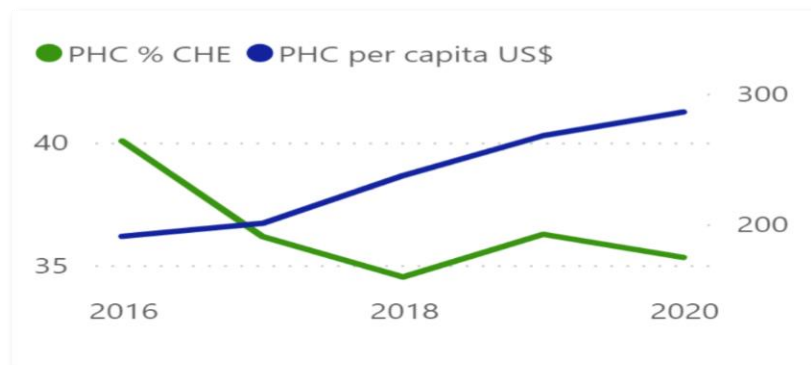


Figure 6. Public health expenditure expressed as a percentage of current health expenditure (GHED)

As far as our study is concerned, we are interested in setting a threshold that gives us clues as to the amounts spent by students participating in the study to maintain health. In order to estimate these expenses at the level of the Romanian population, I proceeded by applying an algorithm at macro level, using the reports of the National Institute of Statistics. Thus, taking into account the average of the direct and indirect expenses for maintaining health (Table 3) reported to the Population of Romania on July 1, 2021, respectively 19,126,302 resident persons (*TEMPO Online*, 2023), we calculate an average of the expenses for maintaining the state of health for 2021 and 2022 (*Calculating the Costs of the Consequences of Obesity | World Obesity Federation*, 2023), a value that we adjusted, taking into account the inflation rate, and we reached the value of 500 lei monthly per capita. Based on this calculated metric, we designed the cost question in our study.

² WHO's Global Health Expenditure Database

Table 3. Categories of total consumption expenditure (INS)

	Year 2021	First quarter 2022	Quarter II 2022	Third quarter 2022
	She	She	She	She
Total consumption expenditure	2979,29	3267,71	3306,1	3562,13
Health	176,86	193,31	177,53	181,01
Recreation, sports and culture	78,54	54,13	67,37	187,37
Personal care, social protection and miscellaneous	158,25	180,95	178,67	186,13

Conclusions

Worldwide, the prevalence of obesity is high and has a financial impact on both state budgets and private and personal budgets.

The food industry has an important role in the mechanisms that can reverse the evolution of the obesity epidemic.

The COVID-19 pandemic has further contributed to the increase in the prevalence of obesity around the world.

The financial impact that excess weight has on the population worldwide and nationally is on an upward trend.

Health expenses is a cause for concern around the world for both public and private budgets, but also among personal budgets. In this regard, evaluations and projections of the financial impact caused by various conditions are constantly needed.

Authors' Contributions

All authors have equally contributed to this study.

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