# Economic Burden of Obesity-Related Comorbidities in Turkey

Türkiye'de Obezite İlişkili Komorbiditelerin Ekonomik Yükü

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## ABSTRACT

Obesity and obesity-related diseases are the leading cause of death worldwide, and mortality and morbidities they cause are important public health problems. The purpose of this study, obesity-related comorbidities is to analyze the economic burden for 2004 and 2015 in Turkey. The most important of the methods used to study the burden of disease is the Disability-Adjusted Life Years (DALYs) approach. DALY and gross domestic product (GDP) per capita were used to estimate the economic burden of obesity. Obesity and related DALYs values were taken from the "Turkey Burden of Disease Study" published by the Ministry of Health. The economic burden of obesity-causing diseases has been estimated according to DALY methodology. Economic burden of obesity-related comorbidities to Turkey in 2004 was estimated to be 4.692.333.776-$. This amounts to 1.20% of gross domestic product. In 2015, the economic burden of obesity-related comorbidities is 17.646.245.880- $ and 2.45% of gross domestic product. Given the increase in obese population, the economic burden of obesity-related diseases is expected to increase further in the coming years. Obesity-related comorbidities represent a substantial financial burden to the Turkey budget. Obesity is an important public health problem that can be treated. In order to use scarce resources devoted to health services more efficiently and effectively, it is indispensable to considerably reduce the economic burden of obesity in Turkey.

**Keywords*:*** Economic Burden, Comorbidities, Obesity, Turkey.

## ÖZ

Obezite ve obeziteye bağlı hastalıklar tüm dünyada önde gelen ölüm nedenidir ve neden oldukları mortalite ve morbiditeler önemli bir halk sağlığı sorununu oluşturmaktadır. Bu araştırmanın amacı, Türkiye'de 2004 ve 2015 yılları için obeziteye bağlı komorbiditelerin ekonomik yükünü analiz etmektir. Hastalık yükü çalışmalarında kullanılan yöntemlerden en önemlisi Engelliğe Bağlı Yaşam Yılları (Disability adjusted life years-DALY) yaklaşımıdır. Obezitenin ekonomik yükünü hesaplamak için, DALY ve gayrisafi yurtiçi hasıladan (GSYİH) kişi başına düşen pay verileri kullanılmıştır. Obezite ve buna bağlı komorbiditelerin DALY değerleri, Sağlık Bakanlığı tarafından yayınlanan "Türkiye Hastalık Yükü Çalışması"ndan alınmıştır. Obeziteye neden olan hastalıkların ekonomik yükü DALY metodolojisine göre tahmin edilmiştir. Türkiye'de obezite ilişkili komorbiditelerin ekonomik yükü 2004 yılında 4.692.333.776-$ olarak tahmin edilmiştir. Bu tutar gayri safi yurtiçi hasılasının %1,20'isini oluşturmaktadır. 2015 yılında ise obezite ilişkili komorbiditelerin ekonomik yükü ise 17.646.245.880-$ ve gayri safi yurtiçi hasılasının %2,45'ini oluşturmaktadır. Obez nüfusun artışı dikkate alındığında obeziteye bağlı hastalıkların ekonomik yükününün ilerleyen yıllarda daha da artacağı düşünülmektedir. Obezite ile ilişkili komorbiditeler, Türkiye bütçesine önemli bir mali yük oluşturmaktadır. Obezite tedavi edilebilen önemli bir halk sağlığı problemdir. Sağlık hizmetlerine ayrılan kıt kaynakları daha verimli ve etkin kullanabilmek için, Türkiye'de obezitenin ekonomik yükünü dikkate değer ölçüde düşürmek gerekmektedir.

**Anahtar Kelimeler:** Ekonomik Yük, Komorbidite, Obezite, Türkiye.

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## INTRODUCTION

Obesity is a worldwide health epidemic problems and regarded as one of the most risky diseases.[1] Obesity has clinical and economic consequences.[2] Obesity is a serious and chronic disease with genetic and environmental interactions. Obesity-related chronic diseases unfavorably impacts numerous relevant health outcomes (quality of life, disability, mortality, shortening of human life and morbidity). This situation leads to more use of healthcare utilization.[3] Obesity has increased remarkably in all age and socio-economic groups both developed and developing countries.[4] This situation increases the health expenditures of the countries and creates an important socio-economic financial burden.[5] Obesity and related comorbidities may have a noteworthy effect on public and private healthcare expenditures.[6] Obesity also affects both community health and the country's economy. Obesity is an important public health problem on a global scale. The economic burden of obesity is increasing day by day in both developed and developing countries.

Across the OECD, 54% of the population is overweight, including 19% of the adult population are obese. Total overweight population (BMI≥25) is least in Japan (24%) and Korea (33%) and most in Mexico and United States (over 70%). The prevalence of obesity, which presents even greater health risks than overweight, from a low of 6 % in Japan and Korea, to over 30% in New Zealand, Mexico and the United States According to OECD reports, obesity has increased two or three times among to OECD countries when compared to1980.[7]

The high prevalence of adult obesity causes an important chronic public health problem also a substantial financial burden.[8] Obesity is a considerable public health problem that dramatic fascinating an important part of the Turkish population.[9] Even though the obesity in Turkey is 16.9% in 2010, this ratio increased to 22.3% in 2015.[7] Obesity and its comorbidities are among the main challenges in the world and also obesity is vastly becoming a problem in Turkey.[10]

Noncommunicable diseases are one of the greatest epidemics in the world. The association of obesity with various diseases is known and it has an effect of increasing morbidity and mortality. The major universal risks for mortality in the world are high blood pressure (13%), tobacco use (9%), high blood sugar (6%), physical inactivity (6%) and overweight and obesity (5%).[11] Obesity is considered to be associated with diabetes, hypertension, cardiovascular diseases and some cancers.[5,12-13] In order to healthcare planning/policy and resource allocation, it is essential to elucidate the economic burden of obesity.[14-15] An assessment of economic burden of obesity would be useful to provide suggestions for health care policy[16] and prioritizing policies.[4]

One of the most fundamental goals of a health system is to develop health policies that will raise the health level of the community. A health care system society has to be fully compliant with real health problems.[17] For this reason, a measure is needed to summarize the health of the community, to ensure effective allocation of resources and to calculate the burden of obesity.

One of the major risk factors for chronic diseases of obesity and obesity-related diseases are the considerable cause of death worldwide, mortality and morbidities they cause are important public health problems.

There is a great need for resources to deliver health care, but resources for health spending are scarce. For this reason, it is necessary to choose cost effective ones from alternative health services. Measures such as QALY (Quality Adjusted Life Year) and DALY (Disability Adjusted Life Years) are used in the measurement of health care output.

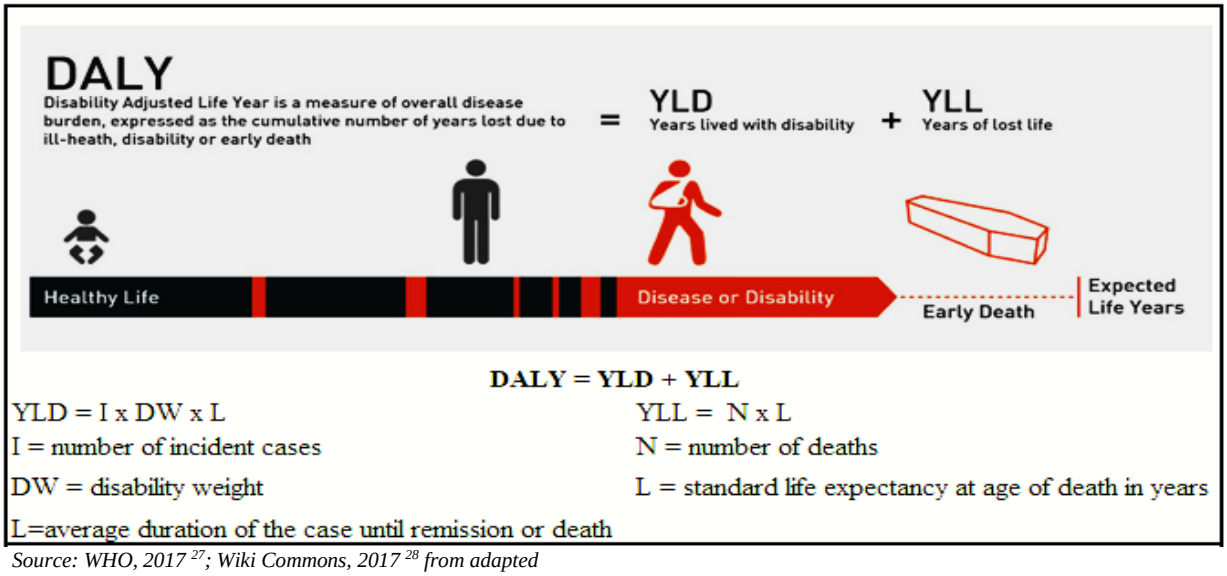
## MATERIAL AND METHODS

The objective of this study, obesity is to analyze the economic burden for 2004 and 2015 in Turkey. The most important of the methods used to study the burden of disease is the DALYs approach. The aim of this study is to estimate economic burden of obesity in Turkey. The DALY account approach has been used to calculate the social economic burden from a social point of view. The economic value of comorbidities associated with obesity was estimated by DALY in the study. This paper has used published data from Ministry of Health and Turkish Statistical Institute. DALY values were taken from the "Turkey Burden of Disease Study" published by the Ministry of Health in 2004.[18] This study, eight obesity-related comorbidities DALY data which can be attributed to high body mass index were obtained. In calculating the economic burden of the disease in the study, Turkey's "Gross Domestic Product (GDP)" and "Gross Domestic Product per Capita" for 2004 and 2015 were used. The economic burden of diseases in health services is measured by DALY. Since the survey did not include DALY data for 2015, the economic burden of obesity was calculated according to 2004. Turkey burden of disease study are included in the eight comorbidities. Because of the limited information available, comorbidities such as sleep apnea, hyperlipidemia, etc. have not been included in the study. In this study, the economic burden of obesity was determined by DALY methodology. The reason for choosing the year 2015 in the research is that the data for this year is the closest to this year. The concept of DALY is briefly explained below.

### Disability-Adjusted Life Year (DALY)

DALYs were developed to help shape the of health policies of international institutions such as the World Bank and World Health Organization (WHO).[19] DALYs accounts for life-year losses due to death or disability of a person. DALY is a summary measure of population health widely used to quantify burden of disease.[20-21] DALYs is essential to researchers and health policy makers, for a strong interpretation of the evidence on the outcomes of health interventions.[22] Today, interventions are considered cost-effective global priorities and their benefits are often measured using DALY.[19,23] Economic burden researcher use many different measures of health outcome to demonstrate the effect of a treatment.[24] DALY is calculated by the formula given below Figure 1.[27-28]

**Figure 1.** DALY Calculation Formula




*Source: WHO, 2017 [27]; Wiki Commons, 2017 [28] from adapted*

As seen in Figure 1, DALY is a sum of the years of life lost and the years lived with disability (DALY = YLL + YLD). DALYs are all common outcome measures in economic evaluations of health interventions. DALY measures health loss in the quality of life. DALY is expressed in either 1 or 0 (Where; 0= perfect health, 1= death).[25] One DALY is expressed as one lost year of "healthy" life.[21] Overweight and obesity have been found to cause 3.4 million deaths, 3.9% of years of life lost, and 3.8% of DALYs worldwide.[26] This necessitates the calculation of the economic burden of obesity.

### Ethical Aspect of Research

As data used in the study is open to everybody and obtained from the Turkey Burden of Disease Study (2004).[18] Hence, both permission and ethics committee approval are not necessary for this study.

## RESULTS AND DISCUSSION

Obesity forces an increasing burden on the health care system in Turkey. The major causes of death and disability have changed from communicable diseases in in adults. According to a study conducted in Turkey burden of disease associated with obesity, attributable death, disease burden and DALYs rates of obesity-related comorbidities are given in Table 1.[29]

With the prevention of obesity, 57.133 deaths can be prevented. DALY number of prevention of obesity is 346.294 in ischemic heart disease, 152.240 in diabetes mellitus, 146.930 in ischemic stroke, 61.035 in osteoarthritis, 61.796 in hypertensive heart disease and 8.859 in breast cancer. The DALY number that is avoided constitutes 7.4% of the total DALYs. The total number of DALYs can be avoided by preventing obesity in Turkey is 787.184. Prevalence of obesity-related disease burden (DALY) is 6.7% in males and 7.9% in females. In both genders, obesity is the most common burden in the 45-59 age group. The number of DALY prevented forms 7.3% of the total DALY.[18]

Table 1 presents the results of calculating the economic burden of obesity-related comorbidities. We estimated the economic burden of obesity in Turkey using DALY methodology.

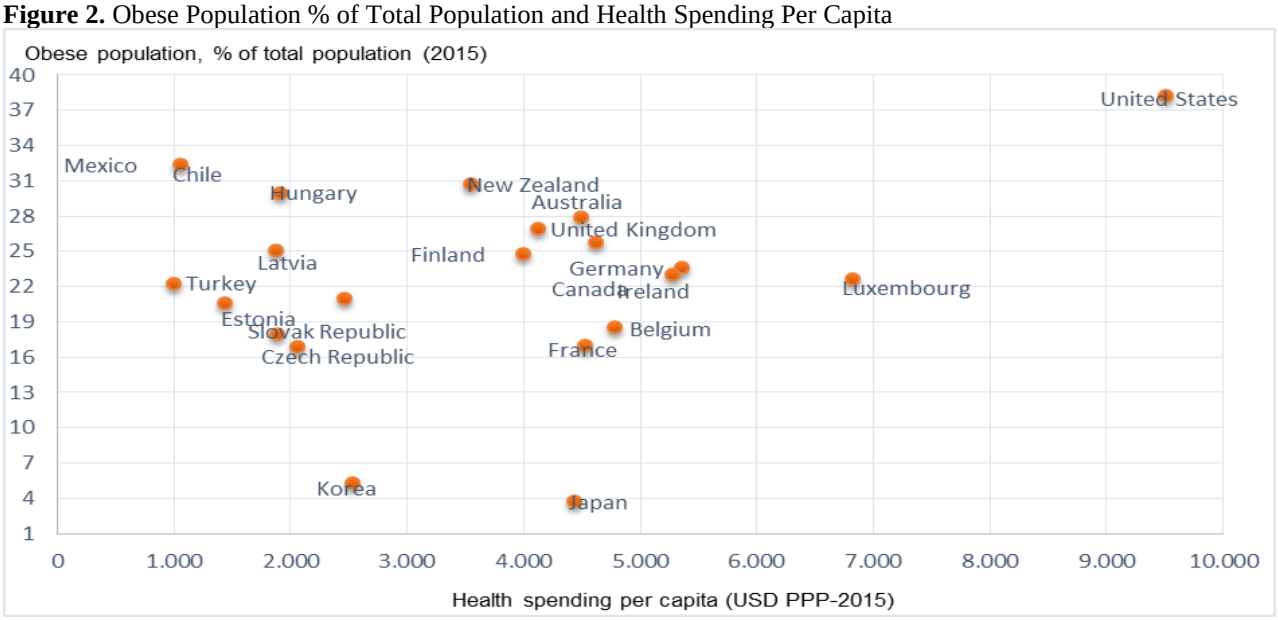
**Table 1.** Economic Burden of Obesity-Related Comorbidities in 2004, 2015

| Cause | 2004 | | 2015 | |
|---|---|---|---|---|
| | Economic Burden ($) | % | Economic Burden ($) | % |
| Ischemic Heart Disease | 2.064.227.719 | 0.53 | 7.762.847.150 | 1.08 |
| Hypertensive Heart Disease | 368.360.457 | 0.09 | 1.385.276.391 | 0.19 |
| Ischemic Stroke | 875.836.655 | 0.22 | 3.293.719.012 | 0.46 |
| Diabetes Mellitus | 907.489.093 | 0.23 | 3.412.752.892 | 0.47 |
| Osteoarthritis | 363.824.204 | 0.09 | 1.368.217.110 | 0.19 |
| Breast Cancer | 52.807.711 | 0.01 | 198.591.552 | 0.03 |
| Colon and rectum cancers | 43.514.650 | 0.01 | 163.643.564 | 0.02 |
| Corpus uteri cancer | 16.273.287 | 0 | 61.198.209 | 0.01 |
| **Total** | **4.692.333.776** | **1.2** | **17.646.245.880** | **2.45** |
| Gross Domestic Product (GDP-$) | 390.387.000.000 | | 719.620.000.000 | |
| Per Capita Gross Domestic Product ($) | 5.961 | | 11.019 | |

DALYs for the disease were multiplied by 5.961-$ for the year 2004 and 11.019 for the year 2015 and the economic burden per disease was found. As can be seen in Table 1 economic burden of obesity-related comorbidities to Turkey in 2004 was estimated to be 4.692.333.776-$. This amounts to 1.20 % of gross domestic product in 2015. Economic burden of obesity-related comorbidities is 17.646.245.880-$ and 2.45% of gross domestic product. A noteworthy proportion of health care dollars is devoted to the treatment of obesity-related comorbidities in Turkey.

Today, more than one in two adults and nearly one in six children are overweight or obese in the OECD area[31]. According obese population and health spending per capita. Obesity is highest in the United States. In this context, Turkey is high in terms of obese population but lower in terms of health expenditure per capita. There is a strong association between obesity rates and health expenditure per capita. It is noteworthy that there is no significant correlation between the obese population and the economic situation of the countries. For example, two most developed countries are the most important evidence that there is a huge difference between the USA and Japan. The highest prevalence of obesity in adulthood was in the USA, Mexico, New Zealand and Hungary; the lowest prevalence of obesity is in Japan and Korea (Figure 2).

**Figure 2.** Obese Population % of Total Population and Health Spending Per Capita




*Source: OECD Health at a Glance 201.* [7]

According to the research conducted by the health ministry. Obesity-related health expenditures are the sum of the majority of OECD countries 1-3% of health expenditures and 5-10% in USA. It is possible that an obese person will die 8-10 years earlier than a normal weight person. An obese person spends 25% more on health care than a normal weighted person for any year. According to the results of this research, total economic burden attributable to obesity was 1.16% in 2004 and 1.73% in 2012 of GDP.[30] In the research conducted according to the ALY methodology, global economic impacts of obesity have been found to be roughly $ 200 trillion or 2.8 percent of global GDP. This financial burden is roughly equal to the global impact of smoking or armed violence, war and terrorism.[31] The total burden of overweight and obesity including direct and indirect costs, can vary from 0.2 % to 0.6% of GDP in some advanced and average life span high countries. For some countries this ratio can reach 4% of GDP.[33] Therefore, obesity-related comorbidities account for a large proportion of total health expenditures.

The worldwide prevalence of overweight and obesity has since 1980 classified almost

one third of the world's population as overweight or obese.[34] Obesity imposes high economic costs on the health system. It is very expensive to take measures to prevent, manage and treat obesity.[35] Countries are allocating fairly large financial resources to budgets to prevent obesity. For example, the total economic costs of physical inactivity and obesity represent 2.6% and 2.2%, respectively, of total health care costs in Canada.[36] In Sweden, approximately 2.3% of total hospital care costs are spent for obesity and comorbidities.[37] In the United States, Obesity-attributable medical costs are allocated between 5% and 7% of annual health expenditure.[38] In a study conducted in Germany in 2002, obesity and overweight accounted for 2.1% of total health expenditure. [39] In another study, obesity accounts for 5 to 7.0% of national health expenditure in the United States, and in other countries it is estimated to be 2.0–3.5%.[40] In a study conducted in China, they estimate that the amount of resource devoted to health promotion, such as obesity and obesity-related diet and physical activity, will increase by 2025.[41] In a study conducted in Korea, socioeconomic costs of overweight and obesity in adults aged 20 years and over were calculated and found to be approximately 0.22% of GDP and 3.7% of national health expenditure. To control the socioeconomic burden attributable to overweight and obesity, effective national strategies for the prevention and management of obesity should be established and implemented.[42] In many studies, cancer is a major cause of disease burden and obesity is considered one of the most important modifiable risk factors for cancer.[43]

Obesity is not only a health problem but also an economic burden. For this reason, the increasing burden of obesity on global health systems also brings a huge financial burden economically.

## CONCLUSION AND RECOMMENDATION

DALY is a commonly used method of estimating the economic burden of diseases and in cost-effectiveness analysis of health services. DALYs is a measure of the burden of disability-causing disease and injury. It is known that many chronic diseases are closely related to obesity.

Obesity-related comorbidities represent a substantial financial burden to the Turkey society. Obesity is a common health problem in all societies and is increasingly becoming a global epidemic. This study showed that obesity affecting a considerable economic burden in Turkey. Economic burden of obesity for Turkey was estimated at US$ 17.646.245.880 in 2015. It was the 2.45% of gross domestic product of Turkey. Obesity is an important public health problem that can be treated and reduces life expectancy. Because of the high prevalence of the overweight could place heavy financial burdens on the health care system. In order to allocate scarce resources devoted to health services more efficiently and effectively. It is essential to considerably decrease the economic burden of obesity in Turkey. Increase in the number of obese in the world and in Turkey, obesity makes it necessary to evaluate the economic dimension.

Many studies have shown that obesity is an important health public health problem that is caused by many factors and can lead to many chronic diseases. National health policy in addressing obesity as a priority issue in Turkey. The prevalence of obesity in Turkey as well as in other countries of the world is increasing day by day. For this reason, the factors that cause obesity should be determined and public intervention should be done to overcome these problems.

In conclusion, we have found that obesity both entails a considerable health hazard and consequently gives rise to substantial hospital costs and indirect costs due to early death.

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