Hacettepe University Graduate School of Social Sciences

Department of Economics

Master of Arts

THE ESTIMATION OF BURDEN OF CHRONIC DISEASES IN TURKEY

Burak BALIK

Master's Thesis

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ABSTRACT

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Chronic diseases are increasing overtime in the world and its treatments can be more not only risky but also costly. However, patients with chronic diseases should learn how to live with it. In that sense, managing the disease for all parties is becoming more crucial. The raise in the prevalence of chronic diseases has increased the demand for healthcare services, and in this direction, a large increase has been observed in the health expenditures of the countries. Circulatory, respiratory and endocrine diseases are three important chronic diseases that causes of high morbidity, premature mortality and disability in Turkey. This study confirms that the current burden of these NCDs is significant, and it will rise in the future due to aging of the population and unhealthy lifestyle. This growing burden of disease will create significant pressure on Turkey's healthcare system in the form of indirect healthcare costs; loss of productivity and rise in the absenteeism and presenteeism. This study represented for the first-time indirect cost by monetary value of potential years of lost (MVYLL) estimation approach of circulatory, respiratory and endocrine diseases in Turkey by using the data which is obtained from Republic of Turkey Ministry of Health and Turkish Statistical Institute.

Keywords

Health expenditure, burden of disease, chronic disease, chronic disease management, monetary value of potential years of lost, potential years of lost, indirect cost

TURKISH ABSTRACT

BALIK, Burak. *Türkiye'de Kronik Hastalıkların Yükü Tahmini*, Yüksek Lisans Tezi, Ankara, 2021.

Dünyada kronik hastalıkların görülme sıklığının giderek artması tedavileri hem riskli hem de maliyetli kılmaktadır. Bu nedenle kronik hastalığı olan bireylerin hastalıklarıyla yaşamayı öğrenmesi gerekmektedir. Bu anlamda, hastalığı tüm taraflar için yönetmek daha önemli hale gelmektedir. Kronik hastalıkların görülme sıklığının artması sağlık hizmetlerine olan talebi artırmış ve bu doğrultuda ülkelerin sağlık harcamalarında büyük artışlar gözlenmektedir. Dolaşım, solunum ve endokrin hastalıkları Türkiye'de yüksek morbidite, erken mortalite ve sakatlığa neden olan üç önemli kronik hastalıktır. Bu çalışma, bahsi geçen bulaşıcı olmayan hastalıkların mevcut yükünün önemli olduğunu ve nüfusun yaşlanması ve sağlıksız yaşam tarzı nedeniyle gelecekte artacağını doğrulamaktadır. Artan hastalık yükü, dolaylı sağlık maliyetleri şeklinde Türkiye'nin sağlık sistemi üzerinde önemli bir baskı yaratmakta olup üretkenlik kaybına neden olmaktadır. Bu çalışma, Türkiye Cumhuriyeti Sağlık Bakanlığı ve Türkiye İstatistik Kurumu'ndan elde edilen veriler kullanılarak Türkiye'de dolaşım, solunum ve endokrin hastalıklarının potansiyel kayıp yılı tahmin yaklaşımının parasal değeri ile dolaylı maliyetini hesaplayan bir ilki temsil etmektedir.

Anahtar Sözcükler

Sağlık harcaması, hastalık yükü, kronik hastalık, kronik hastalık yönetimi, potansiyel kayıp yılların parasal değeri, potansiyel kayıp yıllar, dolaylı maliyet

.

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ABBREVIATONS

CCL	Commission on Chronic Illness
CCM	Chronic Care Model
COPD	Chronic Obstructive Pulmonary Diseases
CVD	Cardiovascular Diseases
GBD	Global Burden of Disease
GDP	Gross Domestic Product
GNP	Gross National Product
HTP	Health Transformation Program
IDF	International Diabetes Federation
MVYLL	Monetary Value of Potential Years of Lost
NCD	Non-Communicable Disease
NCDD	Non-Communicable Disease Deaths
NHGDP	Per Capita Hon-Health GDP in Purchasing Power Parity
PYLL	Potential Years of Life Lost
PVYLL	Discounted/Present Value of YLL
QALY	Quality-Adjusted Life Year
SDG	Sustainable Development Goals
SDH	Social Determinant of Health
TARF	Turkish Adult Risk Factor
TURKSTAT	Turkish Statistical Institute
WHO	World Health Organization

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INTRODUCTION

Human history has witnessed many different events and quests. Finding the secret of immortality has become the common goal of many different civilizations. With the desire of people for eternal life, humanity has turned to different fields. In this direction, alchemy has become a new occupation and different studies have been carried out such as turning worthless materials into gold with the help of alchemy, finding the cure for desperate diseases and obtaining the elixir of immortality. It is seen that the desire for eternal life and health, which has been going on in the last 2500 years, continues today.

The World Health Organization is an international health organization that aims to ensure that all people in the world reach the highest possible health level and live in prosperity. Health is defined as the complete well-being of people in terms of both body, spirit and social aspects (WHO, 2016). The person's genetic structure, income level, socio-cultural level and the environment he/she lives in are of great importance for the health of the individual. In addition to these factors, the health system of the country also affects the health of the person and the society. In this context, health system is the whole of the health personnel, health institutions and all the necessary resources (financing, regulatory, etc.) required to meet the health needs of the society. A good health system should be able to protect the person from diseases, to be able to treat them if they get ill, and to provide rehabilitation services. While providing these services, they should be able to offer equal conditions to each individual in the society, regardless of the income level of the person. Meeting health needs in a quality way is not only with health personnel. The health system should also be supported by different laws and policies so that the service provided can ensure a certain quality sustainable. According to the Alma-Ata Declaration of 1978, countries have to efficiently allocate, diversify, organize and use the necessary resources to provide timely, equitable and quality health services to all segments of society. This is the most fundamental human right (WHO, 1978). Increasing the quality of healthcare services, providing equal conditions to every individual in the society, and financing these services fairly should be the number one priority of all societies.

United Nations put into effect the "Sustainable Development Goals" (SDG) in 2016 and drew certain strategies and roadmaps to achieve these goals by 2030 (UN, 2016). The program, which has a global nature of 17 goals in total, aims to end poverty on earth, protect the planet and enable people to live in peace and prosperity. The goals set in this direction aim to make the world better and livable for future generations. Although all these purposes are interconnected, the human is positioned in the center. One of these 17 goals, "health and quality life", aims to ensure that all

people around the world have access to general health services, medicines and vaccines. Considering the importance of healthy individuals on the development of countries, this goal is critical for humanity. There are many international and national health regulations such as the program put into effect by the United Nations. These programs exist to enable people to live a healthier life and be sustainable. It is the most important duty of countries to consider the health of their citizens.

The development of technology together with health systems has increased the quality and standards of health care provided to individuals and the life expectancy of human beings has increased. Increased use of vaccines and medicines decreased infectious diseases and premature deaths. However, these developments have increased the rate of senility in the society. In aging populations, the frequency of non-communicable chronic diseases has increased. Chronic illness is defined as "generally not fully cured, persistent, slow-progressing and often leading to permanent disability, and in which many social, economic, personal and genetic factors play a role" (Roberts, 1954). Tobacco use, unbalanced diet and physical inactivity pose a risk for chronic diseases, which are the biggest cause of premature deaths all over the world (McGhee et al., 2006). The most common chronic diseases in the world are cardiovascular diseases, respiratory diseases and endocrine diseases (WHO, 2017). It is important that patients who need to live with these diseases throughout their lives learn to live with the disease and have access to the necessary health services continuously.

The raise in the prevalence of chronic diseases has increased the demand for healthcare services, and in this direction, a large increase has been observed in the health expenditures of the countries. Increasing health expenditures resulting from trying to reduce the prevalence, mortality and morbidity rates of chronic diseases have led to the need for rational use of resources used in health services. Both developed and developing countries make various economic analyzes in order to use health sector resources effectively, which have a certain share in their development plans. With the observation of the effect of the health sector on the growth of countries, health indicators have started to be included in the development indicators of countries.

Countries need to make serious health breakthroughs while realizing their own economic development. Turkey has entered a rapid demographic and economic development in recent years. The question of how to use scarce resources in the most efficient way is one of the most important factors that accelerate this process. One of the main goals of every country is to provide quality, efficient and timely health services to its citizens. According to the Turkish Republic Ministry of Health (MoH), the goals of the health system were to improve the health status of the individual

and society, to increase accessibility and efficiency to services, to increase service quality and patient satisfaction, and to ensure continuity of health services (MoH, 2004).

The efficiency of the healthcare system has been one of the most discussed topics in recent years. Accordingly, studies have accelerated in terms of management, organization and resource use of health services. Increasing diseases and health expenditures have led to the need to form and implement rational and accurate policies based on analysis. In this respect, the importance of health economics, which includes many disciplines, has become more evident. It is important to carry out studies that are the subject of health economics, to correctly evaluate the effectiveness of the health system, to increase its efficiency and to identify ineffective resources.

This master thesis is prepared based on these needs and aims to find the monetary value of potential years of lost (MVYLL) of three chronic diseases which caused most of the premature deaths in Turkey. It confirms that the current burden of these NCDs is significant, and it will rise in the future due to aging of the population and unhealthy lifestyle.

This master thesis consists of five chapters in total. Accordingly, the first chapter consists of the definition of health and in-depth information on the health system in Turkey. In the second chapter, three chronic diseases which have high incidence, mortality and morbidity are defined and assessment of the current situation about these diseases in Turkey are made. The third chapter examines the ways in which health services are financed and the area of health economics. In the fourth chapter, methodology related to indirect cost calculation for these three chronic diseases mentioned is given. In the last chapter, analysis results and discussion are given.

CHAPTER 1:

DEFINITION OF HEALTH AND IT'S MEASUREMENT

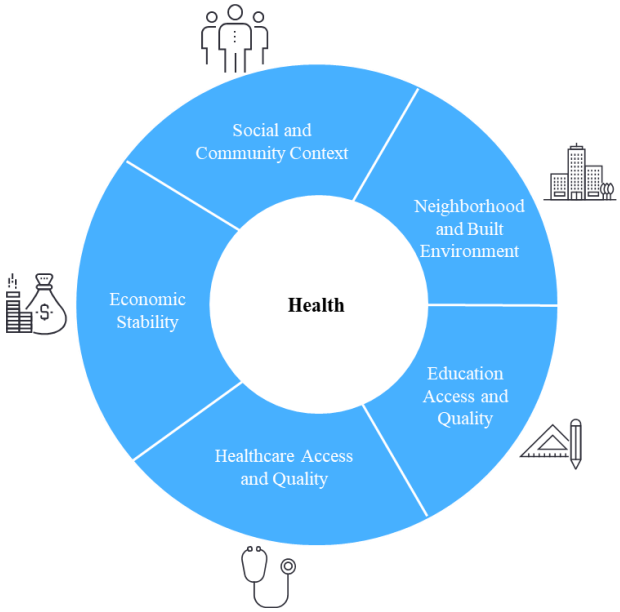
1.1 DEFINITION OF HEALTH

Although it is difficult to define health precisely, according to the definition of the World Health Organization (WHO), health is not just the absence of disease or disability; it is a state of physical, mental and social well-being (WHO, 2016). As can be understood from this definition, the good physical and mental health of the individual means that the person is healthy.

A healthy individual is the most valuable capital of a country. Health is an important determinant of individuals' economic and social well-being (WHO, 2021b). Increasing the health level of the society increases the development and productivity of human capital and contributes positively to the development of the country (Arora, 2001). For this reason, protecting, improving and making human health sustainable are among the social goals of the countries. For a healthy society to exist, economic and social environments must be completely interconnected. While economic environments are the source of financing for health services, social environments should take measures to eliminate the negative effects of physical and biological conditions on human health (Öztek, 2001).

According to the definition of health made by the World Health Organization (WHO, 1946), it is seen that health is a multi-faceted concept and is affected by more than one factor. These factors directly or indirectly affect the health status of individuals. Blum (1974) stated that environment is the leading factor affecting health, followed by lifestyle, heredity and health services. These four basic factors are under the influence of political system, economic system, population, cultural system and ecological balance. U.S. Department of Health and Human Services (2019) has considered the social determinants of health in five components and stated that the places where individuals live, get education and work have an impact on the health of the individual. The figure below shows these components.

Figure 1. Social Determinants of Health (SDH)



Source: (U.S. Department of Health and Human Services, 2019)

These components are;

a. Healthcare Access and Quality: This determinant of health aims to provide individuals with comprehensive and high-quality health care. Lack of knowledge about health, insufficiency of primary healthcare services and health insurances are thought to make the society unhealthy and provide inequality of opportunity between individuals.
b. Economic Stability: It is thought that the individual's income, income-expense balance and socio-economic status influence health. Societies with low unemployment are considered to be healthier because it is seen in studies that poverty leads individuals to unhealthy living conditions.
c. Social and Community Context: It is thought that the society and social environment of the individual influences the health of the person. An individual who is happy at home, at work and in the society is expected to be physically and mentally healthier.
d. Neighborhood and Built Environment: The place that the individual lives provide information about his health and well-being. It is considered that the individual who has access to clean air and water resources, adequate access to healthy food and transportation facilities will lead a healthier life.
e. Education Access and Quality: This determinant of health aims to increase education equality of opportunity and public awareness. It is thought that the educated individual will be more productive and will reduce healthcare costs by maintaining a healthier life.

1.2 DEFINITION AND OBJECTIVES OF THE HEALTH SYSTEM

Health system; can be defined as a whole, including inputs, processes, outputs (results) and feedback elements (WHO, 2006). The purpose of such a system is to cover all kinds of services directly related to health. The World Health Organization presented a comprehensive definition of health system in the World Health Report of 2000 and defined health system as the inclusion of all services and activities whose main purpose is to improve and maintain health. This definition includes both personal and non-personal activities and services across sectors such as service, education, industrial development and environmental systems (WHO, 2000).

Health systems have a vital and ongoing responsibility for the health of people throughout their lives. Accordingly, the World Health Organization collects the goals of the health system under three main headings. These are improvement of health, meeting expectations and fair financing.

In order to find out whether a health system fulfills the three objectives mentioned above, checks should be carried out at various frequency and the distress points identified during these checks should be tried to be improved. In addition, since health is of vital importance to human life, other fields such as education, economy and politics also have a role in achieving these goals. In this direction, improving health, which is considered as the main goal, refers to the elimination of factors that pose a risk to the health of the individual and society. It is believed that a healthier society will live longer and be more productive (WHO, 2000). The fact that individuals have access to the therapeutic, preventive and rehabilitation services they need is one of the conditions that this goal should achieve.

As a secondary goal, meeting expectations means that the individual has access to high quality health care that respects human rights and is based on confidentiality. The individual should be able to determine the place/person where he/she will receive health care and stay in appropriate hospital conditions during the treatment. With another objective, fair financing, it is aimed that economically distressed individuals make their health expenses relatively according to their income. Accordingly, double service standards arising from income inequality should be prevented and every individual in the society should be provided with the same quality of health care. For this purpose, it is also aimed that individuals do not become impoverished with the healthcare they receive or spend a large part of their income on health in order to get the health service they need (Murray & Frenk, 2000).

1.3 IMPORTANCE AND FEATURES OF HEALTHCARE SERVICES

Health has an important place in maintaining people's lives, improving their living standards and ensuring their safety. This is an important service that can directly change the lives and happiness

of individuals. Health services are designed to protect and improve health, prevent diseases, and ensure that diseases are diagnosed and treated as soon as possible (WHO, 2000).

The prevalence of chronic diseases, which has increased in recent years, has increased costs and brought financial difficulties. Despite all these conditions, health services should be provided to individuals at a certain standard. Unlike other goods and services, health services cannot be seen, stored, separated from their source, and their quality may vary (Sayım, 2009). According to Mutlu & Işık (2005) and Sayım (2009), the main features of healthcare services are listed below:

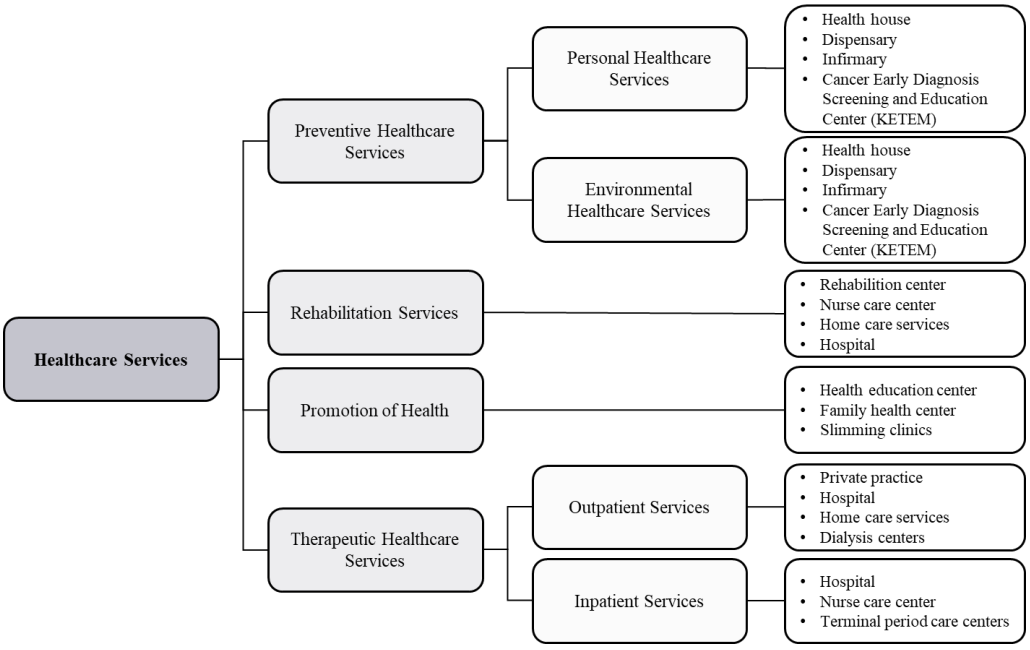
- Healthcare services have externality effect on costs and other sectors.
- The state has a word in planning, controlling and supporting healthcare services.
- There is asymmetrical information between the recipient (patient) and the provider (doctor) of the healthcare service.
- Due to the publicity and externality characteristics of health services, it affects the health of the whole society when it is not consumed sufficiently.

A large part of the budgets of developed and developing countries are allocated to the health sector. Certain conditions must be met in order for individuals to live in harmony with each other or with society. These conditions include treatment services, healthy housing, balanced nutrition, education, social security, social welfare, economic development and equal income distribution were taking place. However, when a regulation needs to be made among these conditions, healthcare services take the first place. In the provision of health services, the right to health, which is a human right for everyone at the individual and social level, should be guaranteed (Bircan & Baycan, 2004: 31).

1.4 CLASSIFICATION OF HEALTHCARE SERVICES

The role of healthcare services is very important in terms of development and welfare level of a country. Since the scope of healthcare services is wide, classification of it will contribute to a better understanding of this service. For this reason, healthcare services have been examined under four main headings as shown in the figure below. These are preventive healthcare services, therapeutic healthcare services, rehabilitation services and the promotion of health (Kavuncubaşı & Yıldırım, 2012). The details of these services are given in the following part.

Figure 2. Overview of the Classification of Healthcare Services



Source: (Kavuncubaşı & Yıldırım, 2012)

1.Preventive Healthcare Services

The purpose of preventive healthcare services is to reduce the likelihood of disease occurrence. It includes pre-illness health services that will minimize or prevent possible future disease risk and ensure early diagnosis of the disease and early initiation of treatment. Thus, the health of the society, primarily the individual, is secured. If this healthcare service isn't provided effectively, situations such as loss of human health, loss of life, loss of production and efficiency may occur. Preventive health services are divided into two sub-services:

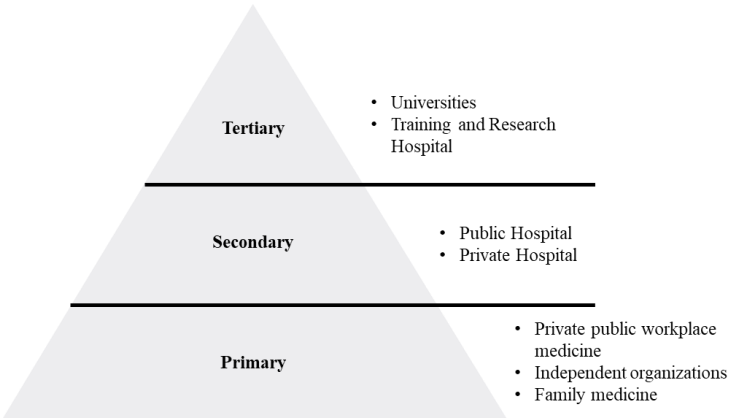
1. Environmental Healthcare Services: It refers to the elimination of factors affecting environmental health. It includes topics such as water resources and waste control, food hygiene, control of air and noise pollution and housing health.
2. Personal Healthcare Services: It includes services such as diagnosis, treatment, food regulation, medication protection, personal hygiene, health education, family planning, mother and child health.

2.Therapeutic Healthcare Services

Therapeutic healthcare services are considered as the next step from preventive healthcare services. It consists of the treatment process provided at the health institution by a team of health professionals as a result of the emergence of the disease or the observation of symptoms.

Therapeutic healthcare services are divided into three groups: primary healthcare, secondary healthcare and tertiary healthcare services. Primary healthcare is home or outpatient services. It is an efficient and widespread healthcare service that individuals can easily access, with low cost. Secondary healthcare are services where the patient cannot be diagnosed and treated in primary healthcare services and requires inpatient treatment in health institutions. Tertiary health services are services provided by university hospitals and oncology hospitals with advanced health technologies at different levels of expertise (Republic of Turkey MoH General Directorate of Public Health, 2021)

Figure 3. Therapeutic Healthcare Service Providers in Turkey



Source: (MoH, 2004)

Primary healthcare services in Turkey is given by private public workplace medicine, independent organizations and family medicine. Secondary healthcare services are provided by both public and private hospitals. Unlike other services, tertiary healthcare services are provided in university hospitals, training and research hospitals.

3.Rehabilitation Services

These services aim to restore physical and mental skills lost as a result of an accident or illness. Medical, social, educational and professional activities are carried out in a coordinated and comprehensive manner in order to restore mental and physical skills. Two types of rehabilitation are applied to reintegrate people after illnesses / accidents and to empower them economically, socially and culturally. These are;

Medical rehabilitation: Aims to reduce physical problems as much as possible. Prostheses, hearing aids, crutches, and wheelchairs are part of this treatment. These services are provided in physical and treatment hospitals.

Social rehabilitation: Gives the opportunity to acquire new job skills for those who cannot work in their jobs due to the skills they lost due to illness. It includes various support programs to adapt to the new situation (MoH, 2019b).

1.5 HEALTH SYSTEM IN TURKEY

The system is a form of mechanism that operates within the framework of complete and specific rules created by a set of ideas and principles formed within a certain logic framework, by parts that interact with each other. Various definitions have been made to explain the health system. According to the statement of the World Health Organization, which can be described as the most comprehensive of these definitions, it is the whole of all goods and services required for the protection and development of health (WHO, 2000). The health system can also be characterized as all resources devoted or dedicated to health, such as the provision and financing of health services, training of health workers, and policies related to health services (WHO, 2006). The provision of services and matching them with appropriate financing resources is critical in fulfilling the three main objectives of health care mentioned in the previous chapters.

Health systems are financed in three different ways: public assistance system, health insurance system and national health service. While the public assistance system enables poor individuals to benefit from health services free of charge, it aims to enable high-income individuals to benefit from these services in return for a certain payment (insurance or out-of-pocket payment). The health insurance system, on the other hand, is financed by insurance premiums paid by individuals who aim to reduce possible future risks. Accordingly, individuals with a high risk of getting sick pay high premiums, while individuals with low risk of getting sick pay low premiums. The national health service, another form of financing, means that all health expenditures incurred are covered by the state.

The health system in Turkey is the combination of these three different financing. Accordingly, while the public assistance system is applied to personnel working in the public sector and individuals with low income levels, insurance is required for individuals in a certain risk group at the same time. Unlike all these, individuals have the freedom to provide healthcare services from their pockets. However, due to insufficient resources and not being able to use them efficiently, periodic densities may be experienced in health services and hospital capacities may be insufficient.

Inefficiencies within the health system in Turkey, has brought the need for revision and renewal of the existed health system. In this direction in 2003, the Republic of Turkey MoH in partnership

with the Ministry of Labor and Social Security "Health Transformation Program" has been launched, aimed at the elimination of the following issues (MoH, 2011).

- Underdeveloped health outcomes compared to other OECD and middle-income countries
- Inequalities in access to healthcare services
- Inefficiencies / insufficiencies in the financing of healthcare services
- Poor healthcare service quality
- The shortage of healthcare services

Starting with the recognition of the related problems, the 10-year reform program aims to eliminate inefficiencies in the management of the health system, to increase the sustainability of health services and to increase service satisfaction. The program, which is planned to provide organizational structuring and resources (finance) in the health system, has nine principles in line with this purpose (MoH, 2003).

1. Human-centeredness: Based on the needs, expectations and demands of the individual who will receive the service.
2. Sustainability: Ensuring the health system is compatible with the conditions and resources of the country and its continuity
3. Continuous quality improvement: Improving healthcare and delivery through feedback
4. Participation: Ensuring integrity in the development and implementation of the health system by receiving the opinions and suggestions of all stakeholders.
5. Compromise: Accepting the health sector as a whole and ensuring a certain standard in methods and practices.
6. Volunteering: Ensuring that all individuals and institutions in the health system act in line with the determined goals, on a voluntary basis.
7. Separation of powers: Ensuring the separation of powers that finance, plan, supervise and produce health services.
8. Decentralization: Ensuring that institutions can make fast and correct decisions to changing conditions
9. Competition in service: De-monopolizing the provision of healthcare services and thus contributing to its development and reduction of costs.

In line with the principles mentioned above, various regulations and innovations have been made in the health system under the leadership of the MoH. Through this Program, health services were delivered to rural areas, innovation in primary health care (family medicine) was made, the immunization program was expanded, the budget allocated to preventive and primary health care services was increased, the reimbursement mechanism was developed, medical devices and

developments were focused, and the human resource in health services was improved (MoH, 2011). The reflection of all these innovations made in ten years can be seen in basic health indicators. Accordingly, improvements have been observed in infant health data, which is considered to be an indicator of the development levels of countries, and life expectancy at birth (years) has increased. When evaluated from these angles, it is seen that the program has been successful. In addition, the work carried out in this period has been effective in many steps taken in the following years. Action plans and strategies and programs for chronic diseases created by the Republic of Turkey MoH are examples of these. In section 2.5.2., the policies and treatments developed for chronic diseases are examined.

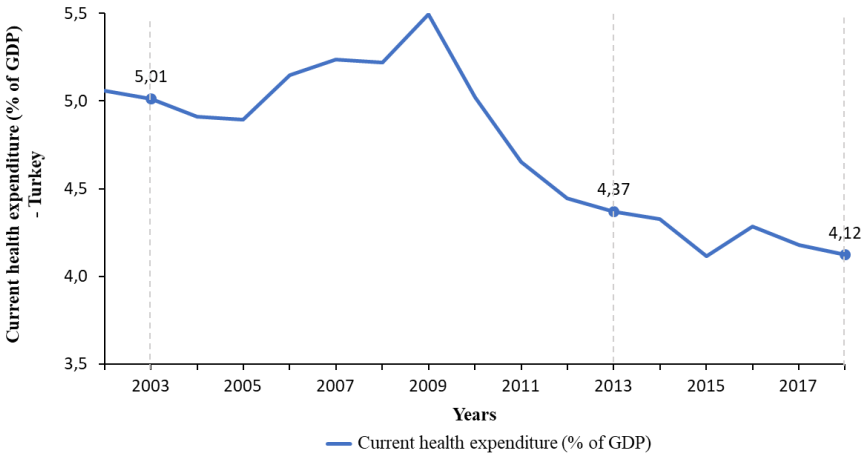
1.5.1 Health Indicators of Turkey

Despite Turkey is achieving the great job on health indicators on average compared to developing countries, indicators are still lower than OECD countries. In addition, the increase in public health expenditures in recent years brings financing risks (TURKSTAT, 2019).

While OECD countries make up about 20% of the world population, they have 84% of health expenditures for the whole world, with health expenditures of 6.5 trillion dollars in 2010 (OECD, 2011). In recent years, health expenditure per capita in Turkey (Int current $) shows an increase from the beginning of the 2000s. The share of the aging population and chronic diseases is thought to be high in this.

The World Health Organization states that the share of health expenditures for a country should be at least 5% of that country's gross domestic product (GDP) (WHO, 2003). It is also stated that developing or less developed countries should set this ratio as a target. The average of OECD countries increased from about 6.7% to 9.3% between 1980-2012. The following figure shows Turkey's current health expenditure in terms of the share to GDP (WHO, 2021a). Since 1980s, social expectations, increasing demand and technological developments in the country have an impact on the health expenditures. As mentioned in the previous chapter, Turkey has undergone a radical reform in the health sector between 2003 and 2013, and it is important to be seen as a tangible result of the effects of it. Accordingly, health expenditures, which had a share of 5.01% in GDP in 2003, showed a great decrease in 2013 and became 4.37%. Despite the increase in GDP in real terms over the years, the decrease in the share of health expenditures is positively interpreted. The organizational structure, manpower quality and technological developments that have improved with the health reform also have an effect on the decrease of this rate.

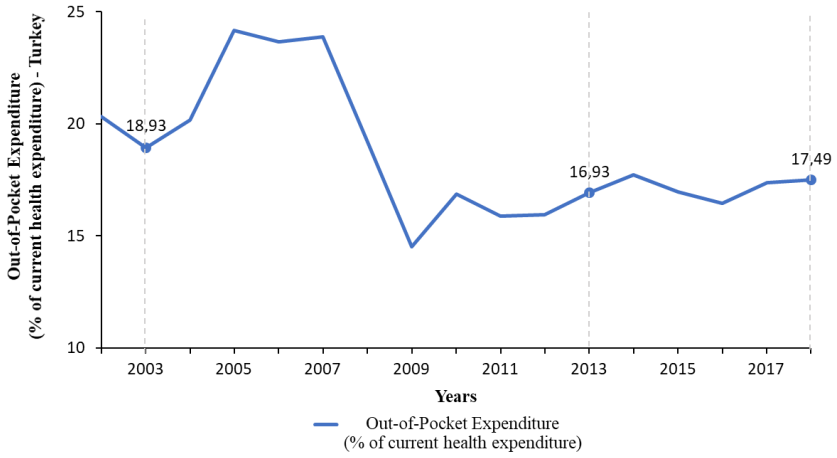
Figure 4. Current health expenditure of Turkey (% of GDP)



Source: (WHO, 2021a)

Out-of-pocket expenditures, which are one of the financing of health services, give a general idea about the health service of a country. Accordingly, the following figure shows the out-of-pocket expenditures of Turkey with respect to its share in current health expenditures. Accordingly, while the rate of out-of-pocket expenditures was high before the "Health Transformation Program", it decreased to 16.93% in 2013 and remained at this level in the following years. The increases in the number of private hospitals and the prevalence of chronic diseases are thought to be the effect of this rate at a certain level. Although the share allocated for health expenditures was 11.3% in 2002 and 16.3% in 2019, the increase in out-of-pocket expenditures shows the importance of the situation (Presidency of Strategy and Budget, 2021). Also, during the 2008 crisis in the world, it is observed that out of pocket payments declined in Turkey.

Figure 5. Out-of-Pocket Expenditure (% of current health expenditure) of Turkey



Source: (WHO, 2021a)

The aging population brings along an increase in the need for healthcare services. Accordingly, the following table shows the distribution of hospitals, health professionals and hospital beds in Turkey among years. A large increase in the number of all relevant components has been observed after the health reform in 2003. It is thought that these numbers will increase even more compared to the increasing population.

Table 1. Distribution of hospitals, healthcare professionals and hospital beds in Turkey

	2003	2013	2018
# of hospitals	1 174	1 517	1 534
# of healthcare professionals	94 466	133 775	153 128
# of hospital beds	165 465	202 031	231 913

Source: (TURKSTAT, 2021)

Health expenditure per capita in Turkey (Int current $) has examined and has shown that it declined in years. The biggest reason for the decrease is seen as the fluctuation in the dollar exchange rate. However, when evaluated in terms of Turkish Lira, it was determined that these expenses increased (TURKSTAT, 2019). In line with Turkey's health indicators that are given in the above, in the next section, three chronic diseases (circulatory diseases, respiratory diseases and endocrine diseases), which are considered to be deadly and have high burden on the economy, are examined. The epidemiology of these diseases, treatment methods and examining the situation in Turkey are discussed in detail.

CHAPTER 2:

CHRONIC DISEASES AND CHRONIC DISEASE MANAGEMENT

2.1 CHRONIC DISEASES

The prevalence of the diseases, the incidence and the economic losses they cause are factors that deeply affect individuals as well as states. Accordingly, it can be considered as the most important disease in the society, the most common disease-causing morbidity, mortality and economic loss. Thanks to the developments in the medical world, infectious diseases, which were the biggest health problems of the twentieth century, have been taken under control, life expectancy of people have been prolonged and premature deaths have been replaced by aging societies. At the beginning of the twenty-first century, this time non-communicable diseases began to be prevalent in aging societies. Increasing tobacco and alcohol consumption, unhealthy diet and physical inactivity brought many risks. Because of the fact that non-communicable/chronic diseases have high incidence, mortality and morbidity rate and high burden, they have priority both in the world and Turkey. Moreover, not only in the world but also in Turkey, chronic diseases have become the main cause of death (TURKSTAT, 2018). According to the 2017 report, non-communicable diseases cause 40 million deaths (70% of all deaths) worldwide each year (WHO, 2017). About 15 million premature deaths (before the age of 70) occur each year due to noncommunicable diseases, and 80% of these deaths occur in low and middle-income countries. In developed Western countries, the situation is not different, it is estimated that one in five people has more than one chronic disease, and this estimation shows that the situation is serious. Deaths from noncommunicable diseases are mostly caused by cardiovascular diseases (CVD), cancers, respiratory diseases and diabetes respectively and these four diseases constitute 80% of all premature deaths (WHO, 2021).

2.1.1. Definition of Chronic Disease

According to the Commission on Chronic Illness (CCI), chronic illness is defined as "generally not fully cured, persistent, slow-progressing and often leading to permanent disability, and in which many social, economic, personal and genetic factors play a role" (Roberts, 1954). According to Durna (2012), to consider a disease as a chronic disease, it must cause permanent disability, cause irreversible pathological changes, require special patient education for rehabilitation, or require long-term supervision and care (Durna, 2012). All kinds of conditions that require continuous interaction between the patient and the healthcare team, including the health system approach, are also defined as chronic diseases (Roberts, 1954).

2.1.2 Epidemiology of Chronic Diseases

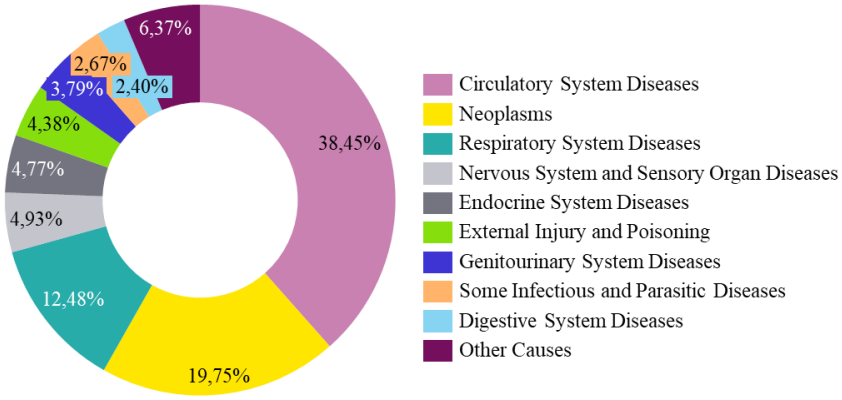
In 1929, Warren Thompson observed the birth and death rate of developed countries over the years, and as a result of his observations, with the "Demographic Transformation Model", he claimed that there was an inverse relationship between the industrialization level of the countries and the birth-death rates. (Thompson, 1929). Accordingly, it has been stated that countries with an understanding of economics based on agriculture have higher birth and death rates compared to an industrial country.

The migration of individuals from rural areas to urban areas has changed many habits and ways of living. On the other hand, the increase in settled life in cities has triggered an increase in the rate of literacy and technological developments. The development in technology has contributed to the increase in the average life expectancy of individuals, as well as providing alternative solutions to diseases. Thus, premature deaths have decreased, especially in developed countries, and senility has become a new trend. It is predicted that the population aged 65 and over will increase to approximately 973 million in 2030. Moreover, the share of the elder population to all is expected to increase to around twelve percent. (WHO, 2015a).

Since it is known that the rate of old age has increased in the world, researches show that non-communicable diseases are more common in the elderly compared to the young. It is known that noncommunicable diseases are not caused by a single cause, but are affected by many individual, environmental and genetic factors. With the increasing rate of elderly population worldwide, there is an increase in non-communicable diseases. Considering that technological developments continue, and the average life expectancy will increase in the future, it is thought that chronic diseases will become more critical issue in the future compared to today. According to the Global Health and Aging report, it is stated that the burden of disease due to non-communicable diseases predicted to be higher in low-middle and low-income countries in 2030 compared to today (WHO, 2015).

Various risk factors play decisive role in the occurrence of chronic diseases. The multiplicity of risk factors also increases the likelihood of disease. According to studies conducted in China, Ghana, South Africa, India, Mexico and Russia, the percentage of those with three or more major risk factors increases from the age of 18 and reaches the highest level between the ages of 60-70 (WHO, 2011). Based on this thesis, the biggest cause of chronic diseases in the elderly is the presence of more than one chronic disease (multimorbidity) in the individual. This situation makes the care and treatment of the elderly more important than ever.

Figure 6. Distribution of Causes of Death, (%), 2018



Source: (TURKSTAT, 2018)

Figure 6 shows the distribution of causes of death in 2018. Accordingly, circulatory system diseases, cancer and respiratory diseases are the leading cause of death in Turkey (TURKSTAT, 2018). In addition, heart disease, cancer, COPD and diabetes are responsible for three-quarters of all deaths in Turkey (TURKSTAT, 2018). Malnutrition, sedentary life and tobacco use play an important role in the occurrence of these four chronic diseases (McGhee et al., 2006). This is one of the main reasons for the estimation of the monetary value of potential years of lost (MVYLL) by addressing cardiovascular disease, COPD and diabetes in the following sections.

There are different ways of preventing diseases from risk factors. Primary prevention is to prevent risk factors. In other words, reducing tobacco products and gaining healthy eating habits are examples of this type. However, even if primary prevention practices are fully implemented, these diseases may still occur with the effect of other uncontrollable factors. At this point, early diagnosis, that is, secondary prevention, comes into play. It is known that early diagnosis facilitates the treatment of many diseases and reduces hospital expenses and labor loss. With early diagnosis, hypertension, diabetes, COPD, anemia, heart diseases and some cancers can be detected. Tertiary prevention includes applications for the individual not to get the same disease again after overcoming the disease and to overcome possible psychological problems due to illness.

2.2. CIRCULATORY DISEASES

The system that carries the nutrients and oxygen necessary for the smallest structural units that make up living beings and carries out the task of carrying ammonia and carbon dioxide released in these small building units to the excretory organs is called the circulatory system. The circulatory system has two important tasks; to deliver nutrients and oxygen to all structural units in the body and to carry the waste materials and carbon dioxide released by the structural units in

the body to the organs in the discharge system. Circulatory system diseases are the most common diseases in the world, the first cause of death and the most burden on the economy. They are chronic diseases that require constant doctor control. Circulatory system diseases are also called heart and vascular (cardiovascular) diseases.

2.2.1 Definition of Coronary Artery Disease

The coronary artery vessels supply the heart muscle, which functions as the heart's primary function of pumping blood to the body. Coronary artery disease occurs as a result of impaired blood flow in these vessels. The disease ends with ischemia (angina pectoris), which is manifested by prolonged silent ischemia, followed by partial narrowing of the vessel, followed by complete occlusion of the vessel, myocardial infarction, and a very widespread blockage and interruption of the heart muscle. It also forms the basis of other heart-related diseases such as arrhythmia, heart failure and pulmonary edema (Porter, 2018).

The most important of these diseases is coronary artery disease, which ranks first among all causes of death (1/3 of all deaths in the USA). According to TURKSTAT (2018), circulatory system diseases are the leading cause of loss of life due to illness in Turkey. In Turkey, 39.6% of deaths occurring circulatory system diseases due to coronary heart disease, cerebrovascular disease 24.7%, 18.8% are due to hypertensive disease and 11.6% are due to other heart diseases.

2.2.2. Epidemiology of Coronary Artery Disease

The main cause of coronary artery disease is atherosclerosis. In other words, it is caused by the formation of plaques called atheroma on the inner surface of large and medium coronary arteries. Although atherosclerosis causes the emergence of other organ diseases, it causes death or paralysis as a result of being in brain vessels. Blood lipid level abnormalities, diabetes, obesity, smoking, alcohol, sedentary life, hypertension and genetic factors affect the occurrence of atherosclerosis. Although it is more common in men, its incidence increases with age.

The incidence of coronary artery disease increases with age and it is more common in males. In the Framingham study, there was a two-fold increase in the incidence of heart failure every 10 years in people aged 45 to 75 years (MoH, 2019a). Hospitalization periods of patients with coronary artery disease are much longer than hospitalization periods of patients with other reasons. 30-40% of the patients go back to the hospital after leaving the hospital. Patients with this disease rank first among hospitalized cases over 65 years age group.

2.2.3. Treatment of Coronary Artery Disease

Symptoms of coronary artery disease may slow to aggravate or manifest themselves with a heart attack as the first finding. Because of this feature, people with risk factors should be checked

regularly. The disease can be diagnosed with blood biochemistry tests, EKG, EKO, effort test and coronary angiography.

At the beginning of the disease, the disease can be controlled by quitting smoking and alcohol, losing weight, regular exercise and a healthy diet with low lipid-cholesterol. In addition, medications (diabetes, hypertension, regular use of lipid-lowering and blood thinners) are also used (Porter, 2018). With drugs with different mechanisms of action, vascular dilation, prevention of thrombus formation that increases the risk of occlusion through plaque formation, reducing the risk of infarction by reducing the blood requirement of the heart muscle, and decreasing vascular spasm are provided.

In advanced cases that cannot be controlled with protection and drugs, balloon angioplasty and stenting are performed on the blocked or about to clog vessels. These procedures are performed through catheters entered through the inguinal or arm veins. If there is obstruction in places where these procedures cannot be performed or in very advanced cases, coronary bypass surgeries are performed. All these procedures, especially heart surgeries, are performed in advanced (3rd stage) hospitals with very expensive equipment (heart-lung machine, etc.) and experienced cardiac surgeons, and their costs are quite high.

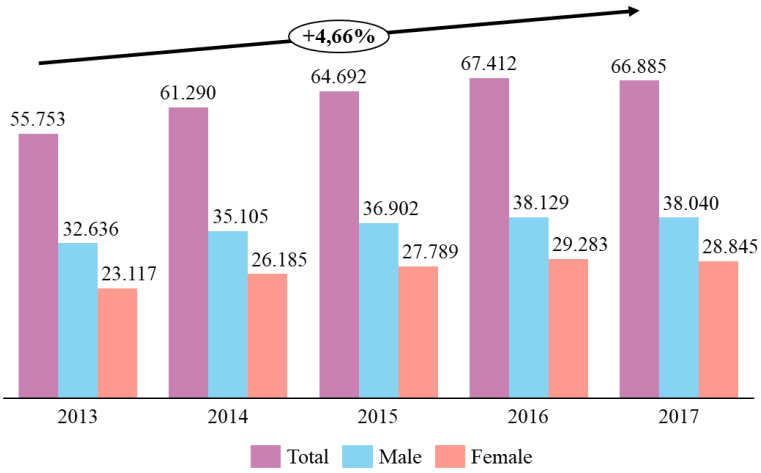
2.2.4. Current State of Coronary Artery Disease in Turkey

Increased cigarette and alcohol consumption, unbalanced eating habits and sedentary lifestyle increased the risk of being cardiovascular disease patient in Turkey. According to research carried out by TURKSTAT, Turkey Health Survey 2016, average daily number of cigarettes per capita for individuals aged between fifteen and over is well above OECD average (TURKSTAT, 2016a). Similarly, Turkey Health Surveys which were conducted in 2012, 2014 and 2016 shows that alcohol consumption in Turkey has increased. The increase in the prevalence of other risk factors causes the increase in the prevalence of coronary artery disease.

The TURKSTAT Cause of Death Statistics published in 2015 and 2016 contain important insights about the rate of deaths per 100,000 people (TURKSTAT, 2015; TURKSTAT, 2016b). Accordingly, it is seen that circulatory system diseases have the highest mortality rate according to ICD-10 diagnosis groups and coronary artery disease has the highest value among circulatory system diseases. In addition, the death rate in men is higher than in women. According to the findings of Turkish Adult Risk Factor (TARF) study, which is still being carried out for nearly 20 years, death rate from cardiovascular diseases is still high (Onat et al., 2016). While the death rate was lower in the Southeast Anatolia region, similar high death rates among geographical regions

of Turkey were determined. Among male and female Europeans aged 45–74 years, death rate is lower than in Turkey, which reveals the need for intensification of preventive measures against coronary artery disease in Turkey (Kesteloot et al. 2006)

Figure 7. Distribution of deaths caused by Coronary Artery Disease by gender, 2013-2017



Source: (TURKSTAT, 2018)

Figure 7 shows the distribution of people who died from coronary artery disease in Turkey between the years of 2013 to 2017 by gender. Accordingly, the total number of deaths from diabetes in 2017 was 66,815, showing a 4.66% increase compared to 2013. Moreover, it is observed that the number of males who died of diabetes between 2013 and 2017 was higher than the number of females. It was observed that the number of deaths increased for both genders.

2.3. RESPIRATORY DISEASES

The respiratory system includes primarily the lungs, pipes and sacs extending from the mouth and nose to the alveoli. The respiratory system is in direct connection with the musculoskeletal system that provides mechanical ventilation and the cardiovascular system that provides blood circulation within the respiratory system.

Causes of respiratory system diseases include genetic factors, age, gender, race, infections, as well as environmental factors such as smoking or exposure to cigarette smoke, air pollution, seasonal factors, geographical conditions, occupational factors.

As in the rest of the world, chronic respiratory diseases are in the first place in Turkey in terms of death and burden of disease (TURKSTAT, 2018). Chronic respiratory system diseases are expected to increase in the coming years due to the increase in the average age of death and the increase in smoking rate in the world and especially in developing countries. Respiratory system diseases constitute a very important part of chronic diseases. According to the 2018 data of the

MoH; based on the diagnosis codes, it ranks 3rd in the causes of death ranking (TURKSTAT, 2018).

Chronic respiratory system diseases are chronic, inflammatory diseases of the lungs and airways, and most of them are asthma and Chronic Obstructive Pulmonary Diseases (COPD). COPD is one of the most common causes of death and chronic disease. Although it is largely preventable, after the onset of the disease, treatment is difficult, and the financial burden is high.

Much less common chronic respiratory diseases other than asthma and COPD; bronchiectasis, cystic fibrosis, chronic rhinosinusitis, pneumonia, lung cancer, lung fibrosis and tuberculosis. According to WHO, respiratory system diseases are expected to increase even more, especially in the elderly population, in the coming years (WHO, 2017c). Details of COPD, the most common and fatal disease among respiratory system diseases, are given below.

2.3.1. Definition of COPD

COPD is an obstructive and progressive lung disease that occurs as a result of the abnormal inflammatory response of the lung to harmful gases and particles. The collapse of the airways during exhalation and excessive bronchial exudation cause narrowing in the airways, reducing the air flow velocity, and this event continuously increases its intensity, leading to a deterioration in the patient's quality of life. As can be understood from this definition, changes occurring in the airways in COPD are irreversible and show a continuously progressive character (Porter, 2018).

In patients with COPD, airflow is restricted as a result of chronic bronchitis and destruction of the air sacs in the lung (emphysema). Due to the narrowing of the airways in COPD patients, the entrance and exit of the air cannot be comfortably provided. Bacterial infection in the lungs develops easily and frequently in individuals with COPD, and therefore the need for hospitalization increases.

2.3.2. Epidemiology of COPD

90% of COPD-related deaths in the world occur in underdeveloped and developing countries. The table below shows the risk factors in terms of environmental and personal factors.

Table 2. Risk Factors for COPD

Environmental Factors	Personnel Factors
Smoking	Genetic factors (alpha1 antitrypsin deficiency)
Occupational dust and chemicals	Airway hypersensitivity
Air pollution	Factors affecting lung development (low birth weight, etc.)
Infections	Familial predisposition
Socio-economic factors	

Source: (Porter, 2018)

The disease remains silent and slow for many years. For example, in people who smoke a pack of cigarettes a day for 20 years, the first symptom of COPD at the age of 40-50 is a cough with sputum. Later, shortness of breath (dyspnea), emphysema and heart failure develop. Death is generally due to causes such as acute respiratory failure, pneumonia, lung cancer, and pulmonary embolism in the advanced stages of COPD. Half of the patients die within 10 years after the initial diagnosis. COPD, which has high mortality and morbidity, causes long-term hospitalizations (Porter, 2018).

The incidence and mortality rates of the disease increase with age. Although the prevalence of the disease is higher in men, the mortality rate is almost the same in women and men. According to the Global Burden of Disease Study data, COPD causes 2.9 million deaths annually. COPD, which has become the third cause of death in the world today, is responsible for 5.5% of all deaths. According to WHO, by 2030, COPD is expected to be the third most common cause of death in the world.

2.3.3. Treatment of COPD

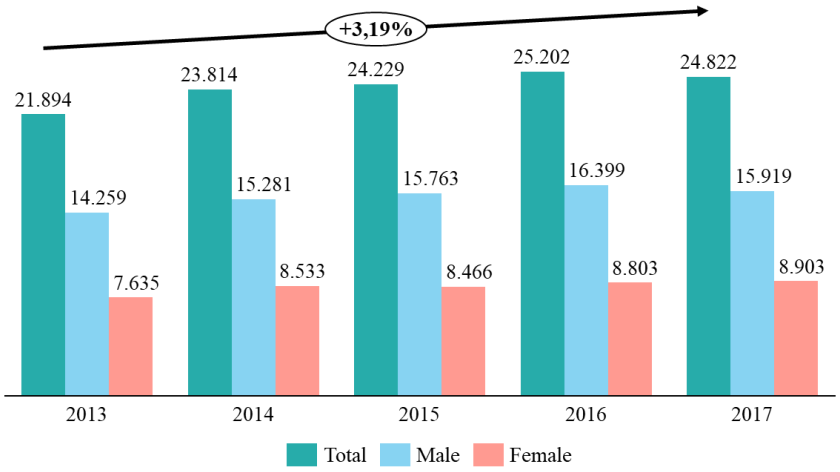
COPD is diagnosed by examination findings, presence of risk factors, chest x-ray and pulmonary function tests. Although COPD is a progressive disease, it can be prevented and treated. The use of drugs in the treatment of COPD, especially inhalers containing bronchodilators and corticosteroids, has become very common in recent years and has become one of the drugs whose share in the drug budget has increased the most. Other treatment methods include oxygen therapy, smoking cessation, physical activity and pulmonary rehabilitation, vaccination, surgery and removal of emphysematous areas, and lung transplantation in very advanced cases. Among these treatment methods, the top priority behavior of a patient with COPD should be to quit smoking (Porter, 2018).

2.3.4. Current State of COPD in Turkey

The prevalence of COPD is 15-20% in adults over the age of 40. In other words, one out of every five people over the age of 40 in the society has COPD. However, only one of ten COPD patients consulted a doctor and could get the correct diagnosis. From this point of view, in 2016, there is around 3-5 million people with COPD in Turkey and only 300-500 thousand of them know the disease itself (TURKSTAT, 2016b).

When the causes of death statistics in Turkey is analyzed, respiratory system diseases are the third most common cause of death and 61.5% of them are COPD related (TURKSTAT, 2018). The lack of enough knowledge of the society about COPD makes early diagnosis and effective treatment of the disease difficult. With the Law No. 5727, which entered into force in July 2009, smoking in indoor areas is prohibited. In this context, although there was a decrease in both smoking and COPD prevalence, the desired levels were not reached. Figure 3 shows the distribution of deaths caused by COPD by gender between 2013 and 2017.

Figure 8. Distribution of deaths caused by COPD by gender, 2013-2017



Source: (TURKSTAT, 2018)

According to the figure, deaths from COPD increased by 3.19% from 2013 to 2017. When the number of deaths is examined in terms of gender, it is seen that deaths are more common in male. Although COPD is seen as a male disease in the society, clinical studies conducted in recent years reveal that the disease is spreading rapidly among female (TURKSTAT, 2018). The most important reason for this is thought to be the rapidly increasing smoking rate among women. COPD deaths have increased significantly among women compared to men in recent years.

2.4. ENDOCRINE DISEASES

The endocrine (endocrine gland) system is a complex system consisting of organs and glands that control vital functions in the human body through hormones. The proper functioning of the endocrine system is critical for the living being to adapt to changes in the external environment and to provide homeostasis. Hormones secreted by the endogenous glands play an important role in maintaining this order. Hormone is a kind of chemical message that a group of cells sends to another group of cells, and through this chemical message, it ensures the regular functioning of related cells and organs. Endocrinology is a branch of science that examines the working system of the endocrine glands and the hormones produced by the glands.

The endocrine system includes the hypothalamus, pituitary, thyroid gland, parathyroid gland, pancreas, adrenal glands, ovaries (ovaries) and testicles secreted by hormones and body systems affected by these hormones. Most of the endocrine diseases include chronic diseases that require lifelong follow-up. Diabetes, obesity and hypothyroidism are the most common endocrine metabolism and nutritional diseases. Among these diseases, diabetes is an endocrine disease that needs to be addressed because it is the most common and has the most impact on workforce loss. In the following chapters, MVYLL will be calculated for all endocrine diseases, and it is thought that diabetes has a high effect on this calculation.

2.4.1 Definition of Diabetes

Diabetes occurs as a result of incomplete secretion of insulin hormone from the pancreas or its inability to use it effectively by cells (insulin resistance). In this case, sugar from food cannot be used and blood sugar rises. Turkey is one of the leading countries in terms of diabetes prevalence and growth rate.

Increased water consumption, frequent urination, dry mouth, feeling of hunger, dry skin, weakness, fatigue, weight loss, frequent infection development and numbness in hands and feet are some of the symptoms of diabetes. Some of these symptoms may increase or decrease depending on the blood sugar level. In the follow-up of symptoms, an increase in complaints is observed due to diabetes complications.

Complications of diabetes are discussed under two headings as acute and chronic. Hypoglycemia (low blood sugar), one of its acute complications, develops due to excessive insulin secretion and insufficient food intake, causing weakness and fainting. Ketoacidosis, another complication, is a state of coma that develops due to excessive rise in blood sugar caused by lack of insulin. Other acute complications related to the disease are the presence of balance disorders and frequent infections (Porter, 2018).

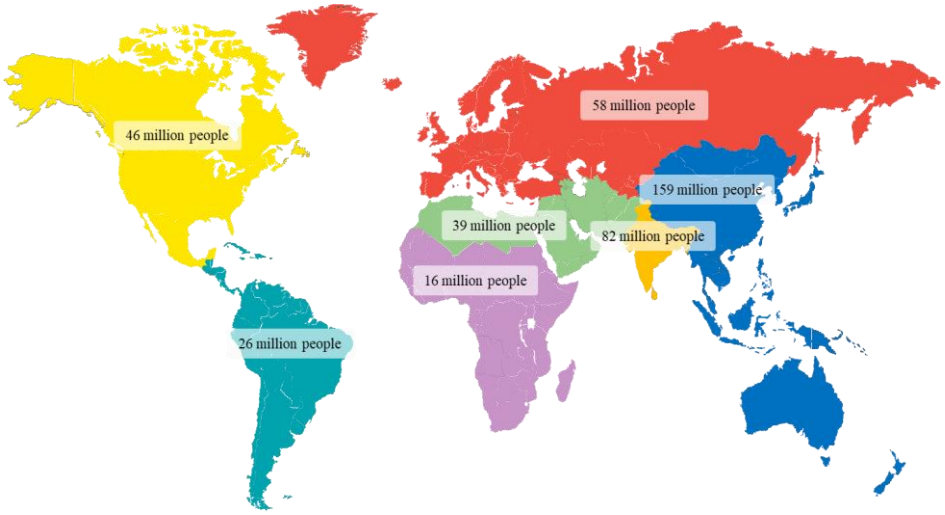
Diabetes is a systemic disease that damages many systems in the body. High blood sugar for a long time damages the vessels and nerves. Which organs have been exposed to the ruin more, primarily chronic effects begin to be seen in this organ. Diabetes causes permanent and difficult to treat chronic complications, especially as a result of damage to kidney, heart, eye and nerves. Kidney (renal) failure, vision loss or blindness, loss of sensation (neuropathy) and cardiovascular diseases are among the main diseases caused by diabetes. Cardiovascular diseases are the most common cause of death in individuals with diabetes.

2.4.2 Epidemiology of Diabetes

According to WHO, diabetes is one of the 21st century's biggest global health emergencies. Diabetes is among the top 10 causes of death globally and accounts for over 80% of all early non-communicable diseases' deaths, along with the other three main NCDs. While diabetes negatively affects the living standards of the person and causes premature deaths, it also makes an important economic pressure on the healthcare systems of countries (Porter, 2018). The IDF Diabetes Atlas, which is renewed every two years, was used to evaluate the impact of diabetes on the world (seven IDF regions) and to make projections for the future. This resource also includes comprehensive analysis that guides health professionals, academicians and policymakers.

According to the findings of IDF Diabetes Atlas (8th edition), in 2017, there are a total of 425 million diabetic patients in the world. While 327 million of these patients are in the 20-64 age group, 98 million are in the 65-79 age group. The prevalence of diabetes has been found around %8,8 in the world and around 79% of these people live in low- and middle-income countries. Moreover, it caused the deaths of 5 million people in 2017. In 2045, this number is expected to increase by 48% to 629 million.

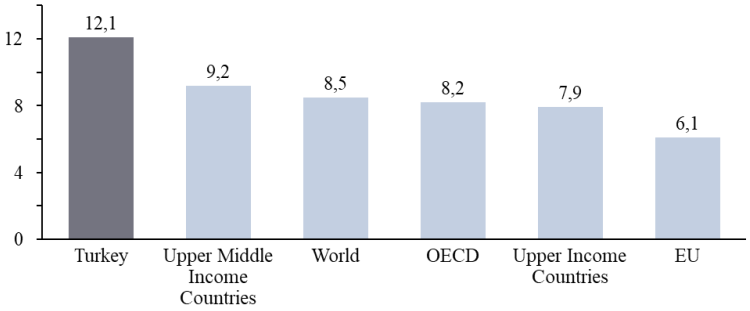
Figure 9. Number of people with diabetes in 2017 (20-79 years)



Source: (IDF, 2017)

In 2017, 34% of people with diabetes live in rural areas, while 279 million of them live in urban areas. By 2045, the number of people with diabetes living in urban areas is projected to double (IDF, 2017). The prevalence of diabetes has been found to be higher in urban areas than in rural areas (10.2% vs 6.9%). The prevalence of diabetes for male is predicted to be 9.1% which is more than among female (8.4%).

Figure 10. International Comparison of Standardized Diabetes Prevalence by Age 20-79 Age Group, (%), (World Standard Population), 2017



Source: (IDF, 2017)

Figure 10 represents a comparison of the standardized prevalence of diabetes for individuals aged 20-79. Accordingly, in 2017, diabetes prevalence in Turkey is located above the world average by 12.1%. This prevalence is higher than in upper middle-income countries. Since in the Africa region, there is lower level of urbanization and higher rates of communicable diseases, the region has the lowest prevalence (4.2%).

Globally, the prevalence of type 2 diabetes is increasing around the world. The aging population, increasing urbanization and unhealthy diet have a great impact on this increase (Saito et al. 2011). Like type 2 diabetes, incidence of type 1 diabetes is on the rise worldwide (IDF, 2016). However, unlike type 2 diabetes, the reason for the increase in type 1 diabetes is not clear. Genetic and environmental factors are thought to be effective on this rise (Sundström et al. 2013).

2.4.3. Types and Treatment of Diabetes

Since **type 1 diabetes** occurs in childhood and adolescence, it is also called juvenile diabetes. This type of diabetes is also referred to as insulin dependent diabetes since patients with this type of diabetes must use insulin throughout their life. They constitute 10% of all diabetes cases. Type 1 diabetes is caused by the inability of the beta cells in the pancreas to make insulin due to auto-immune destruction.

People with type 1 diabetes in their first-degree relatives and people with type 2 diabetes have a higher incidence of diabetes. When evaluated in this respect, it is seen that genetic predisposition constitutes a risk in the disease.

Type 2 diabetes, also called adult-type diabetes, is also called insulin-independent diabetes. It is generally seen in adults, and its incidence increases with age. In recent years, due to the increase in obesity rate in children, its incidence has increased in children. In cases where insulin production is insufficient and/or insulin resistance, the level of glucose in the blood cannot be reduced to normal, causing this type of diabetes. In addition to genetic factors, insulin resistance occurs due to the increase in fat tissue and decrease in muscle mass caused by weight gain, obesity, nutritional disorders and sedentary life, and the emergence of diabetes in such individuals is easier (Saito et al. 2011).

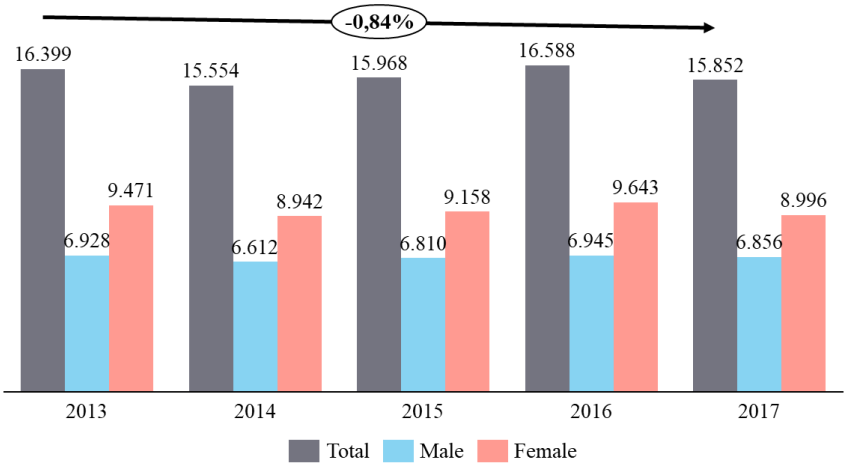
No treatment method can prevent the development or progression of type 1 diabetes. With some immunosuppressive treatments, the need for insulin use can be delayed for about a year in some cases. However, type 2 diabetes can be prevented by lifestyle changes. With moderate exercise (at least 30 minutes of walking a day), reducing body weight by at least 7% reduces the risk of diabetes by at least 50%. (merc)

Patients need to keep the daily blood sugar levels and calories in balance. In order to achieve this balance, they need to balance the daily carbohydrates, fat and protein in their diets and calculate their total calories approximately. They also need to include physical activity in their lives. In this respect, the support of a dietitian is recommended. If blood sugar cannot be controlled with nutrition and exercise, support is taken from medications (injection or oral route). For example, individuals with type 1 diabetes must take insulin during the treatment process (every day), while individuals with type 2 diabetes should start insulin in the later stages of their disease, if deemed necessary. Since the disease is chronic and will continue throughout the life, education and awareness of the individual is of vital importance.

2.4.4. Current State of Diabetes in Turkey

Turkey has the highest standardized diabetes prevalence and the third highest number of people with diabetes in Europe. Diabetes is responsible for 16% of total healthcare expenditure in Turkey. According to Turkey Childhood Obesity Research (COSI-TUR 2016) which was carried out by the Republic of Turkey MoH and published in 2017, 24.2% of girls and 24.9% of boys in the 7-8 age group are overweight or obese in Turkey (Sağlık Bakanlığı, 2017).

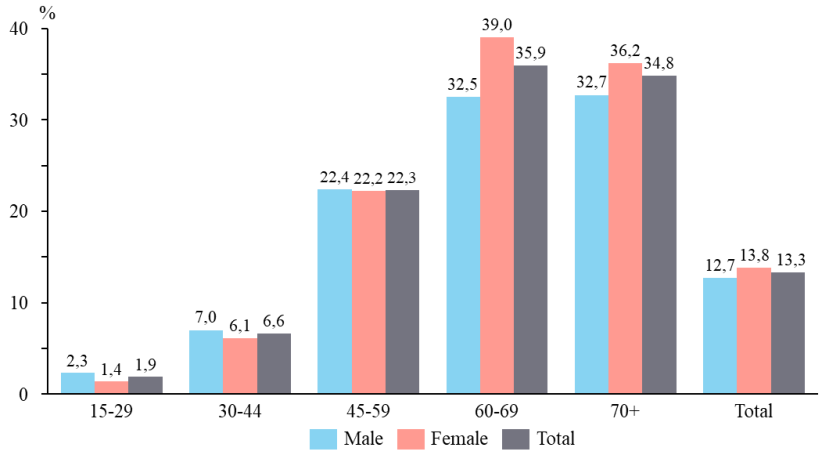
Figure 11. Distribution of deaths caused by diabetes by gender, 2013-2017



Source: (TURKSTAT, 2019)

Accordingly, the total number of deaths caused by diabetes in 2017 was 15,852, showing a 0.84% decrease compared to 2013. Moreover, it is observed that the number of women who died of diabetes between 2013 and 2017 was higher than the number of men. This situation is similar in the world.

Figure 12. Distribution of People with HbA1c Value higher than 6.5% or Current Diabetes Treatment by Gender and Age Group, (%), 2017



Source: (MoH, 2017)

For people without diabetes, the normal value range for hemoglobin A1c (HbA1c) is between 4% and 5.6%. For the HbA1c values between 5.7% and 6.4% mean there is a higher chance of developing diabetes. At value 6.5% or higher, the person has diabetes. In the light of this information, Figure 7 shows the distribution of people with HbA1c value higher than 6.5% or currently in a diabetes treatment in Turkey by gender and age group. It is observed that in 2017, the number of people with diabetes or currently in a diabetes treatment is the highest in the 60-69

age group. This number is followed by the group over 70+ age. While the rate of prevalence is higher in females in these two age groups, the situation is the opposite in the other age groups.

2.5. CHRONIC DISEASE MANAGEMENT

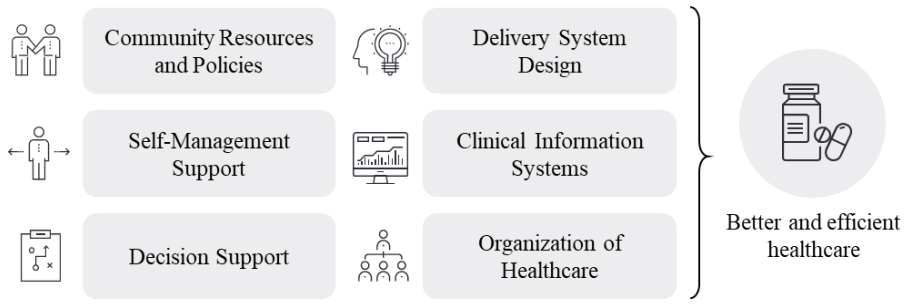
The aging of the population in the world affects the prevalence of chronic diseases. The increase in the prevalence of chronic diseases increases the pressure on the health system negatively. As is known, efficient management of resources is a critical issue. Considering the limited number of healthcare personnel and hospital bed capacity, the situation becomes more critical for individuals with chronic diseases.

Management of chronic diseases is important both to ensure the quality of life of the patient and to reduce morbidity and mortality rates. Management of chronic diseases is essential not only to treat the disease, but also for the patient to gain self-management skills and learn to live with the disease. Both patient and healthcare professionals have a job to manage the disease effectively. The following section includes details about the Chronic Care Model, which gives a systematic approach to chronic patient management.

2.5.1. The Chronic Care Model

With the increasing prevalence of chronic diseases, it seems that the health system cannot adequately meet the needs all over the world. The main shortcomings of the system are the excessive workload of the doctors, the lack of planned and coordinated care, the lack of regular patient follow-ups, and the insufficient knowledge of patients about their diseases (Wagner, 1998). It has been seen that a transformation in health services is necessary to overcome these deficiencies. The Chronic Care Model (CCM), aims to increase the quality of chronic care and reduce chronic care costs by keeping the welfare level of sick individuals above a certain level.

Figure 13. The Chronic Care Model



Source: (Wagner, 1998)

The key of the model defined by Wagner in 1998 is the creation of an efficient interaction between the healthcare team and the patient (Wagner, 1998). The figure above defines the six basic

components of the Chronic Care Model. Accordingly, efficient interaction of the healthcare team with a certain experience in terms of both training and practice and the patient informed about the disease will be ensured and the patient's well-being will be maintained at a high level. In the following section, six components of the model are discussed.

2.5.1.1. Community Resources and Policies

It refers to the use of necessary community resources to meet the needs and care of the patient. At this stage, patients are encouraged to participate in effective community programs (peer support groups, educational programs, exercise programs, etc.) (Wagner, 2000). These include planning programs (quitting smoking, healthy diet and exercise, etc.), establishing appropriate walking paths, developing policies to promote health and ensuring cooperation between the state and pharmaceutical companies (Stellefson et.al. 2013)

2.5.1.2. Self-Management Support

Chronic diseases, as can be understood from its definition, is the name given to the disease that continues throughout human life. For this reason, individual's acceptance of the disease and learning to live with it plays a critical role in fighting the disease. Self-management support refers to the skill set required to provide the necessary skills and resources for disease management, self-care to the individual with a chronic disease and his / her family, and to conduct the individual's life regularly (Epping-Jordan et.al. 2004). Many studies put self-management support at the center of chronic care.

2.5.1.3. Decision Support

It refers to the provision of chronic care consistent with scientific evidence that responds to the wishes and preferences of the patient. In addition to the guidance of the healthcare professional in providing decision-making support to individuals with chronic diseases, the operation of various decision support mechanisms developed with information technologies helps the patient. These technologies make a general assessment of the current condition of the patient and offer alternative solutions to the patient. Diagnosis can be made through these systems, as well as used in adjusting the dosage of drugs and detecting emergencies. (Özata & Aslan 2004).

2.5.1.4. Delivery System Design

One of the essential components of safe and qualified chronic care is the well-organized organizational structure. This structure, on the other hand, should be provided with a workforce that is separated according to their duties and responsibilities in all the steps planned for chronic patient care (Bodenheimer et.al. 2002b). Delivery system design plan includes patient participation, decision support (providing necessary information to the patient), setting specific

goals, solving problems (developing strategies against social and cultural potential barriers) and ensuring regular follow-ups.

2.5.1.5. Clinical Information Systems

It is one of the most important components of the model. Without an effective information system, it is thought that the follow-up of chronic care cannot be done effectively (Bonomi et.al. 2002). In today's conditions, the use of technology in the field of health as it is used in every field has a great contribution to both healthcare service providers and demanders. The advantages of computer-based tracking systems are as follows:

1. It provides prevention of possible late diagnoses by facilitating the follow-up of the disease and the planning of the treatment. In addition, it enables the efficient use of resources (bed, medicine, healthcare personnel, etc.).

2. It provides important input to improve service quality by providing information exchange between patients and service providers.

3. Priorities can be determined impartially by establishing a systematic basis with the creation of a database on diseases in the patient and society in general. In addition, data collected will facilitate the projection of health expenditures. (Hayrinen et.al. 2008).

2.5.1.6. Organization of Healthcare

It refers to program planning to improve chronic health care. This component of the Chronic Care Model includes the creation of the necessary infrastructure (personnel, technical equipment, etc.) for maintenance, the efficient use and management of resources, and the provision of inter-institutional coordination and cooperation efforts. It also includes identifying development areas for healthcare and adopting new strategies in line with these determinations (ICN 2010; Stellefson et.al. 2013). A great responsibility falls on the management level as well as all the healthcare personnel in the fulfillment of these goals. Like all components, this component is vital for an effective CCM.

2.5.2. Policies and Treatments in Turkey

Turkey has taken significant steps in the development, improvement and mobilization of healthcare services which have led a comprehensive and important period of change over the past ten years. With the outbreak of chronic diseases and pandemics (such as COVID-19), the importance of persistent health system and policies become even more prevalent.

Brief information sets about the programs that are being prepared and implemented for the prevention of premature deaths from preventable NCDs in Turkey are in the following table. Knowing and adopting the scope of these programs will play an important role in fighting with

the diseases. Moreover, it also allows commenting on the current situation in Turkey.

Table 3. Policies and treatments to reduce burden of chronic diseases

Policy/Treatment	Periods Covered	Scope/Aim
Republic of Turkey, The Eleventh Development Plan	2019-2023	The aging of the population and the high disease burden of chronic diseases bring new needs in healthcare. Some of these needs are to increase the efficiency of healthcare services and to use technology more widely in healthcare. With the plan, raising awareness about drug use and treatment, and Establishing high quality healthcare services is aimed in order to make Turkey be a health tourism center in the world.
Republic of Turkey, MoH Strategic Plan	2019-2023	The strategic plan includes specific goals and objectives in order to increase health of individuals and ensure everyone has access to quality healthcare". A total of 6 goals and 41 targets under these goals were determined in the strategic plan. These aims are as follows: Promoting healthy lifestyle Increasing the effectiveness of primary health care services Health services are accessible to all; ensuring effective, efficient and quality presentation Implementation of the integrated healthcare model in healthcare services Increasing the satisfaction of health services and ensuring the sustainability of the health system Localization of technology used in healthcare
Republic of Turkey, MoH Multi-Sectoral Action Plan of Turkey for NCDs	2017-2025	The aim of the action plan is defined as "to reduce the preventable deaths and disability burden caused by noncommunicable diseases and to increase the health and well-being of the society by ensuring high health standards of individuals". The targets determined for this purpose are as follows: Prioritizing the prevention and control of NCDs Strengthening the necessary capacity and cooperation for the prevention and control of noncommunicable diseases Reducing modifiable risk factors of noncommunicable diseases Development of primary healthcare services Conducting high-quality research on noncommunicable diseases and supporting national capacity Monitoring and evaluation of trends and determinants of noncommunicable diseases
Republic of Turkey, MoH Turkey Healthy Aging Action Plan and Implementation Program	2015-2020	The program aims to improve the service provided to elderly people, support the fight against non-communicable diseases, increase the health level of the society and develop policies regarding healthy aging. Strategies developed for this purpose are as

		follows: Ensuring healthy aging Protecting the society from risk factors Improving health services for elderly people and facilitating access to services Strengthening monitoring and evaluation
Prevention and Control of Chronic Airway Disease Programme of Turkey	2014-2017	This program is considered as a step for the implementation of Global Alliance against Chronic Respiratory Diseases (GARD) applications in Turkey. It is aimed to inform the public and increase awareness about chronic airway diseases and prevent them from risk factors. Moreover, program will provide the necessary infrastructure for early diagnosis of diseases and will be used in the realization of the high-quality treatment.
National Tobacco Control Programme Action Plan	2015-2018	The program, which was firstly established by the MoH to cover the years 2006-2010, is regularly updated. Program is established in order to draw attention to increasing tobacco use in Turkey and was to reduce the impact of smoking on health. The activities carried out in line with the program are as follows: Increasing the taxation on cigarettes Adding visual and written warnings to cigarette packages to raise awareness Prohibition of tobacco products in closed areas and ensuring strict control Providing free smoking cessation services Prohibition of smoking-related advertising, promotion and sponsorships
Prevention and Control of Cardiovascular Disease Programme of Turkey	2015-2020	The program aims to raise awareness about cardiovascular diseases and to prevent public from risk factors (especially tobacco, obesity and physical inactivity). Additionally, necessary infrastructure for early diagnosis of diseases and high-quality treatment will be provided to the patients.
National Cancer Control Programme	2013-2018	Cancer, both in the world and in Turkey, is the second most important cause of deaths. This situation has made the early diagnosis and treatment of cancer more important. This program aims to perform the necessary steps (registration, prevention, screening and treatment) for the control of cancer at high quality.
Turkey Diabetes Programme	2015-2020	Program aims to the fight against diabetes and develop management policy related with diabetes.
Programme for Reducing High Salt Consumption in Turkey	2017-2021	Since it is known that obesity is a global problem, program is aimed to prohibit the sale of various unhealthy foods (chips, carbonated drinks, energy drinks, etc.) in school canteens and replace them with the healthier ones (milk, buttermilk, yogurt, freshly squeezed orange juice).
Healthy Nutrition and	2014-2017	This program was established for the prevention of

Physical Activity Programme of Turkey		increased obesity rates in Turkey. It encourages individuals to engage in physical activity together with balanced diet. Within the scope of the program, the curriculum of physical education in schools was updated and various measures were taken regarding the regulation of food sold in the canteen. Thus, it is aimed to contribute to the healthy growth and development of individuals from a young age.
Prevention and Control of Kidney Diseases Programme of Turkey	2015-2020	This program aims to diagnose chronic kidney disease early. Moreover, it aims to treat patients with appropriate methods and increase the life expectancy of them.

Source: (MoH, 2019c), (Presidency of Strategy and Budget, 2019), (Republic of Turkey Ministry of Health General Directorate of Public Health, 2017)

CHAPTER 3:

HEALTHCARE SERVICES AND FINANCING-CHRONIC DISEASES RELATIONSHIP

After the definitions of health and chronic diseases are made, some economic activities carried out to maintain health or to make individuals healthy through treatment of diseases, if any, form the basis of the field of health economics. Health needs are met with limited resources, so this information is an important guide in defining the conceptual framework for the health economics. When the literature is examined, health economics in general; reveals the economic analysis of healthcare services by harmonizing some rules and analysis methods used in the economics and some other methods with the health sector. For this reason, the provision of healthcare services will undoubtedly be implemented with an effective health economics. As defined by the State Planning Organization; health economics is defined as the evaluation of the outputs of a series of services and treatments related to these services and the costs of these treatments (Sur et.al, 2013).

3.1. IMPORTANCE OF HEALTH ECONOMICS

Most people receive healthcare services at least once a year. These healthcare services have an increasing trend for the elderly. The financing of these services demanded by the society is an important problem for central administrations. Increasing interest in health economics is directly related to two developments. First, rapid developments in medicine and medical devices strengthened the hands of doctors and increased their effectiveness in fighting diseases. Many studies on health economics show that countries are based on life expectancy at birth and determine general health expenditures accordingly. One of the prominent points in these studies was the increase in health expenditures along with the growth rate of the adult population aged 65 and over (Matteo, 2005). Increasing life expectancy has made the process of balancing health resources and populations more important and has enabled them to develop better alternatives (Sloan and Hsieh, 2012). Second, increase in the prevalence and incidence of the diseases affect the health system negatively and solutions are sought to help reduce this effect. At this point, the health economics helps both the state and hospitals by ensuring the effective use of the right financial resources (Çalışkan, 2008).

Studies in the field of health economics cover the discipline of economics in general and all disciplines of social sciences in a broader sense. It provides valuable information and empirical evidence on health policy, healthcare services, clinical practice and public health. For this reason,

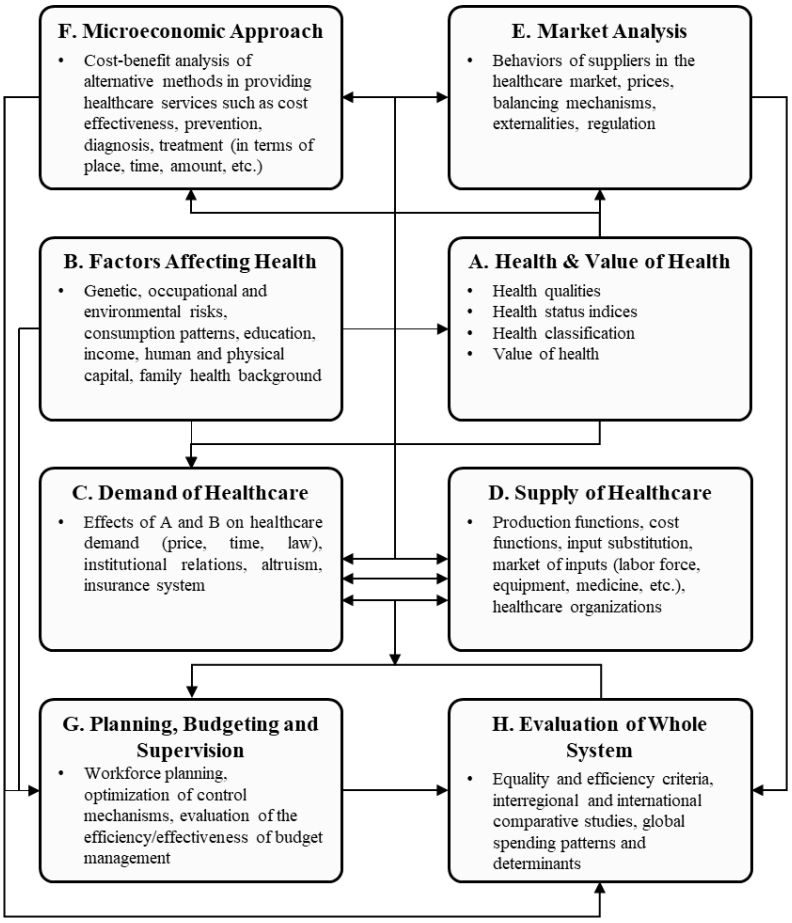
studies on health economics contribute as well as other areas such as medicine, public health and public policy (Çoban, 2009).

3.2. SCOPE OF HEALTH ECONOMICS

Health economics has been briefly defined in the previous section as the application of the basic rules of the economics to the health sector. Therefore, it can be said that health economics, which is both a theoretical and applied science, has developed as a sub-discipline of public economics. However, as in many other fields, the field of health economics is difficult to define with precise lines. While healthcare services work to repair, protect and improve the defective aspects of the body; economics provides the resources needed to carry on these activities. The task of the health economics is to evaluate the effectiveness of a health services organization and to make recommendations for improving the organization. Health promotion includes much more than healthcare professional services. Health promotion includes many factors such as food, housing, comfort and clothing, but these factors are very important to health and should be excluded from the health economics scope. Health economics has been discussed in a broad sense, including social sciences and public administration, and narrowly in relation to organizational structures and alternative methods in payment systems for health services (Mushkin, 1958).

Although it is difficult to define the boundaries of health economics precisely, the figure put forward by Williams (1987) shows the basic elements of health economics, as well as its relationship with other fields. The figure below shows the scope of the health economics mentioned in detail. Accordingly, Culyer and Newhouse put the fields A, B, C and D shown in the figure at the center of health economics, and fields E, F, G and H suggested that health economics constitute the application areas. The content of each box in the figure may differ from country to country.

Figure 14. Scope of Health Economics



Source: (Williams, 1973).

According to the figure, field (A) is on the definition of health and the value of health. The fact that health does not consist of a single component, that is, it is affected by more than one factor, makes it difficult to define. However, according to WHO, health is the well-being of the whole body (physically, spiritually and socially). According to this definition, the importance of not only biological factors but also the environment and social impact is emphasized in the improvement of the living conditions of the individual.

Field (B) refers to the factors affecting health. Individuals' genetic characteristics, occupational and environmental risks, consumption habits, education level, income level, living conditions and the family's illness history significantly affect the individual's health. When evaluated from this point of view, the socio-economic level of individuals and societies also affects the health expenditures in that country. That’s why, it is important to identify these factors that are affecting individual’s health and to improve them on site. These detection and improvement methods depend on the data obtained and the econometric analysis used in the processing of these data.

However, in the underdeveloped and developing countries, this situation can be achieved by simple methods on the contrary.

Field (C) shows the demand for health care. According to Grossman (1972), the individual demands health for two reasons. The fact that health services provide benefits to the individual as well as other goods and services and seeing it as an investment in the future of the individual affects the demand for health. However, another factor that determines the demand for healthcare services is the organization and financing structure of the healthcare system. The financing structure that shapes the health system (taxes and / or insurance premiums and financing, weight of out-of-pocket payments, etc.), health insurance application (voluntary or compulsory) and service reimbursement methods determine the demand for health services. Pauly (1986) states that social unrest may arise due to the individuals not avoiding the unhealthy lifestyle (smoking, excessive alcohol consumption, etc.). As can be seen, although the demand for healthcare services is affected by many factors, these factors may increase or decrease over time.

Field (D) represents the supply of health services. When considered at the sector level, health services are provided in four different forms: preventive healthcare services, therapeutic healthcare services, rehabilitation and promotion of health services. Among these services, it is known that therapeutic healthcare services are more expensive than other services. Both the interventions performed during the treatment and the costs arising from the loss of workforce are the main factors in the cost of this service. Considering the increase in chronic diseases in the world, technological developments (medical and pharmaceutical) and healthcare personnel, supply to the health sector becomes even more important.

Field (E) considers health services as a market area and includes analysis related to it. As in all areas of the economy, resource scarcity has been taken into account in this analysis, and the effect of individuals' behavior on the price is also tried to be measured.

Field (F) plays an important role in determining the priorities (action or intervention) within health services, given the limited resources. Priorities, on the other hand, are not determined randomly, but are addressed in terms of their economic impact with various evaluation methods developed (Drummond, et.al. 2003).

Field (G) examines the health system in such a way as to reveal the efficiency of the supply conditions of the system such as health outcomes, budget, working conditions and related regulations, and distribution of labor force. Considering the level/distribution of the budget allocated for health services and the organizational structure of the system in terms of suppliers,

it is important whether it provides efficiency or not and whether it creates willingness for suppliers.

Finally, field (H) includes the definition of the goals of the health system and performance evaluation (Maynard and Kanavos, 2000). This evaluation requires national and international comparisons. However, the fact that the data is quantitatively and qualitatively different or incomplete makes this comparison difficult. Some of the criteria that are frequently preferred to make a comparison regarding the performance of the health system are life expectancy at birth, infant mortality rate and child mortality rate. Among these criteria, infant mortality rate is widely accepted as it reflects the level and quality of the health system better (Nixon and Ulmann, 2006).

3.3. HISTORICAL DEVELOPMENT OF HEALTH ECONOMICS

Health economics has been accepted by the pharmaceutical industry, academic scientists dealing with pharmaceuticals and pharmacy practices all over the world and has become a discipline. The first studies on health economics were carried out by Milton Friedman and started with the analysis studies on the income of health workers (Friedman and Kuznets, 1954: 3). Then, in 1932, Ray Lyman Wilbur examined the health services applied in America and evaluated the effectiveness of the delivery methods and payment systems (Wilbur, 1932). In 1939, the Medical Economics Office was established by the American Medical Association and economically important issues were studied by medical professionals.

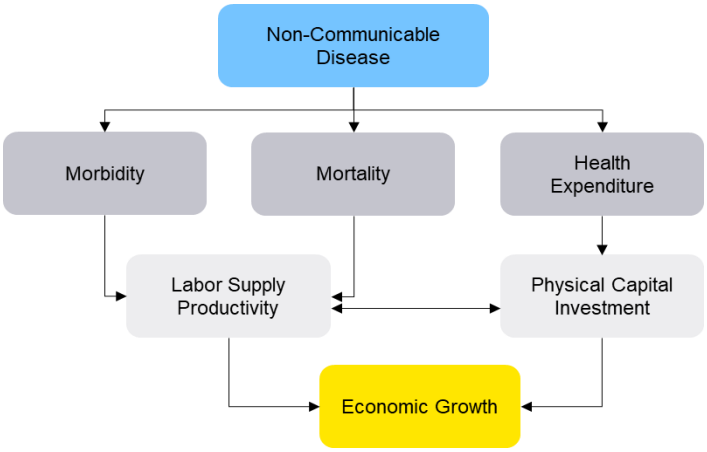
The foundations of today's health economics were laid by Selma Mushkin in 1958 with her study on health economics and the areas it covers. In her study, she emphasized the rapid development of medical technology and the cost it brings, and systematically examined issues such as the healthcare market and the price of the services. By the end of the 1960s, changes in the socio-economic structure of industrially developed societies, especially the United States, brought the need for innovation and technological development in the service sector. These newly developing needs have led to very important developments in the health sector. The book "Uncertainty and The Welfare Economics of Medical Care", written by Kenneth Arrow in 1963, brought a scientific perspective to health economics and is regarded as one of the masterpieces of health economics. In the 1980s, new technological developments were experienced in health measurement and interest in health economics increased. This increase in interest can also be seen from the researches and publications carried out in that period.

3.4 ECONOMIC DIMENSION OF HEALTH

The importance of health was mentioned in previous chapters. Accordingly, health has a critical importance in terms of sustaining human life and increasing productivity. From this point of view,

health is a fundamental source of life and is the most basic need of people. Grossman (1999) made pioneering studies on health demand and reached several important conclusions. Accordingly, individuals see healthcare services as both a consumption good and an investment in the future. It is considered as a consumption good in terms of individuals preferring to be healthy and fulfilling their basic functions. On the other hand, the increase in the health stock of the person is seen as an investment since it will directly affect the economic activities in which he/she will be involved. Grossman's Health Demand Model, which treats health as a capital stock, deals with the fact that the person has a health stock since the first birth and that there is an increasing decrease in this stock as the age gets older and this affects the life of the person. The person also demands health in order to slow the decrease in the health stock.

Figure 15. Relation of Non-Communicable Disease with Economic Growth



There is a positive relationship between health expenditures made in a country and the economic growth of the country. It is thought that the healthy society will live longer, the neonatal mortality rate will be lower, it will be more productive, and it can spend longer time to develop themselves (Bloom & Canning, 2000). In 1996, Hansen and King (1996) examined the effect of health expenditures on economic growth specific to OECD countries and it was found that the level of health expenditures was affected by GDP. Bharvaga (et.al. 2001) analyzed approximately 25 years of growth and health data from 92 countries and observed the positive relation between life expectancy and economic growth in low-income countries. As the development level of the countries increases, more resources are allocated for health services.

As in other services, health services are also economically evaluated and thus the costs and results of the service are measured, evaluated and compared. There are various methods used in making this evaluation:

- Cost Minimization Analysis: This analysis involves comparing costs between alternatives that give equal results. It also enables to compare the cost of treatments and interventions where there are more than one alternative/equal effective options (Drummond et al. 2005).
- Cost Benefit Analysis: This analysis is based on measuring the costs and monetary benefits of alternatives. Since it is not always possible to measure health benefits in monetary terms, willingness to pay and human capital approach are widely used. It is a method which is commonly used to estimate the indirect cost due to productivity loss. Value of the human is estimated according to his average future earnings. Moreover, in this approach, period of absence which is caused by illness is also taken into account and the impact of being illness on productivity is being concerned (Robinson 1993).
- Cost Utility Analysis: This analysis means comparing two or more alternatives in terms of both cost and result (QALY). Cost utility analysis is a frequently used method in evaluating the cost-effectiveness of healthcare alternatives. It is important to measure the effect of health services on the quality of life (Berger et al. 2003). In other words, the purpose of this analysis is to estimate the increase in life expectancy and gain in quality of life by giving a patient a treatment and to evaluate its cost.
- Cost Effectiveness Analysis: The purpose of this analysis is to choose the one with the lowest cost but the highest return among the determined alternatives in achieving the planned goals. The time frame considered must be long in order to carry out this analysis. This is necessary in order to measure the impact of technology developing every day on costs and results. Cost-effectiveness analysis evaluates the additional cost and added effectiveness of one medical intervention over another (Mrazek & Mossialos, 2003).

3.5 HEALTH EXPENDITURES AND FINANCING

It is seen that deaths and prevalence of chronic diseases have increased throughout the world. This situation, together with the pressure on health services, increases the expenditures on health and health services. While some of these expenditures are covered by national income, some of them are covered by individuals. Since the continuous increase in these expenditures has become a global issue, the search for financing to meet these expenditures has accelerated. This pursuit is necessary to ensure the continuity of health services as well as to ensure a reliable quality. In the following section, health expenditures and financing issues are discussed in detail.

3.5.1. Health Expenditures

Health expenditures include treatment, raising the awareness, protecting and improving the health of individuals. When evaluated in this respect, it can be said that there is a positive correlation

between health expenditures and the life expectancy and quality of individuals. It is known that health expenditures of states differ according to their development levels (Akar, 2014).

Every individual in the society, regardless of religion, race or gender, should have access to health services at the same level and this is the responsibility of a social state. It is thought that with the equality of opportunity for healthcare services in the society, both the life span and the period in which individuals are productive will increase (Kamacı & Yazıcı, 2017).

3.5.1.1 Total Health Expenditures

The share of health expenditures in a country's GNP can provide information about the country's level of development. With the share of total health expenditures in GDP, it can be understood how much of the total economic capacity of the country can be attributed to the production of healthcare services. It is known that the increase in health expenditures is a global problem. For example, the increase in health expenditures during the COVID-19 pandemic and the restriction of the production capacity of the countries caused great negative impact on country's economy. It should be considered normal that, under similar conditions/periods, the priority of use of resources is in the health sector.

3.5.1.2 Health Expenditures per Capita

Income per capita refers to the average welfare level of people living in a country. Similarly, health expenditures per capita vary widely according to the development level of the country. As mentioned earlier, health expenditures include both the protection of individuals' health and the coverage of their treatment. From this point of view, countries make a certain per capita health expenditure in order to provide basic health services. However, when the therapeutic services are added to this expenditure, the amount of expenditure increases. The fact that the amount of health expenditure made in a country is very low may indicate that the people living in that country are deprived of basic healthcare services. Similarly, the high per capita health expenditures of the country may indicate that the preventive health measures in the country are not effective and a different solution should be found.

3.5.1.3 Public Health Expenditures

Health expenditures made by the public consist of expenditures made by central and local governments and social security funds. The total share allocated to health expenditures in a country's budget expresses the importance that country attaches to the health of the society. The increase in the total share of health expenditures in the budget limits the country's investment in other areas and causes the current priorities to change. When the role of the public and private

sectors in the health system is examined, the increase in the share of the public in total health expenditures causes a decrease in private health expenditures (Çalışkan, 2009).

3.5.1.4 Private Health Expenditures

Most private health expenditures compose of out-of-pocket expenditures of individuals, expenditures made by companies to employees, private health insurances and expenditures of non-profit organizations serving individuals. It is important to know the share of the public and private sector in total health expenditures as well as the share of out-of-pocket payments in private health expenditures. This share means to what extent the state fulfills its responsibility to provide health care services to public. In addition, the ratio of these payments to the income of the individual as well as the out-of-pocket payments shows the quality of health services in the country. The increase in out-of-pocket health expenditures, especially in developing countries, in recent years draws attention to the insufficiency of countries' investments in the health sector.

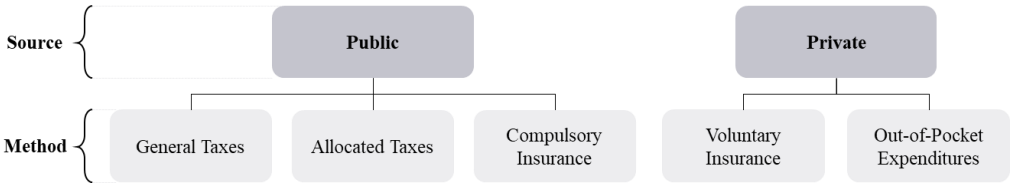
3.5.2. Financing Healthcare Services

Financing of healthcare services and health expenditures provide an idea of the development level of the countries. Increasing average life expectancy, developing technology and changes in the structure of diseases increase health expenditures and make pressure on the health system of countries. Considering the need of the state to provide uninterrupted and high-quality services to individuals, the financing of healthcare services becomes important. The main purpose of healthcare financing is to find the necessary resources to cover the costs of healthcare services and to protect society and individuals fairly from the financial burden of their healthcare needs.

Financing of healthcare services varies from country to country, and similar financing methods cause different results (such as payment method). For this reason, the financing methods discussed in the following section include certain principles in common, even if they do not produce the same results in all countries.

Financing healthcare services is a comprehensive concept. Every individual living in a country has the right to equal life and should have equal and high-quality access to healthcare services. Healthcare services should therefore be financed efficiently, effectively and consistently. Financing of healthcare services has become increasingly important in both developed and developing countries (Doorslaer & Wagstaff, 1998). The figure below shows alternative financing methods of healthcare services. Accordingly, healthcare services are divided into public and private as a source of financing, and then divided into sub-branches according to the method used. Details on these methods are given in the following section.

Figure 16. Alternative financing methods of healthcare services



Kaynak: Appleby (1992)

3.2.2.4 Financing with Taxes

State budget and taxes constitute the most important financial sources of health expenditures (Orhaner, 2006). Taxes, which have a large share in the shaping of the state budget, are the economic values determined and allocated according to the ability of individuals to pay in order to fulfill public services (Orhaner, 2017). A certain percentage of public revenue collected in this way is allocated to the financing of healthcare services through the general or local budget. According to the World Health Organization, the most common form of financing of health expenditures is provided by taxes.

Taxes are collected in two different ways. The first of these methods, direct tax, is collected on the income or profits of individuals or companies. Indirect taxes, another method, are taxes levied on the exchange of goods and services, that is, on the consumption of an individual. Examples of indirect taxes are value added tax and customs duty. According to Carrin (Carrin, 2003: 3), a strong tax infrastructure and institutional capacity are indispensable for a tax-financed healthcare system. In addition, in today's pandemic conditions or economic crisis periods, the production capacity of countries is restricted, and the consumption habits of individuals change. The decrease in production causes a decrease in income and indirectly a decrease in taxes collected. Such periods negatively affect the financing of the healthcare system.

3.2.2.2 Private Health Insurances

Institutions that make private health insurances make an assessment of the health risks of individuals or organizations and as a result of this evaluation, the institution is paid a premium. In other words, those who have any disease (such as diabetes, hypertension) or who have a high risk of getting sick (such as smoking, alcohol users) can pay more premiums than others in private health insurance.

The aforementioned situation is the opposite of the “flow of finances from good to bad health status” that should be in a good health financing system. In addition, high premiums from high-risk patients will cause the premiums to rise unnecessarily and then low-risk individuals will not pay these high premiums. As a result, especially the insurance company will have difficulties in

maintaining the balance of income and expenditure, and financing will be unsustainable in the future. For this reason, private health insurances are not used heavily in terms of financing, and they are preferred for financing the department that is not financed by public healthcare services.

3.2.2.3 Social Health Insurances

Social health insurance, which is different from private health insurance, guarantees the individual within the framework of the social solidarity principle without taking into account of the lives of individuals such as birth, death, sickness, disability, retirement and the previously unknown events such as accident, fire, earthquake, theft, flood that affect their assets and the financial effects that may be caused by these events. As in private health insurances, premium payment is not made according to the risk group of the individual. Financing healthcare services with social insurance ensures a continuous and predictable source of finance. Moreover, being continuous and predictable makes it easier to make various projections (employment policy, premium income, etc.) of the country and to take concrete steps accordingly. However, social health insurance can also cause various difficulties since it does not fully cover the personnel working in the agricultural and informal sector.

3.2.2.1 Out-of-Pocket Expenditures

Out-of-pocket expenditures alone are not enough as a healthcare financing method, as it is not known when and where the need for healthcare services will arise and how much it will cost. These types of expenditures are expenditures that individuals make directly out of their pockets that are not paid by a repayment agency or the government if they purchase any goods or services (Tatar, 2011).

Out-of-pocket expenditures stand out as a widely used healthcare financing method worldwide. However, the share of out-of-pocket expenditures in total health expenditures decreases with the expansion of coverage of social health insurance and the increase in the share of health expenditures in the state budget. It is thought that out-of-pocket expenditures will both prevent unnecessary demand and create additional resources (Tatar, 2011: 114). It is recommended that such payments be used only in compulsory situations, considering the income level of the individual.

3.6 HEALTH EXPENDITURES OF TURKEY

The Health Transformation Program (HTP) was put into effect in 2003, and the Turkish health system has undergone a radical change. With the innovations realized in many related fields from service provision to financing, from labor force to information technologies, high quality and

sustainable health services were tried to be provided to individuals and to a large extent, it was successful (OECD, 2014). In addition, within the scope of the program, hospitals of other public institutions, especially Social Security Institution hospitals, have been transferred to the MoH.

With Health Transformation Program, public resources have been used more efficiently, and financial sustainability has been guaranteed with the medium-term financial plan. Before the program came into force, that is, the satisfaction rate from healthcare services, which was 39.5% in 2002, reached 74.8% at the end of 2012 (TURKSTAT, 2019). Again, in this period, it is seen that there were significant improvements in basic indicators such as life expectancy at birth, maternal mortality rate and infant mortality rate.

Figure 17. Health Expenditures of Turkey (2010-2019)

Source: (TURKSTAT, 2019)

The figure above shows the amount of total health expenditure in Turkey between the years of 2010-2019 (TURKSTAT, 2019). Accordingly, total health expenditure increased by 21.7% in 2019 compared to 2018 and reached 201 billion TL. In 2019, state health expenditure increased by 22.5% and reached 157 billion TL (78% of all expenditure). Private sector health expenditure is estimated as approximately 44 billion TL (22% of all expenditure) with an increase rate of 18.8%. It is seen that government expenditures increased at a higher rate within the total health expenditure. The impact of increase in the coverage of the insurance system cannot be denied. While the share of government spending was 62% in 2000, this rate increased and exceeded the OECD country averages. (OECD, 2015).

When the distribution of total health expenditure by health service providers is examined, hospitals are in the first place with 48.2%. Hospitals are followed by retailers and other medical supplies with 25.8% and outpatient care providers with 11.9%, respectively.

Out-of-pocket health expenditures made by households for treatment purposes increased by 17.4% in 2019 compared to the previous year and reached 33 billion TL. The burden on households in the form of out-of-pocket spending has almost halved since the early 2000s, reaching 22% in 2013 and 16.7% in 2019.

CHAPTER 4:

METHODOLOGY

The concept of cost deals with the resources used or consumed in the creation of a product or service. In the healthcare services, there are various treatment methods that can be considered as products. These can be exemplified as treatments that heal, prevent, or alleviate the disease. Personnel, equipment, facilities and allowances are some of the fundamental resources which used to provide these care services. When evaluated from this aspect, healthcare services can be regarded as an intermediate product since they create a treatment service as a product by using different resources. Therefore, when calculating the cost of treating a disease, the cost of any resource required for that treatment should be considered.

There are multiple ways to analyse costs from a healthcare service perspective. In conducting these analyses, direct and indirect costs are frequently used. Direct costs refer to hospital expenses, drug expenditures, doctor examination and laboratory test fees and other similar resources that are spent to perform the interventions. Indirect costs are related to the morbidity and mortality of the disease. Examples include reduced patient productivity, morbidities, lost gains due to early death of the patient, and future costs that may arise with the patient's recovery.

The quality of a country's workforce, in other words its human capital, is one of the most important actors in the development of that country. The quality of human capital refers to the level of experience, knowledge and other elements of individuals in the workforce. Thanks to the country's investment in human capital, the country's economic welfare level can improve, the workforce can have qualified knowledge and experience, and the society can develop socially (OECD, 1998). In order for the country to reach a higher level of economic and social welfare, it should invest in human capital. This investment should be made in the field of health as well as in education.

Romeder's study in 1977 measured the impact of premature mortality on monetarily value of potential years of lost (MVYLL) by the help of human capital approach (age adjusted). Study is conducted by ages between ages 1 and 70 in order to give a broad view of the relative importance of the mortality (Romeder, 1977). Moreover, in order to examine the effect of EVD in the Democratic Republic of Congo, MVYLL due to EVD is measured by the help human capital approach (Kirigia et al, 2019). During the estimation, future losses were discounted at 3%

discount rate. Similar approaches to MVYLL are also observed in the studies of Musango et al. (2020) and Bloom et al. (2018).

This thesis uses the human capital approach (a way of estimating indirect costs of maternal deaths) to monetarily value potential years of life lost (PYLL) due to NCD diseases in Turkey. OECD defines human capital as knowledge, skills, abilities, and other characteristics that are relevant for economic activity where PYLL is the summary measure of premature mortality which emphasizes the impact of preventable deaths occurring at younger ages to the economy.

The MVYLL due to non-communicable disease (circulatory, endocrine and respiratory) deaths in Turkey is the sum of the potential non-health GDP lost among those aged 0-14 ($MVYLL_{0-14}$), those aged 15-24 ($MVYLL_{15-24}$), those aged 25-34 ($MVYLL_{25-34}$), those aged 35-44 ($MVYLL_{35-44}$), those aged 45-54 ($MVYLL_{45-54}$), those aged 55-64 ($MVYLL_{55-64}$) and those aged 65-74 ($MVYLL_{65-74}$).

The MVYLL among these people which are categorized by age range is equal to the product of the total discounted years of potential years of lost, per capita non-health GDP in purchasing power parity ($NHGDP_{Int\$}$) and the total number of non-communicable disease deaths (NCDD) for that age groups. Turkey's discounted total non-health GDP loss attributable to NCD deaths ($MVYLL_{TUR}$) is calculated using the equations (a) and (b).

(a) $$MVYLL_{TUR} = MVYLL_{0-14} + MVYLL_{15-24} + MVYLL_{25-34} + MVYLL_{35-44} + MVYLL_{45-54} + MVYLL_{55-64} + MVYLL_{65-74}$$

(b) $$MVYLL_{\text{i}} = \sum_{t=1}^{n}\{[1/(1+r)^t] \times [NHGDP] \times [NCDD_i]\} = \{[(1/(1+r)^1] \times [NHGDP] \times [NCDD_i]\} + \{[(1/(1+r)^2] \times [NHGDP] \times [NCDD_i]\} + \cdots + \{[(1/(1+r)^n] \times [NHGDP] \times [NCDD_i]\}$$

Since the change of MVYLL over 5 years (2013-2017) is also an important topic, the equations shown above are applied for all these years. When the equation shown in (b) is analysed deeply, 1/(1 + r)^t represents the discount factor which is used in calculation of the present value of GDP losses in dollars. "r" represents the interest rate, i.e. 3% in this study. $\sum_{t=1}^{n}$ is the summation from year "t" to "n" where "t" is the first year of life lost and "n" is the final year of the total number of YLL per NCD death within the age groups, which is obtained by subtracting the age groups average age death for NCD related causes from the Turkey's life expectancy at birth. NHGDP is non-health GDP per capita, which is obtained by subtracting current health

expenditure (per capita in $) from GDP (per capita in $). $NCDD_i$, which is the last component of the equation, is the total number of non-communicable disease deaths occurring in age group i, where

i = 1 consists of people between 0–14 years,

i = 2 consists of people between 15–24 years,

i = 3 consists of people between 25–34 years,

i = 4 consists of people between 35–44 years,

i = 5 consists of people between 45– 54 years,

i = 6 consists of people between 55–64 years and

i = 7 consists of people between 65–74 years in Turkey.

The equations are calculated by taking 3% discount rates. The average monetary value per NCD death was obtained by dividing $MVYLL_{TUR}$ by the total number of NCD deaths.

Based on the data of The Turkish Statistical Institute (TURKSTAT), Turkey's average life expectancy between 2013-2017 are 76.3 years, 78 years, 78 years, 78.3 years and 78.6 years respectively. In the light of these years, the i'th age group undiscounted potential years of life lost (YLL) from NCD equals to the average life expectancy at birth for Turkey minus the average age at death for i'th age group, where i = 1,2,3,…,7. To be shown more simply, equation (c) is used in the estimation of undiscounted potential years of life lost.

$$\text{(c) } YLL_i = [(TUR\ Life\ Expectancy) - ((age1 + age2)/2)]$$

In order to calculate discounted/present value of YLL (PVYLL), YLL's which are estimated by the formula given above were discounted at a rate (r) of 3% using the following equation below:

$$\text{(d) } PVYLL_{\text{i}} = \sum_{t=1}^{n} YLL_i \times\ [1/(1+r)^n]$$

For instance, the first YLL would be discounted as 0.9708 and for the second YLL would 0.9425. This calculation is calculated up to the nth year and the sum of these years is equal to $PVYLL_i$ of NCD in Turkey.

Equations were re-calculated with 5% and 10% discount rates in order to determine the sensitivity of the $MVYLL_i$. Sensitivity analysis is used in the evaluation of the robustness of $MVYLL_i$ by considering the effects of uncertainty (life expectancy at birth). As the conclusions remain unchanged, results are regarded as robust.

While calculating MYVLL, various sources were used, and care was taken to ensure that these sources were reliable. Turkey's life expectancy at birth and the distribution of circulatory,

endocrine and respiratory deaths by different age groups over the years 2013 and 2017 were obtained from TURSTAT. Turkey's current health expenditure, GDP and world average life expectancy were obtained from the World Bank Database

CHAPTER 5:

RESULT

Health expenditure is used to quantify the final consumption of healthcare goods and services in a period. Not only personal health care goods and services such as rehabilitative and long-term care, but also collectivist good and services are included in the estimation of health expenditure. Estimation is done by excluding spending on investments. Figure 18 shows the health expenditure per capita of Turkey (Int$) and its change between 2013 and 2017. According to the figure, health expenditure per capita, which was Int$551,401 in 2013, decreased by 19.73% in 2017 to Int$442,618.

Figure 18. Health expenditure per capita of Turkey over years (Int$)

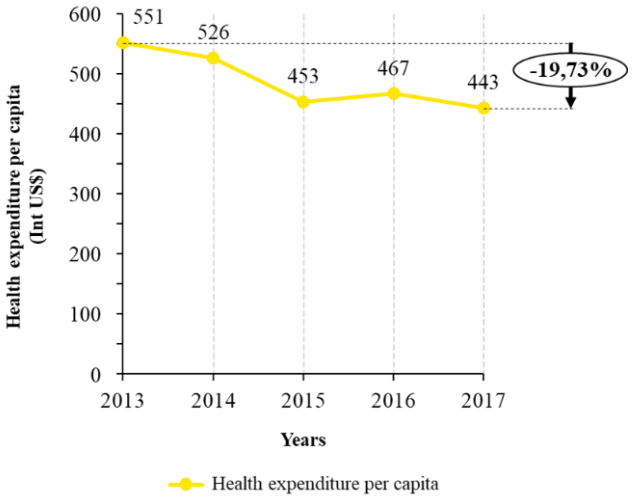
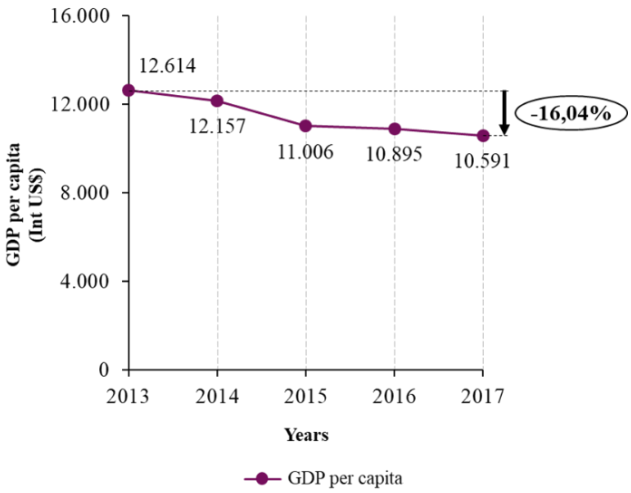


Figure 19 represents the GDP per capita of Turkey (Int$) and its change between 2013 and 2017. According to World Bank, in 2013, GDP per capita was around Int$12.614 where Int$10.591 in 2017. Turkey has seen a sustained period of high growth since 2010 on average of 6% growth per year between these years. With health spending growth estimated to have continued below economic growth, health spending as a share of GDP has also declined from 4.37% in 2013 to 4.18% in 2017.

Figure 19. GDP per capita of Turkey over years (Int$)

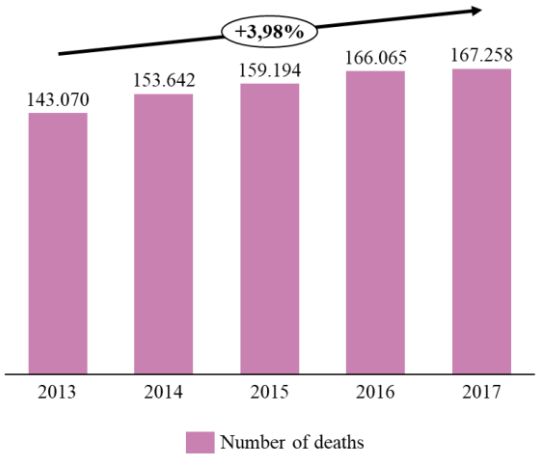


Per capita health expenditure across the OECD increased slightly from 2013 to 2017 and continuing a trend of recent years. Compared with OECD per capita health expenditure with per capita health expenditure of Turkey, it is much higher than Turkey.

Health expenditure per capita and GDP per capita measures were used in the estimation of the monetary value of potential years of lost (MVYLL) due to circulatory, respiratory and endocrine diseases deaths in Turkey. The following part includes the estimation results of disease specific MVYLL between 2013 and 2017 and the sensitivity analysis using 5% and 10% discount rates.

Findings of Circulatory Disease

Figure 20. Number of people who died from circulatory disease in Turkey



As can be seen in Figure 3, the number of deaths from circulatory disorders increased by 3,98% from 2013 to 2017. Increasing death rates from 2013 to 2017 resulted in total MVYLL of Int$7.245.520.384; Int$8.327.440.424; Int$7.692.847.596; Int$8.038.188.998; and Int$8.290.212.788 assuming Turkey's life expectancy of 76.3 years, 78 years, 78 years, 78,3

years and 78,6 years, respectively.

Out of the total MVYLL during these years, on average, about 2,2% occurred among 0–14-year-old; 1,4% among 15–24-year-old; 2.7% among 25–34-year-old; 8.3% among 35–44-year-old; 21.3% among 45–54-year-old; 34.0% among 55–64-year-old; and 30.1% among 65–74-year-old. Thus, 67.8% of the MVYLL ensued among 15-59 years; which coincides with the period when people are the most productive.

Table 4. MVYLL from circulatory disease in Turkey discounted at 3% (Int$)

Age Group	MVYLL assuming TUR average life expectancy & 3% discount rate (Int$)									
	2013		2014		2015		2016		2017	
0-14	170.699.764	2,4%	197.641.740	2,4%	151.232.317	2,0%	171.406.084	2,1%	162.060.362	2,0%
15-24	113.199.709	1,6%	112.536.741	1,4%	101.815.000	1,3%	117.999.127	1,5%	114.452.613	1,4%
25-34	217.874.917	3,0%	222.180.478	2,7%	207.981.494	2,7%	220.017.871	2,7%	205.238.427	2,5%
35-44	650.772.905	9,0%	684.138.678	8,2%	623.797.746	8,1%	655.604.075	8,2%	669.432.326	8,1%
45-54	1.653.602.378	22,8%	1.766.989.189	21,2%	1.600.794.881	20,8%	1.695.584.123	21,1%	1.693.856.022	20,4%
55-64	2.511.081.681	34,7%	2.808.981.554	33,7%	2.611.116.570	33,9%	2.725.721.699	33,9%	2.815.384.170	34,0%
65-74	1.928.289.030	26,6%	2.534.972.044	30,4%	2.396.109.589	31,1%	2.451.856.019	30,5%	2.629.788.870	31,7%
75-84	0	0,0%	0	0,0%	0	0,0%	0	0,0%	0	0,0%
Total	**7.245.520.384**		**8.327.440.424**		**7.692.847.596**		**8.038.188.998**		**8.290.212.788**	

Table 5 presents MVYLL from circulatory disease discounted at a 5% rate. The application of 5% discount rate holding life expectancy constant between 2013 and 2017 reduced the MVYLL by Int$1.099.887.321 (−15.2%), Int$1.322.602.547 (−15.9%), Int$1.209.526.576 (−15.7%), Int$1.273.901.898 (−15.8%) and Int$1.345.958.530 (−16.2%) respectively.

Table 5. MVYLL from circulatory disease in Turkey discounted at 5% (Int$)

Age Group	MVYLL assuming TUR average life expectancy & 5% discount rate (Int$)				
	2013	2014	2015	2016	2017
0-14	113.672.655	130.927.355	100.183.530	113.547.600	107.356.546
15-24	78.495.584	77.490.376	70.107.616	81.251.658	78.542.597
25-34	157.237.029	158.959.837	148.801.122	157.412.592	146.222.650
35-44	493.226.375	513.059.799	467.807.999	491.660.691	499.458.508
45-54	1.329.700.181	1.402.935.300	1.270.982.109	1.346.241.864	1.336.574.477
55-64	2.166.571.416	2.387.450.668	2.219.278.368	2.316.685.234	2.375.404.792
65-74	1.806.729.822	2.334.014.543	2.206.160.277	2.257.487.462	2.400.694.688
75-84	0	0	0	0	0
Total	**6.145.633.062**	**7.004.837.877**	**6.483.321.021**	**6.764.287.100**	**6.944.254.258**

Table 6 presents MVYLL from circulatory disease discounted at a 10% rate. The application of 10% discount rate holding life expectancy constant between 2013 and 2017 reduced the MVYLL by Int$2.807.973.679 (18.8%), Int$3.357.882.547 (40.3%), Int$3.080.671.970 (40%), Int$3.237.027.016 (40.3%) and Int$3.410.924.313 (41.1%) respectively.

Table 6. MVYLL from circulatory disease in Turkey discounted at 10% (Int$)

Age Group	MVYLL assuming TUR average life expectancy & 10% discount rate (Int$)				
	2013	**2014**	**2015**	**2016**	**2017**
0-14	58.785.831	67.501.183	51.650.832	58.540.840	55.348.967
15-24	41.777.656	41.011.855	37.104.523	43.002.517	41.459.984
25-34	86.843.059	87.027.711	81.465.993	86.180.622	79.726.294
35-44	288.436.080	296.031.771	269.921.812	283.684.642	286.371.448
45-54	847.384.614	876.386.035	793.957.477	840.970.762	827.099.615
55-64	1.564.032.472	1.675.034.966	1.557.045.310	1.625.385.950	1.644.149.253
65-74	1.550.286.992	1.926.564.357	1.821.029.679	1.863.396.650	1.945.132.914
75-84	0	0	0	0	0
Total	**4.437.546.705**	**4.969.557.878**	**4.612.175.626**	**4.801.161.982**	**4.879.288.475**

Findings of Respiratory Disease

Figure 21. Number of people who died from respiratory disease in Turkey

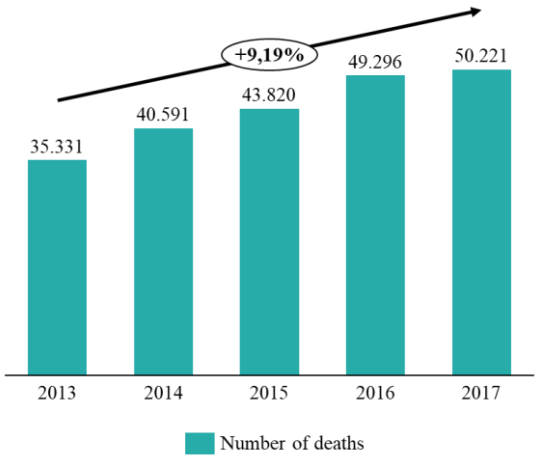


Table 7 presents MVYLL from respiratory disease in Turkey between 2013 and 2017 discounted at a 3% rate. As can be seen in Figure 21, the number of deaths from respiratory disorders increased by 9,19% from 2013 to 2017. Increasing death rates from 2013 to 2017 resulted in total MVYLL of Int$1.839.867.838; Int$2.100.991.989; Int$2.096.928.144; Int$2.347.644.351; and Int$2.280.788.614 assuming Turkey's life expectancy of 76.3 years, 78 years, 78 years, 78,3 years and 78,6 years, respectively.

Out of the total MVYLL during these years, on average, about 11,6% occurred among 0–14-year-old; 3% among 15–24-year-old; 3.2% among 25–34-year-old; 5.5% among 35–44-year-old; 13.8% among 45–54-year-old; 30.1% among 55–64-year-old; and 32.9% among 65–74-year-old. Thus, 55.6% of the MVYLL ensued among 15-59 years; which coincides with the period when people are the most productive.

Table 7. MVYLL from respiratory disease in Turkey discounted at 3% (Int$)

Age Group	MVYLL assuming TUR average life expectancy & 3% discount rate (Int$)									
	2013		2014		2015		2016		2017	
0-14	256.049.645	13,9%	237.442.228	11,3%	226.848.475	10,8%	253.449.209	10,8%	249.620.448	10,9%
15-24	52.696.416	2,9%	63.262.179	3,0%	59.127.691	2,8%	80.946.261	3,4%	64.763.430	2,8%
25-34	62.463.454	3,4%	61.129.020	2,9%	73.860.095	3,5%	75.095.920	3,2%	64.703.161	2,8%
35-44	108.242.681	5,9%	111.712.128	5,3%	115.122.491	5,5%	141.207.032	6,0%	114.349.782	5,0%
45-54	273.228.249	14,9%	283.512.717	13,5%	300.000.525	14,3%	321.896.813	13,7%	282.763.732	12,4%
55-64	565.644.938	30,7%	629.337.288	30,0%	622.952.325	29,7%	712.984.770	30,4%	679.460.196	29,8%
65-74	521.542.455	28,3%	714.596.429	34,0%	699.016.543	33,3%	762.064.346	32,5%	825.127.866	36,2%
75-84	0	0,0%	0	0,0%	0	0,0%	0	0,0%	0	0,0%
Total	**1.839.867.838**		**2.100.991.989**		**2.096.928.144**		**2.347.644.351**		**2.280.788.614**	

Table 8 and Table 9 present the results of sensitivity analysis of using 5% and 10% discount rates respectively. Re-analysis of the model with a discount rate of 5%, while holding Turkey's life expectancy constant between 2013 and 2017, reduced the MYVLL by Int$ 309.286.431 (16.8%), Int$354.682.614 (16.9%), Int$355.498.244 (17.0%), Int$401.166.735 (17.1%) and Int$389.926.925 (17.1%).

Table 8. MVYLL from respiratory disease in Turkey discounted at 5% (Int$)

Age Group	MVYLL assuming TUR average life expectancy & 5% discount rate (Int$)				
	2013	2014	2015	2016	2017
0-14	170.508.983	157.293.104	150.275.295	167.896.895	165.360.540
15-24	36.541.048	43.560.974	40.714.055	55.737.852	44.443.616
25-34	45.078.929	43.734.982	52.843.475	53.727.651	46.097.935
35-44	82.038.058	83.776.877	86.334.429	105.896.149	85.315.527
45-54	219.709.198	225.100.414	238.191.229	255.576.211	223.120.964
55-64	488.040.737	534.895.548	529.468.747	605.990.439	573.276.295
65-74	488.664.454	657.947.476	643.602.670	701.652.419	753.246.813
75-84	0	0	0	0	0
Total	**1.530.581.406**	**1.746.309.375**	**1.741.429.900**	**1.946.477.616**	**1.890.861.689**

Re-estimation of the model with a 10% discount rate, holding the Turkey's life expectancy constant, decreased the MVYLL by Int$747.735.161 (40.6%), Int$865.572.515 (41.2%), Int$867.641.586 (41.4%), Int$977.086.730 (41.6%) and Int$952.846.543 (41.8%) respectively.

Table 9. MVYLL from respiratory disease in Turkey discounted at 10% (Int$)

Age Group	MVYLL assuming TUR average life expectancy & 10% discount rate (Int$)				
	2013	2014	2015	2016	2017
0-14	88.178.747	81.094.364	77.476.248	86.561.277	85.253.629
15-24	19.448.219	23.054.687	21.547.952	29.499.311	23.460.284
25-34	24.897.393	23.944.132	28.930.872	29.414.943	25.134.393
35-44	47.975.406	48.338.649	49.814.337	61.101.307	48.916.838
45-54	140.015.168	140.615.793	148.793.367	159.653.422	138.071.814
55-64	352.313.132	375.282.622	371.475.179	425.162.785	396.796.283
65-74	419.304.612	543.089.228	531.248.603	579.164.575	610.308.831
75-84	0	0	0	0	0
Total	**1.092.132.677**	**1.235.419.475**	**1.229.286.558**	**1.370.557.621**	**1.327.942.071**

Findings of Endocrine Disease

Figure 22. Number of people who died from endocrine disease in Turkey

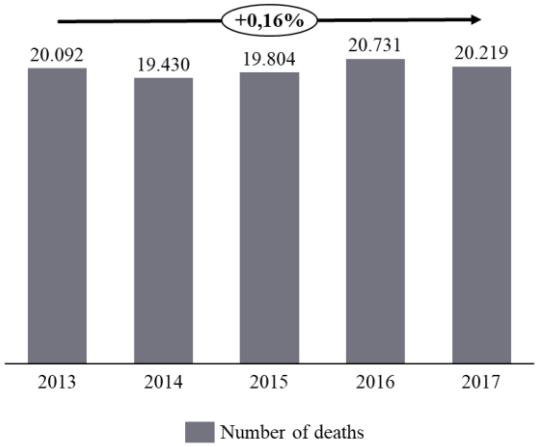


Table 10 presents MVYLL from endocrine disease in Turkey between 2013 and 2017 discounted at a 3% rate. As can be seen in Figure 22, the number of deaths from endocrine disorders increased by 0,16% from 2013 to 2017. Increasing death rates from 2013 to 2017 resulted in total MVYLL of Int $1.310.477.355; Int$1.339.350.343; Int$1.170.972.058; Int$1.226.218.341; and Int$1.200.128.214 assuming Turkey's life expectancy of 76.3 years, 78 years, 78 years, 78,3 years and 78,6 years, respectively.

Out of the total MVYLL during these years, on average, about 11,6% occurred among 0–14-year-old; 1,7% among 15–24-year-old; 2.1% among 25–34-year-old; 5.3% among 35–44-year-old; 16.2% among 45–54-year-old; 33.4% among 55–64-year-old; and 29.6% among 65–74-year-old. Thus, 58.7% of the MVYLL ensued among 15-59 years; which coincides with the period when people are the most productive.

Table 10. MVYLL from endocrine disease in Turkey discounted at 3% (Int$)

Age Group	MVYLL assuming TUR average life expectancy & 3% discount rate (Int$)									
	2013		2014		2015		2016		2017	
0-14	165.452.845	12,6%	174.509.832	13,0%	125.306.777	10,7%	139.991.801	11,4%	124.661.817	10,4%
15-24	23.420.629	1,8%	22.253.028	1,7%	16.151.955	1,4%	22.801.764	1,9%	22.611.370	1,9%
25-34	29.289.084	2,2%	29.976.731	2,2%	25.331.079	2,2%	26.349.446	2,1%	20.963.824	1,7%
35-44	77.955.799	5,9%	66.451.711	5,0%	62.664.614	5,4%	63.097.494	5,1%	61.110.005	5,1%
45-54	233.764.342	17,8%	221.746.667	16,6%	189.505.282	16,2%	189.615.812	15,5%	181.498.484	15,1%
55-64	441.242.448	33,7%	440.088.174	32,9%	387.095.492	33,1%	413.505.349	33,7%	403.111.494	33,6%
65-74	339.352.207	25,9%	384.324.199	28,7%	364.916.860	31,2%	370.856.674	30,2%	386.171.220	32,2%
75-84	0	0,0%	0	0,0%	0	0,0%	0	0,0%	0	0,0%
Total	**1.310.477.355**		**1.339.350.343**		**1.170.972.058**		**1.226.218.341**		**1.200.128.214**	

Table 11 presents MVYLL from endocrine disease discounted at a 5% rate. The re-estimation of the model with a 5% discount rate incised the MVYLL by Int$217.196.827 (16.6%),

Int$233.178.764 (17.4%), Int$196.267.663 (16.8%), Int$208.150.390 (17%) and Int$205.640.071 (17.1%).

Table 11. MVYLL from endocrine disease in Turkey discounted at 5% (Int$)

Age Group	MVYLL assuming TUR average life expectancy & 5% discount rate (Int$)				
	2013	2014	2015	2016	2017
0-14	110.178.619	115.603.671	83.009.210	92.737.274	82.581.958
15-24	16.240.466	15.322.956	11.121.888	15.700.803	15.516.952
25-34	21.137.488	21.446.962	18.123.214	18.851.807	14.935.731
35-44	59.083.370	49.834.489	46.994.411	47.319.043	45.593.723
45-54	187.975.352	176.060.062	150.461.390	150.549.148	143.215.384
55-64	380.705.767	374.046.175	329.005.859	351.452.512	340.114.498
65-74	317.959.467	353.857.263	335.988.422	341.457.364	352.529.896
75-84	0	0	0	0	0
Total	**1.093.280.528**	**1.106.171.579**	**974.704.395**	**1.018.067.952**	**994.488.143**

Table 12 presents MVYLL discounted at a rate of 10%. Re-analysis of the model, while holding Turkey's life expectancy constant between 2013 and 2017, reduced the MYVLL by Int$531.178.967 (40.5%), Int$566.647.620 (42.3%), Int$483.096.352 (41.3%), Int$510.000.003 (41.6%) and Int$505.406.231 (42.1%).

Table 12. MVYLL from endocrine disease in Turkey discounted at 10% (Int$)

Age Group	MVYLL assuming TUR average life expectancy & 10% discount rate (Int$)				
	2013	2014	2015	2016	2017
0-14	56.978.890	59.600.872	42.796.404	47.811.825	42.576.129
15-24	8.643.653	8.109.689	5.886.270	8.309.665	8.190.875
25-34	11.674.376	11.741.834	9.922.140	10.321.033	8.143.543
35-44	34.551.631	28.754.138	27.115.433	27.302.744	26.141.792
45-54	119.791.982	109.981.251	93.990.265	94.045.086	88.624.608
55-64	274.828.781	262.430.730	230.830.453	246.579.020	235.412.087
65-74	272.829.075	292.084.209	277.334.741	281.848.966	285.632.949
75-84	0	0	0	0	0
Total	**779.298.388**	**772.702.723**	**687.875.706**	**716.218.338**	**694.721.983**

Discussion

Using human capital model approach, this study has predicted that the MVYLL by reason of circulatory disease, respiratory disease and endocrine disease between 2013 and 2017. It is identified that these three chronic diseases cause large increases in deaths among these years. Increasing tobacco and alcohol consumption, unbalanced diet and physical inactivity in Turkey, has shown its effects on the frequency and mortality of chronic diseases. According to the results obtained, MVYLL owing to these NCDs has been increasing since 2013 and mainly ensued among 15-59 years; which coincides with the period when people are the most productive.

Number of deaths, increase in the hospitalization costs and life expectancy are some of the main drivers of the MVYLL estimates.

When the literature is reviewed, according to the findings of WHO (2017b) and Ünal et al. (2013), coroner artery disease is responsible for most of the premature deaths in Turkey. According to WHO (2017b), ischemic heart diseases has a burden of around €49 billion a year to European economy whose share is around 2.7% of total healthcare expenditure. Balbay (2018) found that cardiovascular disease will increase its prevalence and mortality rate in the next twenty years in Turkey. They also found that indirect costs of cardiovascular disease will rise in the future, which is consistent with the results achieved in this study. Moreover, projections show that prevalence and mortality rate of CVD will rise between the ages 25-54 which is considered the most productive ages in human life.

Bhutani (2014), in his study, worked on The Global Burden of Disease (GBD) data in order to find the direct and indirect cost of diabetes. It is found that, risk factors of diabetes are increasing, and it is one of the main cause of deaths. Moreover, the prevalence of the disease will rise which means that its burden on the economy will also rise. Bommer et al. (2017) used human-capital approach in his study in order to estimate the indirect cost of diabetes. He found that indirect costs are responsible from the thirty-five percent of the burden of diabetes. Additionally, diabetes decreases the labor-force productivity at a rate of 49% and increase the mortality (around 46%). In 2018, American Diabetes Association (ADA) conducted a study by using data that were obtained from national surveys. It is presented that in the United States, most of the indirect costs were due to disabilities which is raised from disease. Another study used the human capital approach with the data from Poland's administrative database and found that most of the indirect costs were due to absenteeism and presenteeism (Torój & Mela, 2018). Bermudez et al. (2017) found that individual with diabetes have higher likelihood of attempting medical spending compared to individuals without the disease.

As people get older and their share in the population increases, prevalence of chronic diseases is also raised. Chronic diseases have high impact on the rise of medical costs. According to Yoo et al. (2006) study in Korea, it is found that the burden of respiratory diseases has dramatically increased. They found that respiratory diseases affect individual's living style and capacity at work negatively, which elevates the socioeconomic burden of the disease. Moreover, it is estimated that the cost of a Korean COPD patient is high. Tsai et al. (2017) found a 12.4% decrease of indirect costs between 2004-2010 in Taiwan. It is attributed to decreased number of patients with respiratory disease in hospital and intensive care units.

Last of all, this study represented for the first time indirect cost by MVYLL estimation of circulatory, respiratory and endocrine diseases in Turkey. There is no sufficient economic analysis that are done about the burden of chronic disease by state authorities in Turkey. Issues related to the burden and treatment costs of chronic diseases on the health system are calculated on directly with drug prices. Refunds are arranged accordingly. However, cost effectiveness analysis and the indirect effect of disease burden (absenteeism, presenteeism) are not analyzed adequately. Another problem is that adequate measures are not taken on the public side to prevent chronic diseases. Only a small number of non-governmental organizations and some associations carry out public awareness activities regarding diseases like diabetes, obesity and cancer. However, it seems that these activities are not systematically planned and executed. Therefore, as in this study, it is seen that by analyzing the data, much more important steps will be taken in the health system and services related to chronic diseases. It is thought that this study will be a source of inspiration for the analyzes expected to be used in the steps to be taken.

CONCLUSION

Circulatory, respiratory and endocrine diseases are three important chronic diseases that causes of morbidity, premature mortality and disability in Turkey. This thesis confirms that the current burden of these NCDs is significant, and it will rise in the future due to aging of the population and unhealthy lifestyle. This growing burden of disease will create significant pressure on Turkey's healthcare system in the form of indirect healthcare costs; loss of productivity and rise in the absenteeism and presenteeism. In order to draw attention to the importance of risk factors for these diseases, Turkey should create policy documents in the light of in-depth economic analysis. Otherwise, no matter how quality the healthcare system is, health expenditures will increase and reach to a level where cannot be covered. Sustainability of the Turkish healthcare system be achieved with strong infrastructure, qualified health professionals and conscious individuals.

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