THE MINISTRY OF HEALTH OF TURKEY

TURKEY
BURDEN OF DISEASE STUDY

The Ministry of Health of Turkey ■ Refik Saydam Hygiene Center,
School of Public Health

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TURKEY BURDEN OF DISEASE STUDY 2004

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FOREWORD

It is essential to identify priorities when determining health policies. In today's world, where demand for health care services is far more than those that could be financed by usable sources, the need has aroused to make assessment of health policies and comparison among various programs and to ensure convenient information for adopting new policies, as well. Such growing need gave rise to the launch of studies in 1993 regarding the burden of disease, which later proved out to be so useful for guiding health sector reforms and identifying the plans of priority in the country.

Data on mortality, morbidity, causes and dimension of disability are not full and comprehensive in the country. That's why an in-depth analysis of burden of disease is highly needed in Turkey, which takes into consideration fatal and non-fatal effects borne by diseases, injuries and important risk factors, as well. Outcomes of the study pointed out to the need to enhance the capacity of Primary Health Care Information Systems on central and provincial level. Thus, the activities under the Health Transformation Program (HTP) have created solutions to this end.

"Access to Effective Information in Decision-Making Process: Health Information System" is one of the HTP components, which were put into effect for productive, efficient and just management of sources in delivery of health care services; accurate and update information-based policy formulation, organization and planning; buiding infrastructure and institutional capacity in this context; and implementation of legal amendments required for all these.

An integrated health information system is necessary so as to ensure harmony among all components of the Health Transformation Program. It is essential to set up Health Information System in order to achieve coordination in health care services, formulate health inventory, preserve medical records of individuals, and accurately transfer information between the steps of referral and to collect data in primary health care practices, as well. Accompanied by proper analysis of data, the system, will certainly contribute a lot to decision-makers and health policy-makers.

I hold the strong belief that the studies, which are conducted to develop clear and objective criteria to guide health sector reforms, policies and strategies for the next century in Turkey, will prove to be helpful to all relevant agencies and individuals in the sector. Thus, I would like to extend my most sincere thanks to all my colleagues, who made invaluable efforts for this study.

Prof. Dr. Necdet ÜNÜVAR

Undersecretary

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School of Public Health

PRESENTING

National Burden of Disease Study is one of the pre-investment activities, which are designed to support Health Reforming Activities initiated by the First Health Project and maintained by the Second Health Project that aim at promoting health and health care services in Turkey. The study is financed by the World Bank.

The fact that data on mortality, morbidity, causes and dimension of disability are not full and comprehensive in Turkey raised the need to make an in-depth analysis of burden of disease in Turkey, which takes into consideration fatal and non-fatal effects borne by diseases, injuries and important risk factors, as well.

NBD Study targets to develop well-defined and objective criteria in order to guide health sector reforms, policies and strategies for the next century in Turkey and to alleviate burden of disease which is caused by avoidable diseases and injuries. In this context, the NBD Study is likely to contribute a lot to promoting local capacity for routine follow-up of burden of disease.

The study was started on 11 March 2002 and finished on 14 December 2004. Burden of disease analysis was made in consultation with Prof. Dr. Alan Lopez. Apart from all data sources available in the country, the National Household Survey was also conducted in order to obtain data needed for the National Burden of Disease Study. National Household Survey was conducted on 12.000 households, the sampling of which was determined by TÜİK (Turkish Institute of Statistics), and the World Health Questionnaire was utilized in the study. In addition to data obtained from the current registration system (TÜİK, Turkish Ministry of Internal Affairs), the Verbal Autopsy Survey, which addressed 60.000 households, was conducted across Turkey so as to find out the causes of deaths. Through the National Household Survey, household individuals (12.000) were visited, deaths which occurred in the last one year in the household, 18+ aged individuals in the same household who had a sibling who died outside of the household, 2 neighboring households on the left side and 2 neighboring households on the right side of the target household having deaths in the last one year were determined. Surveys were applied by medical doctors except the sibling deaths residing outside of that household.

I would like to thank to all people who contributed to this study and to my colleagues at the Department of Public Health Promotion of the School of Public Health, who shared this study with the public so as to assist decision-makers, planners and all personnel in the health sector.

Dr. Salih MOLLAHALİLOĞLU

Director

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ABBREVATIONS

- AF: Attributable Fraction
- BMI: Body Mass Index
- DALY: Disability Adjusted Life Years
- SIS: State Institute of Statistics
- WHO: World Health Organization
- DW: Disability Weight
- HALE: Health Adjusted Life Expectancy
- ICD: International Codes for Diseases
- GBD: Global Burden of Disease
- COPD: Chronic Obstructive Pulmonary Disease
- CRE: Comparable Risk Evaluation
- RR: Relative Risk
- SIR: Smoking Influence Rate
- TDHS: Turkey Demographic Health Survey
- NBD: National Burden of Disease
- YLD: Years Lost with Disability
- YLL: Years of Life Lost

EXECUTIVE SUMMARY

Primary objective of the NBD study is to identify clear and objective criteria to provide guidance for health sector reforms, policies and strategies in Turkey for the next century and this study aims to enable comprehensive data which are needed to make an in-depth evaluation of burden of disease, injuries and important risk factors; to establish a basis for evaluating the progress made in health and health systems performance; to support rational allocation of sources and to eliminate inequities in service supply.

Guided by the School of Public Health, the study was conducted between March 1, 2002 and December 25, 2004 in cooperation with Baskent University (Turkey), INTRAH (USA) (The University of North Caroline at Chapel Hall, School of Medicine, School of Public Health, Sheps Center for Health Services Research), John Hopkins University, School of Hygiene and Public Health (USA) Tulane University-School of Public Health and Tropical Medicine (USA).

Methods that are used in this study comply with the Global Burden of Disease-oriented approach, which was first defined in 1993 and amended in 1996. By adding up the latest amendments made to the recent evaluation in 2003, burden of disease and risk factors were analyzed by Prof. Dr. Alan Lopez.

Within the scope of this study, a "Monitoring Board" consisting of the representatives from General Directorates of the Ministry of Health, an "Executive Board" consisting of the representatives from the State Institute of Statistics (SIS), SSK (Social Security Institution), ES (Public Employees' Retirement Fund), State Planning Organization (SPO), Ministry of Finance, Ministry of Internal Affairs and Treasury Undersecretariat and a "Scientific Board" consisting of the representatives from relevant departments at universities and faculties was founded. On behalf of our Ministry, the study was followed by these boards.

Studies in the following were conducted so as to make the National Burden of Disease and Cost-Effectiveness Analysis, which is the final outcome of the study.

1. Household Survey, sampling plan of which was made by the SIS and which covered 12.000 households was conducted. (January 2003 – April 2003). The World Health Survey Questionnaire of the WHO was adapted to the needs of this study and then used.

2. Verbal Autopsy Survey covering 60.000 households was conducted (April-May 2003) to find out causes of death, identify age-specific mortality rates and to design country life tables for rural/urban areas and regions according to age groups and gender.

3. In addition to these, all scientific studies in Turkey, regardless if they were published or not, all statistical health and disease data by the SIS, Ministry of Internal Affairs and Ministry of Health were collected as "secondary data". A catalogues was formed by entering the secondary data into the "Reference Manager" computer program.

4. Causes of Mortality based on rural/urban areas and regions in Turkey by age and gender were identified; Crude Death Rate, 0 Age Death Rate, Death Rate Under Age 5 were calculated and life tables were developed.

5. Burden of Disease (DALY) was calculated for Turkey, rural/urban areas and regions by age and gender.

6. HALE analysis was conducted for whole Turkey, rural/urban areas and regions by age and gender.

7. Decline in burden of disease was noted through risk factor analysis of physical activity, vegetable and fruit consumption, tobacco and alcohol use, hypertension, high BMI, high cholesterol and water sanitation.

8. Projections were made for the year 2010, 2020 and 2030.

Besides, aiming at the contribution from various sectors, 15-day training was given on NBD-CE by international consultants to a total of 60 participants, which facilitated to build and develop capacity in Turkey. Apart from this, with the participation of Provincial Health Directorates, a Training Meeting was held in December 20-24, 2004 for an audience of 100 people, which was another step taken towards the efforts of capacity building in this field.

In addition to this, "Web Supported Distant Learning Certificate Program" was implemented on NBD-CE, which host any personnel who desired to participate also including those positioned in local organization of the MoH, and successful participants were awarded with a certificate at the end of the program.

Being independent from technical report prepared at the end of the study, this book was developed based on the existing sets of data.

INTRODUCTION

Population of Turkey is estimated 72.974.000 for the year 2005 and the country has a young population due to high fertility and growth rates. However, radical decline has been observed in fertility for the last 30 years. Total Fertility Rate was noted 5 in the early 1970s whereas it was noted 2.6 in 1998 and 2.3 in 2003. However, fertility rate in the eastern provinces, which is noted 3.65, is still above the national average (TPHS 2003).

It is estimated that crude death rates, though noted 30/1000 in 1940s, declined to 7/1000 in the mid 1990. Infant Mortality Rate, which was noted 43/1000 in 1998, declined to 29/1000 in 2003. Mortality Rate Under Age 5 was noted 52/1000 in 1998 and declined to 43/1000 in 2003. (TPHS 1998, TPHS 2003)

Mortality data are not collected completely in Turkey since deaths are recorded just in provinces and town centers where municipalities are available. As complete and comprehensive population data are not sufficient on mortality, morbidity, causes and dimension of disability in Turkey, it was needed to make a comprehensive evaluation of burden of disease within the country which takes into consideration fatal or non-fatal effects of diseases and injuries, and significant risk factors, as well.

Republic of Turkey, Ministry of Health, aiming at promoting the quality of health and health care system, initiated the NBD-CE Study in March 2002. NBD-CE study is a part of pre-investment studies designed to support Health Reforming Activities which were started by the First Health Project and then maintained by the Second Health Project. Guided by the School of Public Health, studies were conducted in Marc 1, 2002 – December 25, 2004 in collaboration with Başkent University (Turkey), INTRAH (ABD) (The University of North Caroline at Chapel Hall, School of Medicine, School of Public Health, Sheps Center for Health Services Research), John Hopkins University, School of Hygiene and Public Health (USA) Tulane University-School of Public Health and Tropical Medicine (USA).

GOAL

The goal of the NBD-CE study is to set up clear and objective criteria which shall guide health sector reforms, policies and strategies in Turkey for the next century. It is thought that the NBD-CE study shall contribute a lot to the improvement of local capacity for routine follow-up of burden of disease and the analysis of cost-effectiveness of health care interventions.

More specific goals of the NBD-CE Study are as follows:

• In order to make a comprehensive evaluation of burden of diseases, injuries and important risk factors for the population:

, To constitute a basis for evaluating the improvements in health and health system performance;

, To assist rational allocation of sources and to provide comprehensive data in the means of the required needs for eliminating inequalities when providing services.

• To constitute the technical and institutional capacity in Turkey for improving the NBD studies in the future.

• To strengthen and improve the Health Enformation Systems in Turkey in order to achieve monitoring of the sustainable NBD.

METHOD

In order to prepare this book, analysis of existing data sets were made independent from technical reports of the National Burden of Disease Study, which was concluded in 2004 and then publicized in Turkish and English versions on www.hm.saglik.gov.tr address. The Australian Burden of Disease Study 1996 was accepted as a model in preparing tables and graphics.

Method used in conducting analysis and designing the data sets, is summarized from the technical reports and presented in the Annex.

LIFE EXPECTANCY AND DEATH PROBABILITY

Table 1 presents life expectancy at birth and at the age of 60 on national level, in regions, rural and urban areas by both genders.

Table 1. Life Expectancies at Birth and at Age 60, and Death Probabilities of Both Sexes at National and Regional Level, Urban and Rural Areas (Turkey, 2004)

MALE-FEMALE	**e0** (Life Expectancy at Birth)	**5q0** (‰) (Death probability under 5 years)	**e60** (Life Expectancy at Age 60)	**45q15** (‰) (death probability between the ages 15-60)
Nationwide	69,77	43,92	17,86	147,87
Urban Area	71,16	39,03	18,44	131,94
Rural Area	67,66	52,03	17,21	176,38
Western Region	71,14	31,93	18,08	139,35
Southern Region	70,73	35,72	18,03	143,25
Central Region	69,82	41,34	17,74	149,47
Northern Region	69,76	41,89	17,75	152,55
Eastern Region	67,31	63,40	17,45	168,82

As seen in Table 1, life expectancy at birth (e0) is 69,77 on national level. With 71,14 it is highest in the West and with 67,31 lowest in the East. It is 71,16 in urban areas while it is 67,66 in rural areas.

As for life expectancy at the age 60 (e60), there is not an outstanding difference among regions and between rural and urban areas. e60 value is 17,86 on national level, 17,21 in rural and 18,44 in urban areas.

As for regional differences in death probability under the age 5 (5q0), it is lowest in the West with 31,93/1000 and highest in the East with 63,40/1000. It is noted 43,92/1000 on national level.

Death probability between 15-60 ages (45q15) is 147,87/1000 on national level but there are differences in rural/urban areas and regions. Lowest value is noted in the West with 139,35/1000 and highest value is in the East with 168,82/1000. It is 176,38/1000 and 131,94/1000 relatively in rural and urban areas.

Life Expectancy at Birth and Death Probability for Males at national level, in regions and rural/urban areas is presented in Table 2.

Table 2. Life Expectancy at Birth and Death Probabilities for Males at National and Regional Level, Urban and Rural Areas (Turkey, 2004)

MALE	**e0** (Life Expectancy at Birth)	**5q0** (‰) (Death probability under 5 years)	**e60** (Life Expectancy at Age 60)	**45q15** (‰) (death probability between the ages 15-60)
Nationwide	67,69	44,89	16,62	180,22
Urban Area	68,62	39,99	16,94	170,00
Rural Area	66,21	53,00	16,27	199,00
Western Region	68,96	32,67	16,68	169,43
Southern Region	68,69	36,30	16,80	173,96
Central Region	67,67	42,48	16,50	183,79
Northern Region	67,63	42,67	16,60	187,25
Eastern Region	65,50	64,55	16,68	205,02

For male, e0 value is 67,69 on national level. It is highest in the West with 68,96 and lowest in the East with 65,50. In urban areas, it is noted 68,62 while in rural areas it is noted 66,21. As for e60 values, the southern region has the highest value with 16, 80 and central region has the lowest with 16,50.

For male, 5q0 value is 44,89 on national level. It is highest in the East with 64,55 and lowest in the West with 32,67. As for 45q15 value, it is noted 180, 22 at national level, while it is lowest in the West with 169,43 and highest in the East with 205,02.

Life Expectancy at Birth and Death Probability for females at national level, in regions and rural/urban areas is presented in Table 3.

Table 3. Life Expectancy at Birth and Death Probabilities for Females at National and Regional Level, Urban and Rural Areas (Turkey, 2004)

FEMALE	**e0** (Life Expectancy at Birth)	**5q0 (‰)** (Death probability under 5 years)	**e60** (Life Expectancy at Age 60)	**45q15 (‰)** (death probability between the ages 15-60)
Nationwide	71,94	42,90	19,05	114,03
Urban Area	73,81	38,00	19,83	91,00
Rural Area	69,13	51,00	18,13	154,00
Western Region	73,36	31,16	19,36	107,31
Southern Region	72,88	35,13	19,25	110,83
Central Region	72,05	40,15	18,93	114,34
Northern Region	71,90	41,07	18,90	117,75
Eastern Region	69,25	62,17	18,31	131,01

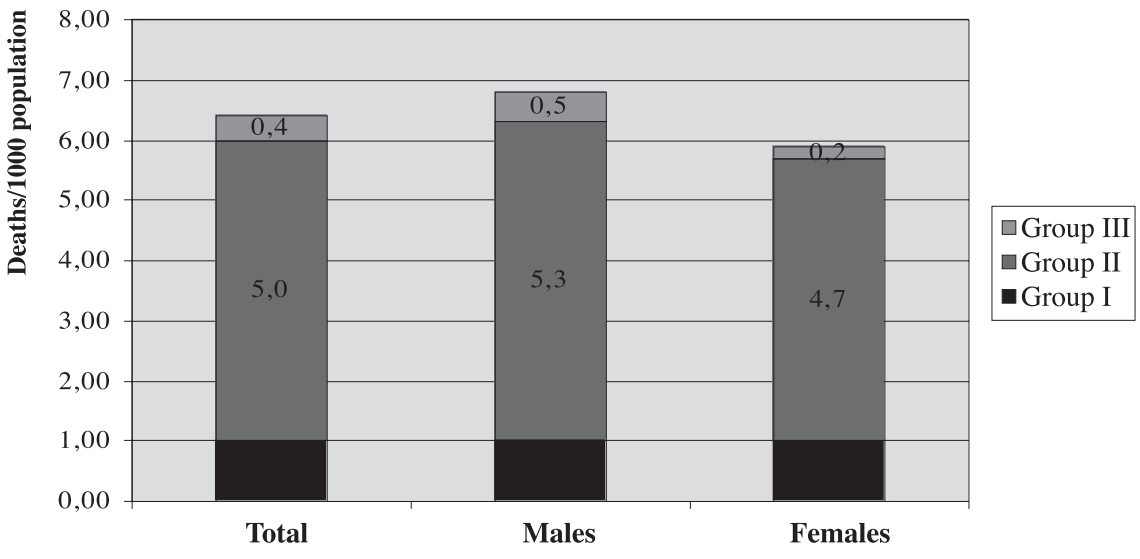
Life expectancy at birth in female is 71, 94; it is highest in the West with 73, 36 and lowest in the East with 69, 25. There is not a big difference among regions and rural/urban areas in life expectancy at the age 60.

As for death probability under the age 5, lowest value is noted in the West (‰ 31,16) and highest in the East (‰ 62,17).

DEATHS IN TURKEY 2004

Figure 1 presents distribution of Turkish national crude death rates by groups of disease and gender. Crude death rate on national level is 6,3/1000 in Turkey. It is noted 6,8/1000 for male and 5,9/1000 for female. In total, 1/1000 of Mortality Rate consists of the I. Group Diseases, 5/1000 consists of the II. Group Diseases and 0,4/1000 consists of the III. Group Diseases. For male, mortality rate in the group I, II and III is relatively 1/1000, 5.3/1000 and 0,5/1000. For female, it is 1/1000, 4,7/1000 and 0, 2/1000 orderly.

Figure 1. Distribution of Crude Death Rate According to Disease Groups and Gender at National Level (Deaths/1000) (Turkey, 2004)



Group I: Communicable, Maternal Causes, Perinatal Causes and Nutritional Deficiencies.

Group II: Noncommunicable diseases; Cardiovascular System Diseases, Respiratory System Diseases, Digestive System Diseases, Endocrine, Nutritional and Metabolic Diseases, Sense Organ Disorders, Genitourinary System Diseases, Malign Neoplasms, Musculoskeletal Diseases and Neurologic Disorders, Neurophyciatric Disorders and Mouth and Dental Health Disorders.

Group III: Injuries; intentional and unintentional injuries.

Figure 2 presents distribution of national death rates by age and gender. In 0-4 age group of male, death rates is noted 8, 9/1000 while it is 8,5/1000 in female. As for 80+ age group which has the highest death rates, death rates is 184,7/1000 in male and 166,4/1000 in female.

Figure 2. Distribution of Death Rates According to Age Groups and Gender at National Level, (Death/1000) (Turkey, 2004)

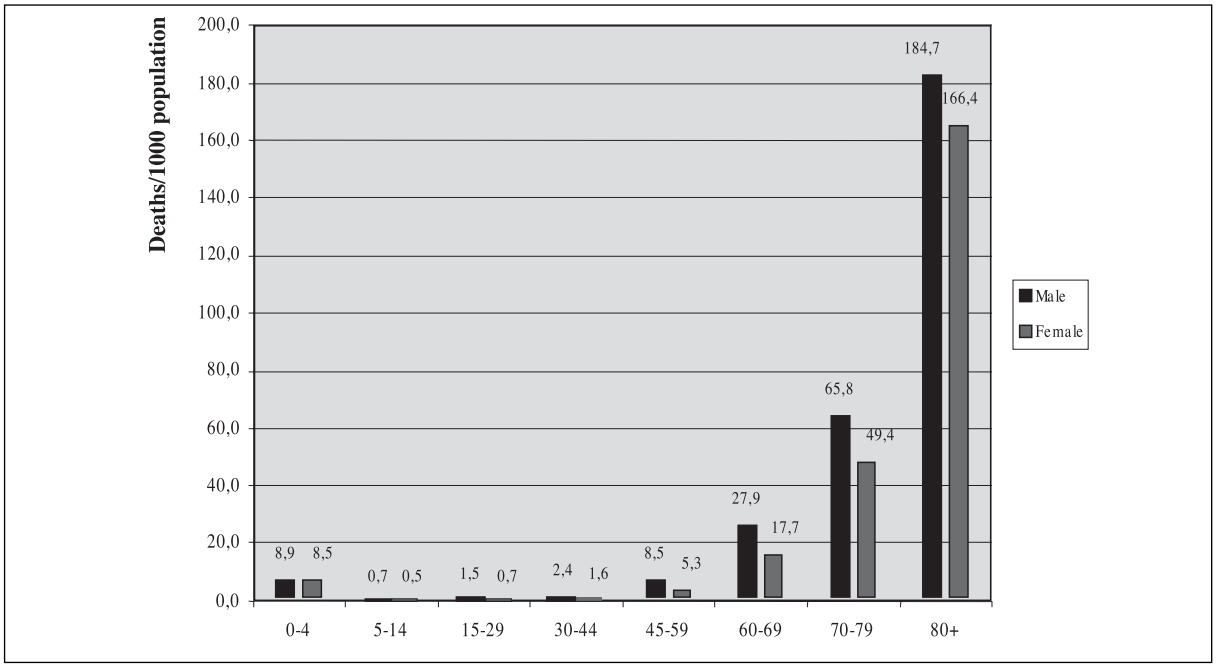


Figure 3 presents percentage distribution of deaths on national level by groups of disease and age. As seen in the figure, approximately 80 % of deaths in 0-4 age group is caused by the Group I diseases. In 5-14 age group, 25 % of deaths is caused by the Group I diseases and 30 % of deaths is caused by the injuries-Group III diseases. Most of injuries, that is Group III diseases caused deaths in other words are seen in 15-29 age group (40 %). Deaths caused by the Group II diseases increase beginning with 30-44 age group.

Figure 3. Distribution of the Number of Deaths at National Level According to Disease Groups and Age (Turkey, 2004)

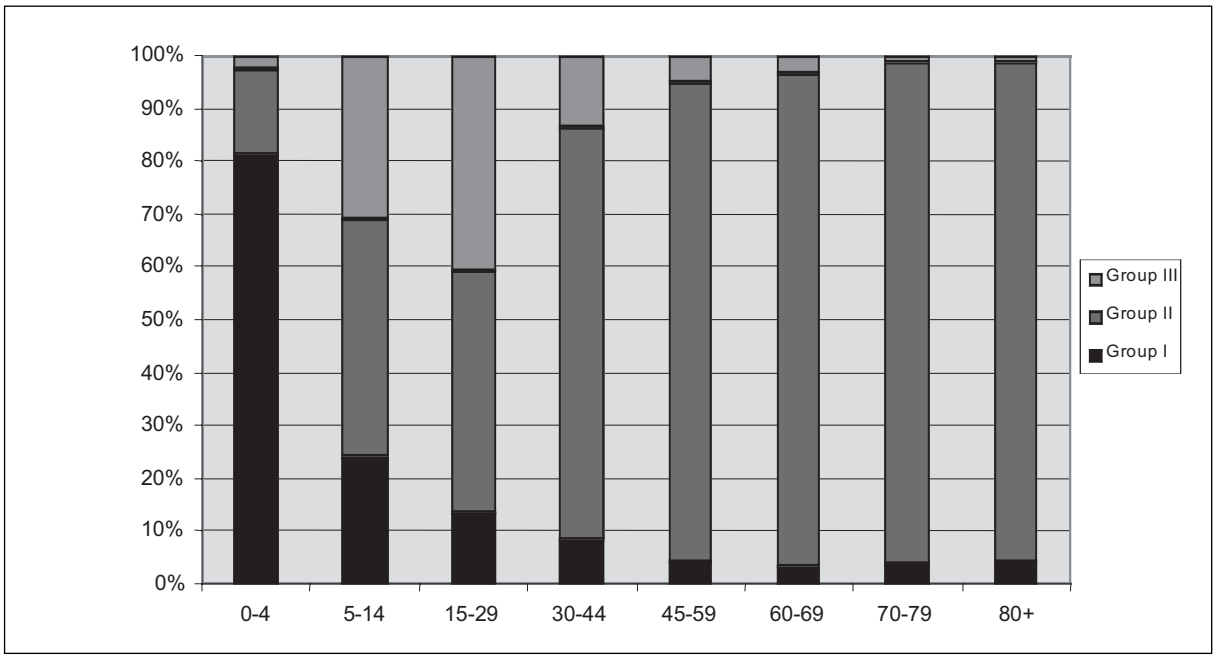


Table 4 presents the number of deaths and percentage distribution by major groups and gender at national level in Turkey.

Table 4. Distribution of The Number of Deaths at National Level in Turkey by Major Disease Groups and Gender (Turkey, 2004)

	Male		Female		Total	
	Number	**Percentage**	**Number**	**Percentage**	**Number**	**Percentage**
Cardiovascular	102386	43,89	103071	52,27	205457	47,73
Cancers	35076	15,04	21174	10,74	56250	13,07
Other infectious diseases	20186	8,65	17860	9,06	38046	8,84
Respiratory system	21879	9,38	12332	6,25	34211	7,95
Maternal and perinatal	13124	5,63	12704	6,44	25828	6,00
Injuries	17860	7,66	7165	3,63	25025	5,81
Digestive	7105	3,05	6008	3,05	13113	3,05
Diabetes	3746	1,61	5803	2,94	9549	2,22
Other Group II*	3948	1,69	3193	1,62	7141	1,66
Genitourinary	3619	1,55	3296	1,67	6915	1,61
Neuropsychiatric	3072	1,32	3015	1,53	6087	1,41
Nutritional deficiencies	1179	0,51	1452	0,74	2631	0,61
Musculoskeletal	64	0,03	93	0,05	157	0,04
HIV/AIDS	21	0,01	4	0,00	25	0,01
Sense organs	17	0,01	6	0,00	23	0,01

*Dermal oral and dental health disorders and congenital anomalies are classified among other group II diseases and lined in the GBD list.

As seen in Table 4, cardiovascular diseases occupy the first rank with 205.457 deaths, cancers occupy the second rank with 56.250 deaths and infectious diseases (except for the HIV/AIDS) occupy the third rank with 38.046 deaths. When gender differences are considered, cardiovascular diseases cause almost the same number of deaths in both genders (102.386 deaths in male and 103.071 deaths in female) but cancers cause more deaths among male (35.076 deaths in male and 21.174 deaths in female). As for infectious diseases caused deaths, male are affected more (20.186 deaths in male and 17.860 deaths in female).

Figure 4 presents distribution of deaths by disease groups. 15 % of all deaths is caused by the I. Group diseases (communicable diseases, maternal and perinatal causes, insufficient nutrition caused diseases), 79 % is caused by the II. Group diseases (non-communicable diseases) and 6 % by the III. Group diseases (injuries).

Figure 4. Distribution of Deaths by Disease Groups (Turkey,2004)

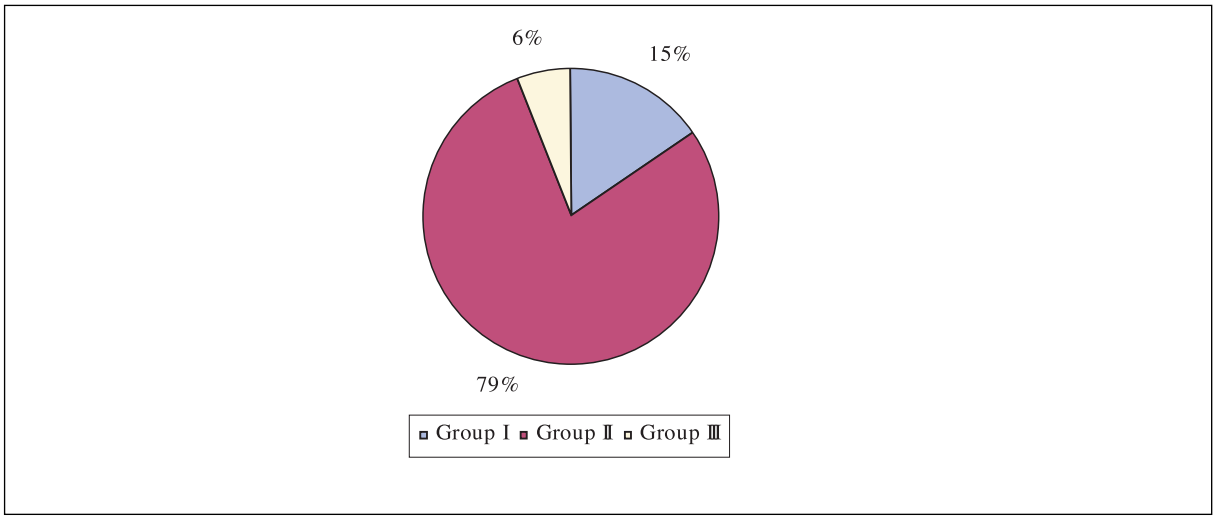
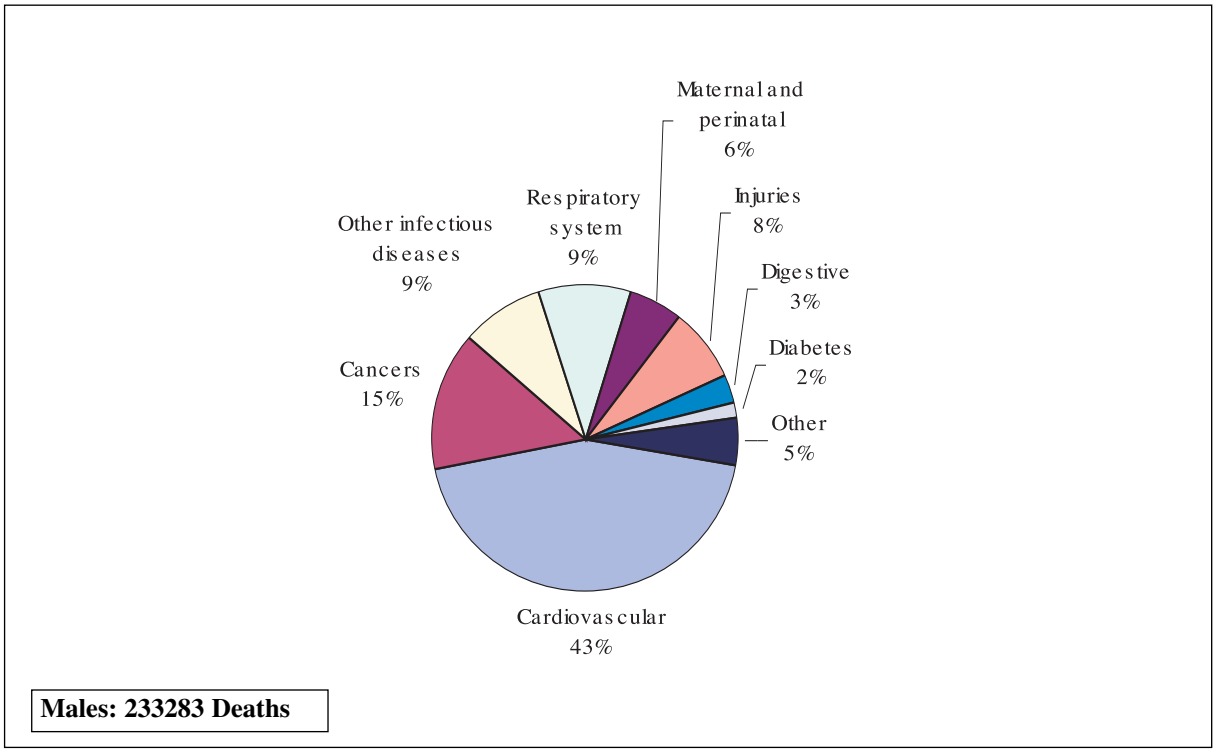


Figure 5 presents distribution of deaths by major disease groups on gender basis. As for male, 43 % of total 233.283 deaths is caused by cardiovascular diseases, 15 % is caused cancers, 9 % is caused by communicable diseases except for the HIV/AIDS and 9 % by respiratory diseases. As for female, a total of 197.177 deaths is noted. % 52 of them is caused by cardiovascular diseases, 11 % by cancers and 9 % by infectious diseases except for the HIV/AIDS.

Figure 5. Deaths by Gender and Major Disease Groups (Turkey, 2004)



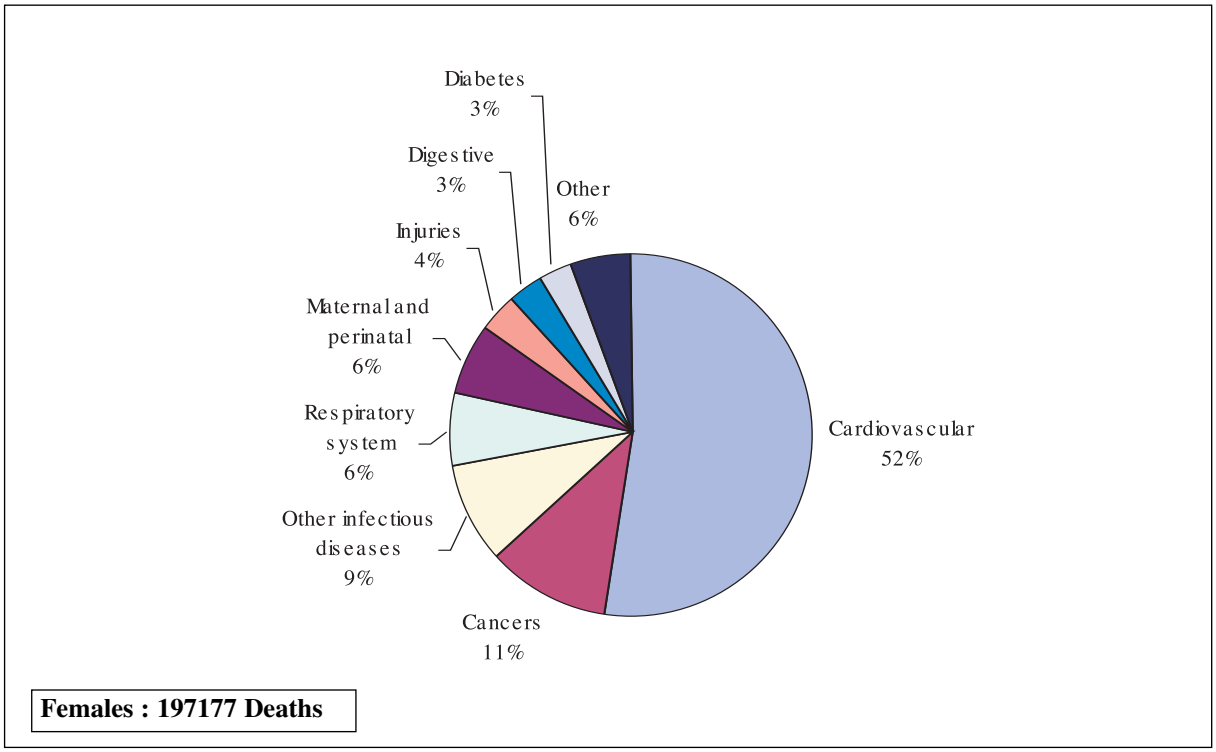


Table 5 presents the number o deaths for the first 10 diseases causing death on national level and their percentage distribution in total sum.

Table 5. Ten Leading Causes of Death (Turkey, 2004)

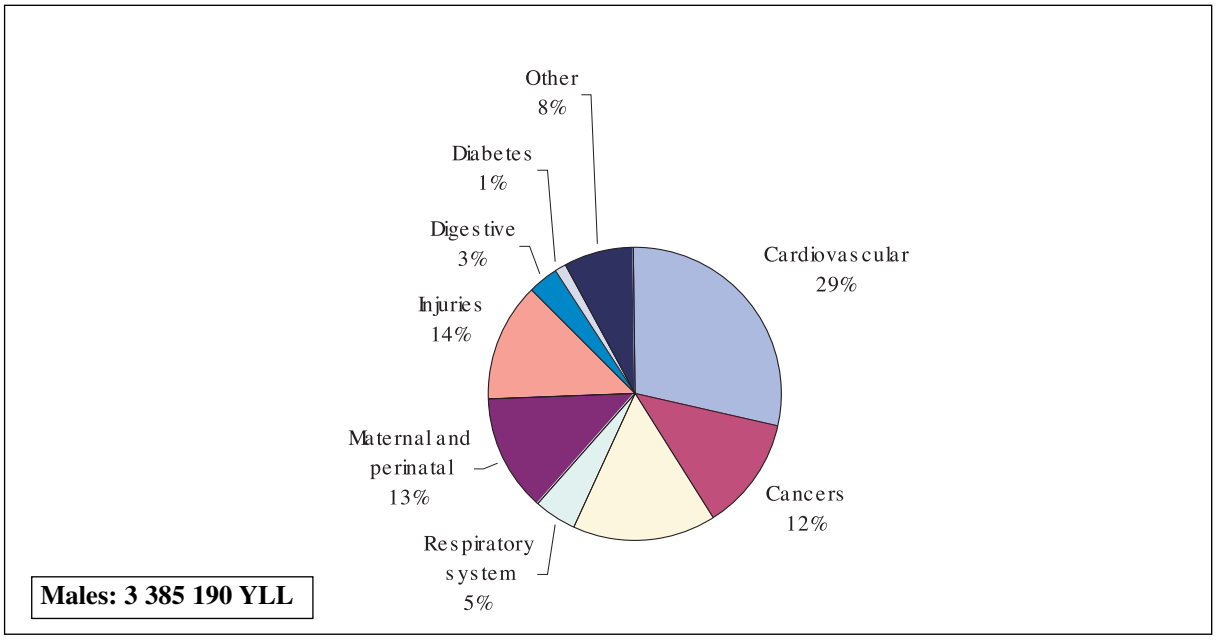
	Causes of Death	No. Of Deaths	Percent of total
1	Ischaemic heart disease	93260	21,7
2	Cerebrovascular disease	64780	15,0
3	COPD	25104	5,8
4	Perinatal Causes	24756	5,8
5	Lower respiratory infections	18225	4,2
6	Hypertensive heart disease	12805	3,0
7	Trachea, bronchus and lung cancers	11586	2,7
8	Diabetes Mellitus	9548	2,2
9	Road traffic accidents	8395	2,0
10	Inflammatory heart diseases	7992	1,9

As seen in Table 5, ischaemic heart diseases occupy the first rank with 21,7 %, cerebrovascular diseases occupy the second rank with 15 % and COPD and Perinatal causes occupy the third rank with 5, 8 %.

BURDEN OF MORTALITY IN TURKEY (YLL) 2004

Burden of mortality (YLL) for male and female in Turkey is presented in Figure 6. According to this, cardiovascular diseases-specific burden of mortality is at the top of the list with 29 % in male and 31 % in female. Infectious diseases-specific burden of mortality (except for the HIV/AIDS) occupies the second rank with 15 % in male and 17 % in female. Maternal and perinatal causes-specific burden of mortality occupies the third rank with 13 % in male and 16 % in female. Cancer-specific burden of mortality is noted 12 % for male and 11 % for female.

Figure 6. Distribution of Mortality Burden (YLL) by Gender and Major Disease Groups (Turkey, 2004)



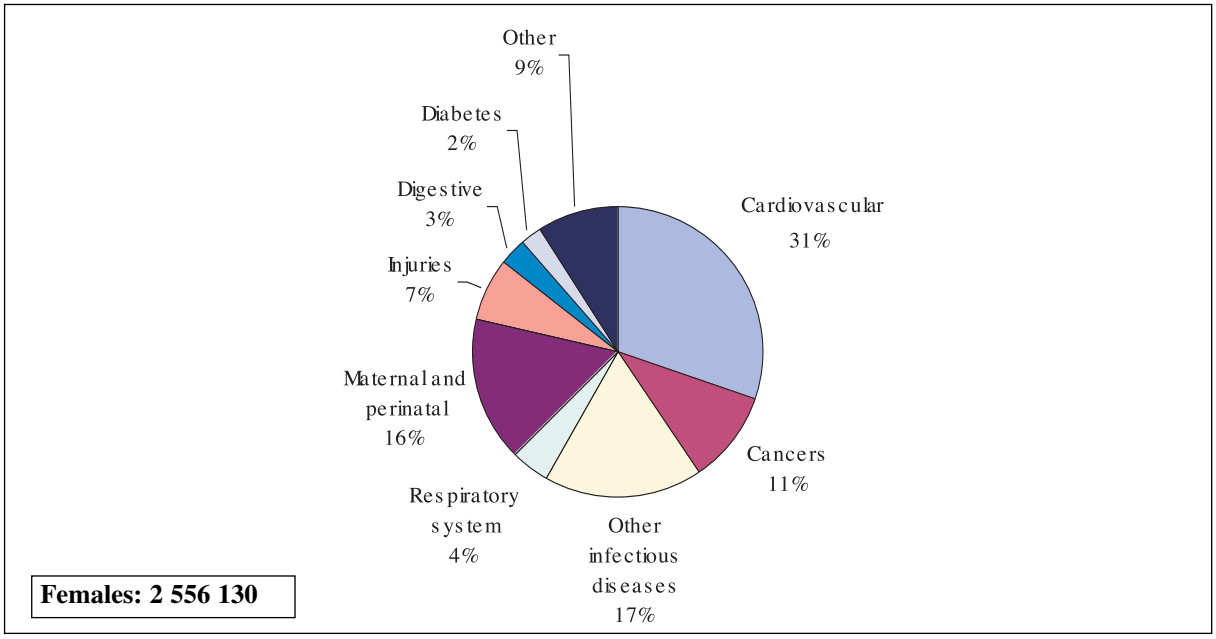
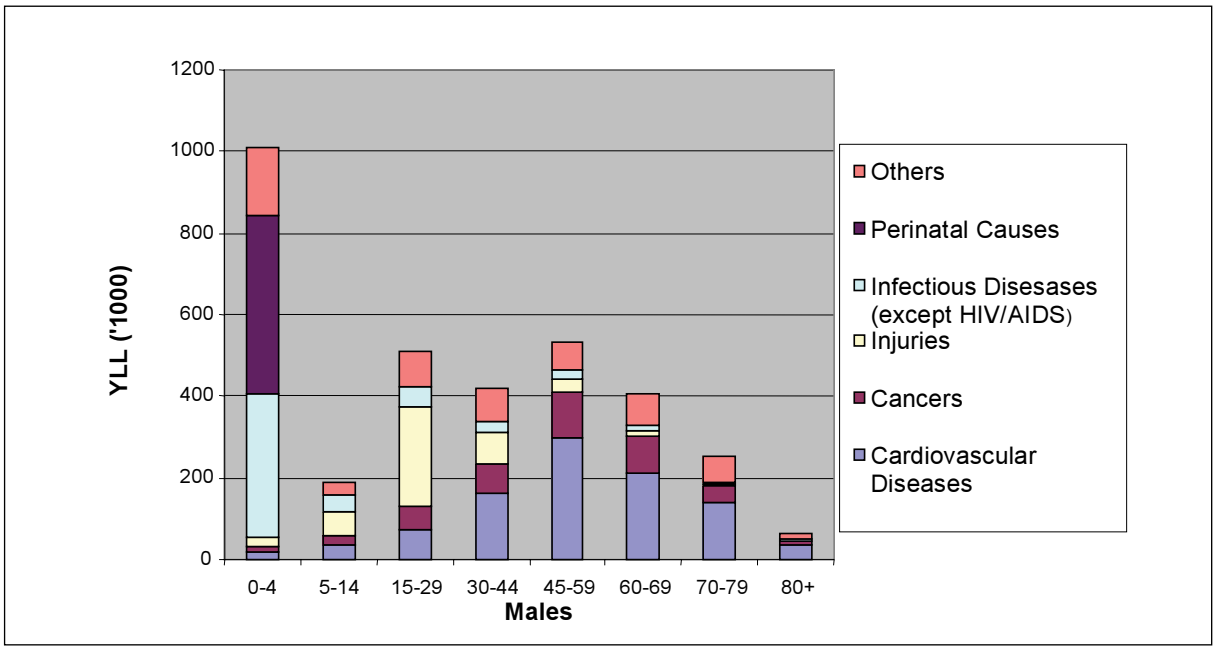


Figure 7 presents distribution of YLL by age groups, gender and major disease groups. According to this, highest burden of fatality for male in 0-4 age group is caused by the perinatal reasons (434.541 YLL) and infectious diseases (except for the HIV/AIDS) (353.376 YLL) while injuries are the leading causes for male in 15-29 age group (244.461 YLL). For male in 45-59 age group, cardiovascular diseases (299.522 YLL) and cancers (110.237 YLL) constitute the highest burden of mortality.

Though burden of fatality for female in 0-4 age group is similar to that of male, perinatal causes (386.466 YLL) and infectious diseases (except for the HIV/AIDS) (329.908 YLL) occupy the first rank. In 15-29 age group, injuries are significant (60.214 YLL) and maternal causes (19.374 YLL) are outstanding, as well.

Figure 7. Distribution of Years of Life Lost (YLL) by Age, Gender and Major Disease Groups (Turkey, 2004)



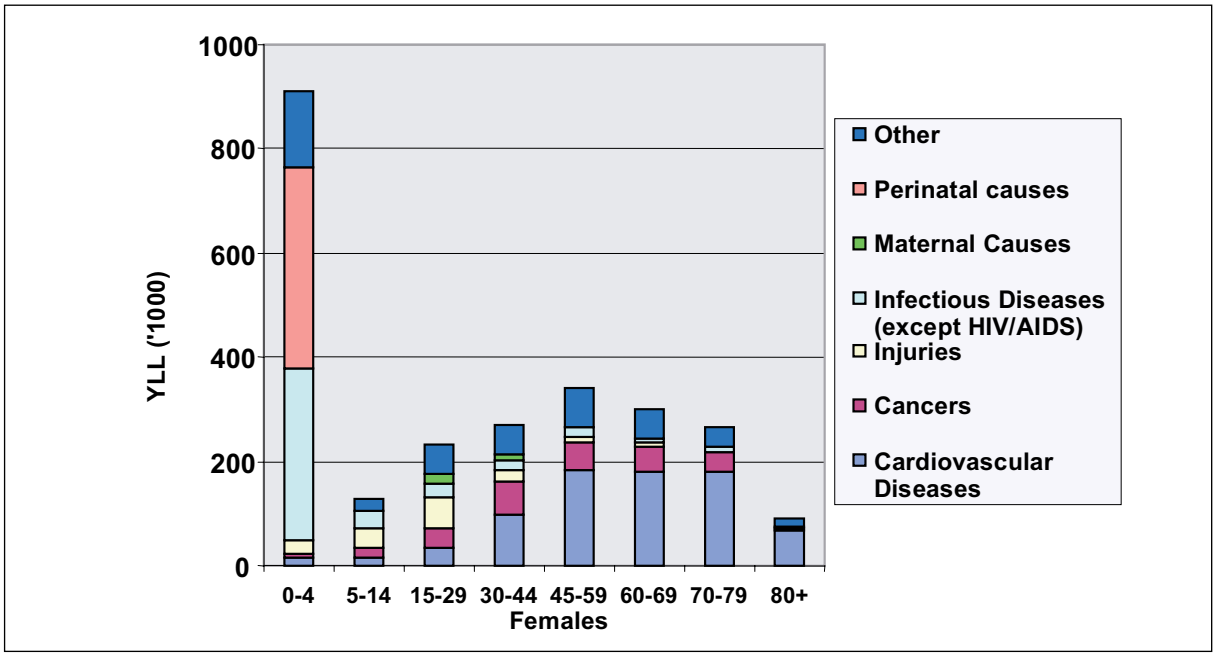


Table 6 presents distribution of burden of mortality (YLL) for first 20 diseases by gender in Turkey.

Table 6. Distribution of the Mortality Burden (YLL) of the Top 20 Diseases by Gender (Turkey, 2004)

	Males	YLL ('000)	Females	YLL ('000)	Persons	YLL ('000)
1	Ischemic heart disease	472,843	Perinatal Causes	386,467	Perinatal Causes	821,008
2	Perinatal Causes	434,541	Ischemic heart disease	321,489	Ischemic heart disease	794,332
3	Cerebrovascular disease	283,111	Cerebrovascular disease	220,422	Cerebrovascular disease	503,533
4	Lower respiratory infections	211,318	Lower respiratory infections	183,826	Lower respiratory infections	395,144
5	Road traffic accidents	161,306	Congenital anomalies	101,303	Congenital anomalies	225,712
6	Congenital anomalies	124,409	Diarrhoeal diseases	93,698	Road traffic accidents	223,309
7	Diarrhoeal diseases	105,266	Road traffic accidents	62,003	Diarrhoeal diseases	198,964
8	Trachea, bronchus and lung cancers	102,623	Diabetes Mellitus	57,119	COPD	130,136
9	COPD	95,822	Rheumatic heart disease	55,182	Trachea, bronchus and lung cancers	117,921
10	Leukaemia	63,509	Hypertensive heart disease	51,092	Diabetes Mellitus	97,388
11	Tuberculosis	57,008	Breast cancer	49,063	Leukaemia	93,965
12	Violence	46,088	Nephritis and nephrosis	37,56	Tuberculosis	93,729
13	Self-inflicted injuries	45,888	Tuberculosis	36,722	Hypertensive heart disease	93,401
14	Hypertensive heart disease	42,309	Self-inflicted injuries	35,024	Rheumatic heart disease	86,073
15	Lymphomas and multiple myeloma	40,915	COPD	34,314	Self-inflicted injuries	80,912
16	Diabetes Mellitus	40,269	Leukaemia	30,456	Nephritis and nephrosis	75,987
17	Nephritis and nephrosis	38,427	Meningitis	29,924	Lymphomas and multiple myeloma	69,578
18	Peptic ulcer disease	36,963	Maternal Causes	31,338	Meningitis	65,809
19	Meningitis	35,885	Lymphomas and multiple myeloma	28,664	Peptic ulcer disease	59,562
20	Stomach cancer	32,087	Measles	26,652	Stomach cancer	56,958
	All Causes	**338.519**	**All Causes**	**255.613**	**All Causes**	**594.132**

As seen in Table 6, perinatal causes amounting to 821.008 compose the biggest share of burden of mortality in Turkey. Ischemic heart diseases (794.332) occupy the second rank and cerebrovascular diseases (503.533) occupy the third rank. Lower respiratory infections are at the fourth rank (395.144).

When burden of mortality by gender is examined, it is seen that ischemic heart diseases, perinatal causes, cerebrovascular diseases and lower respiratory infections occupy the first four ranks in both genders. Ischemic heart diseases are at the first rank in male while it is at the second rank in female. Perinatal causes are at the second rank in male and at the first rank in female.

Figure 8 presents distribution of first 20 diseases, which constitute burden of mortality (YLL/1000 people), by gender. According to this, male have higher burden of disease regarding other groups of diseases except for hypertensive heart diseases, diabetes mellitus and rheumatoid heart diseases.

Figure 8. Distribution of First 20 Diseases Which Constitutes Burden of Mortality (YLL/1000 population) by Gender (Turkey, 2004)

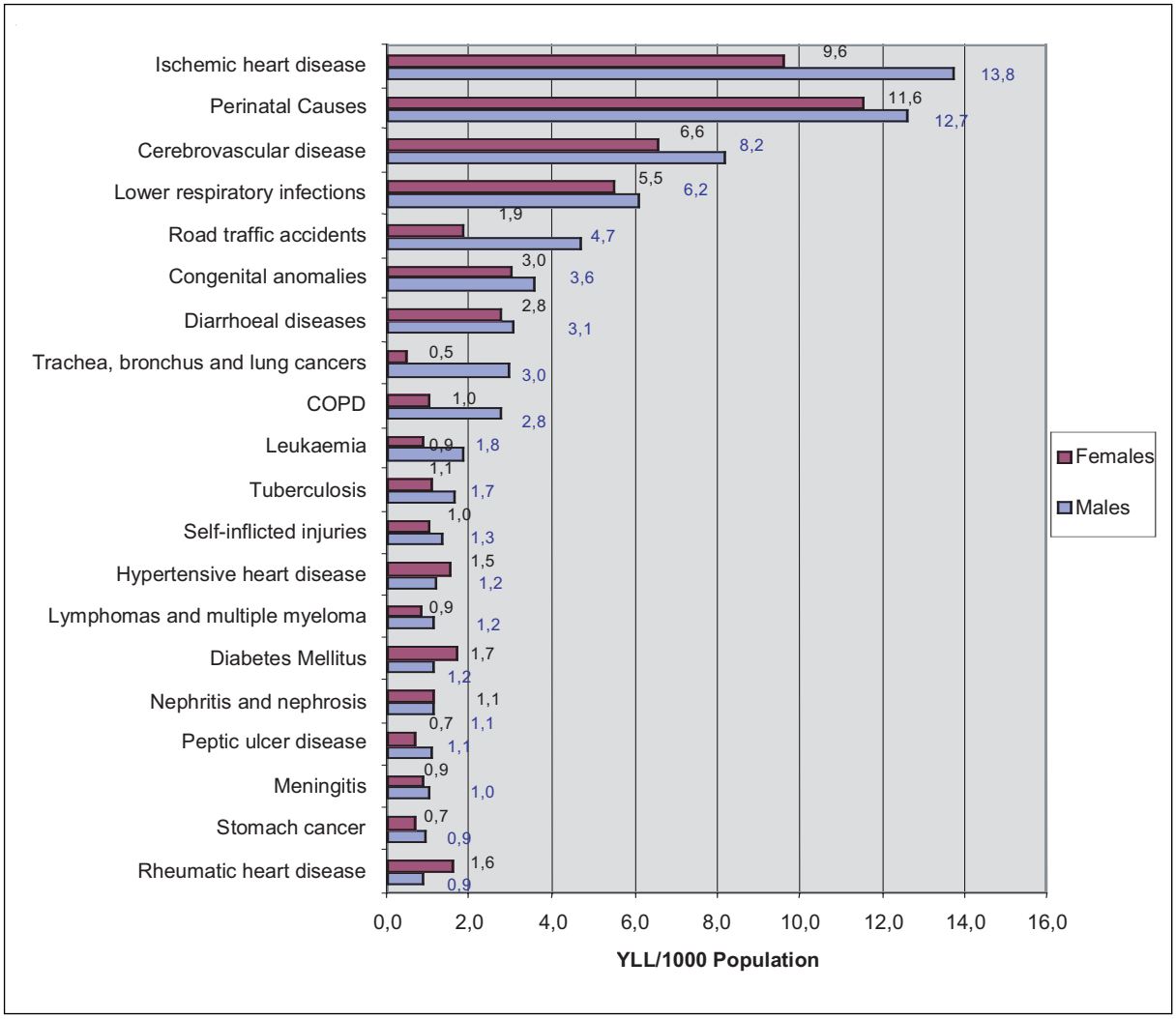
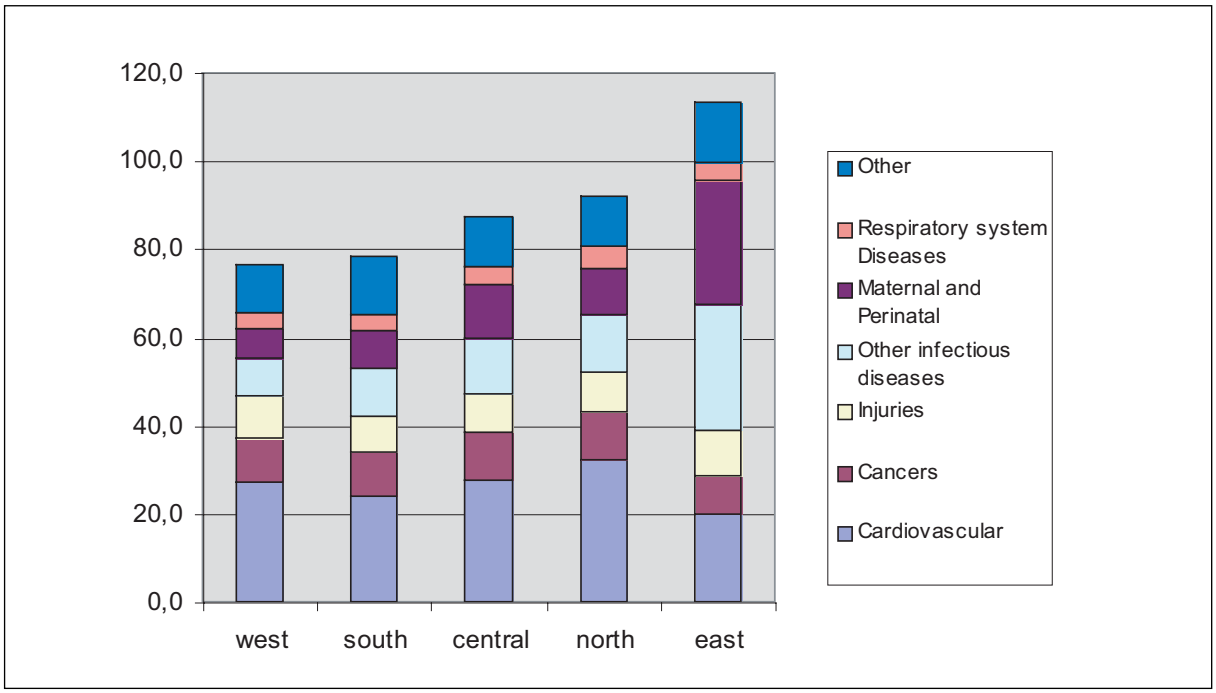


Figure 9 presents distribution of YLL (YLL/1000 people) by regions. According to this, burden of mortality due to cardiovascular diseases is highest in the northern region (32,2/1000 people); burden of mortality due to infectious diseases (28,5/1000 people), maternal and perinatal causes (28,0/1000 people), and injuries (10,6/1000 people) is highest in the eastern region. As for the burden of mortality due to cancer, on the other hand, there are not big differences among regions (10,3/1000 people in the West; 9,8/1000 people in the South; 10,9/1000 people in the Center; 10,9/1000 people in the North and 8,6/1000 people in the East).

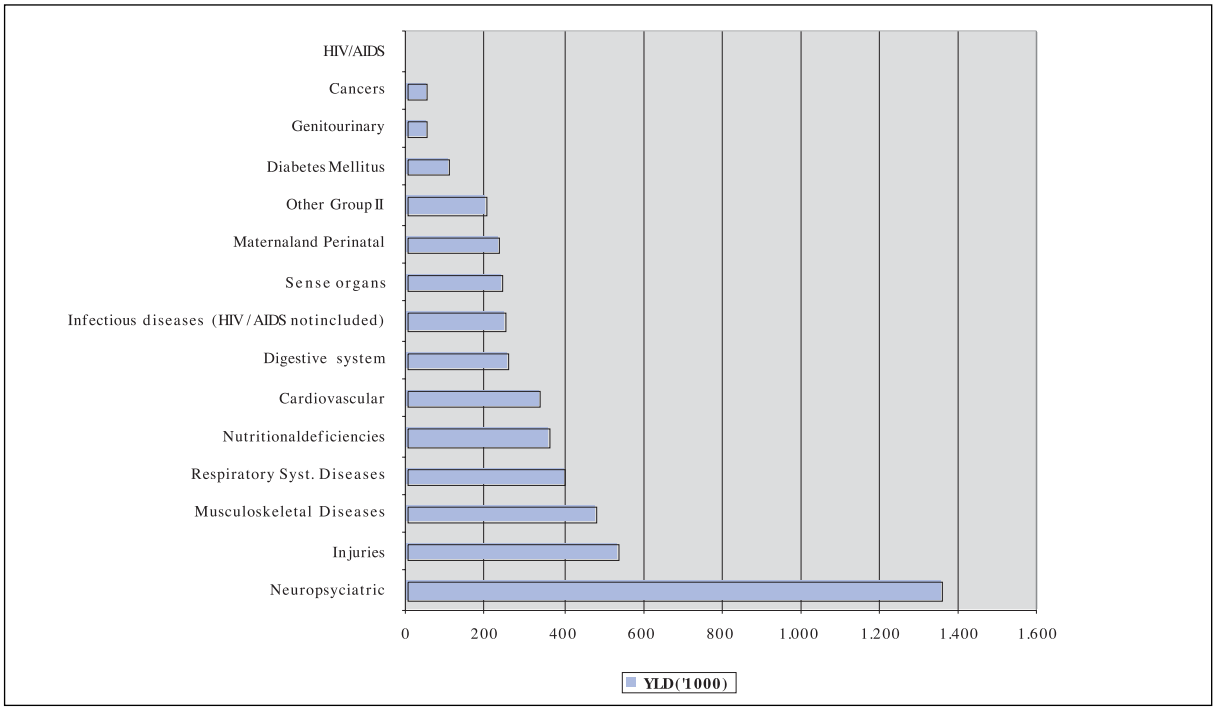
Figure 9. Distribution of YLL (YLL/1000 population) by Regions (Turkey, 2004)



YEARS OF LIFE LOST DUE TO DISABILITY (YLD)

Figure 10 presents distribution of burden of non-fatal diseases (YLD) by basic disease groups. According to this, first three groups that cause the major part of YLD are orderly neuro-psychiatric disease, injuries and musculo-skeletal diseases.

Figure 10. Non-Fatal Burden of Disease (YLD) for Major Disease Groups (Turkey, 2004)



INCIDENCE AND PREVALANCE

Table 7 presents estimated total incidence and prevalence of some diseases by gender.

Table 7. Estimated Total Incidence and Prevalance of Some Diseases By Gender (Turkey, 2004)

	Incidence			Prevalence		
Disease Category	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
HIV/AIDS	1,8	0,3	1,1	0,2	0,03	0,1
Diarrhoeal diseases	29686,6	29217,5	29455,1	29,8	29,5	29,7
Colon and rectum cancers	7,3	5,7	6,5	0,1	0,1	0,1
Trachea, bronchus, lung cancers	63,6	5	34,7	0,3	0	0,2
Melanoma and other skin cancers	0,8	0,8	0,8	0	0	0
Breast cancer	0	24,4	24,9	0	0,3	0,1
Prostate cancer	5,4	0	2,7	0,1	0	0
Diabetes mellitus	3210,2	4280,1	3820	46,5	62,8	55,8
Alcohol use disorders	17,3	1	9,2	21,3	3,3	12,4
Unipolar depressive disorders	1824,6	3573,6	2687,6	16	26,3	21,1
Alzheimer and other dementias*	47,2	69,1	58	2,8	4	3,4
Romatoid Artrit	26,4	69	47,4	2,9	8,4	5,6
Angina pectoris	840	640	740	41,2	35	38
Hypertensive heart disease	21	31,4	26,1	15	28	22
Chronic obstructive pulmonary disease	76,8	68,5	72,7	8,4	11,9	10,2
Asthma	256,2	152,2	204,9	31,1	44,4	38,7

LEADING CAUSES OF THE BURDEN OF DISABILITY (YLD)

Table 8 presents the first 20 YLD numbers and their percentage in total by gender.

Table 8. The first 20 YLD Numbers and Their Percentage in Total by Gender (Turkey, 2004)

	Males	YLD ('000)	Percent of total		Females	YLD ('000)	Percent of total
1	Osteoarthritis	166,494	7,3	**1**	Unipolar Depressive Disorders	276,576	10,7
2	Unipolar Depressive Disorders	146,608	6,4	**2**	Iron-deficiency Anemia	180,828	7
3	Alcohol use disorders	99,351	4,4	**3**	Osteoarthritis	150,154	5,8
4	Hearing Loss, adult onset	97,714	4,3	**4**	COPD	98,271	3,8
5	Cerebrovascular Diseases	72,827	3,2	**5**	Maternal conditions	95,882	3,7
6	COPD	71,552	3,1	**6**	Hearing Loss, adult onset	86,978	3,4
7	Perinatal Causes	66,150	2,9	**7**	Perinatal Causes	70,340	2,7
8	Iodine deficiencies	56,206	2,5	**8**	Rheumotoid arthritis	68,912	2,7
9	Schizophrenia	55,945	2,5	**9**	Cerebrovascular Diseases	64,495	2,5
10	Diabetes Mellitus	52,888	2,3	**10**	Migraine	59,451	2,3
11	Congenital anomalies	50,424	2,2	**11**	Schizophrenia	54,878	2,1
12	Asthma	46,023	2	**12**	Diabetes Mellitus	52,751	2
13	Inflammatory heart disease	41,827	1,8	**13**	Iodine deficiency	47,944	1,9
14	Violence	35,475	1,6	**14**	Alzeheimer and other dementias	45,216	1,8
15	Alzeheimer and other dementias	34,473	1,5	**15**	Congenital anomalies	43,847	1,7
16	Ischaemic heart disease	33,190	1,5	**16**	Asthma	38,017	1,5
17	Bipolar affective disorders	29,445	1,3	**17**	Bipolar affective disorders	34,111	1,3
18	Drug use disorders	28,400	1,2	**18**	Ischaemic heart disease	32,562	1,3
19	Epilepsy	27,481	1,2	**19**	Panic disorders	30,116	1,2
20	Migrain	27,357	1,2	**20**	Falls	27,796	1,1
	Total	**2278,407**	**100,0**		**Total**	**2582,768**	**100,0**

As seen in Table 8, first cause of YLD in male is osteoarthritis with 7,3 % and Unipolar Depressive Disorders in female with 10,7 %. In male second rank is occupied by Unipolar Depressive Disorders (% 6,4) and by iron deficiency anemia in female (7 %). Third rank is occupied by alcohol consumption disorders in male (4,4 %) and by osteoarthritis in female (5,8 %).

Table 9 presents distribution of YLD percentages by major disease categorieas, gender and age groups.

Table 9. Percentage Distribution of YLD by Major Disease Categories, Gender and Age Group (Turkey, 2004)

	Percent of Total YLD										
Disease Category	**Total**	**Male**	**Female**	**0-4**	**5-14**	**15-29**	**30-44**	**45-59**	**60-69**	**70-79**	**80+**
A. Infectious and parasitic diseases	4,6	2,7	6,3	11,3	7,8	5,9	3,8	0,8	0,4	0,3	0,2
B. Respiratory infections	0,5	0,5	0,5	1,7	3,1	0,1	0,1	0,1	0,1	0,1	0,0
C. Maternal conditions	2,0	0,0	3,7	0,0	0,0	3,7	2,3	1,0	1,1	1,2	1,5
D. Perinatal conditions	2,8	2,9	2,7	2,4	5,8	2,4	2,7	2,5	2,3	2,6	2,9
E. Nutritional deficiencies	7,4	4,5	10,0	7,1	10,1	9,0	5,8	5,9	9,1	1,9	1,6
F. Malignant neoplasms	1,0	0,9	1,2	0,1	0,1	0,3	1,5	2,0	2,3	1,7	1,8
G. Other neoplasms	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
H. Diabetes mellitus	2,2	2,3	2,0	0,0	0,1	0,2	1,4	4,3	7,8	10,2	11,1
I. Endocrine disorders	0,2	0,2	0,3	0,1	0,2	0,2	0,4	0,3	0,1	0,1	0,1
J. Neuropsychiatric conditions	27,8	27,4	28,2	25,3	27,1	38,8	28,0	16,9	13,4	21,0	19,1
K. Sense organ diseases	5,0	5,3	4,8	0,0	0,0	2,3	6,8	8,7	12,2	10,7	4,0
L. Cardiovascular diseases	7,0	8,1	6,0	0,4	0,4	1,9	6,1	13,6	20,2	22,1	35,6
M.Respiratory diseases	8,2	8,2	8,2	6,3	8,6	4,6	9,4	11,6	10,4	14,1	12,4
N. Digestive diseases	5,3	5,3	5,2	4,8	1,3	5,7	4,6	8,7	5,0	3,1	2,8
O. Genitourinary diseases	1,1	1,0	1,1	0,8	0,7	1,5	0,2	1,9	1,1	0,9	1,2
P. Skin diseases	0,1	0,1	0,1	0,2	0,1	0,1	0,1	0,1	0,1	0,1	0,8
Q. Musculoskeletal diseases	9,9	9,9	10,0	0,5	4,4	7,8	16,2	14,1	11,1	8,4	3,5
R. Congenital anomalies	1,9	2,2	1,7	21,6	0,0	0,0	0,0	0,0	0,0	0,0	0,0
S. Oral conditions	1,9	2,0	1,8	1,9	2,6	2,1	1,3	2,6	1,4	0,7	0,4
T. Unintentional injuries	9,3	13,6	5,5	14,8	25,0	10,8	7,0	4,1	1,8	0,9	0,9
U. Intentional injuries	1,7	2,8	0,8	0,8	2,6	2,5	2,3	0,7	0,1	0,1	0,1
Total	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0

As seen in Table 9, neuro-psychiatric diseases are at the first rank with 27,8 %, musculo-skeletal system diseases are at the second rank with 9,9 % and unintended injuries at the third rank with 9,3 % in total. Although neuro-psychiatric diseases occupy the first rank in both genders, second rank is occupied by unintended injuries in male and by musculo-skeletal system diseases and nutrition deficiency in female. Musculo-skeletal system diseases occupy third rank in male and respiratory diseases occupy third rank in female.

BURDEN OF DISEASES AND INJURIES

In this section, age, gender and cause-specific burden of disease (DALY) is presented.

Figure 11 presents distribution of DALY with YLL and YLD components by major disease groups. According to this, as for major disease groups that cause the burden of disease, first rank is occupied by cardiovascular diseases; second rank is occupied by neuro-psychiatric diseases, third rank by injuries and fourth rank by perinatal causes. However, infectious diseases might rise to the third rank if infectious and parasitic diseases are evaluated together with respiratory diseases.

Figure 11. Distribution of the Burden of Disease (DALY) with YLL and YLD Components by Major Diseases Groups (Turkey, 2004)

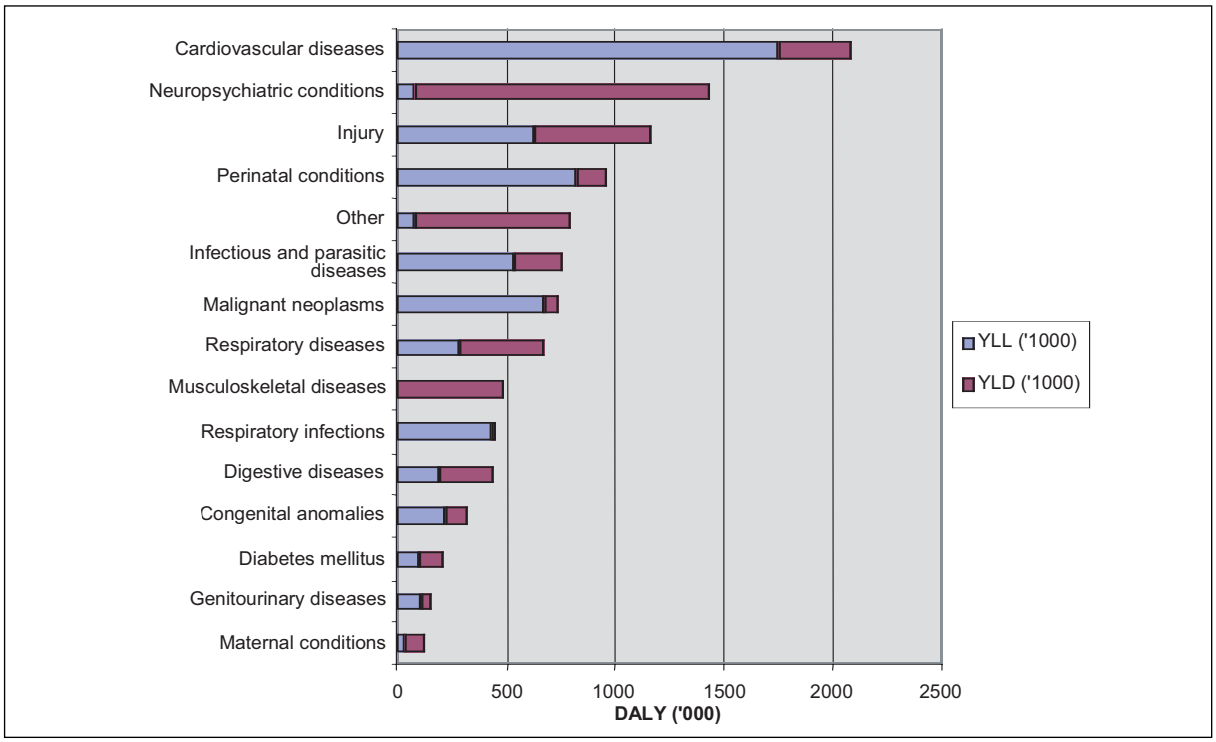


Figure 12 presents distribution of burden of disease (DALY) by gender. According to this, total burden of disease in male is higher than that of female (for male, 5.663.597 DALY and for female 5.138.897 DALY). Examining distribution of YLL and YLD, it could be seen that male have more burden of YLL while female have more burden of YLD.

Figure 12. Distribution of the Burden of Disease (DALY) with YLL and YLD Proportions by Gender (Turkey, 2004)

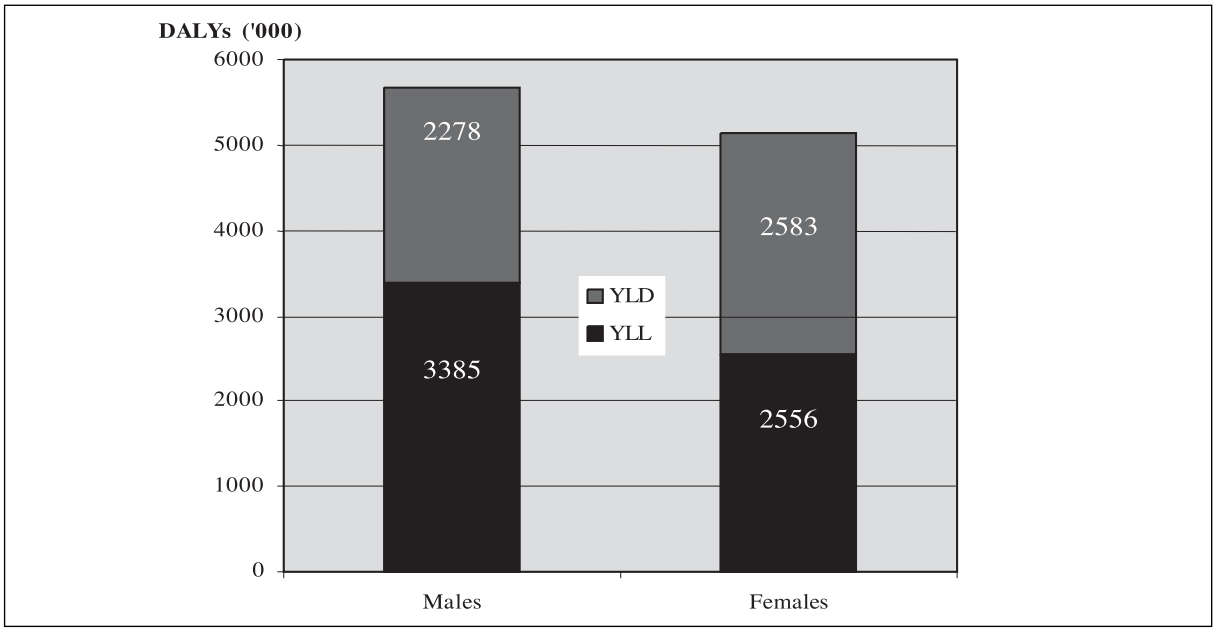


Table 10 presents distribution of total burden of disease by gender.

Table 10. Distribution of the Total Burden of Disease of Turkey by Gender (Turkey, 2004)

	DALYs	
	Number	**Per 1000 population**
Males	5663597	164,9
Females	5138897	153,6
Total	10802494	159,3

According to this, the share of total burden of disease (10802494 DALY) is noted 52,5 % in male (5663597 DALY) and 47,5 % in female (5138897 DALY).

LEADING CAUSES OF DISEASE BURDEN

Table 11 presents first ten diseases which constitute the burden of disease (DALY).

Table 11. First Ten Causes of Disease Burden (DALYs) (Turkey, 2004)

	Causes	**Percent of total DALYs**
1	Perinatal conditions	8,9
2	Ischaemic Heart Disease	8,0
3	Cerebrovascular Disease	5,9
4	Unipolar Depressive Disorders	3,9
5	Lower Respiratory Infections	3,8
6	Congenital Anomalies	3,0
7	Osteoarthritis	2,9
8	COPD	2,8
9	Road Traffic Accidents	2,4
10	Iron deficiency Anemia	2,1

As seen in Table 11, first three ranks in total burden of disease are occupies orderly by perinatal causes (8,9 %), ischemic heart diseases (8 %) and cerebrovascular diseases (5,9 %).

Table 12 presents the number and percentage distribution in the total of first 20 diseases constituting disease burden (DALY) by gender in Turkey.

Table 12. The Number and Percentage Distribution in the Total of First 20 Diseases Constituting Disease Burden (DALYs) by Gender (Turkey, 2004)

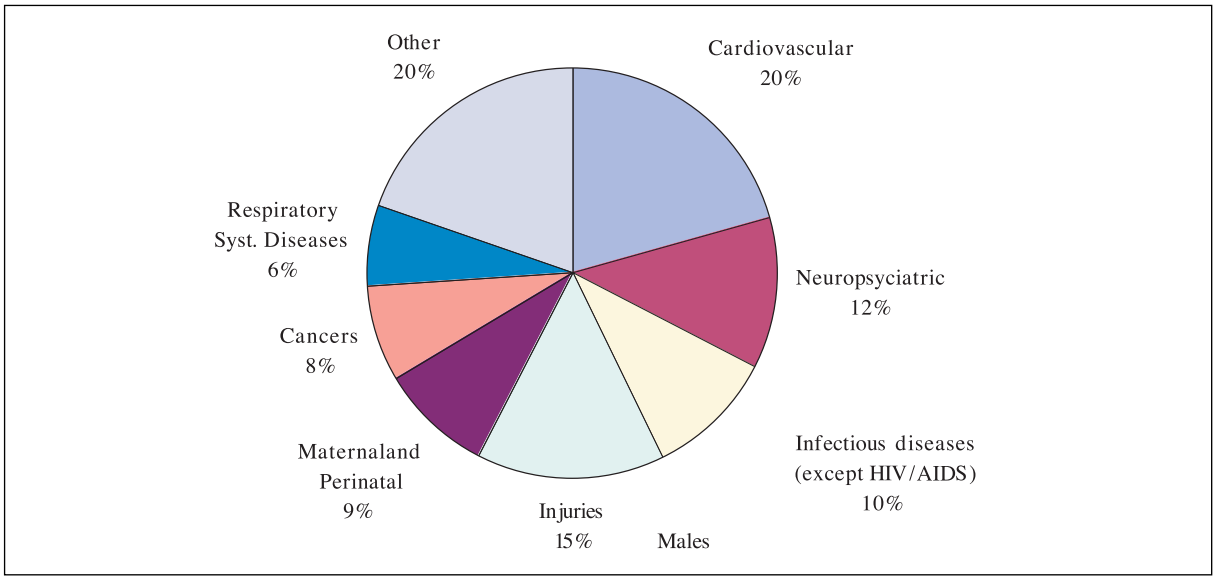
	Males	DALY ('000)	Percent of total		Females	DALY ('000)	Percent of total
1	Ischaemic Heart Disease	506,033	8,9	**1**	Perinatal conditions	456,807	8,9
2	Perinatal conditions	500,691	8,8	**2**	Ischaemic Heart Disease	354,051	6,9
3	Cerebrovascular Disease	355,938	6,3	**3**	Cerebrovascular Disease	284,917	5,5
4	Lower Respiratory Infections	217,552	3,8	**4**	Unipolar Depressive Disorders	276,576	5,4
5	Road Traffic Accidents	184,218	3,3	**5**	Iron Deficiency Anemia	195,284	3,8
6	Congenital Anomalies	174,833	3,1	**6**	Lower Respiratory Infections	190,523	3,7
7	COPD	167,374	3	**7**	Osteoarthritis	150,154	2,9
8	Osteoarthritis	166,494	2,9	**8**	Congenital Anomalies	145,150	2,8
9	Unipolar Depressive Disorder	146,608	2,6	**9**	COPD	132,584	2,6
10	Diarrhoeal Diseases	116,543	2,1	**10**	Maternal Conditions	127,220	2,5
11	Trachea, Bronchus and Lung Cancer	108,722	1,9	**11**	Diabetes Mellitus	109,869	2,1
12	Alcohol Use Disorder	99,351	1,8	**12**	Diarrhoeal Diseases	104,548	2
13	Hearing Loss, Adult Onset	97,714	1,7	**13**	Hearing loss, adult onset	86,978	1,7
14	Diabetes Mellitus	93,158	1,6	**14**	Road Traffic Accidents	77,410	1,5
15	Violence	81,563	1,4	**15**	Breast Cancer	66,125	1,3
16	Inflammatory Heart Disease	73,721	1,3	**16**	Rheumatoid Arthritis	69,242	1,3
17	Asthma	71,738	1,3	**17**	Hypertensive Heart Disease	63,545	1,2
18	Tuberculosis	69,967	1,2	**18**	Rheumatic Heart Diseases	63,009	1,2
19	Leukemia	64,205	1,1	**19**	Asthma	60,654	1,2
20	Schizophrenia	56,635	1	**20**	Migraine	59,451	1,2

As seen in Table 12, ischemic heart diseases (8,9 %), perinatal causes (8,8 %) and cerebrovascular diseases (6,3 %) occupy first three ranks in male. In female, perinatal causes rise to the first rank (8.9 %), second rank is occupied by ischemic heart diseases (6.9 %) and third rank by cerebrovascular diseases (5,5 %). Fourth and fifth ranks are occupied orderly by lower respiratory infections (3,8 %) and traffic accidents (3,3 %) in male, and by Unipolar depressive disorders (5,4 %) and iron deficiency anemia (3,8 %) in female.

AGE AND GENDER PATTERNS OF DISEASE BURDEN

Figure 13 presents distribution of burden of disease (DALY) by gender and major disease groups. According to this, cardiovascular diseases (20 %) occupy the first and injuries (15 %) occupy the second rank in male. As for female, cardiovascular diseases occupy the first and neuro-psychiatric causes occupy the second rank.

Figure 13. Distribution of Disease Burden (DALYs) by Gender and Major Disease Groups (Turkey, 2004)



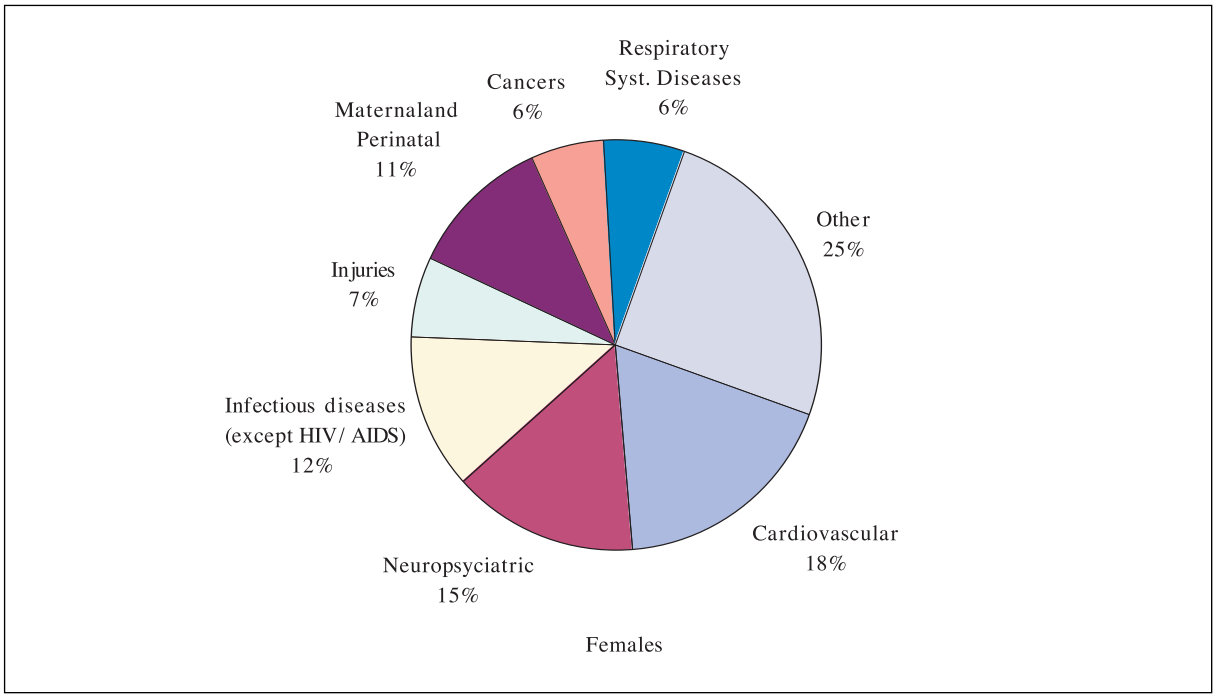


Table 13 presents the number and percentage distribution in the total of DALYs by life cycle stage and gender.

Table 13. The Number and Percentage Distribution in the Total of DALYs by Life Cycle Stage and Gender (Turkey, 2004)

Males	DALY ('000)	Percent of total	Females	DALY ('000)	Percent of total
0-14 years	1649,594	29,1	**0-14 years**	1449,105	28,2
15-60 years	3030,742	53,5	**15-60 years**	2664,234	51,8
60 years and over	983,261	17,4	**60 years and over**	1025,558	20,0
Total	5663,597	100,0	**Total**	5138,897	100,0

Table 14 presents percentage distribution of DALYs by major disease groups, gender and age group.

Table 14. Percentage Distribution of DALYs by Major Disease Groups, Gender and Age Group (Turkey, 2004)

	Percent of Total DALYs										
Disease Category	**Persons**	**Male**	**Female**	**0-4**	**5-14**	**15-29**	**30-44**	**45-59**	**60-69**	**70-79**	**80+**
A. Infectious and parasitic diseases	7,0	6,2	7,8	18,0	9,6	6,5	4,1	1,3	1,0	0,9	0,7
B. Respiratory infections	4,2	4,2	4,2	13,4	6,5	0,9	0,7	1,5	1,5	1,8	2,5
C. Maternal conditions	1,2	0,0	2,5	0,0	0,0	3,3	1,9	0,6	0,4	0,3	0,4
D. Perinatal conditions	8,9	8,8	8,9	35,2	3,3	1,6	1,6	1,2	0,8	0,7	0,7
E. Nutritional deficiencies	4,0	2,4	5,8	3,7	6,3	6,4	4,0	2,8	3,3	0,6	0,5
F. Malignant neoplasms	6,8	7,6	5,8	0,8	5,7	4,4	8,7	10,9	13,1	11,2	6,8
G. Other neoplasms	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
H. Diabetes mellitus	1,9	1,6	2,1	0,0	0,3	0,5	1,5	3,9	5,3	4,5	4,0
I. Endocrine disorders	0,1	0,1	0,2	0,0	0,2	0,2	0,3	0,2	0,0	0,1	0,1
J. Neuropsychiatric conditions	13,3	11,9	14,9	4,9	17,3	27,1	18,0	8,4	5,5	6,6	5,8
K. Sense organ diseases	2,3	2,2	2,4	0,0	0,0	1,6	4,1	4,1	4,2	2,8	1,0
L. Cardiovascular diseases	19,3	20,5	18,0	1,5	7,2	5,9	18,4	35,6	42,9	50,9	59,3
M. Respiratory diseases	6,3	6,2	6,3	1,9	6,7	4,8	7,9	7,4	8,8	12,3	13,0
N. Digestive diseases	4,1	4,1	4,2	1,2	2,1	5,5	5,2	7,0	4,5	2,6	1,8
O. Genitourinary diseases	1,5	1,4	1,6	0,3	1,6	2,2	1,6	2,1	1,6	1,1	1,0
P. Skin diseases	0,1	0,1	0,1	0,0	0,0	0,1	0,1	0,1	0,0	0,0	0,2
R. Musculoskeletal diseases	4,5	4,0	5,1	0,1	2,5	5,3	9,9	6,6	3,9	2,2	0,9
S. Congenital anomalies	3,0	3,1	2,8	13,6	0,0	0,0	0,0	0,0	0,0	0,0	0,0
T. Oral conditions	0,9	0,8	0,9	0,3	1,5	1,4	0,8	1,2	0,5	0,2	0,1
U. Unintentional injuries	8,7	11,9	5,2	4,8	24,6	16,7	8,8	4,5	2,6	1,1	1,3
V. Intentional injuries	2,0	2,7	1,3	0,1	4,4	5,7	2,4	0,7	0,2	0,1	0,1
Total	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0

BURDEN OF DISEASE CALCULATIONS WITH NO DISCOUNT

3 % discount rate is used for DALY calculations presented so far.

Table 15, however, presents DALY calculations with no discount.

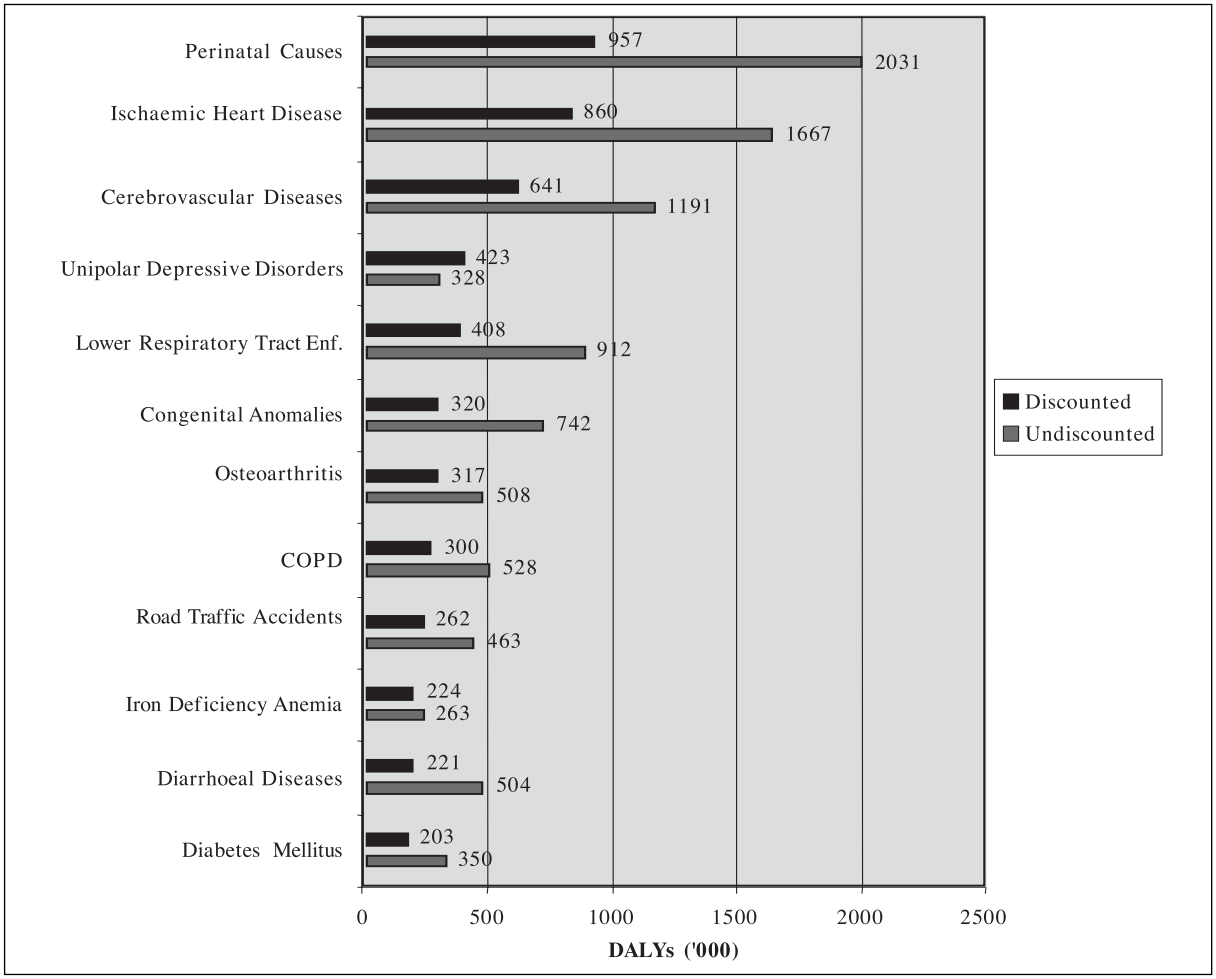
Table 15. Ten Leading Diseases Constituting Undiscounted DALYs by Gender (Turkey, 2004)

	Males	DALY ('000)	Percent of total		Females	DALY ('000)	Percent of total
1	Perinatal Causes	1060,443	11	**1**	Perinatal Causes	970,684	11,2
2	Ischaemic Heart Diseases	941,959	9,7	**2**	Ischaemic Heart Disease	725,425	8,3
3	Cerebrovascular Diseases	640,112	6,6	**3**	Cerebrovascular Disease	551,211	6,3
4	Lower Respiratory Infections	475,292	4,9	**4**	Lower Respiratory Infections	436,682	5
5	Congenital anomalies	399,313	4,1	**5**	Congenital anomalies	343,004	3,9
6	Road traffic accidents	319,025	3,3	**6**	Osteoartritis	256,394	2,9
7	COPD	294,466	3	**7**	Diarrhoeal Diseases	242,450	2,8
8	Diarrhoeal Diseases	261,659	2,7	**8**	COPD	233,060	2,7
9	Osteoartritis	251,585	2,6	**9**	Iron deficiency Anemia	222,908	2,6
10	Trachea, Bronchus and Lung Cancers	202,003	2,1	**10**	Unipolar Depressive Disorders	213,033	2,4

As for diseases which constitute burden of disease, discounted and undiscounted calculations for DALY do not vary in the rank (see Table 12). As seen in Table 15, first rank is occupied by perinatal causes with 11 %, second rank is occupied by ischemic heart diseases with 9,7 % and third rank by cerebrovascular diseases with 6,6 % in male. As for female, perinatal causes (11,2 %), ischemic heart diseases (8,3 %) and cerebrovascular diseases (6,3 %) occupy first three ranks respectively. Apart from these, unipolar depressive disorders in female, which occupied the 4th rank before, has decreased to the 10th rank.

Figure 14 presents discounted and undiscounted comparisons of DALY for first ten diseases which constitute the burden of disease in Turkey. When the undiscounted value of perinatal causes is 2.031.127 DALY, the discounted value is 957.498 DALY. These values are orderly 1.667.384 DALY and 860.083 DALY for ischemic heart diseases, and 1.191.323 DALY and 640.854 DALY for cerebrovascular diseases.

Figure 14. Comparison of discounted and undiscounted DALYs (Turkey, 2004)



Percentage distribution of undiscounted DALYs by major disease groups, gender and age groups is presented in Table 16.

Table 16. Percentage Distribution of Undiscounted DALYs by Major Disease Groups, Gender and Age Groups (Turkey, 2004)

	Percent of Total Undiscounted DALYs										
Disease Category	**Persons**	**Male**	**Female**	**0-4**	**5-14**	**15-29**	**30-44**	**45-59**	**60-69**	**70-79**	**80+**
A. Infectious and parasitic diseases	7,8	7,5	8,2	17,9	9,6	6,0	3,7	1,3	1,0	0,9	0,7
B. Respiratory infections	5,4	5,3	5,6	13,3	7,5	1,2	0,8	1,7	1,6	1,9	2,6
C. Maternal conditions	0,6	0,0	1,4	0,0	0,0	2,8	1,5	0,2	0,0	0,0	0,0
D. Perinatal conditions	11,1	11,0	11,2	35,9	0,0	0,0	0,0	0,0	0,0	0,0	0,0
E. Nutritional deficiencies	3,2	2,0	4,5	3,4	4,7	5,9	3,3	2,1	2,3	0,4	0,3
F. Malignant neoplasms	7,5	8,3	6,6	0,8	7,5	6,3	11,2	12,4	14,1	11,6	7,0
G. Other neoplasms	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
H. Diabetes mellitus	1,9	1,5	2,3	0,0	0,4	0,6	1,6	4,0	5,1	4,3	3,8
I. Endocrine disorders	0,1	0,1	0,1	0,0	0,1	0,2	0,2	0,1	0,0	0,1	0,1
J. Neuropsychiatric conditions	9,0	7,9	10,2	5,2	15,3	20,1	11,9	5,9	4,7	6,1	5,6
K. Sense organ diseases	2,2	2,0	2,4	0,0	0,0	2,0	4,8	4,2	4,2	2,7	0,9
L. Cardiovascular diseases	21,4	21,7	21,0	1,5	9,3	7,5	22,4	39,7	45,2	52,7	60,5
M. Respiratory diseases	5,7	5,6	5,9	1,9	5,4	4,4	7,3	6,9	8,7	12,2	13,0
N. Digestive diseases	3,5	3,5	3,5	1,8	2,2	4,6	4,8	6,0	4,3	2,5	1,7
O. Genitourinary diseases	1,4	1,4	1,5	0,4	1,8	2,4	2,0	2,1	1,6	1,1	1,0
P. Skin diseases	0,0	0,0	0,1	0,0	0,0	0,1	0,1	0,0	0,0	0,0	1,3
R. Musculoskeletal diseases	3,7	3,3	4,2	0,1	1,6	5,2	10,4	6,5	3,8	2,2	0,9
S. Congenital anomalies	4,0	4,1	3,9	13,1	0,0	0,0	0,0	0,0	0,0	0,0	0,0
T. Oral conditions	0,7	0,6	0,7	0,3	0,9	1,3	0,7	1,1	0,5	0,2	0,1
U. Unintentional injuries	8,7	11,5	5,5	4,3	28,4	21,8	10,6	4,9	2,8	1,1	1,3
V. Intentional injuries	2,0	2,6	1,3	0,1	5,2	7,7	2,7	0,8	0,2	0,1	0,1
Total	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0

As seen in Table 16, cardiovascular diseases occupy the first rank with 21,4 %, perinatal causes occupy the second rank with 11,1 % and neuro-psychiatric diseases occupy the third rank with 9 % in the list of undiscounted burden of diseases by major disease groups.

BURDEN ATTRIBUTABLE TO SEVEN BASIC RISK FACTORS

This section aims to find out what part of society could be protected from identified risk factors in Turkey by age groups and gender by either alleviating or eradicating exposure to these factors and what kind of gains the society would have with respect to the status of health.

Figure 15 presents distribution of the proportion of burden attributed to selected risks, by gender, to total burden. According to this, DALY to be obtained by prevention of smoking is 15,4 % of total DALY in men and DALY to be obtained by prevention of high blood pressure is 9,4 % of total DALY in female.

Figure 15. Distrubition of the Proportion of Burden Attributed to Selected Risk Factors toTotal Burden by Gender, (Turkey, 2004)

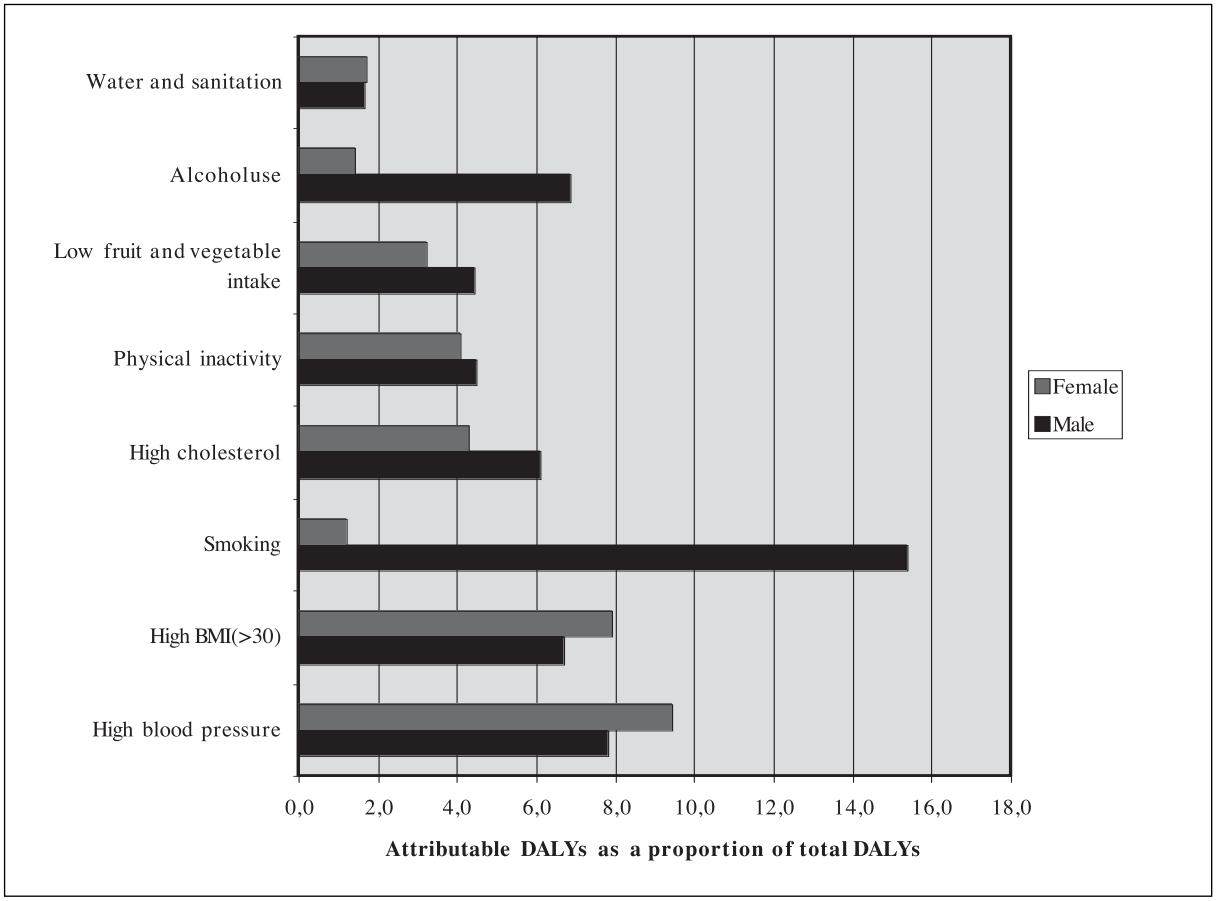
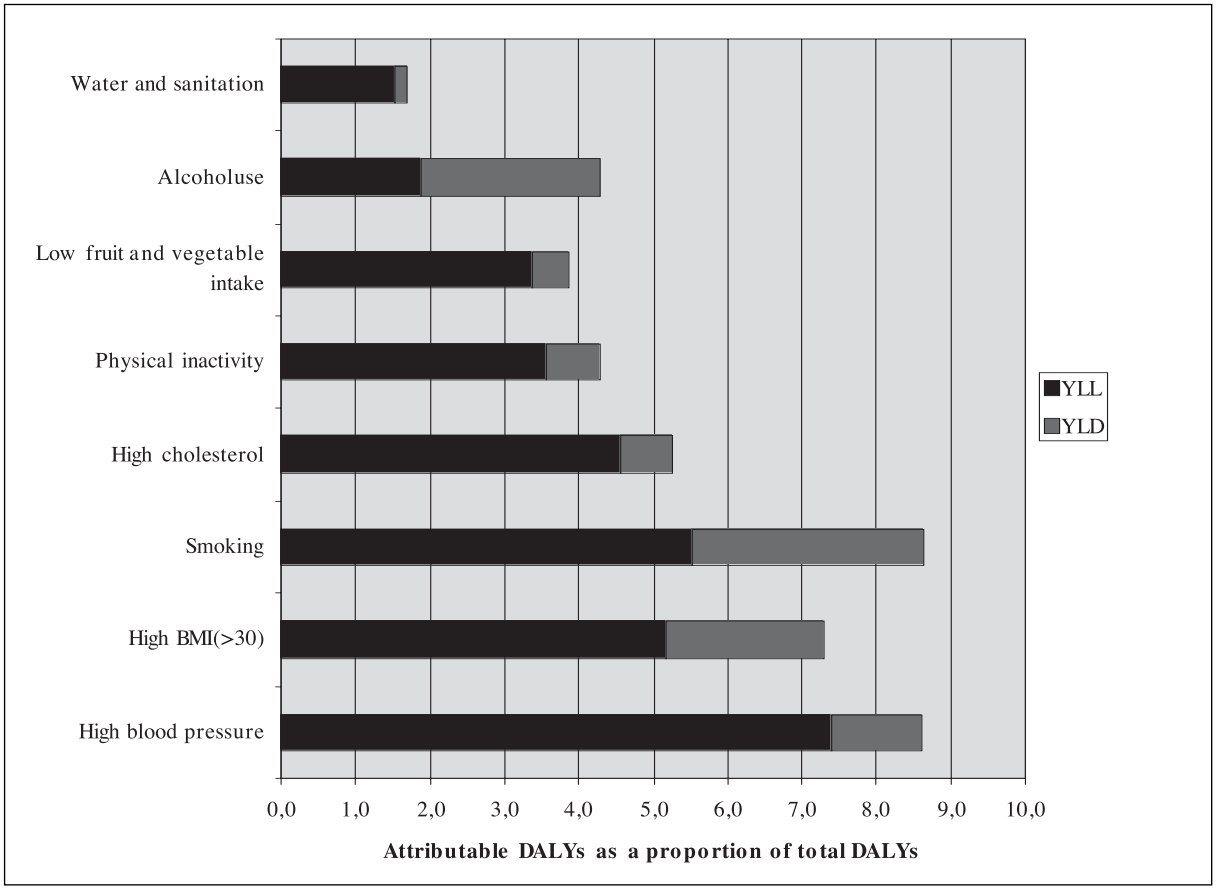


Figure 16 presents YLL and YLD comparison of the proportion of burden attiributed to some selected risk factors to total burden. As seen in Figure 16, the proportion of burden attiributed to smoking and high blood pressure- to total burden is 8,6 %. However, YLL and YLD distribution in high blood pressure is orderly 5,5 and 3,1 % while it is 7,4 and 1,2 % in smoking. The proportion of burden attributed to high body-mass index- to total burden is 7,3 %. Distribution of YLL and YLD is orderly 5,2 and 2,1 %.

Figure 16. YLL and YLD Comparison of the Proportion of Burden Attiributed to Some Selected Risk Factors to Total Burden (Turkey, 2004)



TOBACCO

Distribution of burden of disease attributed to tobacco consumption- and number of deaths by diseases are presented in Table 17.

Table 17. Distribution of Burden of Disease Attributed to Tobacco Consumption and Number of Deaths by Diseases

Disease	Attributable Deaths	Attributable YLL	Attributable DALYs	Attributable DALYs as a proportion of total DALYs
Trachea bronchus lung cancers	10510	107075	112634	1,0
Upper aerodigestive cancer	1340	15593	16469	0,2
Other cancers	3341	43163	45833	0,4
Chronic obstructive pulmonary disease	12902	72689	150406	1,4
Other respiratory diseases	2105	33387	58377	0,5
Cardiovascular diseases	21317	274770	321237	3,0
Selected other medical causes	3185	50006	226953	2,1
All causes	54699	596684	931909	8,6

As seen in Table 17, tobacco has a major share of 8,6 % in burden of relevant diseases. Of tobacco-related diseases, tobacco is a major cause of cardiovascular diseases (3 %) and chronical obstructive pulmonary diseases (COPD) (1,4 %).

When tobacco consumption is prevented, number of deaths caused by cardiovascular diseases that will be prevented is 21 317 (5% of total deaths). Number of deaths caused by the COPD is 12.902 (3 % of all deaths) and the number of deaths caused by trachea-bronchus and lung cancer is 10.510 (2,4 % of all deaths).

Distribution of tobacco-attributable burden of disease and death numbers by gender is presented in Table 18.

Table 18. The Burden of Disease Attributable to Tobacco (Turkey, 2004)

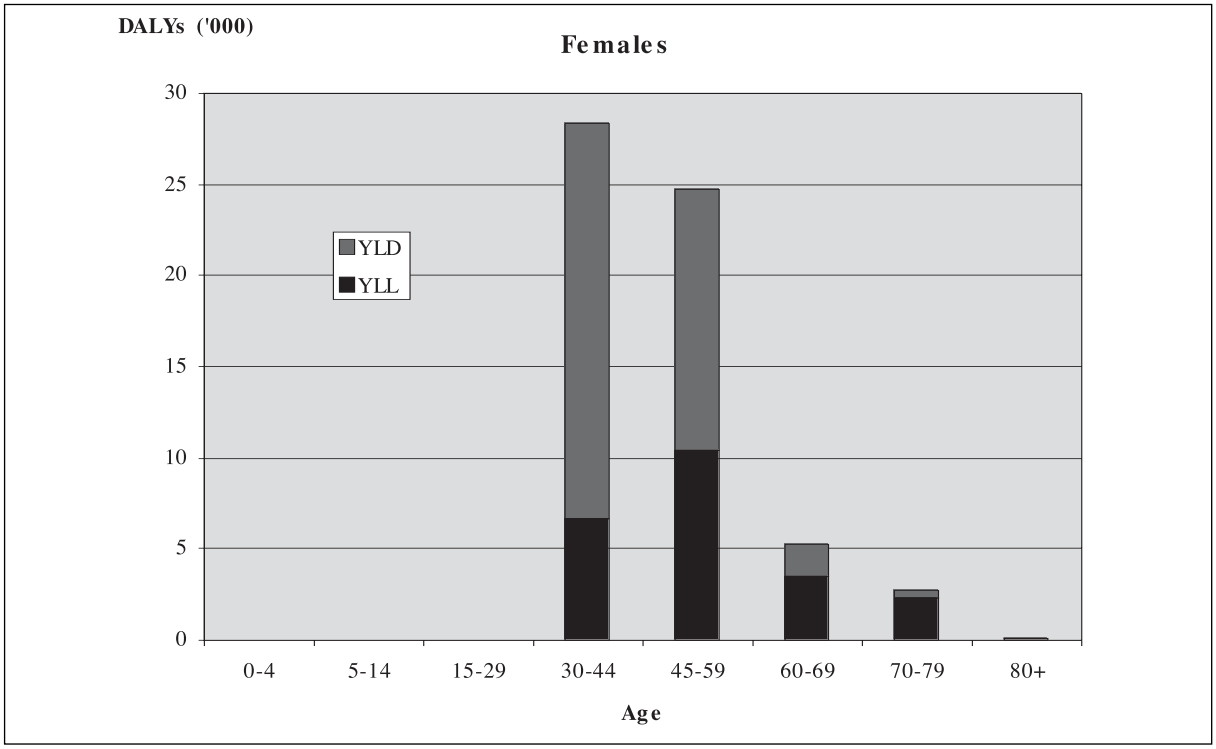
	Males		Females		Persons	
	Number	Percent	Number	Percent	Number	Percent
Deaths	52.905	22,7	1.794	0,9	54.699	12,7
YLL	573.573	16,9	23.110	0,9	596.684	10,0
YLD	297.030	13,0	38.196	1,5	335.225	6,9
DALYs	870.603	15,4	61.306	1,2	931.909	8,6

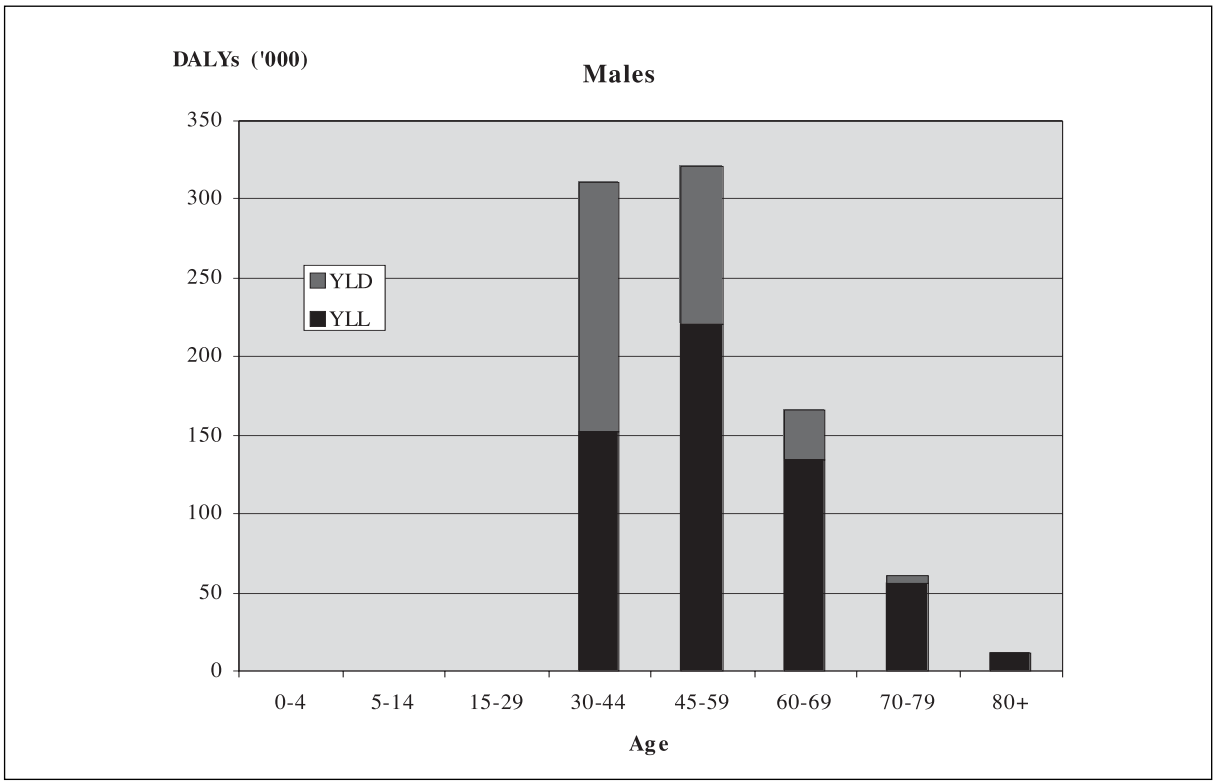
As seen in Table 18, 54.699 deaths could be prevented by prevention of tobacco consumption, which is 12,7 % of all deaths. The percentage is higher in male and prevention of tobacco consumption could prevent 22,7 % of deaths in male and 15,4 % of total DALY.

Figure 17 presents distribution of burden of diseases attributable to tobacco by gender and age groups. According to this, major part of tobacco-caused burden of disease is seen in 30-44 age group in female and 45-59 age group in male.

As for total burden of disease attributable to tobacco, total DALY for 30-44 age group is 28000 and 25000 for 45-59 age group in female. It is 310000 for 30-44 age group and 320000 for 45-59 age group in male, which is very high.

Figure 17. The Distribution of Burden of Diseases Attributable toTobacco by Age Groups and Gender (Turkey, 2004)





ALCOHOL

Figure 18 presents distribution of adverse effects of alcohol-attributed burden of disease by gender and age. According to this, burden of disease attributed to adverse effects of alcohol is condensed in 15-29 age group regarding both genders. This is followed by 30-44 and 45-59 age groups. As for YLL and YLD figures, female in 15-29 age group have 8.346 YLL, and 18.062 YLD, while the figures are 49.173 and 112.989 for male.

Figure 18. The Distribution of Attributable Burden of the Harmful Effects of Alcohol by Age Groups and Gender (Turkey, 2004)

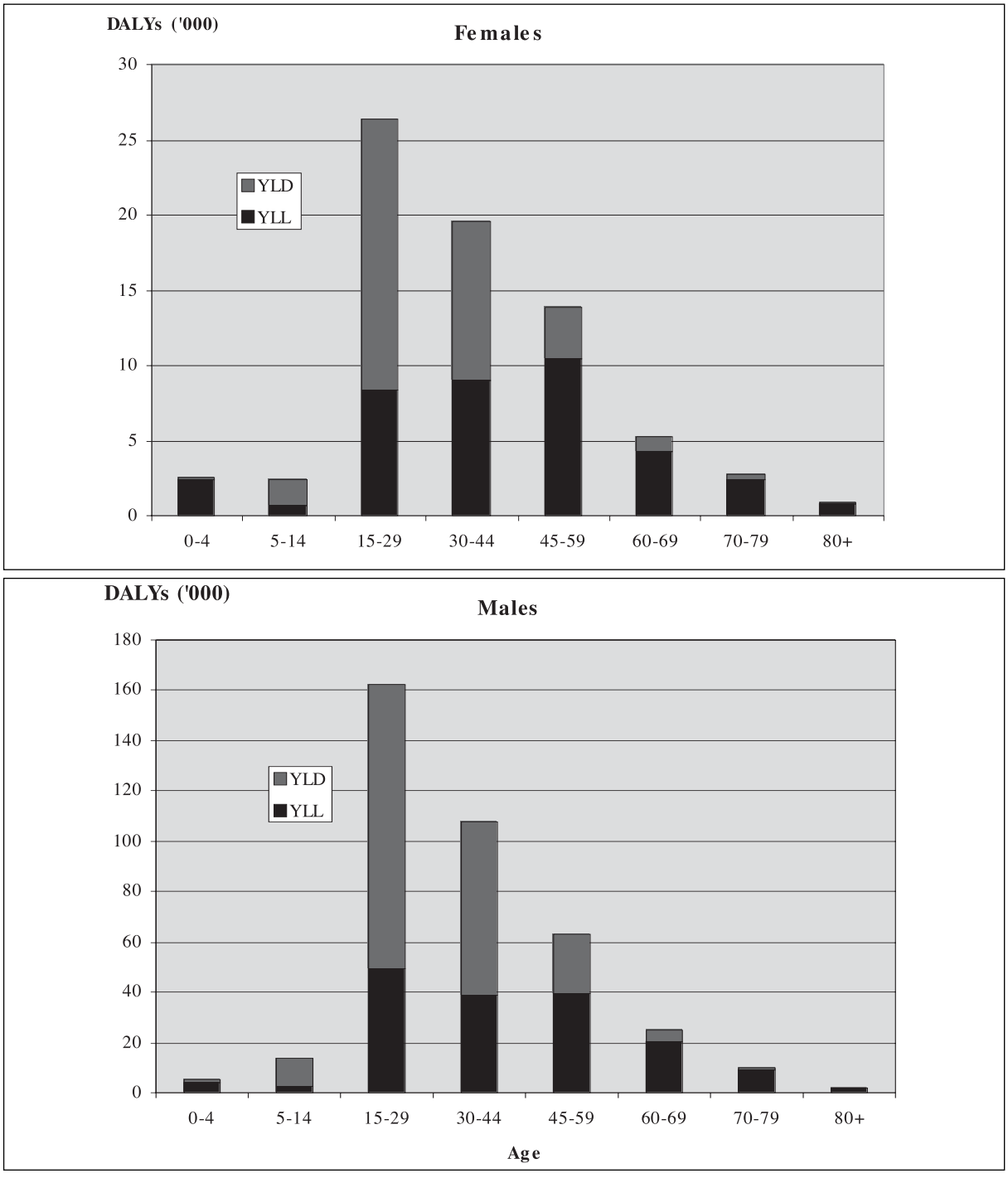


Table 19 presents Distribution of Alcohol Consumption-attributed Death Numbers of Burden of Disease by Causes.

Table 19. Distribution of Alcohol Consumption Attributed Disease Burden and Death Numbers by Causes (Turkey, 2004)

Cause	Deaths	YLL	YLD	DALYs	As percent of totak DALYs
Low birth weight	67	2528	0	2528	<0,1
Mouth and Oropharynx cancers	327	4231	208	4439	<0,1
Oesophagus cancer	237	2858	94	2952	<0,1
Liver cancer	229	3016	29	3045	<0,1
Breast cancer	158	2312	412	2724	<0,1
Other neoplasms	1	11	0	11	<0,1
Diabetes Mellitus	2	22	54	76	<0,1
Epilepsy	122	2958	4597	7555	0,1
Hypertensive heart disease	1425	12504	804	13308	0,1
Ischemic heart disease	3540	31642	1980	33622	0,3
Ischemic stroke	272	2835	1214	4049	<0,1
Haemorrhagic stroke	2088	23578	1675	25253	0,2
Cirrhosis of the liver	798	11959	4531	16490	0,2
Unipolar depressive disorders	0	0	2624	2624	<0,1
Alcohol use disorders	0	0	204797	204797	1,9
Road traffic accidents	1023	26375	5253	31628	0,3
Poisonings	53	1360	1	1361	<0,1
Falls	117	2425	4925	7350	0,1
Drownings	95	2575	16	2591	<0,1
Other unintentional injuries	1902	46344	21607	67951	0,6
Self-inflicted injuries	383	10323	19	10342	0,1
Violence	489	11597	4538	16135	0,1
Total	13435	203781	258237	462018	4,3

As presented in Table 19, alcohol consumption-attributed deaths are mostly the consequences ischemic heart diseases and hemorragic stroke. Deaths caused by hypertensive cardiac diseases, traffic accidents and liver cirrhosis are also included in other alcohol-attributed deaths. In other words, 3450 deaths caused by ischemic heart diseases and 2088 deaths caused by hemorrhagic stroke could be prevented by prevention of alcohol consumption as well as preventing 204.797 YLD and DALY in alcohol consumption-related disorders.

4,3 % of total burden of disease could be prevented by preventing alcohol consumption in the society. The percentage is 1,9 % in alcohol consumption disorders and 0,6 % in other unintended injuries.

Table 20 presents distribution of alcohol consumption-attributed burden of disease and death numbers.

Table 20. Distribution of Alcohol Consumption Attributed Disease Burden and Death Numbers (Turkey, 2004)

	Males		Females		Total	
	Number	in total %	Number	in total %	Number	in total %
Deaths	10850	4,7	2585	1,3	13435	3,1
YLL	165550	4,9	38231	1,5	203781	3,4
DALY	388526	6,9	73492	1,4	462018	4,3

As seen in Table 20, prevention of alcohol consumption could prevent a total of 10850 deaths in male, which corresponds to 4,7 % of all deaths. As for female, the percentage is 1,3 %, which corresponds to 3,1 % of all deaths in total.

YLD and DALY numbers to be prevented by prevention of alcohol consumption are orderly 165.550 and 388.526 in male, which have a share of 4,9 % and 6,9 % in total YLD and DALYs. These shares ale lower in female, which are relatively 1,5 % and 1,4 %.

In total, 13435 deaths and 462018 DALYs could be prevented, which are equivalent to 3,1 % of all deaths and 4,3 % of total DALYs.

HIGH BODY-MASS INDEX

Table 21 presents distribution of high body mass index attributed burden of disease and death numbers.

Table 21. Distribution of High Body Mass Index Attributed Disease Burden and Death Numbers (Turkey, 2004)

Cause	Attributable Deaths	Attributable YLL	Attributable YLD	Attributable DALYs	Attributable DALYs as a proportion of total DALYs
Ischemic heart disease	29581	317790	28504	346294	3,2
Hypertensive heart disease	7174	57723	4073	61796	0,6
Ischemic stroke	11109	93794	53136	146930	1,4
Diabetes Mellitus	7674	73921	78319	152240	1,4
Osteoarthritis	0	0	61035	61035	0,6
Breast cancer	724	7141	1718	8859	0,1
Colon and rectum cancers	646	6583	717	7300	0,1
Corpus uteri cancer	235	2079	651	2730	0,0
Total	57143	559032	228151	787183	7,3

As seen in Table 21, a total of 57143 deaths, which consist of 29581 deaths caused by ischemic heart disease, 11109 deaths caused by ischemic stroke and 7674 deaths caused by diabetes mellitus could be prevented by prevention of obesity, which refer to 13,3 % of all deaths. As for the attributed YLD figures, it is 78319 for diabetes mellitus, 61035 for osteoarthritis, and 53136 for ischemic heart diseases. Figures of DALY prevented by prevention of obesity are 346.294 for ischemic heart disease, 152.240 for diabetes mellitus, and 146.930 in ischemic stroke. Prevented numbers of DALY make 7,3 % of total DALY.

Table 22 presents distribution of high body mass index-attributed burden of disease.

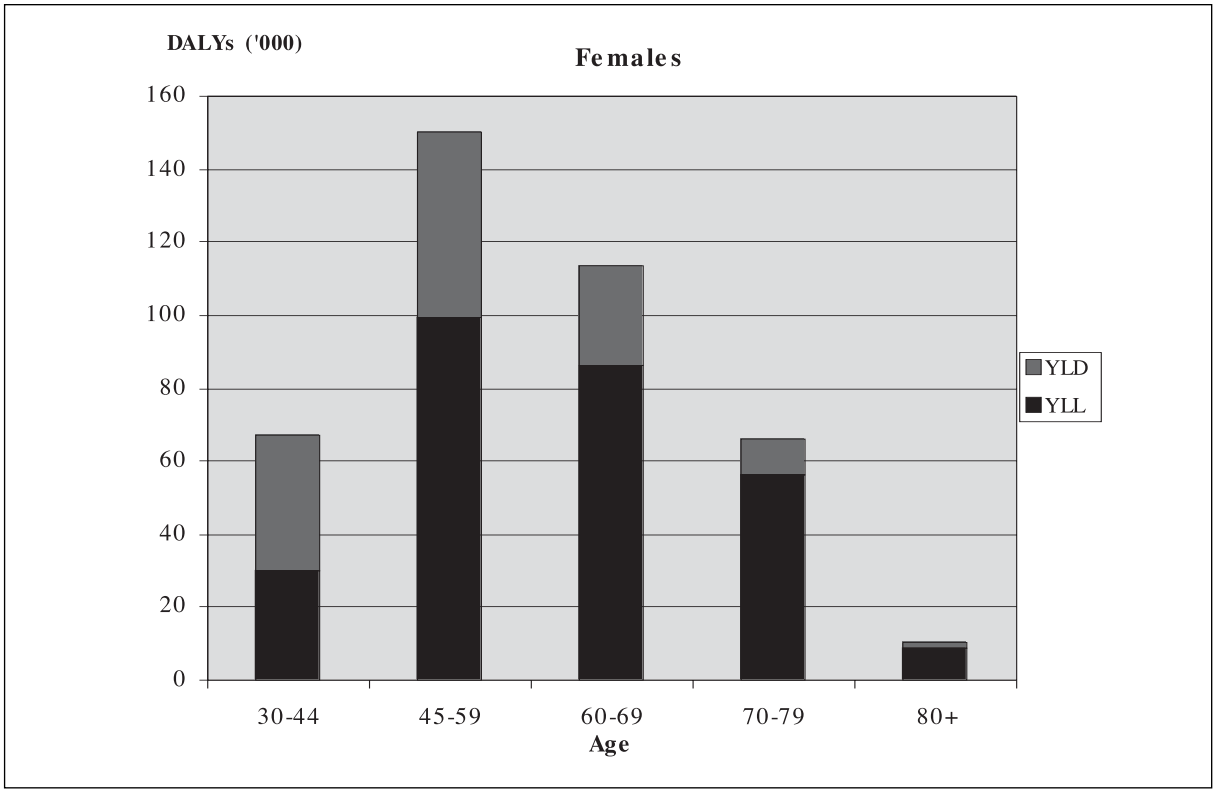
Table 22. Distribution of High Body Mass Index Attributed Disease Burden (Turkey, 2004)

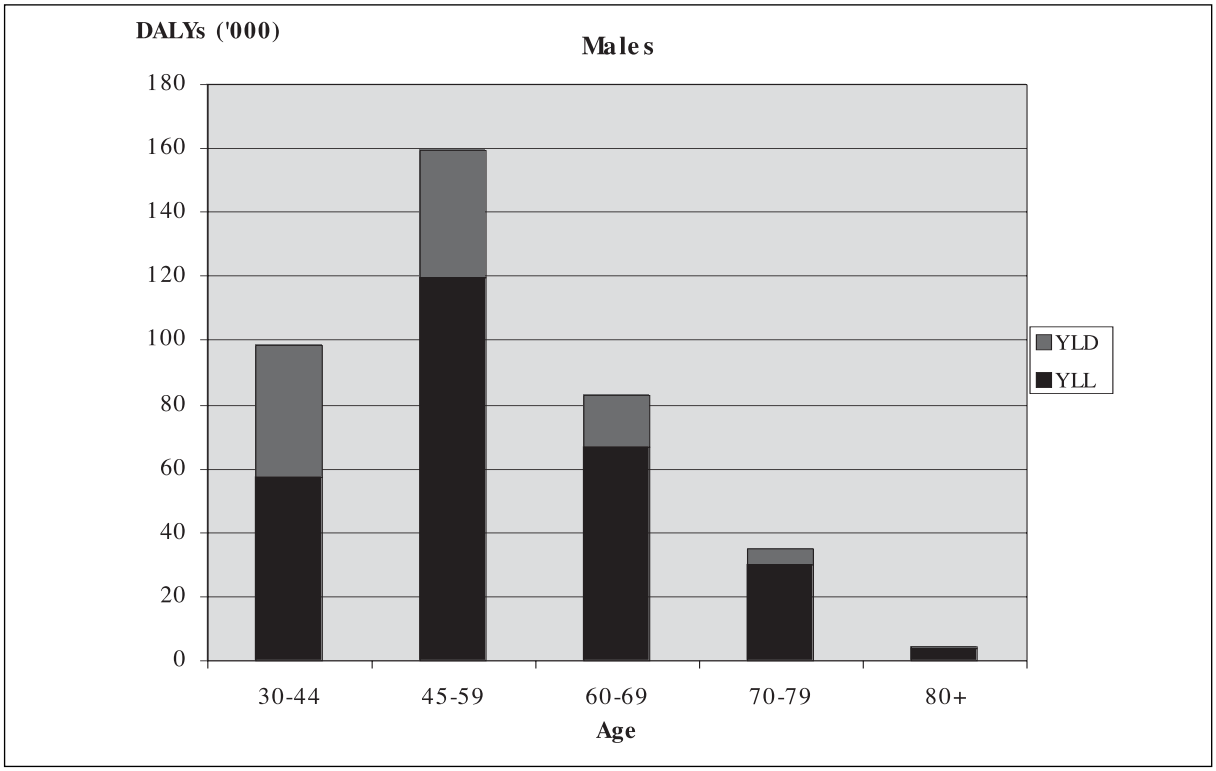
	Males		Females		Persons	
	Number	Percent	Number	Percent	Number	Percent
Deaths	26006	11,1	31136	15,8	57143	13,3
YLL	278008	8,2	281024	11,0	559032	9,4
YLD	101972	4,5	126179	4,9	228151	4,7
DALYs	379980	6,7	407203	7,9	787183	7,3

As seen in Table 22, prevention of obesity could prevent 26.006 deaths in male, which is is equivalent to 11,1 % of all deaths. It could also prevent 31.136 deaths in female, which is equivalent to 15,8 % of all deaths. As for prevented DALY, burden of disease prevented in male is 6,7 % while it is 7,3 in female.

Distribution of High Body Mass Index-Attributed Burden of Disease by Age Groups and Gender is presented in Figure 19. According to this, highest burden of disease caused by obesity is seen in 45-59 age group in both genders and the burden decreases as people become elder in both genders.

Figure 19. Distribution of High Body Mass Index Attributed Disease Burden by Age Groups and Gender (Turkey, 2004)





HYPERTENSION

Distribution of Hypertension-attributed Burden of Disease and Death Numbers are presented in Table 23.

Table 23. Distribution of Hypertension Attributed Disease Burden and Death Numbers (Turkey, 2004)

Cause	Attributable Deaths	Attributable YLL	Attributable YLD	Attributable DALYs	Attributable DALYs as a proportion of total DALYs
Ischemic heart disease	50717	399783	32421	432204	4,0
Cerebrovascular disease	39731	279541	81368	360909	3,3
Hypertensive heart disease	11503	80829	6053	86882	0,8
Other cardiovascular diseases	6518	38199	10757	48956	0,5
Total	**108468**	**798353**	**130597**	**928950**	**8,6**

As seen in Table 23, number of deaths attributed to hypertension, which refers to the fact that they could be prevented by keeping hypertension under control, is 50.717 for ischemic heart disease, 39.731 for cerebrovascular diseases and 11.503 for hypertensive heart diseases. Total number of deaths prevented is 108.468, which constitutes 25,2 % of all deaths.

As for prevented DALY numbers, a total of 928.950 DALY could be prevented by prevention of hypertension, which is equivalent to 8,6 % of the burden of disease.

Distribution of Hypertension-Attributed Burden of Disease and Death Numbers by Gender is presented in Table 24.

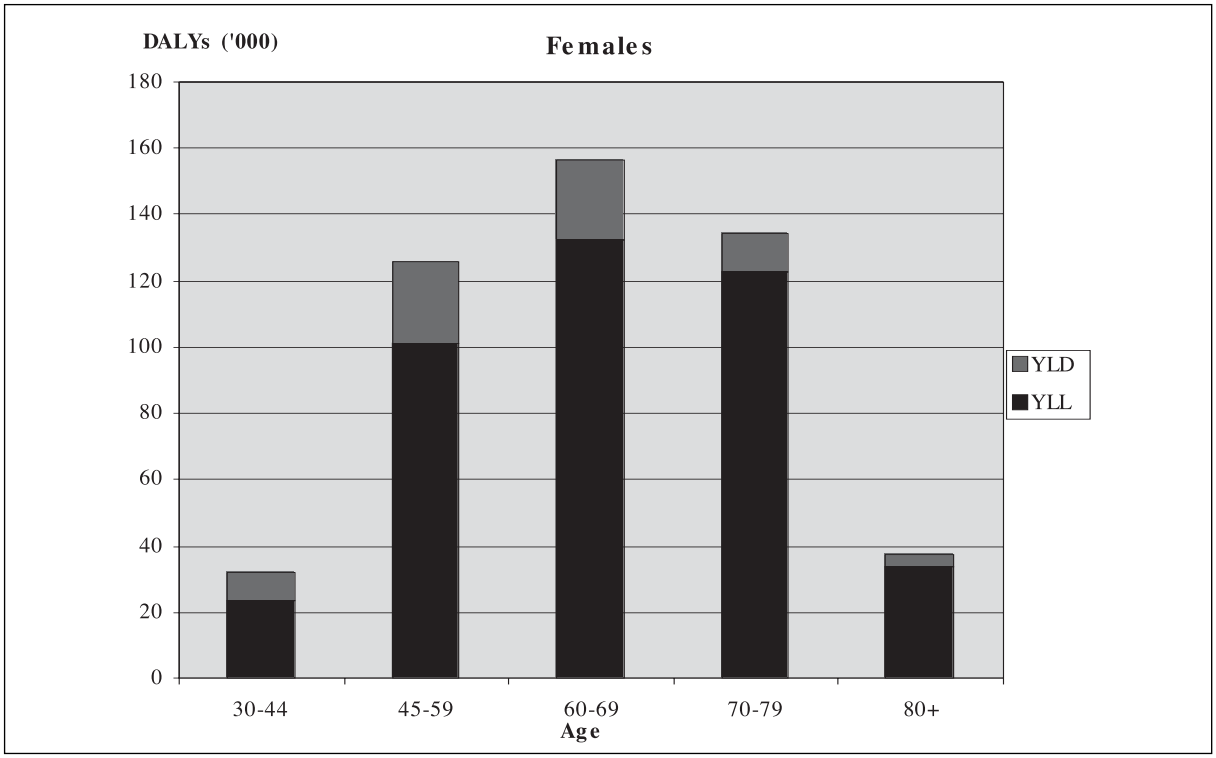
Table 24. Distribution of Hypertension Attributed Disease Burden and Death Numbers by Gender (Turkey, 2004)

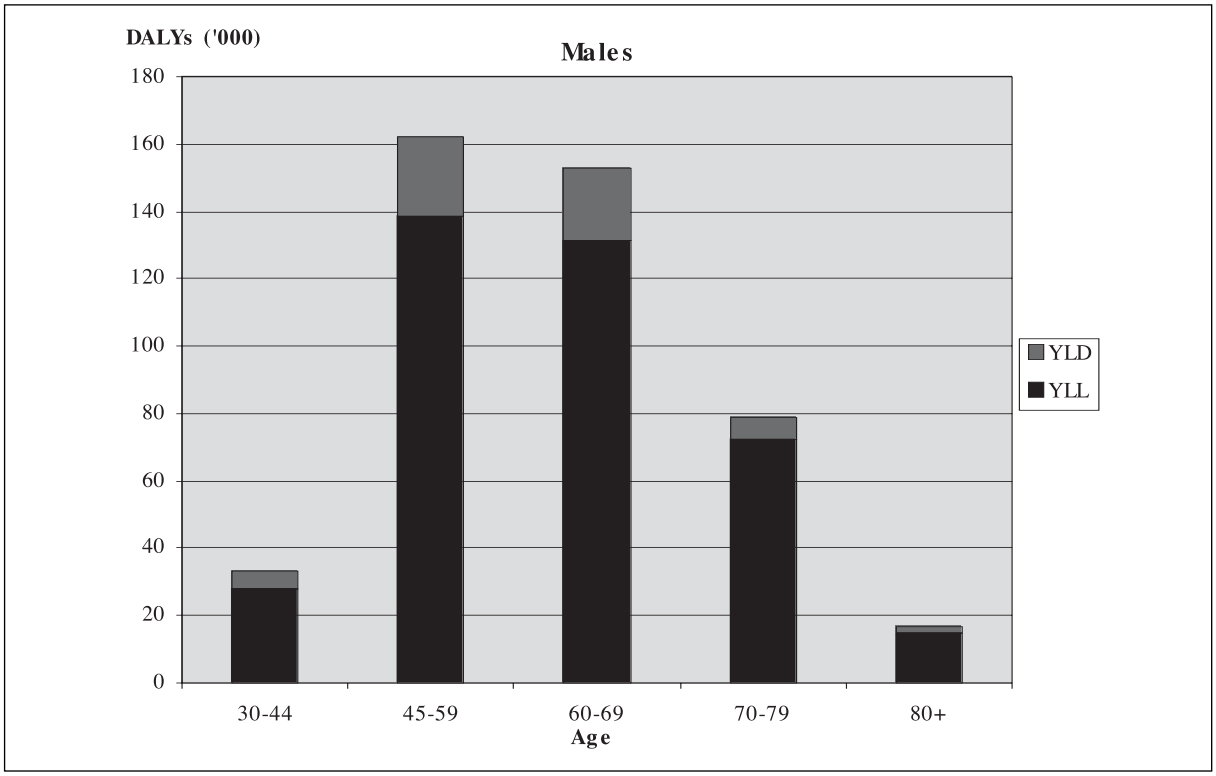
	Males		Females		Persons	
	Number	Percent	Number	Percent	Number	Percent
Deaths	47643	20,4	60825	30,8	108468	25,2
YLL	384659	11,4	413694	16,2	798353	13,4
YLD	59129	2,6	71468	2,8	130597	2,7
DALYs	443788	7,8	485162	9,4	928950	8,6

As seen in Table 24, keeping hypertension under control could prevent 20,4 % of deaths in male and 30,8 % of deaths in female. As for the prevented YLL values, keeping hypertension under control could prevent 11,4 % of total YLL in male and 16,2 % of total YLL in female. Hypertension causes 443.788 DALY in male and 485.162 DALY in female, which refers to 7,8 % burden of disease in male and 9,4 % in female. In other words, keeping hypertension in normal limits could prevent 8,6 % of total burden of disease.

Distribution of hypertension-attributed burden of disease by age groups and gender is presented in Figure 20. According to this, hypertension-caused burden of disease is mostly seen in female 60-69 age group and is alleviated in further ages. Though 60-69 age group in male has almost the same values as female, hypertension-caused burden of disease is mostly seen in 45-59 age group in male. Burden of disease in male is alleviated in further ages, however, female 70-79 and 80+ age groups have higher values.

Figure 20. Distribution of Hypertension Attributed Disease Burden by Age Groups and Gender (Turkey, 2004)





HIGH BLOOD CHOLESTEROL

High cholesterol-attributed burden of disease and death numbers is presented in Table 25.

Table 25. Distribution of High Cholesterol Attributed Disease Burden and Death Numbers by Causes (Turkey, 2004)

Cause	Attributable Deaths	Attributable YLL	Attributable YLD	Attributable DALYs	Attributable DALYs as a proportion of total DALYs
Ischemic heart disease	41226	425726	36397	462123	4,3
Ischemic stroke	7802	66715	37843	104558	1
Total	**49029**	**492441**	**74240**	**566681**	**5,2**

As seen in Table 25, high cholesterol is among major risk factors of ischemic heart diseases and ischemic stroke, which constitutes 5,2 % of total burden of disease. Prevention of high cholesterol could prevent 41.226 deaths caused by ischemic heart diseases and 7.802 deaths caused by ischemic stroke.

Distribution of high cholesterol-attributed burden of disease and death numbers is presented in Table 26.

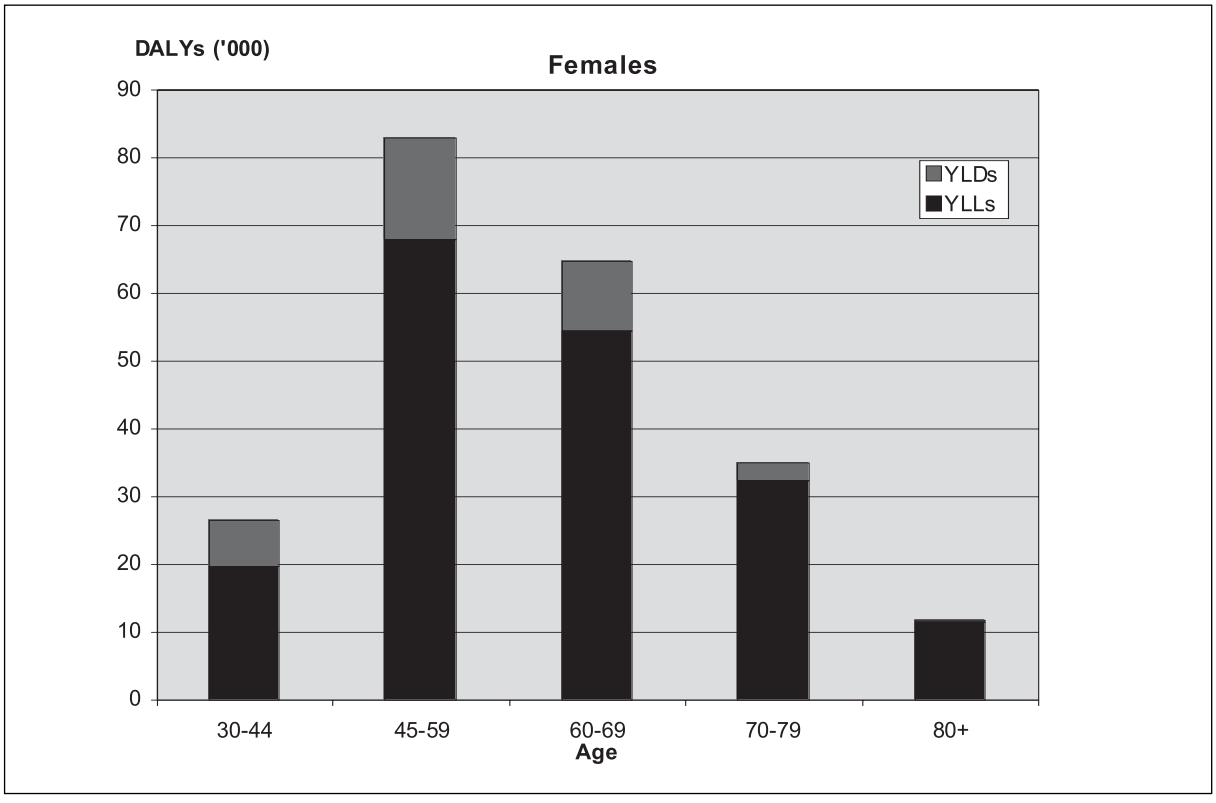
Table 26. Distribution of High Cholesterol Attributed Disease Burden and Death Numbers by Gender (Turkey, 2004)

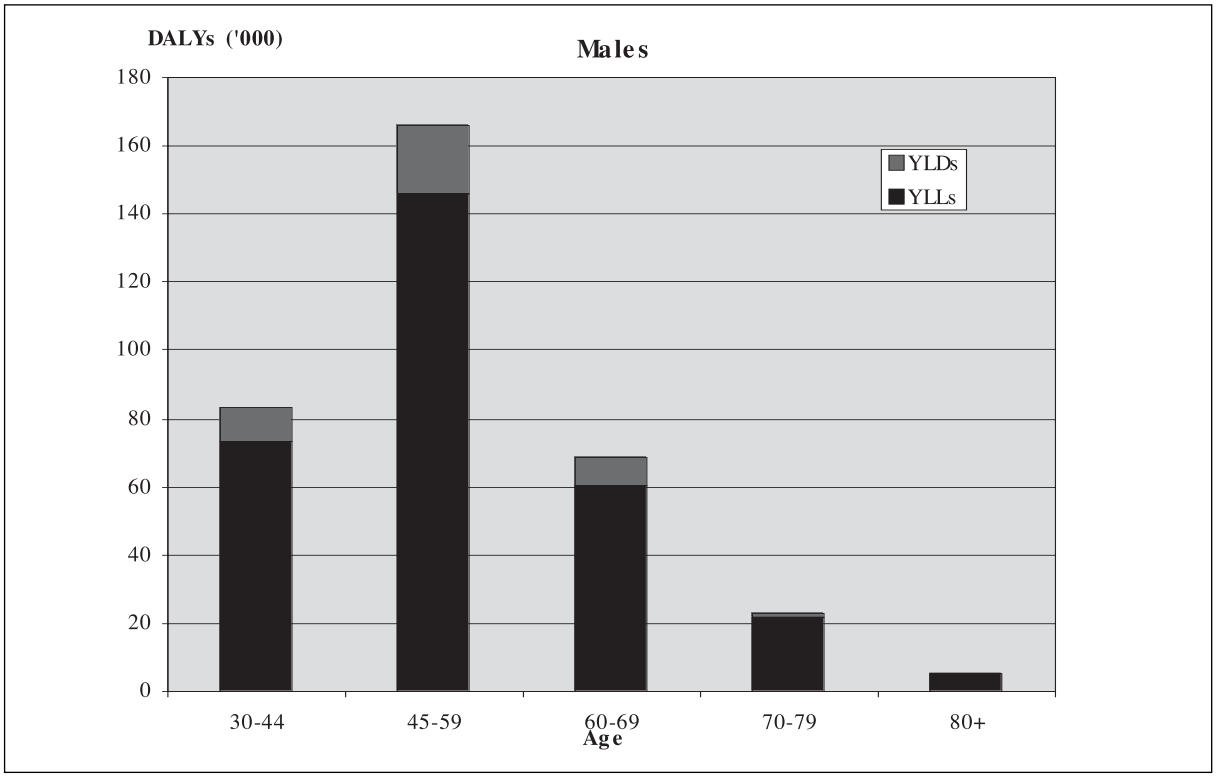
	Males		Females		Persons	
	Number	Percent	Number	Percent	Number	Percent
Deaths	26487	11,4	22542	11,4	49029	11,4
YLL	306362	9,1	186079	7,3	492441	8,3
YLD	39631	1,7	34609	1,3	74240	1,5
DALYs	345993	6,1	220688	4,3	566681	5,2

As seen in Table 26, taking high cholesterol under control could prevent 11,4 % of all deaths in both genders. As for YLL that could be prevented, it is 9,1 % of total YLL in male, 7,3 % in female and 8,3 % in total. As for total burden of disease, number of DALY prevented in male is 345.993 (6,1 % of all DALYs), in female is 220.688 (4,3 %) and 566.681 in total (5,2 %).

Figure 21 presents distribution of high cholesterol-attributed burden of disease by age groups and gender. As also seen in the figure, high cholesterol-caused burden of disease is mostly seen in 45-59 age groups in both genders. Though burden of disease due to high cholesterol is alleviated by further ages, it is higher in male than in female.

Figure 21. Distribution of High Cholesterol Attributed Disease Burden by Age Groups and Gender (Turkey, 2004)





PHYSICAL INACTIVITY

Table 27 presents insufficient physical activity-attributed burden of disease and death numbers by causes.

Table 27. Distribution of Physical Inactivity Attributed Disease Burden and Death Numbers by Causes (Turkey, 2004)

Cause	Attributable Deaths	Attributable YLL	Attributable YLD	Attributable DALYs	Attributable DALYs as a proportion of total DALYs
Ischemic heart disease	31519	277445	23405	300850	2,8
Ischemic stroke	10269	70003	31575	101578	0,9
Diabetes Mellitus	1663	17194	20262	37456	0,3
Breast cancer	821	10793	3606	14399	0,1
Colon and rectum cancers	848	9389	954	10343	0,1
Total	45120	384823	79804	464627	4,3

Sufficient amount of physical activity could prevent 31,519 deaths caused by ischemic heart diseases and 10.269 deaths caused by ischemic stroke. As for burden of disease which is preventable, physical activity could prevent 300.850 DALY in ischemic heart diseases, which is 64,8 % of preventable burden of disease. This is followed by ischemic stroke and diabetes mellitus. 464.627 DALY could be prevented in total, which is equivalent to 4,3 % of all burden of disease.

Distribution of insufficient physical activity-attributed burden of disease and death numbers is presented in Table 28.

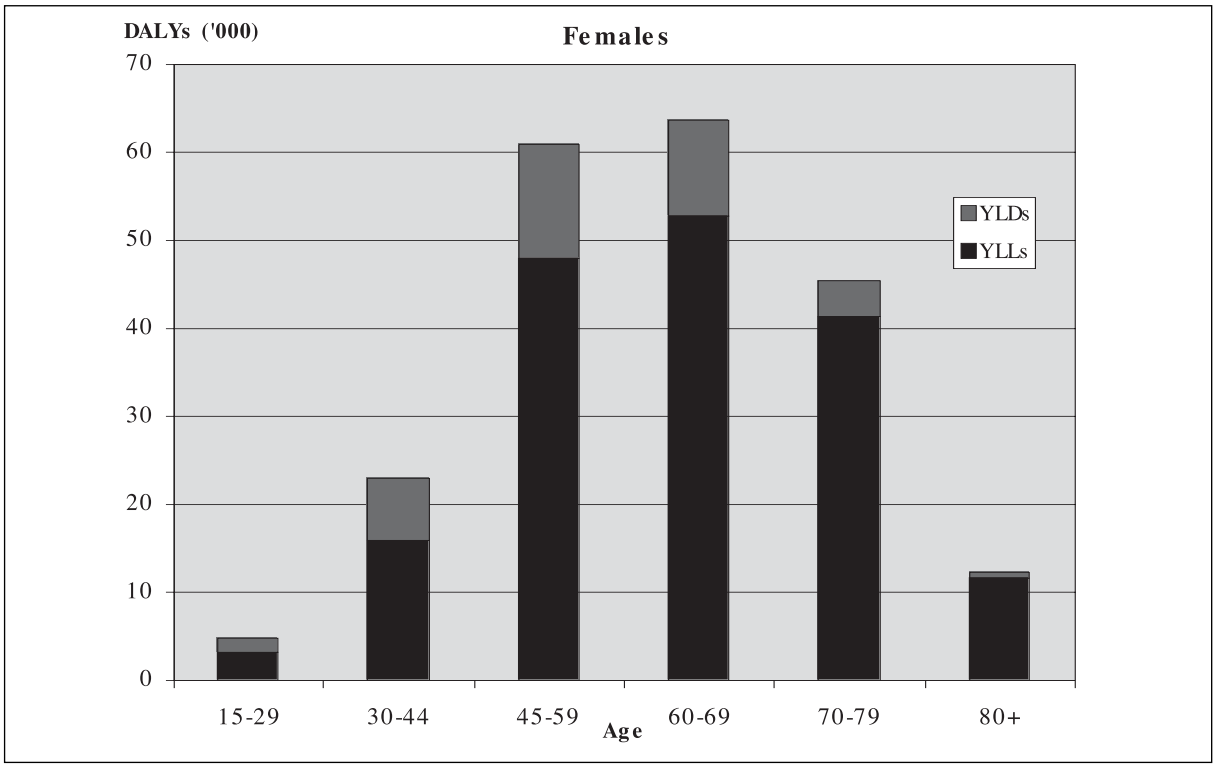
Table 28. Distribution of Physical Inactivity Attributed Disease Burden and Death Numbers by Causes (Turkey, 2004)

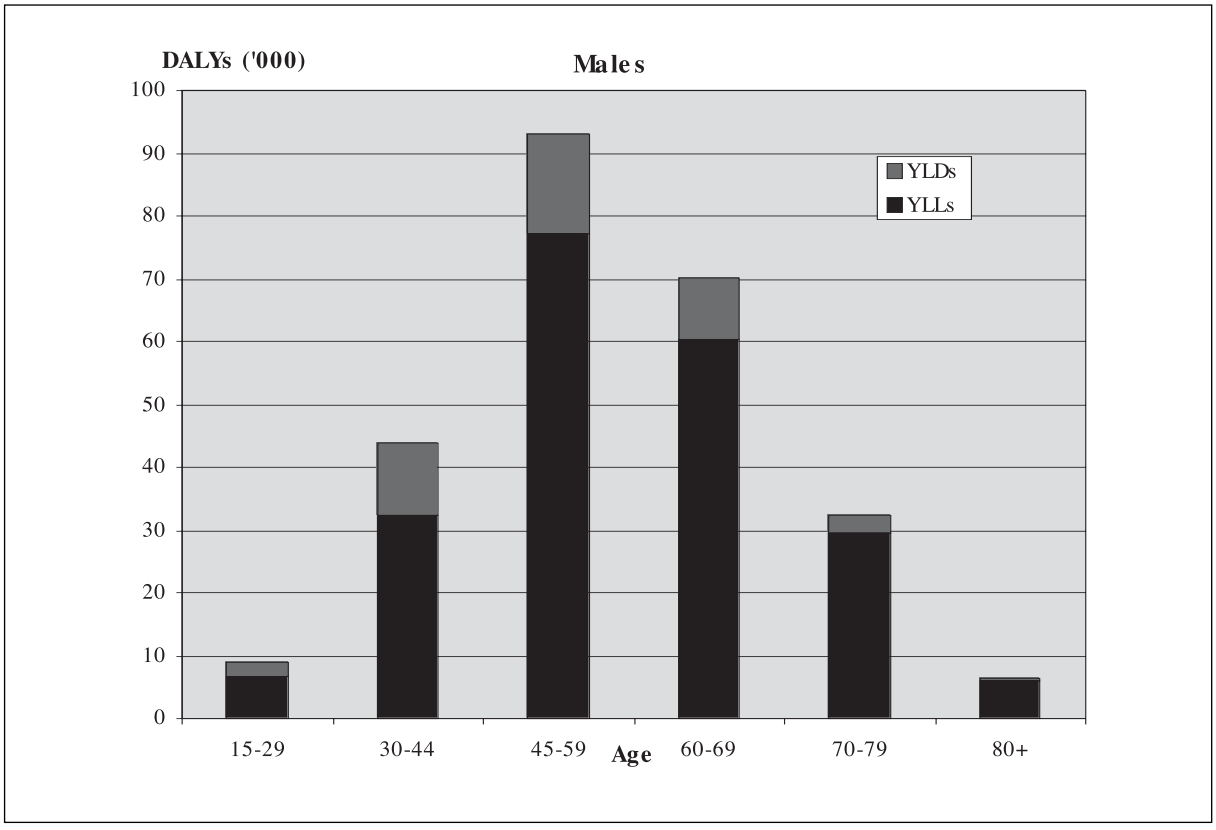
	Males		Females		Persons	
	Number	Percent	Number	Percent	Number	Percent
Deaths	22515	9,7	22605	11,5	45120	10,5
YLL	212190	6,3	172633	6,8	384823	6,5
YLD	42365	1,9	37439	1,4	79804	1,6
DALYs	254555	4,5	210072	4,1	464627	4,3

According to this table, 22.515 deaths occur in men due to insufficient physical activity, which refer to 9,7 % of all deaths. In other words, more physical activity could prevent 9,7 % of all deaths. It is a bit higher in female, so, 11,5 % of all deaths could be prevented by facilitated physical activity. In total, 10,5 % of all deaths, 6,5 % of all YLLs and 4,3 % of all DALYs could be prevented.

Figure 22 represents insufficient physical activity-attributed burden of disease by age groups and gender. In female, highest burden of disease is seen in 60-69 age group. In male, on the other hand, highest burden of disease is seen in 49-59 age group.

Figure 22. Distribution of Physical Inactivity Attributed Disease Burden by Age Groups and Gender (Turkey, 2004)





INSUFFICIENT CONSUMPTION OF VEGETABLES AND FRUIT

Distribution of insufficient consumption of vegetables and fruit-attributed burden of disease and death numbers by gender is presented in Table 29.

Table 29. Distribution of Insufficient Consumption of Vegetables and Fruit Attributed Disease Burden and Death Numbers by Gender (Turkey, 2004)

	Males		Females		Persons	
	Number	Percent	Number	Percent	Number	Percent
Deaths	21668	9,3	17066	8,7	38734	9,0
YLL	223356	6,6	141241	5,5	364597	6,1
YLD	27304	1,2	24975	1,0	52279	1,1
DALYs	250660	4,4	166216	3,2	416876	3,9

Number of deaths attributed to insufficient consumption of vegetables and fruit is 38.734, which constitutes 9,0 % of all deaths, and burden of disease is 416.876 DALY, which constitutes 3,9 % of total burden of disease. YLL forms the biggest part of burden of disease caused by insufficient consumption of vegetables and fruit. YLL attributed is 364.597, which is equivalent to 6,1 % of total YLL, and YDL attributed is 52.279, which is equivalent to 1,1 % of total YLD. Table 30 presents distribution of insufficient vegetables and fruit consumption-attributed burden of diseases and death numbers by diseases.

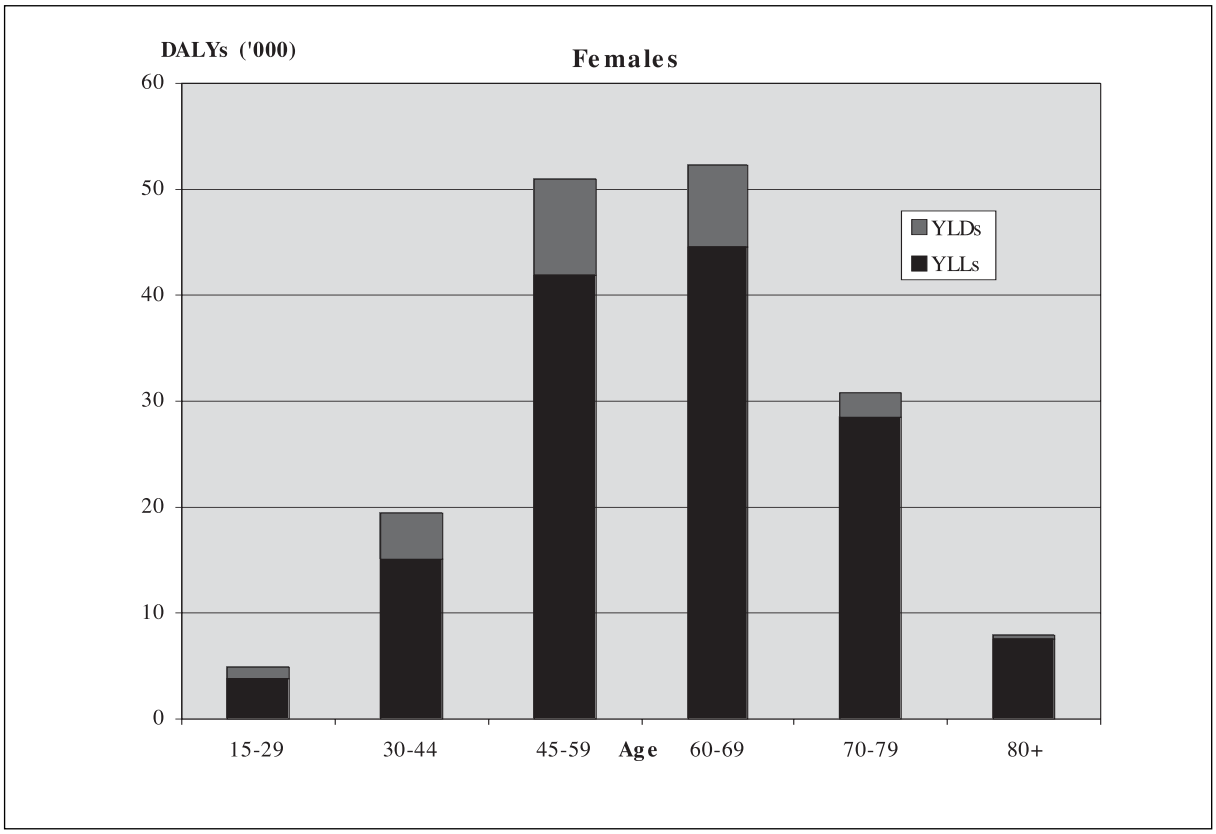
Table 30. Distribution of Insufficient Vegetables and Fruit Consumption Attributed Disease Burden and Death Numbers by Diseases (Turkey, 2004)

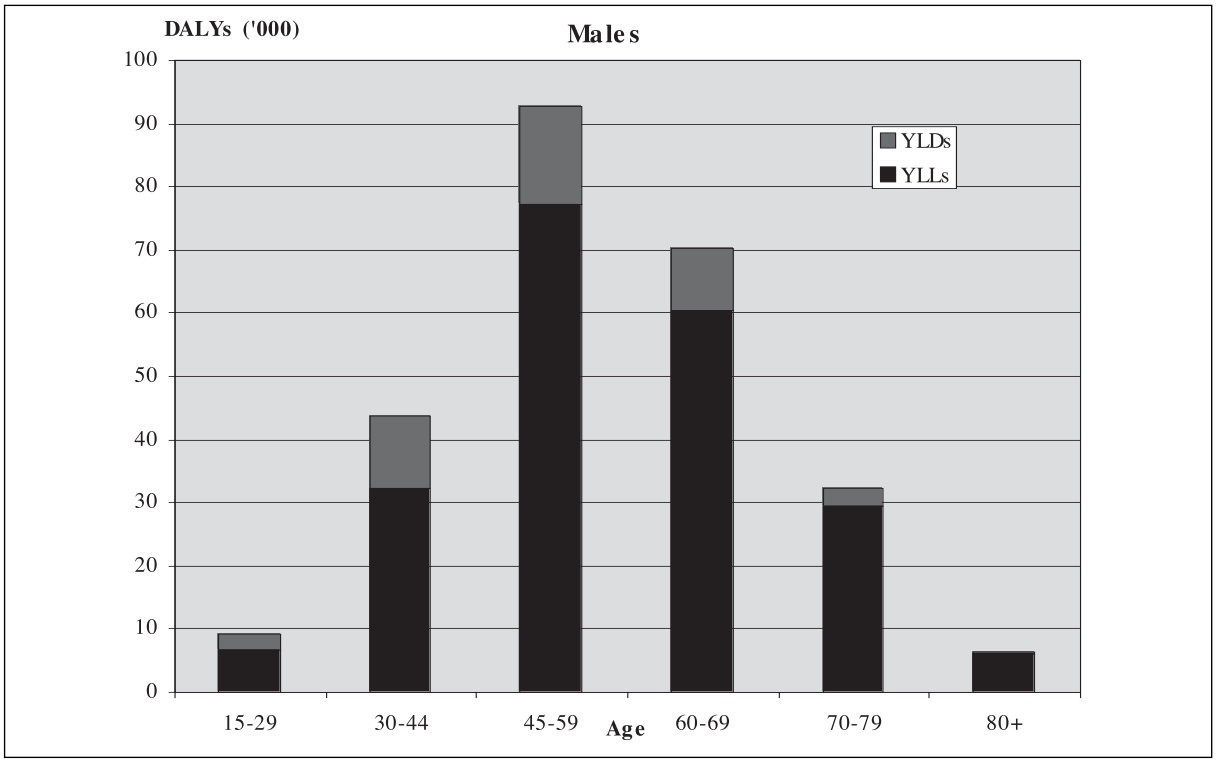
Disease	Attributable Deaths	Attributable YLL	Attributable YLD	Attributable DALYs	Attributable DALYs as a proportion of total DALYs
Ischemic heart disease	28144	269591	23301	292892	2,7
Cerebrovascular disease	7140	55326	27335	82661	0,8
Trachea, bronchus and lung cancers	1938	20750	977	21727	0,2
Stomach cancer	1182	15018	427	15445	0,1
Colon and rectum cancers	105	1377	138	1515	0,0
Oesophagus cancer	226	2535	102	2637	0,0
Total	**38734**	**364597**	**52279**	**416876**	**3,9**

Though cancers have a big share in insufficient vegetables and fruit consumption-attributed burden of disease, ischemic heart diseases (70,3 % of DALY attributed) and cerebrovascular diseases (19,8 5 of DALY attributed) have the highest attributed risk. Percentages of these diseases in burden of disease is relatively 2,7 % and 0,8 %.

Figure 23 presents distribution of insufficient vegetables and fruit consumption-attributed burden of disease by age groups and gender. Male in 15-69 age group has more attributed burden of disease than female. However, attributed burden of disease is higher in female in 70+ age group. Considering age groups, highest attributed burden is seen in 60-69 age group in female and in 45-59 age group in male.

Figure 23. Distribution of Insufficient Vegetables and Fruit Consumption Attributed Disease Burden by Age Groups and Gender (Turkey, 2004)





ANNEX: METHODOLOGY

When beginning the study, GBD Disease Categories 2004 by the WHO were examined and a list was made for national diseases to be covered.

Adapting the disease lists and sequelas of the WHO to domestic conditions in Turkey, 131 diseases and their sequelas were identified. Besides, disability weights for every disease and sequela corresponding to WHO and the Netherlands were accepted and listed.

Results obtained from the SIS Population Census 2000 were revised taking into account the age groups of GBD as basis (0-4, 5-14, 15-29, 30-44, 45-59, 60-69, 70-79, 80+) and used in GBD analysis. Results of the Population Census 2000 are presented in Table 31.

Table 31: Population Distribution According to the Age Groups and Gender (Population Census 2000)

Age Groups	Male		Female		Total	
	Number	Percent	Number	Percent	Number	Percent
0-4	3.396.690	9,89	3.188.132	9,53	6.584.822	9,71
5-9	3.485.746	10,15	3.270.871	9,78	6.756.617	9,96
10-14	3.570.657	10,40	3.307.999	9,89	6.878.656	10,14
15-19	3.691.218	10,75	3.518.257	10,52	7.209.475	10,63
20-24	3.426.714	9,98	3.263.432	9,75	6.690.146	9,87
25-29	2.976.430	8,67	2.918.825	8,72	5.895.255	8,69
30-34	2.552.370	7,43	2.457.285	7,34	5.009.655	7,39
35-39	2.453.579	7,14	2.400.808	7,18	4.854.387	7,16
40-44	2.083.531	6,07	1.985.225	5,93	4.068.756	6,00
45-49	1.710.757	4,98	1.658.012	4,96	3.368.769	4,97
50-54	1.356.391	3,95	1.360.958	4,07	2.717.349	4,01
55-59	1.016.254	2,96	1.042.168	3,11	2.058.422	3,04
60-64	864.299	2,52	964.989	2,88	1.829.288	2,70
65-69	794.881	2,31	850.636	2,54	1.645.517	2,43
70-74	517.870	1,51	654.773	1,96	1.172.643	1,73
75-79	254.443	0,74	323.154	0,97	577.597	0,85
80-84	98.797	0,29	147.895	0,44	246.692	0,36
85+	83.572	0,24	132.928	0,40	216.500	0,32
Unknown	12.536	0,04	10.845	0,03	23.381	0,03
Total	**34.346.735**	**100,00**	**33.457.192**	**100,00**	**67.803.927**	**100,00**

Reference: SIS, Population Census 2000. The unknown population is not distributed according to the age groups and gender in this table; the results of the Population Census 2000 are taken directly from the Prime Ministry SIS 2003 publication.

I. DEVELOPING LIFE TABLES

In order to make mortality analysis and burden of disease calculations, first of all it is needed to calculate age and gender-specific mortality rates and develop life tables specific to the reference year. The reference year distinguished for this project is the year 2000 because the last population consensus was made in this year. The results of the population consensus 2000, death statistics from SIS, data of the Turkey Demographic Health Survey and "Verbal Autopsy Survey", which was conducted on the basis of the study, were used to develop life tables. Preston-Coale (50%) Method which corresponds to the Horiuchi Method was used when developing life tables, in order to revise the number of deaths and it was found that the ratio of the neglected deaths in adult deaths is 20%.

The life table for Turkey at national level was developed after life tables for urban areas, rural areas and five regions in Turkey had been developed.

1.1. Development of Life Tables for Urban Areas in Turkey

When developing life tables for urban areas in Turkey population census for the year 2000 and death statistics of 1990-2000 of the SIS were used. In the applied method, 5q0 is needed for child mortality level in Turkey and 45q15 is needed for death possibilities for 15-60 ages. As for development of life tables, Turkey Demographic and Health Survey was utilized for 5q0 value and SIS values were utilized for 45q15 value.

As the second step, with Benett-Horichi and Hill Generalized Growth Balance method, age and gender-specific mortality rates were identified by making use of all ages and genders-specific number of deaths taken from the Ministry of Internal Affairs and data obtained from population census for the year 1990 and 2000 and thus completeness rates number of deaths of the SIS urban areas were calculated. As a result of this evaluation, it was found out that accurate data collection for female number of deaths was 84 % and for male number of deaths was 88 % with respect to urban areas in Turkey. At the next step, previously identified 5q0 values and urban areas-oriented 45q15 values were used and life tables of urban areas in Turkey were developed by means of the **"WHO Modified logit life table system".**

1.2. Development of Life Tables for Rural Areas in Turkey

Turkey Demographic Health Survey 1998 rural areas data were used for rural areas 5q0 value in Turkey. Whereas the SIS presents the population under 20.000 as 40 % of the entire population, administrative distribution used in the SIS death statistics presents rural population as 35 %. In order to eliminate difference of 5 % between two definitions, 60/65 urban and 5/65 rural weighting was applied as in urban areas and calculations were based on this. 45q15 average was estimated for adult mortality and for 5q0 value, corresponding values in females and males were compared by means of the WHO Modified Logit Life Table system. Besides, in random selection of 1000, adult mortality was estimated considering theoretical distribution of 45q15. Apart from this, with the help of the verbal autopsy data, the values that correspond to 33 % were estimated and the model is applied.

1.3. Development of Life Tables for Five Regions in Turkey

5q0 value was obtained from Turkey Demographic Health Survey 1998 data while life tables related to the regions were being developed. 45q15 value for adult mortality was estimated and life tables were developed based on the SIS data.

II. IDENTIFYING CAUSES OF DEATH

As in the method used for demographical structure analysis in Turkey, analysis for causes of death was made separately for every other group as national, urban, rural and in five regions and according to distribution of age groups and gender.

In GBD study, causes of death are put in to three groups for the relevant categorization:

Gorup I: *Communicable diseases, maternal and perinatal causes and diseases due to insufficient nutrition*

Gorup II: *Non-communicable diseases; Cardiovascular System Diseases, Respiratory System Diseases, Digestive System Diseases, Endocrine, Nutritional and Metabolic Diseases, Sense Organ Disorders,Genito-urinary System Diseases, Malign Neoplasms, Musculo-skelatal System and Neurologic Disorders, Neuropsychiatric Disorders and Oral and Dental Health Disorders*

Gorup III: *Intentional and unintentional injuries;*

Diseases available in all current data sources were evaluated in these three groups.

As for analyzing the causes of death, **death statistics** obtained from provincial and town centers in Turkey were used first. Considering possible differences from year to year and their influence on average, all causes of deaths taken from SIS death statistics in 1990-2000 were distributed among three groups of diseases defined above.

At the second stage, all deaths with cause of death above 0,1% were listed so as to check if the causes of deaths are included in one of the National Burden of Disease categories. This is very important since causes of deaths should be re-evaluated in accordance with the list of diseases in the GBD and National Burden of Disease and be distributed among the existing codes on condition that they can not be put into any category and thus listed. For this reason, basic disease categories are formed depending on various age groups. The mosy significant problem encountered in coding system of the list is the fact that percentages of "Other" disease codes are high. It is thought that most of adult deaths are put into the II. Group deaths as false classification. Thus, it was needed to re-distribute some causes of deaths and to put them into the accurate categories of diseases, which is not a case specific for this study. Also including the Australian study, almost in all studies on burden of disease, diseases which are not well defined or encoded accurately (wrongly or defective encoded) are re-evaluated and re-coded by experts.

Current literature on causes of deaths in Turkey was scanned and the SIS data for 1998-2000 were evaluated based on separate diseases that were compared one by one, to this end. After such comparisons, particularly the codes of "other heart diseases" and "chronic lung diseases" were re-distributed. Hospital records regarding causes of deaths in re-distribution process were encoded according to the ICD 10 encoding system to be used particularly in thi study. Causes of deaths of the Baskent University Hospital in the last three years, which were encoded by the ICD-10 encoding system, were listed by age groups and genders, and then they were compared with the current data on hand. Besides, all hospital statistics across Turkey, studies conducted on causes of infant and child deaths, "Maternal Death Report" which is made to determine maternal causes of death and prepared by the Ministry of Health, Directorate General of Mother and Child Health Care/Family Planning and UNFPA and all of other relevant records were examined carefully and the following method was used for distribution of causes of deaths in the light of existing evidences:

1. When examining causes of deaths, SIS death statistics, the most comprehensive and single data source available, were used. SIS data are being collected only from provincial and town centers. SIS data for the last two years were used when making an in-depth analysis of causes of deaths. SIS, especially for the year 2000, is an invaluable source of information regarding distribution of causes of 185.000 deaths, which is relatively high. Besides, 80.000 causes of deaths taken from all hospital records (Form 053) in Turkey, and the Directorate General of Security data of the cases of road accidents, suicides and homicides out were utilized.

2. Before than anything else, SIS data were classified according to three groups of diseases. Age groups and gender-specific distribution was made. When encoding diseases and deaths, ICD 8 encoding system-based list with 150 topics is used in our country. Diseases included in the GBD survey's list of diseases were converted to

ICD 10 encoding system by applying a standard method. When converting two lists to each other, some codes were directly converted to one code and some codes were converted to more then one codes and some ICD 8, while they were a single code, were converted necessarily to more than one code in the GBD.

3. One of the most important bottlenecks in the identification of causes of deaths, is the existence of "other" categories which are called "garbage" code. All countries come across this problem this way or that way. 59 % of all deaths that occur in Turkey is included in this category. 30.7 % of all deaths is included in other heart diseases. GBD methodology presents how to make distribution of some codes. For example, symptoms and other diseases not defined well, code 137-registered deaths shall be distributed the Group I for 0-4 ages and to the Group II for 5+ ages. 6321 deaths are included in this group of SIS data. However, no standard method is available in distributing other "garbage" codes. So, distribution methods of "other categories" for every other system were determined by making use of various sources and consulting experts. The alphabetical guideline used by the SIS in encoding was utilized for the re-arrangement of deaths. Verbal autopsy survey - which was made to figure out causes of deaths- data also contributed to the efforts of distribution. Detailed explanations on distribution of codes are presented in the published technical report.

As for **the causes of death in urban areas in Turkey**, deaths by ICD 10 encoding system were evaluated by means of Başkent University's Hospital records (thought to be accurate and complete) , all other studies on causes of death those present, hospital statistics, records kept by the Ministry of Internal Affairs and Directorate General of Security and all of the other related data sources were evaluated by the WHO experts, experts at the Ministry of Health, and the project epidemiology team , diseases thought to be encoded improperly were re-distributed severally by reviewing other GBD studies, as well. Besides, number of deaths were re-evaluated for all diseases and interaction with epidemiologic analysis was considered. After all estimations were reviewed carefully, internal consistency was checked with the DISMOD and interaction with the mortality results was considered. Then, keeping shares the same to complete the missing reporting in general, they were expanded so as to reach the number of deaths estimated for Turkey.

After this stage, causes of deaths above were re-compared with all existing sources in Turkey. Data on violence and suicide were obtained from records kept by the Ministry of Internal Affairs and Directorate General of Security and they were used to make comparison for the number of deaths in the third group. Deaths specific to diseases such as cardio-vascular diseases, cancers and chronic respiratory tract diseases in the second group were compared with the existing data and thus age, gender and cause-specific number of deaths was found on national level in Turkey.

As for **the causes of death in rural areas in Turkey**, no data is available. So, models that are used in estimating the causes of death were applied. As known, when estimating total mortality share in a region where data are not collected properly, the CODMOD program might be used based on the assumption that deviation models in that region is similar to deviation models in the registered region. Data on share of deaths between registered I., II., and III. region, total mortality rates in the registered regions (by age and gender) and gross domestic product per capita in rural areas are needed to use the CODMOD program.

Age and gender-specific mortality rates were obtained by the life table developed for rural areas in Turkey. Then, three groups of disease shares for rural areas of Turkey were made considering distribution made for urban areas in Turkey. In the next stage, gross domestic product per capita was calculated for rural areas in Turkey. To this end, gross domestic products per capita in 81 provinces for the year 2000 were listed, then converted to dollar, and urban and rural distribution of provinces were calculated so. Out of 81 provinces, provinces with a percentage of rural area distribution more than 50 % and gross domestic product per capita less than 2500 dollars were accepted as rural areas and gross domestic product per capita, which is about 3846 $ in 2000, was found 1620 $ for rural areas. Entering these three variables into the CODMOD program, distribution of causes of deaths for rural areas in Turkey regarding diseases in these three groups was identified.

In the next stage, considering age and gender distribution in Turkey, distributions were re-evaluated in consultation with the WHO experts, MoH specialists and the project's epidemiology team. Disease spectrums, gender and age-specific states of diseases were evaluated separately for all diseases included in the list.

The first stage in **the analysis of causes of deaths by five regions in Turkey** is developing of the life tables for the five regions. Then, disease share in three groups, which referred to urban areas previously, was repeated for five regions in Turkey. And then, gross domestic product per capita was calculated for the Western, Southern, Central, Northern and Eastern Regions. To this end, gross domestic product of all provinces in a certain region for the year 2000 was listed and averages were calculated by converting the to the US Dollar.

Entering age and gender-specific mortality rates, age and gender-specific disease patterns for every other region and gross domestic product per capita seperately calculated for every other regions were entered into the CODMOD program and distribution of causes of deaths for five regions in Turkey regarding diseases in these three groups was identified.

III. CALCULATION OF YEARS OF LIFE LOST (YLL)

No matter what age categories are selected for YLD and DALYs in the NBD Turkey study, it is recommended to calculate YLLs by making use of deaths that are put into tables in five-year age groups and preferably to separate deaths of children at 1-4 ages etc. (0, 1–4, 5–9, 10–14, ….., 80–84, 85+)

For deaths at all age intervals, average age of death should be calculated in order to calculate YLL. The calculation could directly be made with data in population providing that detailed data on all causes of deaths by months and days for every other age and children's deaths. If data are availale on dates of birth and death, average age of death at an interval could be accurately calculated. Most of the time, age of death is found in years. In this case, 0.5 years should be added to the calculated average when calculating average age of death at an interval. This is applied to put emphasis on deaths between 60 and 60.99 real ages among deaths at the age of 60, for example. Otherwise, average age of death in general, except for children's deaths (accepted 0.1 years in countries with a low-mortality level and 0.3 years in countries with high-mortality level) and except 1-4 age group (accepted as 2.6 years), is assumed as the intermediate point of every five-year age group.

As for every age-gender group, standard life expectancy for average ages in death should be calculated either by age-specific values given by the Model West standard life tables or interpolation between exact age of death and standard life expectancy in standard life tables that are shortened by five-year intervals.

YLL lost for deaths in every age-gender category could be estimated by average age of death observed at age interval and standard life expectancy figures at full ages which determine the age interval. These standard life expectancies are used for interpolation of the standard life expectancy for the average age of the deaths observed in the interval. Then, number of deaths equivalent to total YLL for a specific cause, age and gender coud be calculated from N as in the following;

Without discount or age weighting;

$YLL = N * L$

With %3 discounted homogenous weighting;

$$YLL = \frac{N}{0.03}\left(1 - e^{-0.03L}\right)$$

Full formula given by Murray ve Lopez (1996) for discount rather than zero and age weighting is as follows:

$$YLL = N\,Ce^{(ra)} / (\beta+r)^2\ [e^{-(\beta+r)(L+a)}\ [-(\beta+r)(L+a)-1] - e^{-(,+r)a}\ [-(,+r)a-1]]$$

r Share of Discount (GBD standard value 0.03)

C Age- weighting correction constant (GBD standard value 0.1658)

β Parameter from age- weighting function (GBD standard value 0.04)

a Age of beginning

L Length of disability or time lost due to early death

If the standard life expectancy used in the GBD 1990 is utilized, then there is no need to use this formula. In this case, it could be easily calculated from the number of deaths by using interpolation for all proper full ages in the right column of standard life tables (full or summarized) of YLL deducted and age-weighting life expectancy tables.

IV. LIFE YEARS LOST DUE TO DISABILITY (YLD) CALCULATIONS

Estimating the Life Years Lost Due to Disability is the most challanging component of surveys on burden of diseases since source of data is not single and epidemiology of every other disease and sequela needs to be understood well, there can be inconsistency and discontinuity in the information obtained.

Following efforts were made when calculating the YLD component of the burden of disease:

1. Preparing the List of Diseases to be Used in National Burden of Disease and Cost-Effectiveness Study: Examining Disease Categories GBD 2000 table designed by the WHO at the beginning of the study, the list of national diseases was made.

2. Searching Up-to-date Information on Diseases: All information was collected which was needed for designing diagram of diseases.

3. Designing Daigrams of Diseases: Identifying Case Definitions, Causes, Development, Results and Sequelas of Diseases. When designing disease modules it is helps a lot to design diagrams so as to comprehend all phases of diseases and find out their natural progress and sequelas after making an in-depth assessment of all groups of diseases. When designing disease diagrams, the population which estimations are based on should be defined together with case definitions and relations among diseases. The list of diseases, categories of diseases and sequelas were made by examining Australian and the WHO Burden of Disease Studies in details. As a result, burden of disease in Turkey was calculated by the new protocol and the list of diseases which is based on some adjustments by the WHO in 2003.

4. Defining Epidemiologic Indicators to be Calculated: Data such as the incidence, average duration, onset age and distribution by severity of diseases are used when estimating YLD. All of these data should be distributed by age and gender.

5. Reviewing All Epidemiologic Data Published or Not:

Data sources which are used in estimating the National Burden of Disease YLD:

1. Population Census: As for constituting data basis to be used in estimating YLD, the population data 2000 were obtained from the SIS (State Institute of Statistics) first and age groups used for the GBD survey among male and female were defined as following: 0-4, 5-14, 15-29, 30-44, 45-59, 60-69, 70-79, 80+ . Then, population per each age group was calculated and registered for 131 diseases and sequelas seperately. Unknown part was distributed according to age groups by considering each age group's share.
2. Records obtained from government agencies that collect data regularly.
3. National surveys, national and international reports on different regions of Turkey by different agencies
4. Articles published in national and international academic journals or statements/declarations not published but presented in various congresses and thesis: when conducting the study, surveys (the MoH reports and documentation, national and international medline scans, academic and/or sceintific journals, reports on the status of health and diseases in Turkey, research and thesis outcomes in Turkey regarding the Burden of Disease, congress statements made in Turkey or international field regarding the Burden of Disease and other health and epidemiology-specific

documentation), regardless if they were published or not, were collected, those specific to the subject were listed with sources and references. A "CATALOGUE" was developed in order for collected data to be kept in a proper format and preserved.

5. National Household Survey 2003: Within the scope of the NBD-CE Study, a household survey was made on 12,000 households so as to find out the prevelance and disability weightings of some diseases. When making comparison between the prevelance and incidence, data were obtained first from Turkey National Health Survey which handled 12,000 households representing the whole country in the scope of this project.
6. In case that no data was available regarding some diseases, the WHO data – together with other data from similar countries- were taken as the basis in order to develop values for Turkey. To this end, burden of disease values which were obtained from countries having similar geographical and life style characteristics with Turkey such as Albenia, Bonia-Herzegovina, Bulgaria, Georgia, former Republic of Yugoslavia, Macedonia, Polond, Romania, Slovakia, Serbia and Karabagh or EMRO country data were tested by DISMOD Program with respect to their cinternal onsistency, and were used if necessary.

6. Choosing the Best Estimations: As for YLD estimations, it is essential to determine what data source is the most convenient one and to identify which parameter defines each disease and sequela best. In general, requested data are relevant to the indicence and duration of disease and sequela, onset age of disease and distribution of these values by age and gender. Age and gender-specific prevelance, remission, case fatality and relative risks could be found out then. However, information on duration and incidence of disease and sequela is restricted whereas further information is available on prevelance. In such a case, it is targeted these information by prevalance.

Usually in YLD estimations of GBD studies, epidemiological models are set by experts' views rather than objective evidence, estimations are made on the basis of available data and the relation between these estimations and three groups of indicators are figured out by DISMOD Program. An experts' panel was also held to ensure consensus on disease categories and sequlas and on the parameters selected to be used for calculations in the DISMOD Program (incidence, disease duration, remission, case fatality); and to reach the missing data which could not be obtained by the evaluation of the above mentioned data sources.

7. Testing Internal Consistency of Estimations:

After collecting possible data on every other disease, DISMOD Program which was developed by WHO was used in order to test the consistency among prevalance, incidence, remission, case-fatality rate, disease duration, assumptions of mortality and mortality relative risks, and to find out/estimate lacking disease-specific parameters.

In case of providing at least three of the above-mentioned disease specific parameters could obtained from data sources, the information on other parameters of a certain disease were obtained by DISMOD program and different graphics were designed for the age groups that were requested. Last output of this program is consistent incidence and prevalance between age groups. These findings were utilized for calculating 'Disability-Adjusted Life Years".

8. Calculating YLD Estimations:

YLD is disability component of DALYs. Basic formula of YLD is as following:

YLD = I * DW * L

I Number of cases in reference period;

DW Disability weight (0-1);

L Average duration of disability (in years);

With 3 % of discount, the formula is as following:

$$YLD = \frac{I \times DW \times (1 - e^{-0.03L})}{0.03}$$

With unhomogeneous weight of age, the exact formula for YLD is as following :

$$YLD = I\ DW\ Ce^{(ra)} / (\beta+r)2\ [e^{-(\beta+r)(L+a)}\ [-(\beta+r)(L+a)-1] - e^{-(\beta+r)a}\ [-(\beta+r)a-1]]$$

DW Disability Weight;

r Discount Rate (GBD standard value 0.03);

C Age-Weighting Correction Constant (GBD standard value 0.1658);

β Parameter from Age-Weighting Function (GBD standard value 0.04);

a Beginning Age and L is duration of disability.

Above formulas could be combined in a single general formula for YLD by means of a K parameter which identifies if age-weighting is applied (K=1) or not (K=0):

$$YLD = I\ DW\ \{ K\ Ce^{(ra)} / (\beta+r)2\ [e^{-(\beta+r)(L+a)}\ [-(\beta+r)(L+a)-1] - e^{-(\beta+r)a}\ [-(\beta+r)a-1]] + (1-K)\ (L/r)\ (1- e^{-rL})$$

V. DISABILITY-ADJUSTED LIFE YEARS (DALY) CALCULATIONS

DALY aims at evaluating the burden of disease (YLD), which do not result in premature deaths (YLL) caused by various diseases but do lead to long-term disability and functional losses, by means of a single criteria. "One DALY" means "loss of one healthy life year". In brief, DALY is calculated as DALY= YLL+YLD.

The burden of disease calculation method used in this study was developed by Murray and Lopez. General formula suggested by Murray and Lopez for calculating DALY is as following:

$$DALY = -\left[\frac{DCe^{-\beta a}}{(\beta + r)^2}\right]\left[e^{-(\beta+r)L}\left(1 + (\beta + r)(L + a) - (1 + (\beta + r)a\right)\right]$$

In this formula:

r= discount rate (r=0.03)

a= age of disease onset

L= length of disease

D= disability share

C= correction factor of age-weighing function (C=0,16243)

β= parameter of age-weighing function (,=0.04).

VI. LIFE EXPECTANCY, AGE-WEIGHTING, DISCOUNT RATES AND DISABILITY WEIGHT USED IN CALCULATING BURDEN OF DISEASE

In this study, the method of Loss of Standard Expected Life Years, which is used in all GBD studies, was used in this study, as well.

Besides, standard age weight was used in this study. "Age-specific weight function" is defined as a continuous function due to its mathematical convevience. Such exponential function indicates increasing or decreasing value of an individual life year spent at different ages. In this equation, β refers to the importance of age weights and is a constant value. In the very same way, C refers to the beginning of age weight which is a constant number selected so as not to change total number of life years lost. Age-weight function could be changed as desired in accordance with the β value. In addition to this, only β values at a very narrow interval (values between 0,03-0,05) proved to be appropriate for calculating DALY. The value used in GBD study is 0,04. The method of standard age weights was also used in this study and calculations were based on these values. C correction constant was also added to the formula to avoid any changes due to age-weighing total burden of disease values. In GBD study which β was taken as 0,04, the value of C was approximately 0,16243.

3 % discount was applied to this study. In addition to this, burden of disease was re-calculated by using 0% and 6 % discount rates.

Disability weights were calculated in accordance with person-trade off method, which was also used in this study as in GBD 2000 studies and accepted disability weights were used.

VII. RISK FACTOR ANALYSIS

When calculating the National Burden of Disease, "Comparable Risk Evaluation (CRE)" method was used to evaluate the effect of seven risk factors on burden of disease. Selected risk factors are those, which were proved scientifically to effect burden of disease in CRE studies all over the world and are important risk factors for population health.

In this study, a model developed by Ezzati and Lopez, which is used world-wide and also should be used for comparison between countries, was applied to this study, too.

Comparable Risk Evaluation (CRE) method is a systematic evaluation of changes born by exposure to a risk factor or factors in public health which compares them with other risk factors. Standard approach in epidemiology, which is used to estimate health outcomes of a risk factor , is to make calculation with. Standard approach used to estimate the effects of a risk factor on health outcomes in epidemiology is as the following: the risk attributed to a risk factor-caused disease or injury is compared with a group, which is not exposed to (P) as a function of exposure prevalance and the relative risk (RR).

$$AF = \frac{P(RR-1)}{P(RR-1)+1}$$

Basic statistic, which is used in evaluating such "exposure" is the Attributable Fraction (AF) which is defined as the percentage of decrease likely to occur in diseases or deaths on condition that exposure to the risk factor is degraded to zero.

Contribution of a risk factor to the burden of disease could be estimated by comparig the burden with a scenario or scenarios, which is caused by distribution of exposure observed in a community. This hypothetic exposure is called "Counterfactual Distribution".

AF of a disease, which is caused by exposure to a risk factor, is expressed as the following:

$$AF = \frac{\sum_{i=1}^{n} P_i RR_i - \sum_{i=1}^{n} P_i' RR_i}{\sum_{i=1}^{n} P_i RR_i}$$

AF= attributable share of burden of disease,

N= exposure category or number of level,

Pi= population in i exposure category,

RRi= relative risk in i exposure category

P'i= counterfactual distribution in i exposure category population

The fraction attributable to continous risk factors (such as particle concentration or blood pressure) could be obtained as in the following equation:

$$AF = \frac{\int_{x=0}^{m} RR(x)P(x) - \int_{x=0}^{m} RR(x)P'(x)}{\int_{x=0}^{m} RR(x)P(x)}$$

A comperative risk assessment application steps are as follows:

1. selecting risk factors

2. selecting relevant diseases or injuries caused by the risk factors,

3. selecting proper exposure variables,

4. adding up the population exposure values for the risk factors included in the Article 1

5. identifying risk factor-disease correlation for each disease and injury included in the second article, which is caused by exposure to the risk factor mentioned in the first article. Systematic evaluation of the epidemiologic literature is needed to this end.

6. selecting counterfactual distribution of exposure.

7. calculating the burden of disease or injury caused by any reason in the second article

8. uncertainity analysis

Accepting reference exposure 0 for some reasons might be helpful, however, have bring up some restrictions from different aspects, as well. The effect of a risk factor upon disease or death could be estimated by comparing it with the burden, which is caused by distribution of exposure observed in a population which has a different kind of distribution defined by "potential influence fraction" as generalized in the following (instead of a single reference such as "not exposed").

$$PIF = \frac{\int_{x=0}^{m} RR(x)P(x)\,dx - \int_{x=0}^{m} RR(x)P'(x)\,dx}{\int_{x=0}^{m} RR(x)P(x)\,dx}$$

PIF: Potential Influence Fraction

RR(x): Relative risk of exposure on X level

P(x): Distribution of exposure in total

P?(x): Counterfactual distribution of exposure

m: Maximum level of exposure

Attiributability of Death and Burden of Disease

For every other risk factor, population-attributed fraction value (PAF) was calculated first. (PAFM) was calculated for death and (PAFI) was calculated for disease prevelance then, since RR is different for death and incidences. For each group and gender, disease-based (AMij) and (ABij) were found and attributed fracrion of this risk factor was obtained so. As known, DALY is comprised of the combination of YLL and YLD. The following formula was applied in the case:

$AM_{ij} = PAF_{M\text{-}ij} \times Mj$

$A\text{-}YLL_{ij} = PAF_{M\text{-}ij} \times YLL_j$

$A\text{-}YLD_{ij} = PAF_{I\text{-}ij} \times YLD_j$

$AB_{ij} = A\text{-}YLL_{ij} + A\text{-}YLD_{ij}$

M=mortality

İ=incidence

J=disease

As in alcohol consumption which leads to accidents, data on disease, accident or mortality were estimated by means of existing records or the equivalent relation of hazard providing that the relative risk model was not appropriate for the case.

The effect of a risk factor, which is specific to a disease or cause of mortality, could be calculated by means of some alternative exposure scenarios. If, at this point, exposure to the risk factor is eradicated or alleviated, then it is assumed that disease or cause of mortality within population would have a proportional decrease, as well.

Table 32 presents the risk factors selected for Turkey, sources of data used in the analysises, and the methods applied. Data were calculated seperately for female and male and by GBD age groups, as well.

As for data sources used in the analysises, data on average systolic blood pressure and their standard deviations by male, female, and different age groups obtained from TEKHARF Study (which was conducted on a sampling group respresenting Turkey) were used for hypertension, for instance. Data on alcohol consumption, on the other hand, were obtained from the NBD-CE Study. These data were also compared with others from Euro-B1 and EMR-B countries, which are similar to Turkey.

Table 33 presents distribution of exposure to risk groups by age and gender for different categories.

Table 32: Risk factors, exposure variables, theoretical minimum risks and data sources (NBD-CE Study, 2004, Turkey)

Risk Factors	Exposure Variables	Theoritical Minimum Risk Distribution	Caused Diseases	Data Sources-Risk Factors	Data Sources for Hazard Estimates
High systolic blood pressure	Systolic blood pressure	115 (SD 6) mmHg	Ischaemic Heart Disease, Stroke, Hypertensive Heart Diseases and other heart diseases, Renal Deficiency	TEKHARF Study, 1990-1995	Meta-analysis, result of 61 cohort studies (conducted with participation of a 1,000,000 population living in the North America and Europe) [Prospective Studies Collaboration, 2002]
High Cholesterol	Total Cholesterol Level	3.8 (SD 0.6) mmol/l (147 (SD 23) mg/dl)	Ischaemic Heart Disease, Stroke, Hypertensive Heart Diseases and other heart diseases,	Meta Analysis; Onat A, Surdum-Avci G, Senocak M, Ornek E, Gozukara Y. Plasma lipids and their interrelationship in Turkish adults. Journal of Epidemiology & Community Health 1992;46(5):470-6. * Mahley RW, Palaoglu KE, Atak Z, Dawson-Pepin J, Langlois AM, Cheung V, et al. Turkish Heart Study: lipids, lipoproteins, and apolipoproteins. Journal of Lipid Research 1995;36(4):839-59. *Professor Robert Mahley, Gladstone Institute of Cardiovascular Disease, Francisco S. Individual Interview, 2001.	Meta-Analysis (results from 10 cohort studies conducted on 490,000 people living in the North America and Europe and 29 cohort studies conducted on 350,000 people living in Asian-Pacific Region)

Risk Factors	Exposure Variables	Theoritical Minimum Risk Distribution	Caused Diseases	Data Sources-Risk Factors	Data Sources for Hazard Estimates
High Body-Mass Index (BMI)	Body-Mass Index, BMI weight/length 2 (in meter)	21 (SD 1) kg/m2	Ischaemic Heart Disease, Stroke, Hypertensive Heart DiseasesDiabetes, osteoartrit, endometrial and colon cancers, post-menopausal Breast Cancer; gall bladder cancer, renal cancer, difficulty in respiration, back pain , dermatititis, menstrual disorders and infertility, calculus, psycohological effects.	TEKHARF Study 1990-1995	Meta-Analysis, results obtained from 310,000 people under cardiovascular risks in 33 cohort groups; from 27 cohort groups and systematic review of studies conducted on diabetes mellitus risk groups
Insufficient Consumption of Fruit and Vegetable	Frequency of Daily Consumption of Fruit and Vegetables	600 (SD 50) g fruit and/or vegetable consumption for adults per day	Ischaemic Heart Disease, Stroke , colon and rectal cancers, stomach cancer, lung and Esophagus Cancer	NBD-CE Study Household Survey 2003	Systematic compositions and meta analysises made from recently published cohort studies
Physical activity	Analysed in 4 categories. 1.category inactive, 2. insufficiently active (< mean activity less than 2.5hours or less than 4,000 KJ per week 3. moderately active (about 2,5 hours per week and 4000 KJ) 4. vigorously active inluding leisure time, job and transportation	Very active	Ischaemic Heart Disease, Breast Cancer, colon cancer, diabetes mellitus, falls, osteoporosis, osteoartritler, back pain, prostate and rectal cancer	TEKHARF Study*	Systematic compositions and meta analysises made from recently published cohort studies

Risk Factors	Exposure Variables	Theoritical Minimum Risk Distribution	Caused Diseases	Data Sources-Risk Factors	Data Sources for Hazard Estimates
Smoking	Smoking impact ratio(SIR) level	Not smoking	Trachea, bronch and lung cancers, all other cancers, COPD, other respiratory and cardio-vascular diseases, other selected medical causes for 30+ adults , burns, maternal outputs and perinatal cases	NBD-CE Study Household Survey 2003, GBD Study Cancer mortality data base	ACS-CPS II cohort study conducted on more than one million US people regarding the causes of mortality
Alcohol Consumption Status	Current Quantity and Pattern of Alcohol Consumption	Not Consuming Alcohol	Ischaemic Heart Disease, Stroke, Hypertensive Heart Diseases and other heart diseases, Diabetes, Liver Cirrhosis, Oral and Oropharynx Cancers, Breast Cancer, Esophagus Cancer, other cancers, Epilepsy, Depression, self-injury or intentional injuries, accidents,other selected cardiovascular diseases, social effects and results.	NBD-CE Study Household Survey 2003	Systematic Evaluation of Published Literature, meta analysises and modelling to figure out disease patterns

***Experts considered that data on physical activity, which were obtained from NBD-CE Study results, were not an appropriate classification for the CRE model but TEKHARF Study. Thus, analysises were made on on data basis, which is appropriate for this classifaction.**

a Age groups are the GBD age groups.

Table 33: Distribution of Exposure to Risk by Age Groups and Gender

Age [a]		0-4		5-14		15-29		30-44		45-59		60-69		70-79		80+	
		M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
Blood Pressure (mmHg)	Mean	–	–	–	–	–	–	117	122	127	136	139	150	139	158	139	158
	SD [b]	–	–	–	–	–	–	16	20	23	25	27	29	24	30	24	30
Cholesterol (mmol/l)	Mean	–	–	–	–	–	–	4.8	4.5	5.2	5.0	4.9	5.2	4.7	4.9	4.7	4.9
	SD [b]	–	–	–	–	–	–	1.1	0.9	1.2	1.0	1.1	1.1	1.0	1.0	1.0	1.0
BMI (kg/m^2)	Mean	– [c]	–	–	–	–	–	25.6	27.7	26.3	29.6	26.3	29.4	25.6	29.2	24.8	27.5
	SD	–	–	–	–	–	–	4.6	5.0	4.7	4.7	4.2	4.8	4.6	4.8	4.6	5.6
Fruit and vegetable intake (g/day)	Mean	–	–	–	–	–	–	262	253	251	245	281	262	269	258	278	240
	SD	–	–	–	–	–	–	186	165	175	155	177	165	181	155	177	174
Physical Activity (% population in categories)	Highly active					29.0	5.0	18.7	7.3	13.3	3.3	9.0	11.0	0.0	8.0	0.0	8.0
	Moderately active					36.0	24.0	37.3	21.0	32.7	11.0	28.0	11.0	22.0	3.0	22.0	3.0
	Insufficiently active					27.0	70.0	33.0	68.7	43.7	80.0	40.0	49.0	48.0	38.0	48.0	38.0
	Inactive					8.0	1.0	11.0	3.0	10.3	5.7	23.0	29.0	30.0	51.0	30.0	51.0

b Standard deviations for blood pressure and cholesterol were developed on the existing data base and their accuracy was tested by regression distribution then.

c Physical development of children is evaluated by weight according to age, lentgh according to age and weight according to length.

d In the Table, exposure status was not separately explained, because in the methods section a detailed explanation is provided for cigarette and alcohol related exposure and these are explained in terms of SIR. In this calculation, the baseline data related to SIR (Smoking Influence Rate) are employed and evaluations also included the situation of alcohol non-use.