

## Original Article

### Cause-of-death Distributions and Mortality Trends in Turkey Between 2009 and 2017

Ayşe Gülşen Teker, Ahmet Naci Emecen, Gül Ergör  
Department of Public Health, Dokuz Eylül University School of Medicine, Izmir, Turkey

**Address for Correspondence:** Ayşe Gülşen Teker, Department of Public Health, Dokuz Eylül University School of Medicine, Izmir, Turkey  
agulsenteker@hotmail.com  
+90 232 412 40 08

**Received:** 28 April 2020

**Accepted:** 14 October 2020

**DOI:** [10.4274/balkanmedj.galenos.2020.2020.4.200](https://doi.org/10.4274/balkanmedj.galenos.2020.2020.4.200)

**Cite this article as:** Teker AG, Emecen AN, Ergör G. Cause-of-death Distributions and Mortality Trends in Turkey Between 2009 and 2017. *Balkan Med J*

#### Abstract

**Background:** Making the right decisions in the field of Public Health depends on the reliable recording of statistical data such as death and birth. There have been radical changes and innovations in the death registration since 2009 in Turkey to improve reporting.

**Aims:** The aim of this study is to examine the distribution and the trend of causes of death between the years of 2009-2017 in Turkey.

**Study Design:** Descriptive Study.

**Methods:** In this study, the causes of death were evaluated in three groups used in Global Burden of Disease study (GBD). Group I: infectious, maternal, perinatal and nutritional conditions; group II: noncommunicable diseases (NCDs); and group III: injuries. Age-standardized mortality rates (ASMRs) were calculated per 100,000 according to age, sex, and cause of death. Joinpoint regression was used to evaluate the trend in mortality rates. Additionally, the leading causes of death were also determined.

**Results:** In total, ASMRs increased significantly on average annually (1.5% per year). When the trends of causes of death were examined according to gender, there was a significant increase in deaths from group I in both genders and a significant increase in deaths from group 3 in males whereas there was no statistically significant change in deaths from group II between 2009-2017.

**Conclusions:** A significant quantitative improvements in death registration was seen in Turkey between the years 2009-2017. This is due to the increase in the number of reported deaths. The change in the distribution of causes of death is noteworthy. This research can provide the basis for further researches that will examine the change in causes of death.

**Keywords:** Cause specific mortality, causes of death, death registration system, mortality statistics, Turkey

Making the right decisions in the field of Public Health depends on the reliable recording of statistical data such as death and birth. Regular, frequent, and timely recording and evaluation of vital statistical records are critical not only in the healthcare decision-making process but also in social, economic, legal and human rights issues (1). It is also important for comparing the health systems of countries or for comparing the same country with previous years.

The death recording in Turkey has been carried out since 1931. The death records at the national level are collected and presented annually by the Turkish Statistical Institute (TURKSTAT). To increase death registration and improve the quality radical changes and innovations have been made in the system since 2009.

The basic two changes are that previously deaths in provincial and district centers were recorded in the registration system, while in the new system, deaths in the entire country, including villages, are recorded and ICD-10 was started to be used in the classification of causes of death.

The death certificate for each death is filled by the physician in charge. This form includes the place and date of death, as well as demographic data of the deceased, the main cause of death, other causes that are not relevant to this main cause but which are associated with death. The underlying cause of death in the form is recorded as the main cause of death in the cause of death classification. It is the conditions or an accident or violent act that results in illness or injury, or fatal injury, leading to the onset of disease conditions that directly cause death. Contributing causes are diseases or conditions that are not part of the chain of events leading to death, but have

contributed to death according to the person filling out the form. If the death has occurred in the hospital, it is reported by the responsible physician, if the death has occurred at home or elsewhere, it is reported by the family physician, the municipality physician or another designated physician. It is essential that the person reporting the death is to be a physician; however, another officer, headman or military officer in the rural regions where the physician is not present can do the death registration (2,3).

Turkey has experienced a period of sociodemographic and economic change, especially since the 1970s. This change was reflected in the life expectancy, birth and mortality rates, and the distribution of causes of death particularly since the 1970s (4-6). However, no comprehensive study of the causes of death has been conducted in recent years after the new death registration system.

The aim of this study is to examine the distribution and trend of causes of death between the years of 2009-2017 in Turkey.

## **MATERIAL AND METHODS**

### **Data sources**

For this descriptive study, data related to the deaths between the years 2009-2017 and mid-year populations of these years were obtained from TURKSTAT.

### **Classification of causes of death**

The causes of death classified according to ICD-10 classification were in 19 groups and 211 subgroups. The causes of death were divided in three groups as in the first level classification of the Global Burden of Disease study (GBD) (7). Group I includes infectious, maternal, perinatal and nutritional conditions, Group II includes NCDs and Group III includes external causes including both intentional and unintentional injuries. Deaths for garbage/ill-defined reasons were also examined. The codes of the groups and garbage/ill-defined reasons are defined according to the World Health Organisation (WHO) Global Health Estimates (GHE) 2016 (8) specified in Appendix 1.

### **Statistical analysis**

Data received as excel files were transferred to R version 3.4.3. Although the total number of deaths in the database was 3,187,877; 10,531 records could not be analyzed due to missing values of age, sex and/or ICD code, the remaining 3,177,346 records were analyzed.

In the first step, crude mortality rates (CMR) and age-specific mortality rates for women and men were calculated for each year, then age-standardized mortality rates (ASMRs) were calculated using the standard population distribution (9) of the WHO. The formulas used in the calculations are as follows:

**A. Crude Mortality Rate (CMR)** = (Total No. of deaths from all causes/No. of persons in the population at mid year) X 100000

**B. Age-Specific Mortality Rate** = (Number of deaths among age group 'k' in one year/No. of persons at age group 'k' in the population at mid year) X 100000

**C. Age Standardized Mortality Rate (ASMR)** = Age specific mortality rate per 100000 X weight in the standard population

In the second step, CMR and ASMR values were calculated separately for each year and sex, of the death cause groups and garbage/ill-defined causes of death.

In the last step, we performed joinpoint regression analysis (Joinpoint Regression Program, Version 4.6.0.0; Statistical Methodology and Applications Branch, Surveillance Research Program, National Cancer Institute) to study the trends over time in order to identify the time point(s) in which the trend significantly changes in the study period. The average annual percentage change (AAPC) of the ASMRs from 2009 to 2017 was calculated for the sex and the cause of death groups, assuming that the random errors were heteroscedastic.

Ethics committee approval for the study was obtained Ethics Committee for Non-Interventional Studies (Protocol Number: 2019/04-12).

## **RESULTS**

According to TURKSTAT database 3,187,877 deaths occurred between the years 2009-2017 in Turkey (1,744,211 men and 1,443,355 women). Figure 1 shows the percentage distribution of causes of death by groups and gender. In the period between 2009-2017, the percentage of Group I causes in males was increased from 5.6% to 8.9%, and 5.7% to 9.9% in females. Group II causes were decreased in males from 77.8% to 75.6% and 77.1% to 75.5% in females. Group III causes were increased from 4.8% to 5.8% in males; however, they were decreased slightly from 2.8% to 2.7% in females. Deaths from garbage/ill-defined causes decreased in both males and females, from 11.8% to 9.7% in males and from 14.4% to 11.9% in females.

The changes in CMR and ASMR among males and females and the average annual percentage change (AAPC) of the ASMRs in the 9-year period between 2009-2017, were presented in Table 1. ASMR values among both males and females were increased significantly at the end of this 9-year period. ASMR was annually increased by 1.5% in total (1.6% in males and 1.4% in females) ( $p < 0.05$ ).

Table 2 shows the CMR and ASMR values in males and females in 2009 and 2017, by cause of death groups and gender with the average annual percentage change (AAPC) for ASMR values between the years 2009-2017. According to Table 2 an overall increase in mortality rates of Group I and Group III has occurred (11.8% and

4.8%). Mortality rates in Group I and Group III causes were increased significantly in males (12.0% and 5.4%); however, in females, there was a significant increase in mortality rates only in Group I (11.8%). No significant change was observed in mortality rates due to Group II and garbage/ill-defined causes of death.

When the increase in deaths due to Group I causes was examined in more detail, it was observed that pneumonia is the main reason for the change. While the number of deaths due to pneumonia in 2009 was 2,784, it was increased to 18,484 in 2017; and while 17.7% of the causes of death in Group I in 2009 was pneumonia, this rate was 47.4% in 2017. The frequencies of all other leading communicable, maternal, perinatal and nutritional conditions-related death causes have decreased in 2017. In addition, 84% of the deaths due to pneumonia were observed in persons who were 65 years old and over.

When a closer look was taken at the increase in deaths in Group III, it was determined that the number increased from 10,869 in 2009 to 18,183 in 2017. This situation is not related to a specific cause of death. There has been no change in the ranking of non-transport accidents, transport accidents and intentional self-harm, which are the 3 most common causes of death in Group III. There was also no significant change in the frequency of these causes in Group III (46.3%, 35.8%, 9.6% to 46.1%, 34.7%, 9.7% respectively); however, their numbers have increased.

Table 3 shows the leading causes of death in males and females. Ischemic heart diseases and malignant neoplasms, which were ranked in the top 2 in 2009 in males, have remained in place in 2017 (from 15.3% to 16.4% and from 10.2% to 9.4%). While the garbage/ill-defined causes (4.7%) and hypertensive diseases (3%) listed in 2009 were not in the list in 2017; pneumonia (4.2%) and non-transport accidents (2.8%) were added to the list. While cerebrovascular diseases (13.2%), the most common cause of death in females in 2009, were replaced by ischemic heart disease (15%) in 2017; the top three leading causes of death in females have not changed in 2009 and 2017. However, the garbage/ill-defined causes (4.7%) and respiratory and intrathoracic organ cancers (2.1%) that were listed in 2009, were not in the list in 2017. Instead of these causes, pneumonia (4.7%) and Alzheimer's disease (4.4%) were added to the leading causes of death in 2017.

Although the causes of death that were newly added to the list are not detailed in Table 3, it was found that the number of deaths due to non-transport accidents increased from 5,125 to 9,054 between 2009-2017. The most common reasons were falls (% 40), accidental poisonings (12%) and accidental exposure to other and unspecified factors (16%). Deaths due to Alzheimer's disease increased from 3,844 to 13,743. The increase in pneumonia-related mortality has been mentioned previously.

#### **DISCUSSION**

In this study, ASMRs increased significantly on average percentage (1.5% per year) between 2009-2017. Moreover, the number of expected deaths was as 415,900 in 2010 in Turkey, in fact there were 295,501 deaths reported in that year, showing that the records from outside of the provinces and districts were missing (10). While the expected number of deaths was 455,400 in 2016, there were 420,189 deaths reported (11,12,13). This change in death numbers and ASMR is not due to an increase in the number of deaths but with an increase in the number of reported deaths. This indicates a notable quantitative improvement in death registration in 9 years-period.

The main finding of this study was the increase in deaths caused by group I and group III, whereas there was no statistically significant change in deaths from NCDs (Group II) between 2009-2017.

Many studies conducted in recent years have shown a significant decrease occurred in cardiovascular mortality. In a study conducted by Dinc et al., it has been found that the decrease since 1994 has reached 7.9% in males and 4.4% in females between 2004 and 2008 (14). A similar decrease has been revealed in many countries such as the USA, Western Europe, Ireland, Sweden, England and Wales, Italy and Poland. In the modeling studies, this situation was mainly attributed to the reduction of the risk factors and effective treatments (14-22). This decrease in NCD-related deaths seen in previous studies does not seem to continue during 2009-2017, cardiovascular diseases continue to constitute a significant morbidity and mortality burden. Today in Turkey, the structural problems on the prevention of NCDs, early diagnosis and follow-up issues could not be resolved; such as integration of primary health care services into the management of chronic diseases, lack of coordination between health institutions. Effective control strategies and programs are not implemented nationally (5).

In the GBD study, the deaths due to infection of the lower respiratory tract are estimated to be increased by 38.3% in Turkey in 2017 (23). In accordance with this an increase in mortality rates related to group I causes was detected in this study. Also, it was found that the major cause of the increase in the causes of death in Group I was pneumonia-related deaths. A significant part of these deaths occurred in people 65 and over years of age. The proportion of people 65 and over years of age in Turkey is rising steadily in recent years (24). While 64.6% of all deaths have occurred in people aged 65 years and over in 2009, it has increased to 70.7% in 2017 (12,13). Another reason, The Sentinel Severe Acute Respiratory Tract Infections Surveillance has been initiated in Turkey since 2015 (25). This may have increased the coding of deaths caused by pneumonia.

Other notable finding in this study was, deaths due to Alzheimer's disease were listed among the leading causes of death. The changing demography and the increasing number of the elderly population make health care needs of this special group necessary for Turkey.

In this study, it was observed that the rate of deaths due to Group III conditions in men increased annually by 5% in 9 years-period. This is similar to the GBD study (26). In Group III, deaths were mostly related to non-transport accidents. These accidents are the result of a combination of multiple risk factors and there is no single simple method to avoid these accidents. Risk factors should be identified individually and multifactorial protection strategies should be planned (27,28).

The strengths of this study were the inclusion of the 9 years after the transition to the new system and the evaluation of all deaths which are reported in this period in Turkey. Additionally, the change in the causes of deaths over the study period was presented with AAPC, which is a summary measure of the trend over the fixed interval, using joinpoint regression. Evaluating AAPCs made different groups comparable to the change in trends for the same period. As a limitation, the effect of the improvement in death records on the distribution of causes of death could not be determined in this study. Improvement in death records may have affected both ASMR and distribution of causes of death.

In conclusion, a significant quantitative improvement in death registration was seen in Turkey between 2009-2017. In addition to quantitative improvement in death registration, changes in the pattern of causes is also observed. The change in the distribution of causes of death is noteworthy. This overall analysis for the whole country can provide the basis for further research that will examine the change in causes of death more in depth.

There are no conflicts of interest in connection with this paper.

This research received no specific grant from any funding agency, commercial entity or not-for-profit organization.

## REFERENCES

1. AbouZahr C, Cleland J, Coullare F, Macfarlane SB, Notzon FC, Setel P, et al. The way forward (2007). *The Lancet*. DOI:10.1016/S0140-6736(07)61310-5.
2. Bakar C, Cevizci S. Data for death registration system: an accuracy evaluation of the data of death causes in Canakkale, Turkey. *Nobel Med* 2016;12(3):39-46.
3. Ozdemir R, Rao C, Ocek Z, Horasan GD. Reliable mortality statistics for Turkey: Are we there yet? *BMC Public Health* 2015;15:545-556.
4. Hacettepe University Institute of Population Studies. Turkey demographic and health survey, 2013, Hacettepe University Institute of Population Studies. Ankara, Turkey: T.R. Ministry of Development and TUBITAK; 2014. Available from: [http://www.hips.hacettepe.edu.tr/tnsa2013/rapor/TNSA\\_2013\\_ana\\_rapor.pdf](http://www.hips.hacettepe.edu.tr/tnsa2013/rapor/TNSA_2013_ana_rapor.pdf) (last accessed 2 January 2019).
5. Ozdemir R, Horasa GD, Rao C, Sozmen MK, Unal B. An evaluation of cause-of-death trends from recent decades based on registered deaths in Turkey. *PUBLIC HEALTH* 2017;151:121-130.
6. Turkish Statistical Institute. Available from: <http://www.tuik.gov.tr/UstMenu.do?metod=temelist> (last accessed on 3 January 2019).
7. Global Burden of Disease Collaborative Network. Global Burden of Disease Study 2017 (GBD 2017) Covariates 1980-2017. Seattle, United States: Institute for Health Metrics and Evaluation (IHME), 2018.
8. World Health Organization. WHO methods and data sources for country-level causes of death 2000-2016 (Global Health Estimates Technical Paper WHO/HIS/IER/GHE/2018.3). Geneva: World Health Organization, 2018. (available from: [http://terrance.who.int/mediacentre/data/ghe/GlobalCOD\\_method\\_2000\\_2016.pdf?ua=1](http://terrance.who.int/mediacentre/data/ghe/GlobalCOD_method_2000_2016.pdf?ua=1) last accessed on 3 January 2019)
9. Ahmad OB, Boschi-Pinto C, Lopez AD, Murray CJ, Lozano R, Inoue M. Age standardization of rates: a new WHO standard. Geneva: World Health Organization; 2001.
10. Bakar C, Oymak S, Maral I. Turkey's Epidemiological and Demographic Transitions: 1931-2013. *Balkan Med J* 2017;34:323-34.
11. Global Health Estimates 2016: Deaths by Cause, Age, Sex, by Country and by Region, 2000-2016. Geneva, World Health Organization; 2018.
12. Turkish Statistical Institute. Available from: <http://www.tuik.gov.tr/PreHaberBultenleri.do?id=10712> (last accessed on 3 January 2019).
13. Turkish Statistical Institute. Available from: <http://www.tuik.gov.tr/PdfGetir.do?id=27620> (last accessed on 3 January 2019).
14. Dinc, G, Sozmen K, Gerceklioglu G, Arık H, Critchley J, Unal B. Decreasing trends in cardiovascular mortality in Turkey between 1988 and 2008. *BMC Public Health* 2013 Sep 30;13:896.
15. Ford ES, Ajani UA, Croft JB, Critchley JA, Labarthe DR, Kottke TE, Giles WH, Capewell S: Explaining the decrease in U.S. deaths from coronary disease, 1980–2000. *N Engl J Med* 2007, 356(23):2388–2398.

16. Müller-Nordhorn J, Binting S, Roll S, Willich SN: An update on regional variation in cardiovascular mortality within Europe. *Eur Heart J* 2008;29(10):1316–1326.
17. Bennett K, Zubair K, Unal B, Shelley E, Critchley J, Perry I. Explaining the recent decrease in coronary heart disease mortality rates in Ireland, 1985–2000. *J Epidemiol Community Health* 2006;60(4):322–327.
18. Bjorck L, Rosengren A, Bennett K, Lappas G, Capewell S: Modelling the decreasing coronary heart disease mortality in Sweden between 1986 and 2002. *Eur Heart J* 2009, 30(9):1046–1056.
19. Unal B, Critchley JA, Capewell S: Circulation: explaining the decline in coronary heart disease mortality in England and Wales between 1981 and 2000. *Circulation* 2004;109(9):1101–1107.
20. Palmieri L, Bennett K, Giampaoli S, Capewell S: Explaining the decrease in coronary heart disease mortality in Italy between 1980 and 2000. *Am J Public Health* 2010;100(4):684–692.
21. Badosz P, Sobien B, Podolec M, Dziedzic H, Zarzecka J, Loster B, et al: Decline in mortality from coronary heart disease in Poland after socioeconomic transformation: modelling study. *BMJ* 2012, 344:d8136.
22. Unal B, Sozmen K, Arık H, Gerçeklioglu G, Altun DU, Simsek H, et al. Explaining the decline in coronary heart disease mortality in Turkey between 1995 and 2008. *BMC Public Health* 2013 Dec 5;13:1135.
23. IHME Institute for Health Metrics and Evaluation. Turkey. Available from: <http://www.healthdata.org/turkey> (last accessed on 14 February 2019).
24. Turkish Statistical Institute. Available from: <http://www.tuik.gov.tr/PreHaberBultenleri.do?id=27595> (last accessed on 3 January 2019).
25. Civelek-Eser F, Tütüncü EE, Haykır-Solay A, et al. [Evaluation of patients diagnosed with severe acute respiratory tract infection: 2015-2016 influenza season]. *Klimik Derg.* 2017; 30(3): 114-9.
26. Roth GA, Abate D, Abate KH et al. Global, regional, and national agesex-specific mortality for 282 causes of death in 195 countries and territories, 1980–2017: a systematic analysis for the global burden of disease study 2017. *Lancet* 2018;392:1736–88.
27. Ambrose AF, Cruz L, Paul G. Falls and Fractures: A systematic approach to screening and prevention. *Maturitas* 2015;82:85–93.
28. Callis N. Falls prevention: Identification of predictive fall risk factors. *Appl Nurs Res.* 2016;29:53–8.

<b>Table 1. CMR and ASMR per 100000 by gender in 2009 and 2017 with average annual percent change in ASMRs between 2009 and 2017</b>					
<b>Group</b>	<b>2009</b>		<b>2017</b>		<b>2009-2017</b>
	CMR	ASMR	CMR	ASMR	AAPC (95% CI)
<b>Overall</b>	388.45	455.52	517.34	491.39	1.5 (0.7, 2.4)*
<b>Male</b>	428.52	567.39	560.78	614.72	1.6 (0.7, 2.5)*
<b>Female</b>	348.02	362.91	473.71	388.79	1.4 (0.6, 2.3)*

CMR: Crude mortality rate, ASMR: Age-standardized mortality rate, AAPC: Average annual percent change, CI: Confidence interval, \*p<0.05

**Table 2.** CMR and ASMR per 100000 by cause of death groups and gender in 2009 and 2017 with average annual percent change in ASMRs between 2009 and 2017

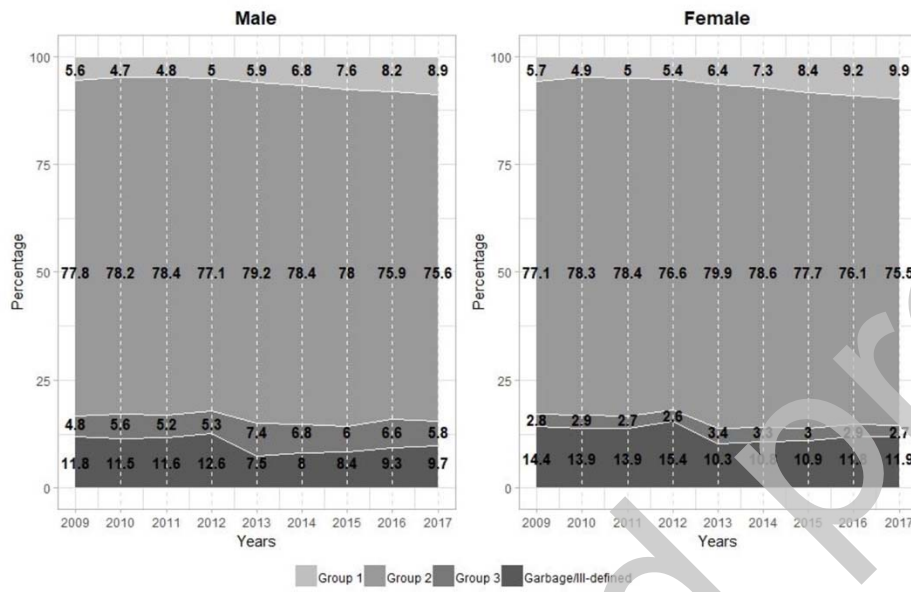
	Cause of death groups	2009		2017		2009-2017
		CMR	ASMR	CMR	ASMR	AAPC (95% CI)
<b>Overall</b>	Group I	21.90	24.16	48.47	47.25	11.8 (8.6, 15.1)*
	Group II	301.09	352.99	390.76	369.98	1.1 (-0.1, 2.4)
	Group III	15.09	16.38	22.64	21.93	4.8 (0.2, 9.6)*
	Garbage/ill-defined	50.39	61.86	55.52	52.07	-2.8 (-6.2, 0.6)
<b>Male</b>	Group I	23.88	27.89	49.85	55.82	12.0 (8.9, 15.3)*
	Group II	333.64	444.05	423.66	464.25	1.1 (-0.2, 2.4)
	Group III	20.48	23.14	32.75	33.25	5.4 (0.5, 10.6)*
	Garbage/ill-defined	50.53	72.14	54.53	61.22	-2.9 (-6.5, 1.0)
<b>Female</b>	Group I	19.90	21.00	47.07	40.54	11.8 (8.5, 15.1)*
	Group II	268.24	278.71	357.65	292.70	1.1 (-0.1, 2.3)
	Group III	9.65	9.94	12.46	11.12	2.9 (-1, 7.1)
	Garbage/ill-defined	50.23	53.14	56.52	44.32	-2.7 (-5.6, 0.3)

CMR: Crude mortality rate, ASMR: Age-standardized mortality rate, AAPC: Average annual percent change, CI: Confidence interval  
\*p<0.05

Gender	No	2009			2017		
		ICD-10 code	Cause of death	%	ICD-10 code	Cause of death	%
<b>Male</b>	1	I20-I25	Ischemic heart diseases	15.3	I20-I25	Ischemic heart diseases	16.4
	2	C30-C39	Malignant neoplasms of respiratory and intrathoracic organs	10.2	C30-C39	Malignant neoplasms of respiratory and intrathoracic organs	9.4
	3	I60-I69	Cerebrovascular diseases	8.7	I30-I52	Other forms of heart disease	8.4
	4	I30-I52	Other forms of heart disease	8.0	I60-I69	Cerebrovascular diseases	7.5
	5	J40-J47	Chronic lower respiratory diseases	7.5	J40-J47	Chronic lower respiratory diseases	7.3
	6	C15-C26	Malignant neoplasms of digestive organs	6.3	C15-C26	Malignant neoplasms of digestive organs	6.5
	7	R00-R99	Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	4.7	J12-J18	Pneumonia	4.2
	8	E10-E14	Diabetes mellitus	4.0	E10-E14	Diabetes mellitus	3.0
	9	I10-I15	Hypertensive diseases	3.0	N17-N19	Renal failure	3.0
	10	N17-N19	Renal failure	2.2	W00-X59, Y86	Non-transport accidents	2.8
		Other remaining causes	30.1		Other remaining causes	31.5	
<b>Female</b>	1	I60-I69	Cerebrovascular diseases	13.2	I20-I25	Ischemic heart diseases	15.0
	2	I20-I25	Ischemic heart diseases	12.6	I30-I52	Other forms of heart disease	11.1
	3	I30-I52	Other forms of heart disease	10.9	I60-I69	Cerebrovascular diseases	10.9
	4	E10-E14	Diabetes mellitus	7.2	J40-J47	Chronic lower respiratory diseases	5.3
	5	I10-I15	Hypertensive diseases	6.1	C15-C26	Malignant neoplasms of digestive organs	5.0
	6	C15-C26	Malignant neoplasms of digestive organs	5.2	I10-I15	Hypertensive diseases	4.8
	7	R00-R99	Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	4.7	J12-J18	Pneumonia	4.7
	8	J40-J47	Chronic lower respiratory Diseases	4.7	E10-E14	Diabetes mellitus	4.7
	9	N17-N19	Renal failure	2.6	G30	Alzheimer's disease	4.4
	10	C30-C39	Malignant neoplasms of respiratory and intrathoracic organs	2.1	N17-N19	Renal failure	3.7
		Other remaining causes	30.6		Other remaining causes	30.4	

Cause-of-death	ICD-10 codes
Group I : communicable, maternal, perinatal and nutritional conditions	A00-B99, D50-D53, D64.9, E00-E02, E40 E46, G00-G04, G14, H65- H66, J00-J22, N70-N73, O00-O99, P00-P96, U04
Group II : non-communicable diseases	C00-C97, D00-D48, D55-D64 (minus D64.9), D65-D89, E03-E07, E10-E16, E20-E34, E65-E88, F01-F99, G06-G99 (minus G14), H00-H61, H68-H93, I00-I99, J30-J98, K00- K92, L00- L98, M00-M99, N00-N64, N75-N98, Q00-Q99, X41-X42, X44, X45, R95
Group III : injuries	V01-Y89 (minus X41-X42, X44, X45)
Garbage/ill-defined causes of death	I47.2, I49.0, I46, I50, I51.4, I51.5, I51.6, I51.9, I70.9, R00-R99 (minus R95)

**Figure Legend:**



**Figure 1:** The distribution of group 1, group 2, group 3 and garbage/ill-defined causes of death between 2009 and 2017 by gender.

**FIG. 1.** The distribution of group 1, group 2, group 3 and garbage/ill-defined causes of death between 2009 and 2017 by gender.