Research Paper

Years of Life Lost Due to Premature Mortality in Northern Iran: A Cross-sectional Study

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Citation Allah Kalteh E, Golfiroozi S, Karimi F, Niknam N, Salami J, Delavari S, et al. Years of Life Lost Due to Premature Mortality in Northern Iran: A Cross-sectional Study. Journal of Research & Health. 2024; 14(3):277-290. http://dx.doi.org/10.32598/JRH.14.3.2087.4

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ABSTRACT

Background: Years of life lost (YLL) is commonly used to determine the social and economic burden of loss due to premature mortality. The present study estimated YLL based on general mortality groups in Golestan Province, Iran, in 2018.

Methods: In this cross-sectional study, by referring to the province death registration system information and using standard expected years of life lost (SEYLL) of the World Health Organization (WHO), YLL was calculated due to premature mortality based on general mortality groups in ICD-10 (international classification of diseases 10th revision).

Results: The total number of deaths in Golestan Province was 8543 in 2018. The overall YLL due to premature mortality was 129838 years, of which 57.4% occurred among men. The major causes of YLL due to premature mortality (YLL%) were diseases of the circulatory system (I00-I99) (32.3%), external causes (V01-Y89) (17.3%), certain conditions originating in the perinatal period (P00-P96) (14.5%), and cancers (C00-D48) (13.9%). After diseases of the circulatory system, the most common cause of YLL due to premature mortality is external causes (22.9%) among men and cancers (16.2%) among women. In general, the highest YLL rate occurred due to circulatory system diseases (22.5 per 1000 people).

Conclusion: According to the results of our study, most years of life lost in both sexes are related to diseases of the circulatory system, followed by external causes of morbidity and mortality. Therefore, it is important to pay attention to the diseases of the circulatory system and its causes, as well as external causes of morbidity and mortality.

Keywords: Standard expected years of life lost (SEYLL), Years of life lost (YLL), Golestan

Article info:
Received: 19 Jul 2023
Accepted: 04 Oct 2023
Publish: 01 May 2024

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Introduction

To evaluate a health system, the overall level of health should be measured. One of the main approaches to measure the overall level of health is to estimate the burden of diseases using disability-adjusted life years (DALYs) [1, 2]. DALYs is the sum of years of life lost due to premature mortality (YLL) and years of life lost due to disability (YLD) in society [3-6].

DALYs distinguish and specify the contribution of each disease to the final result [1]. Other traditional indicators of the past, such as life expectancy, attenuation rates, incidence rates of some communicable diseases, and the prevalence of a limited number of non-communicable diseases, do not determine the health status of the society, nor with their help, it is possible to plan to respond the needs of rights-conscious societies.

In general, we need indicators that can express the burden caused by death due to various causes and disability caused by different diseases and external injuries in society in a way that can be converted into priority and money loss so that economists, sociologists, and policymakers can use them. DALY index has been designed to achieve this goal [7]. The DALYs index was used for the first time to calculate the global burden of disease (GBD). The study of GBD was initiated as a joint project of the World Health Organization (WHO), the World Bank, and the Harvard School of Public Health in 1988, and GBD was calculated in 1990 [4]. The study focused on diseases like a microscope, and due to its importance as a comprehensive measurement tool, it cannot be ignored in epidemiological studies. Many countries such as Australia, India, Mexico, South Africa, Thailand, Turkey, and the United States made the global burden of diseases the basis of health accreditation and setting priorities [8].

The first national study of the burden of diseases and injuries and the burden of health risk factors and healthy life expectancy in the Islamic Republic of Iran was done in 2013 by the Health Program Management Department of the Network Expansion and Health Promotion Center in the Ministry of Health and Medical Education. It was conducted with the cooperation of other departments in the Ministry of Health and Medical Education and several universities of medical sciences and clinical research centers, and the assistance of the WHO (in the form of providing advice by Alan Lopez, Dean of the School of Community Health at the University of Queensland, Australia) [9].

To calculate YLL, the standard expected years of life lost (SEYLL) due to premature mortality is used, which is the simple difference of the age at death from the standardized life expectancy for the same age in the same sex and usually the life set. However, the simple sum of SEYLLs of people who died in that community may be missing. In recent years, SEYLL has been increasingly used to prioritize health problems. In this index, the younger a person dies, the more years of his life will be lost. Unlike the traditional values of death (number of deaths and death rates), this index gives more value to the death of young people, and the concept of premature death and preventable emphasizes [10-13].

This index is not just an inferential statistic but a measure to determine the social and economic burden lost in a population due to premature death caused by a cause [14]. Few studies have been conducted in Iran regarding the estimation of this index. Most of these studies have been conducted only for a specific cause of death. Therefore, conducting comprehensive research regarding SEYLL estimation for all causes of death seems necessary. The purpose of this study is to calculate the burden of death using the index of years of life lost due to premature death for all general causes of death in Golestan Province, Iran, in 2018. The result of this research could be used to identify the most important causes of lost life so that health problems can be prioritized, wastage of resources can be prevented, and the effectiveness of health interventions can be increased.

Methods

Study design and data collection

This cross-sectional study examined the total number of deaths (8543 cases) recorded in the death registration system in Golestan Province, Iran, in 2018. The province's mortality data was extracted from death certificates and the mortality registration files of the covered health centers, which were filled by doctors through verbal autopsy and disease history and based on the available examinations, documents, and questions from relatives and friends. The data of the deceased were extracted and stored as an Excel file in the death registration database of the provincial health department after listing the causes of death according to the table of "international classification of diseases and injuries version 10" [15]. We extracted the information needed for this research without mentioning the name, the father's name, and the national number of the deceased. However, like any other data collected and recorded through the care system, these data may need more details. In

this study, to address this problem, the deaths repeatedly recorded, the cases of deaths of residents of other provinces, and the deaths of people whose gender or age were not recorded in the analysis were excluded.

Measurements

The calculation of lost years of life due to premature death was estimated using the SEYLL method. The calculations were done according to the standard method of the WHO and using the Excel Template file of that organization based on the following formula (Equation 1):

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

In this formula, N is the number of deaths and β is the parameter of the age weighting function, whose standard number is 0.04 for different years of life. 'r' is the discounting rate number in disease burden studies as standard 0.03 for the future time [8, 16]. 'a' is the age at the time of death and 'c' is the correction factor for the weight of age, which is considered a fixed number equal to 0.1658. For the standard life table (standard life expectancy), level 26 of the west model of the coal and Demand table set has been used.

In this study, instead of life expectancy at birth for Iranian men and women (70 years for men and 75 years for women), we considered the standard life expectancy that belongs to Japanese women and men (80 years for men and 82.5 for women) [8, 16]. By choosing this standard life expectancy, the results of our study will be comparable with those of other studies.

The required variables in the Excel template file were age, gender, and cause of death (underlying cause of death and based on the death certificate), and finally, YLL general groups of deaths. These groups included parasitic diseases and specific infections (A00-B99), cancers (C00-D48), diseases of the blood and blood-forming organs and specific disorders involving the immune mechanism (D50-D89), endocrine, nutritional and metabolic diseases (E00-E88), mental and behavioral disorders (F01- F99), diseases of the nervous system (G00-G98), diseases of the eye and eye appendages (H00-H59), diseases of the circulatory system (I00-I99), diseases of the respiratory system (J00-J98), diseases of the digestive system (K00-K92), diseases of the skin and subcutaneous tissue (L00-L98), diseases of the musculoskeletal system and connective tissue (M00-N99), diseases of the urogenital system (N00-N99), pregnancy, childbirth and the puerperium (O00-O99), special conditions of perinatal origin (P00-P96), congenital and chromosomal malformations and abnormalities (Q00-Q99), abnormal clinical and laboratory signs, symptoms and findings not elsewhere classified (R00-R99) and external causes of disease and mortality (V01-Y89).

The meaning of percentage of death=proportional mortality rate: The share of a cause of death from the total causes of death in percentage terms, and the meaning of percentage of YLL=proportional YLL rate: The share of YLLs of a cause of death compared to the YLLs of total deaths).

Statistical analysis

Based on the Excel template file, YLL was calculated using SEYLL method from the difference between the age at death due to colorectal neoplasm (as the underlying cause of death) and the standardized life expectancy for the same age in the same sex. Also, the total number of lives lost in the entire province of Golestan Province due to this neoplasm will be the sum of SEYLLs of people who died in the province, which was calculated for 2018.

Results

The total number of deaths registered in the death registration system of Golestan Province in 2018 is 8543, of which 56.66% (4841 cases) occurred in men and 43.33% (3702 cases) in women. The total number of years lost due to premature death was 129838 years, of which 57.38% (74509 years) belonged to men and 42.61% (55331 years) to women.

As seen in Table 1, the leading causes of loss of life years (%YLL) in men are related to diseases of the circulatory system with 29.84%, external causes of morbidity and mortality with 22.92%, certain conditions originating in the perinatal period with 15.01% and cancers with 12.29%. The leading causes of loss of life years (%YLL) in women are related to diseases of the circulatory system with 35.68%, cancers with 16.16%, certain conditions originating in the perinatal period with 13.74%, and external causes of morbidity and mortality with 9%. According to Figure 1, the highest number of years of life lost due to premature death in men is related to diseases of the circulatory system, with 23.7 YLL per 1000 people. Then, it belongs to external causes of morbidity and mortality with 2.18 YLL per 1000. The highest amount of YLL due to premature death in women is related to diseases of the circulatory system, with 21.2 YLL per 1000 people, and then cancers, with 9.6 YLL

Table 1. Deaths and YLL for different causes of death by sex in Golestan Province, Iran, in 2018

Cause of Death	Men								Women							
	Death				YLL				Death				YLL			
	Death Number	Death per 1000 people	%	Rank	YLLs	YLL per 1000 people	%	Rank	Death Number	Death per 1000 people	%	Rank	YLLs	YLL per 1000 people	%	Rank
Diseases of the circulatory system	2017	2.15	41.66	1	22233	23.7	29.84	1	1750	1.88	47.27	1	19743	21.2	35.68	1
External causes of morbidity and mortality	731	0.78	15.10	2	17074	18.2	22.92	2	219	0.24	5.92	4	5350	5.7	9.67	4
Certain conditions originating in the perinatal period	369	0.39	7.62	4	11182	11.9	15.01	3	249	0.27	6.73	3	7600	8.2	13.74	3
Neoplasms (cancers)	677	0.72	13.98	3	9159	9.8	12.29	4	548	0.59	14.80	2	8943	9.6	16.16	2
Diseases of the respiratory system	318	0.34	6.57	5	3980	4.2	5.34	5	215	0.23	5.81	5	2753	3	4.98	6
Endocrine, nutritional, and metabolic diseases	151	0.16	3.12	6	2012	2.1	2.70	6	208	0.22	5.62	6	2829	3	5.11	5
Diseases of the nervous	97	0.10	2.00	9	1513	1.6	2.03	7	83	0.09	2.24	8	1592	1.7	2.88	7
Diseases of the genitourinary system	112	0.12	2.31	7	1450	1.5	1.95	8	74	0.08	2.00	9	1099	1.2	1.99	9
Diseases of the digestive system	106	0.11	2.19	8	1448	1.5	1.94	9	116	0.12	3.13	7	1472	1.6	2.66	8
Certain infectious and parasitic diseases	86	0.09	1.78	10	1419	1.5	1.90	10	69	0.07	1.86	10	1085	1.2	1.96	11
Congenital malformations, deformations, and chromosomal abnormalities	35	0.04	0.72	12	1061	1.1	1.42	11	36	0.04	0.97	12	1099	1.2	1.99	10
Symptoms, signs and abnormal clinical and laboratory finding, not elsewhere classified	48	0.05	0.99	11	477	0.5	0.64	12	57	0.06	1.54	11	504	0.5	0.91	12
Mental and behavioral	24	0.03	0.50	14	466	0.5	0.63	13	11	0.01	0.30	16	208	0.2	0.38	16
Pregnancy, childbirth, and the puerperium	12	0.01	0.25	17	364	0.4	0.49	14	10	0.01	0.27	17	290	0.3	0.52	15
Diseases of the skin and subcutaneous tissue	29	0.03	0.60	13	280	0.3	0.38	15	15	0.02	0.41	15	118	0.1	0.21	17
Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	14	0.01	0.29	16	212	0.2	0.28	16	22	0.02	0.59	13	319	0.3	0.58	14
Diseases of the musculoskeletal system and connective tissue	15	0.02	0.31	15	179	0.2	0.24	17	19	0.02	0.51	14	323	0.3	0.58	13
Diseases of the eye and adnexa	0	0.00	0.00	18	0	0	0.00	18	1	0.00	0.03	18	4	0	0.01	18

Cause of Death	Both Sex			
	Death			
	Deaths Number	Death per 1000	%	Rank
Diseases of the circulatory system	3767	2.02	44.09	1
Neoplasms	1225	0.66	14.34	2
External causes of morbidity and mortality	950	0.51	11.12	3
Certain conditions originating in the perinatal period	618	0.33	7.23	4
Diseases of the respiratory system	533	0.29	6.24	5
Endocrine, nutritional, and metabolic diseases	359	0.19	4.20	6
Diseases of the digestive system	222	0.12	2.60	7
Diseases of the genitourinary system	186	0.10	2.18	8
Diseases of the nervous	180	0.10	2.11	9
Certain infectious and parasitic diseases	155	0.08	1.81	10
Symptoms, signs, and abnormal clinical and laboratory findings not elsewhere classified	105	0.06	1.23	11
Congenital malformations, deformations, and chromosomal abnormalities	71	0.04	0.83	12
Diseases of the skin and subcutaneous tissue	44	0.02	0.52	13
Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	36	0.02	0.42	14
Mental and behavioral	35	0.02	0.41	15
Diseases of the musculoskeletal system and connective tissue	34	0.02	0.40	16
Diseases of the eye and adnexa	1	0.00	0.01	18

Cause of Death	Both Sex			
	YLL			
	YLLs	YLL per 1000	%	Rank
Diseases of the circulatory system	41976	22.5	32.33	1
External causes of morbidity and mortality	22424	12	17.27	2
Certain conditions originating in the perinatal period	18782	10.1	14.47	3
Neoplasms	18102	9.7	13.94	4
Diseases of the respiratory system	6733	3.6	5.19	5
Endocrine, nutritional, and metabolic diseases	4840	2.6	3.73	6
Diseases of the nervous	3105	1.7	2.39	7
Diseases of the digestive system	2920	1.6	2.25	8
Diseases of the genitourinary system	2549	1.4	1.96	9
Certain infectious and parasitic diseases	2504	1.3	1.93	10
Congenital malformations, deformations, and chromosomal abnormalities	2159	1.2	1.66	11
Symptoms, signs, and abnormal clinical and laboratory findings not elsewhere classified	981	0.5	0.76	12
Mental and behavioral	675	0.4	0.52	13
Pregnancy, childbirth, and the puerperium	653	0.3	0.50	14
Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	530	0.3	0.41	15
Diseases of the musculoskeletal system and connective tissue	503	0.3	0.39	16
subcutaneous tissue				
Diseases of the eye and adnexa	4	0	0.00	18

Figure 1. Variation between rank % death*, and rank, years of lost life (YLL)%

*For different causes of death by both sex, Golestan Province, Iran, in 2018.

per 1000 people. In both sexes, most of the years of life lost due to premature death are related to diseases of the circulatory system, with 22.5 YLL per 1000 people, and then to external causes of morbidity and mortality, with 12 YLL per 1000 people.

Also, as seen in Figure 1, the proportional damping load rating of external causes of morbidity and mortality, certain conditions originating in the perinatal period, diseases of the nervous system, congenital malformations, deformations and chromosomal abnormalities, mental and behavioral and pregnancy, childbirth, and the puerperium is higher than their proportional damping rating and vice versa. For neoplasms, diseases of the digestive system, diseases of the genitourinary system, symptoms, signs, and abnormal clinical and laboratory findings not elsewhere classified, diseases of the skin and subcutaneous tissue, diseases of the blood and blood-forming organs, and certain disorders involving the immune mechanism, the proportional damping rate is higher than the proportional load damping rate.

Figure 2 shows the number of years of life lost for the most important intentional causes of death according to gender and age groups.

Table 2 shows that in the age group of 0-4 years old, the leading cause of premature death is certain conditions originating in the perinatal period, which accounted for 68.46% of total deaths. For age groups between 5 and 44 years old, external causes of morbidity and mortality, and age groups older than 44 years, diseases of the circulatory system are the most common causes of premature death.

Table 3 shows that the primary premature mortality caused by neoplasms in the age group of 45-59 years was 33.46%; in external causes of morbidity and mortality, in the age group of 15-29 years, with 36.47%, in certain conditions originating in the perinatal period in the age group of 0-4 years with 100% and in diseases of the circulatory system with the age group of 45-59 years with 25.3%.

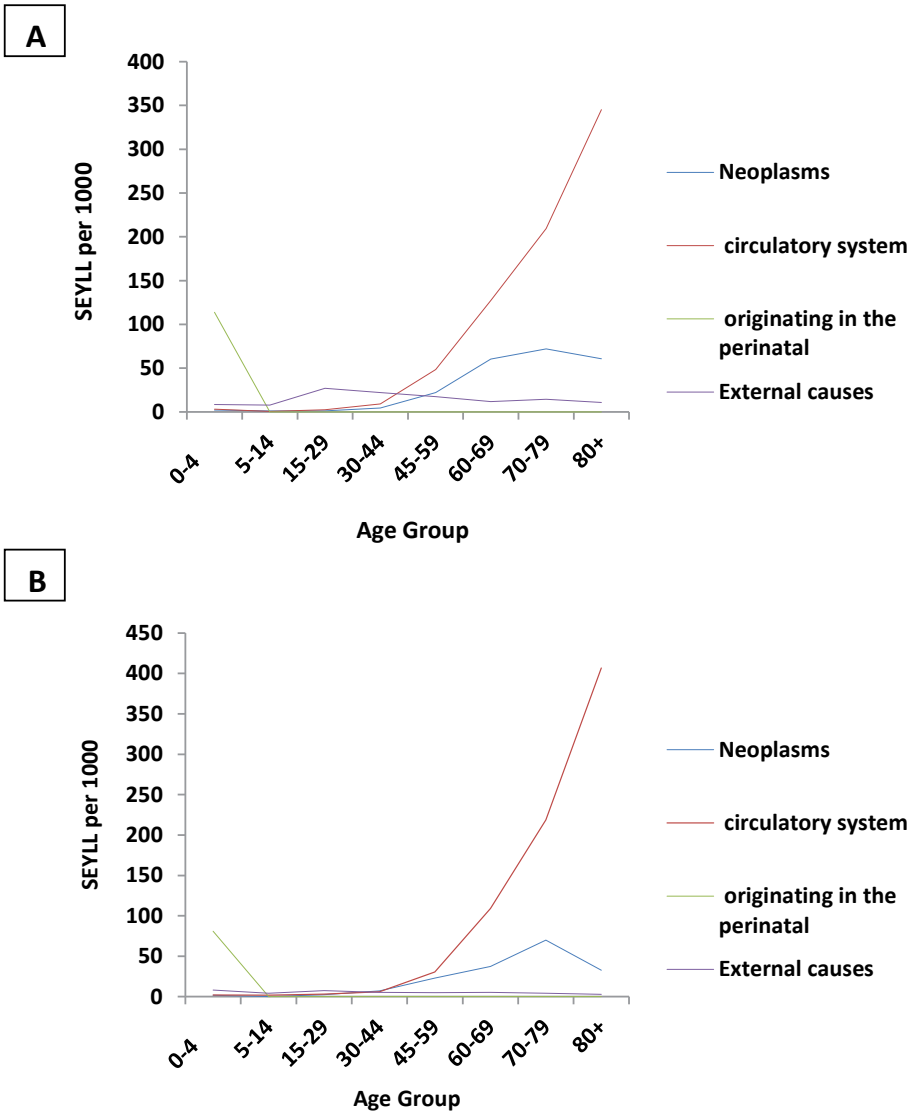

Figure 2. SEYLL rates by 4 most important causes of death in Golestan Province, Iran, 2018

A) For men, B) For women

Discussion

This study examined the YLL due to premature death in northern Iran. The results of this study showed that the total number of deaths and YLL are higher in men than in women. Also, the leading causes of YLL for men are diseases of the circulatory system, external causes of morbidity and mortality, certain conditions originating in the perinatal period, and cancer. For women, they include diseases of the circulatory system, cancers, certain conditions originating in the perinatal period, and external causes of morbidity and mortality. In both genders, most YLLs due to premature death are related to diseases of the circulatory system. The other results of our study indicate that the majority of premature deaths are caused by neoplasms in the age group of 45-59 years, external causes of morbidity and mortality in the age group of 15-29 years, and certain conditions originating in the perinatal period in the group 0-4 years old and diseases of the circulatory system in the age group of 45-59 years.

As mentioned in our study, the total number of deaths and YLL were higher in men than in women. Our study was similar to the results of a previous study that examined the leading causes of death in the elderly in the provinces of Iran. In that study, YLL was higher in men than women. However, the main reasons for the YLL in men and women in our study show little difference

Table 2. The main causes of premature mortality according to age and sex groups in Golestan Province in 2018

Age Group (y)	Rank 1			Rank 2			Rank 3		
	Men	Women	Both	Men	Women	Both	Men	Women	Both
	Cause of Death	Cause of Death	Cause of Death	Cause of Death	Cause of Death	Cause of Death	Cause of Death	Cause of Death	Cause of Death
	YLLs (YLL%)	YLLs (YLL%)	YLLs (YLL%)	YLLs (YLL%)	YLLs (YLL%)	YLLs (YLL%)	YLLs (YLL%)	YLLs (YLL%)	YLLs (YLL%)
0-4	Certain conditions originating in the perinatal period	Certain conditions originating in the perinatal period	Certain conditions originating in the perinatal period	Congenital malformations, deformations, and chromosomal abnormalities	Congenital malformations, deformations, and chromosomal abnormalities	Congenital malformations, deformations, and chromosomal abnormalities	External causes of morbidity and mortality	External causes of morbidity and mortality	External causes of morbidity and mortality
	11182 (71.97)	7600 (63.88)	18782 (68.46)	1061 (6.83)	1099 (9.24)	2159 (7.87)	845 (5.44)	760 (6.39)	1605 (5.85)
5-14	External causes of morbidity and mortality	External causes of morbidity and mortality	External causes of morbidity and mortality	Diseases of the nervous system	Diseases of the nervous system	Diseases of the nervous system	Diseases of the circulatory system	Diseases of the circulatory system	Diseases of the circulatory system
	1228 (58.31)	653 (43.13)	1881(51.58)	205 (9.73)	298 (19.68)	502 (13.76)	204 (9.69)	267 (17.64)	355 (9.73)
15-29	External causes of morbidity and mortality	External causes of morbidity and mortality	External causes of morbidity and mortality	Diseases of the circulatory system	Diseases of the circulatory system	Diseases of the circulatory system	Neoplasms	Neoplasms	Neoplasms
	6487 (77.81)	1692 (46.53)	8179(68.33)	622 (7.46)	697 (19.17)	1318 (11.01)	299 (3.59)	526 (14.47)	825 (6.89)
30-44	External causes of morbidity and mortality	Neoplasms	External causes of morbidity and mortality	Diseases of the circulatory system	Diseases of the circulatory system	Diseases of the circulatory system	External causes of morbidity and mortality	Neoplasms	Neoplasms
	5283 (51.10)	1721(33.26)	6509 (41.97)	2229 (21.56)	1467 (28.35)	3696 (23.83)	1049 (10.15)	1226 (23.70)	2769 (17.86)
45-59	Diseases of the circulatory system	Diseases of the circulatory system	Neoplasms	2952 (19.82)	3106 (30.21)	6057 (24.06)	2367 (15.89)	847 (8.23)	3019 (11.99)
	6505 (43.69)	4128 (40.15)	10634 (42.25)	Neoplasms	Neoplasms	External causes of morbidity and mortality	Endocrine, nutritional, and metabolic diseases	External causes of morbidity and mortality	External causes of morbidity and mortality

Age Group (y)	Rank 1			Rank 2			Rank 3		
	Men	Women	Both	Men	Women	Both	Men	Women	Both
	Cause of Death	YLLs (YLL%)	Cause of Death	YLLs (YLL%)	Cause of Death	YLLs (YLL%)	Cause of Death	YLLs (YLL%)	Cause of Death	YLLs (YLL%)	Cause of Death	YLLs (YLL%)
60-69	Diseases of the circulatory system	5321 (49.67)	Diseases of the circulatory system	5159 (52.53)	Diseases of the circulatory system	10480 (51.03)	Neoplasms	2525 (23.57)	Neoplasms	1763 (17.95)	Diseases of the respiratory system	4289 (20.88)	Endocrine, nutritional, and metabolic diseases	732 (6.83)	Endocrine, nutritional, and metabolic diseases	931 (9.48)	Endocrine, nutritional, and metabolic diseases	1539 (7.49)
70-79	Diseases of the circulatory system	3246 (44.28)	Diseases of the circulatory system	3478 (44.70)	Diseases of the circulatory system	8283 (54.82)	Neoplasms	571(7.78)	Diseases of the respiratory system	378(4.85)	Neoplasms	2743 (18.15)	Diseases of the respiratory system	483 (6.58)	Neoplasms	281 (3.61)	Diseases of the respiratory system	1175 (7.77)
80+	Diseases of the circulatory system	3246 (61.69)	Diseases of the circulatory system	3478 (66.75)	Diseases of the circulatory system	6724 (64.21)	Neoplasms	571 (10.85)	Diseases of the respiratory system	378 (7.25)	Diseases of the respiratory system	862 (8.23)	Diseases of the respiratory system	483 (9.18)	Neoplasms	281 (5.39)	Neoplasms	851 (8.12)

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in gender groups. Although circulatory system diseases are one of the leading causes in both men and women, changes in the subsequent causes were seen between the two sexes. These findings show gender differences in YLL in Iran. Still, contrary to our study in previous studies, men experience higher rates of YLL due to certain reasons, such as accidents [17] and suicide [18].

In comparison, women experience higher rates of YLL due to other reasons, such as hypertension [19]. A previous study that examined the global burden of the disease reported that men in most countries have a higher YLL rate than women, and the biggest gender gap was observed in low- and middle-income countries [20]. In addition, differences in the leading causes of YLL have been seen between different genders in different countries. A previous study has shown that the leading causes of YLL in men are ischemic heart disease, stroke, and lower respiratory tract infections. In contrast, for women, the main causes are ischemic heart disease, stroke, and Alzheimer disease [20].

Also, in another study, heart diseases, malignant neoplasms, and accidents are the leading causes of death and loss of potentially productive life years. These causes include various conditions that might be entirely prevented, or their incidence or severity may be reduced. Most accidents' preventable aspects are evident, and accumulating evidence strongly backs the preventable nature of many cancers and most heart diseases [21].

Three leading causes of YLL, stated in our study, may be preventable. Various perinatal conditions, especially those associated with very low birth weight and prematurity, can be amended to interventions including adequate nutrition, appropriate prenatal care, and counsel-

Table 3. The main age and sex groups according to the main death groups in Golestan Province in 2018

		Cause of Death	Certain infectious and parasitic diseases	Neoplasms	Diseases of the blood and blood-forming organs and certain disorders involving the immune mechanism	Endocrine, nutritional, and metabolic diseases	Mental and behavioral	Diseases of the nervous	Diseases of the eye and adnexa
Rank 1	Men	Age Group (y)	45-59	45-59	60-69	60-69	30-44	15-29	
		YLLs (YLL%)	308 (21.71)	2952 (32.22)	54 (25.59)	608 (30.23)	166 (30.35)	248 (16.38)	
	Women	Age Group (y)	0-4	45-59	45-59	60-69	45-59	0-4	80+
		YLLs (YLL%)	244 (22.49)	3106 (34.73)	80 (25)	931 (32.91)	65 (31.1)	548 (34.42)	4 (100)
	Both	Age Group (y)	0-4	45-59	45-59	60-69	30-44	0-4	80+
		YLLs (YLL%)	546 (21.8)	6057 (33.46)	133 (25.09)	1539 (31.67)	218 (32.34)	760 (24.47)	4 (100)
Rank 2	Men	Age Group (y)	0-4	60-69	45-59	45-59	45-59	30-44	
		YLLs (YLL%)	302 (21.28)	2525 (27.56)	53 (25.12)	597 (29.69)	120 (21.94)	243 (16.05)	
	Women	Age Group (y)	60-69	60-69	15-29	45-59	30-44	5-14	
		YLLs (YLL%)	215 (19.82)	1763 (19.71)	56 (17.5)	847 (29.93)	52 (24.88)	298 (18.71)	
	Both	Age group (y)	45-59	60-69	60-69	45-59	45-59	5-14	
		YLLs (YLL%)	482 (19.25)	4289 (23.69)	101 (19.06)	1444 (29.72)	185 (27.45)	502 (16.16)	
Rank 3	Men	Age Group (y)	30-44	70-79	30-44	70-79	80+	45-59	
		YLLs (YLL%)	290 (20.44)	1349 (14.72)	51 (24.17)	364 (18.10)	90 (16.45)	212 (14)	
	Women	Age Group (y)	45-59	30-44	70-79	70-79	70-79	45-59	
		YLLs (YLL%)	174 (16.04)	1721 (19.24)	53 (16.56)	476 (16.82)	30 (14.35)	264 (16.58)	
	Both	Age group (y)	60-69	30-44	30-44	70-79	15-29	45-59	
		9.5	378 (15.10)	2769 (15.29)	74 (13.96)	841 (17.31)	111 (16.46)	475 (15.29)	

Rank 3	Both	9.5	8283 (19.73)	1175 (17.45)	530 (18.14)	89 (22.3)	84 (16.66)	415 (16.28)	26 (3.98)	
		Age group (y)	70-79	70-79	70-79	60-69	15-29	70-79	30-44	
	Women	YLLs (YLL%)	4128 (20.90)	524 (19.02)	270 (18.34)	21 (17.64)	58 (18.01)	188 (17.1)	26 (8.96)	
		Age Group (y)	45-59	45-59	70-79	70-79	60-69	70-79	30-44	
	Men	YLLs (YLL%)	3919 (17.6)	635 (15.95)	260 (19.94)	53 (18.86)	30 (16.75)	209 (14.42)		
		Age Group (y)	70-79	0-4	70-79	70-79	0-4	60-69		
Rank 2	Both	YLLs (YLL%)	10480 (24.96)	1295 (19.23)	662 (22.66)	95 (23.80)	95 (18.84)	482 (18.9)	28 (4.28)	
		Age group (y)	60-65	60-69	45-59	30-44	30-44	45-59	15-29	
	Women	YLLs (YLL%)	4364 (22.10)	563 (20.44)	281 (19.08)	47 (39.49)	72 (22.36)	244 (22.2)	28 (9.65)	
		Age Group (y)	70-79	70-79	45-59	60-69	30-44	0-4	15-29	
	Men	YLLs (YLL%)	5321 (23.93)	732 (18.39)	301 (20.77)	64 (22.77)	36 (20.11)	227 (15.66)		
		Age Group (y)	60-69	60-69	60-69	80+	45-59	70-79		
Rank 1	Both	YLLs (YLL%)	10634 (25.33)	1457 (21.63)	689 (23.58)	114 (28.57)	113 (22.42)	513 (20.12)	577 (88.36)	18782 (100)
		Age Group (y)	45-59	45-59	60-69	80+	60-69	60-69	0-4	0-4
	Women	YLLs (YLL%)	5159 (26.13)	564 (20.47)	388 (26.35)	51 (42.85)	84 (26.08)	304 (27.66)	214 (73.79)	7600 (100)
		Age Group (y)	60-69	60-69	60-69	80+	15-29	60-69	0-4	0-4
	Men	YLLs (YLL%)	6505 (29.25)	933 (23.44)	381 (26.29)	95 (33.8)	54 (30.16)	384 (26.50)	364 (100)	11182 (100)
		Age Group (y)	45-59	45-59	45-59	30-44	60-69	45-59	0-4	0-4
		Cause of Death	Diseases of the circulatory system	Diseases of the respiratory system	Diseases of the digestive system	Diseases of the skin and subcutaneous tissue	Diseases of the musculoskeletal system and connective tissue	Diseases of the genitourinary system	Pregnancy, childbirth, and the puerperium	Certain conditions originating in the perinatal period

Cause of Death	Rank 1			Rank 2			Rank 3		
	Men	Women	Both	Men	Women	Both	Men	Women	Both
	Age Group (y)	Age Group (y)	Age Group (y)	Age Group (y)	Age Group (y)	Age group (y)	Age Group (y)	Age Group (y)	9.5
	YLLs (YLL%)	YLLs (YLL%)	YLLs (YLL%)	YLLs (YLL%)	YLLs (YLL%)	YLLs (YLL%)	YLLs (YLL%)	YLLs (YLL%)	YLLs (YLL%)
Congenital malformations, deformations, and chromosomal abnormalities	0-4	0-4	0-4						
	1061 (100)	1099 (100)	2160 (100)						
Symptoms, signs, and abnormal clinical and laboratory findings not elsewhere classified	80+	80+	80+	15-29	15-29	15-29	30-44	30-44	30-44
	137 (28.72)	185 (36.7)	322 (32.85)	110 (23.06)	82 (16.2)	192 (19.59)	74 (15.51)	76 (15.07)	149 (15.20)
External causes of morbidity and mortality	15-29	15-29	15-29	30-44	30-44	30-44	45-59	0-4	45-59
	6487 (37.99)	1692 (31.63)	8179 (36.47)	5283 (30.94)	1226 (22.92)	6509 (29.02)	2367 (13.869)	760 (14.20)	3019 (13.46)

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ing on using alcohol, cigarettes, and drugs [22, 23, 24]. Many mortal congenital abnormalities can be prevented by amniocentesis, genetic counseling, and induced abortion. Also, among the external causes of morbidity and mortality, such as an unusual cause of YLL, homicide is preventable. Similarly, suicide is a remarkable cause of lost potential life years, offering substantial prevention opportunities [25, 26].

Reducing the YLL due to the most frequent conditions will require extensive social, behavioral, and medical interventions. Medical care advancements have decreased the impact of malignant neoplasms, heart diseases, congenital abnormalities, and perinatal conditions. Improving access to the present medical techniques and developing new modalities through continuing biomedical research may further reduce these disorders' burden. Homicides, suicides, and accidents will require broader-based social interventions in addition to medical care: Interventions that deal with the individual's environment and the personal behavior that impact all of the mentioned causes. Environment and behavior may be the major factors that determine the rates of heart disease, cancer, and specific perinatal conditions, besides their apparent importance regarding accidents, homicides, and suicide [21].

Focusing on the environment and lifestyle rather than disease alters the emphasis on what can be done to prolong life and implement change. Increasing medical care funding or reorganizing the health care delivery system alone cannot enhance lifestyle conditions [27].

Considering the social roots of plenty of morbidity and premature deaths, we preserve a broad outlook on the issues and the possible prevention strategies that may transcend the medical system [21]. Also, sharp race-sex-age differences exist among the leading causes of premature deaths, suggesting that specific groups have higher risks and need to be investigated more. Policymakers pay more attention to particular sex and age groups for the causes of loss of life-related to that sex age group.

Conclusion

According to the results of our study, the most years of life lost in both sexes are related to diseases of the circulatory system, followed by external causes of morbidity and mortality. Most of the deaths are related to the circulatory system in the ages of 45-59 years and external causes of morbidity and mortality in the ages of 15-29 years. Therefore, it is important to pay attention to the diseases of the circulatory system and its causes, as well as external causes of morbidity and mortality that harm people of working age. It can be one of the priority diseases in this province, and policymakers need to pay more attention to it and provide short-term and long-term plans to prevent it from happening.

Study strengths and limitations

One of the study's strengths is the study of all diseases and the estimation of proportional damping in addition to the damping section of the DALY index. Study limitations should also be considered, including restrictions on the cross-sectioned study type. There are also limitations related to the registration system, incomplete information related to registration, and failure to collect this information for research.

Ethical Considerations

Compliance with ethical guidelines

This study was approved by the Research Ethics Committee of Golestan University of Medical Sciences (Code: IR.Goums.REC.1395.219).

Funding

This study was financially supported by Golestan University of Medical Sciences.

Authors' contributions

Conceptualization and study design: Mousa Ghelichi-Ghojogh and Ehsan Allah Kalteh; Data collection: Hamideh sadeghzadeh; Writing the original draft: Saeed Golfiroozi, Sahar Delavari and Tahere Ghotbi; Final approval: All authors.

Conflict of interest

The authors declared no conflict of interest.

Acknowledgments

The authors would like to express their sincere gratitude to the Deputy of Research and Technology of Golestan University of Medical Sciences for financial assistance in implementing this research project.

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