Observational Study

Medicine®

OPEN

Cancer death and potential years of life lost in Feicheng City, China

Trends from 2013 to 2018

Jia Yang, MS[a], Li Zhao, MS[b], Nan Zhang, PhD[c], Zhenhua Du, MS[d], Yanyan Li, BM[b], Xia Li, MS[e], Deli Zhao, BM[b], Jialin Wang, BM[c,*]

Abstract

This study aimed to evaluate the impact of cancer-related mortality on life expectancy in Feicheng City.

We extracted the death records and population data of Feicheng City from 2013 to 2018 through the Feicheng Center for Disease Control and Prevention. The mortality, premature mortality, cause-eliminated life expectancy, potential years of life lost (PYLL), average potential years of life lost (APYLL), annual change percentage (APC), and other indicators of cancer were calculated. The age-standardized rates were calculated using the sixth national census (2010).

From 2013 to 2018, the mortality rate of cancer in Feicheng City was 221.55/100,000, and the standardized mortality rate was 166.37/100,000. The standardized mortality rate increased from 2013 to 2014 and then decreased annually. The premature mortality of cancer was 8.98% and showed a downward trend (APC = −2.47%, $t = -3.10$, $P = .04$). From 2013 to 2018, the average life expectancy of residents in Feicheng City was 78.63 years. Eliminating the impact of cancer, life expectancy could increase by 3.72 years. The rate of life loss caused by cancer in men was higher than that in women. The total life loss caused by cancer deaths was 126,870.50 person-years, the potential life loss rate was 22.51‰, and the average potential life loss was 13.30 years. The standardized potential years of life lost rate showed a downward trend (APC = −2.96%, $t = -3.72$, $P = .02$), and APYLL decreased by 1.98% annually ($t = -5.44$, $P = .01$). The top 5 malignant tumors in APYLL were leukemia, breast cancer, brain tumor, liver cancer, and ovarian cancer.

Lung cancer, esophageal cancer, female breast cancer, and childhood leukemia have a great impact on the life expectancy of residents in Feicheng City. Effective measures need to be taken to reduce the disease burden of malignant tumors.

Abbreviations: APC = annual change percentage, APYLL = average potential years of life lost, PYLL = potential years of life lost, PYLLR = potential life loss rate, SPYLL = standardized years of potential loss of life, SPYLLR = standardized rate of potential life loss.

Keywords: cancer, cause eliminated life expectancy, potential years of life lost, premature mortality

Editor: Maya Saranathan.

This study was supported by National Natural Science Foundation of China (71904109) and Natural Science Foundation of Shandong Province (ZR2019PG006).

The authors have no conflicts of interests to disclose.

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

[a] *Liaocheng People's Hospital, Liaocheng, Shandong, China,* [b] *Cancer Prevention and Trentment Center, Feicheng People's Hospital, Feicheng, Shandong, China,* [c] *Shandong Cancer Hospital and Institute, Shandong First Medical University and Shandong Academy of Medical Sciences, Jinan, Shandong, China,* [d] *Feicheng Center for Disease Control and Prevention, Feicheng, Shandong, China,* [e] *Department of Biostatistics, School of Public Health, Shandong University, Jinan, Shandong, China.*

[*] *Correspondence: Jialin Wang, Shandong Cancer Hospital and Institute, Shandong First Medical University and Shandong Academy of Medical Sciences, No. 440 Jiyan Road, Huaiyin District, Jinan City 250117, Shandong Province PR China (e-mail: wangjialin6681@163.com).*

Copyright © 2021 the Author(s). Published by Wolters Kluwer Health, Inc. This is an open access article distributed under the terms of the Creative Commons Attribution-Non Commercial License 4.0 (CCBY-NC), where it is permissible to download, share, remix, transform, and buildup the work provided it is properly cited. The work cannot be used commercially without permission from the journal.

How to cite this article: Yang J, Zhao L, Zhang N, Du Z, Li Y, Li X, Zhao D, Wang J. Cancer death and potential years of life lost in Feicheng City, China: trends from 2013 to 2018. Medicine 2021;100:39(e27370).

Received: 7 December 2020 / Received in final form: 29 August 2021 / Accepted: 13 September 2021

http://dx.doi.org/10.1097/MD.0000000000027370

1. Introduction

With the accelerated process of population aging, industrialization, and urbanization in China, cancer has become one of the main serious threats to human health. According to GLOBOCAN 2018, 9.56 million people died of cancer worldwide, and China accounted for approximately 30% of this figure.[1] In 2015, 2.338 million people died of cancer in China, and the mortality rate from cancer was 170.05/100,000. Cancer is the leading cause of disease-related deaths. In the past 10 years, the incidence and mortality of cancer have been on the rise,[2] and the circumstances of malignant tumor prevention and control are severe.

In 2014, the WHO defined death before the age of 70 years as "premature death" and recommended "premature death" as a significant indicator for evaluating the prevention and control of chronic noncommunicable diseases in various countries. Premature mortality is a probability indicator that is similar to a healthy life expectancy. It is not affected by age composition and can be compared between different times and regions.[3] In 2016, the "Healthy China 2030" plan emphasized that the premature mortality of major chronic diseases in 2030 will be 30% lower than in 2015.[4] Our study evaluated the effectiveness of malignant tumor prevention by continuously monitoring the premature mortality of malignant tumors.

Life expectancy refers to the average number of years that a group of people born in the same period can survive for,

according to the current age-specific mortality rate.[5] It is a comprehensive indicator that reflects the country's socioeconomic level, cultural education level, residents' health status, and health care level.[6–8] It was not until the beginning of the 20th century that people began to use cause-elimination life tables to assess the impact of specific diseases on population health and life expectancy.[9] The cause-eliminated life expectancy is based on the assumption that the life span will be extended if the cause of death is eliminated. The greater the risk of death caused by a particular disease, the greater the loss of life, and the greater the life expectancy after the cause is eliminated. One of the important goals in the "Healthy China 2030" Plan was that the average life expectancy per capita reaches 79.0 years by 2030.[4] The Statistical Bulletin on the Development of China's Health Services showed that China's average life expectancy was 77.3 years in 2019. Among the average life expectancy of countries published by the World Health Organization in 2019, China's average life expectancy was 76.1 years (men, 77.6 years; women, 74.6 years). China also needs to continue to control related factors that affect life expectancy. Based on the local cancer death database, we performed the current study to evaluate the impact of cancer-related mortality on life expectancy in Feicheng City.

2. Methods

2.1. Data source

Feicheng is a county-level city in eastern China, with a population of 1,000,000. At the beginning of this century, Feicheng City was included in the World Health Organization's tumor incidence and death registration and established a complete tumor incidence and death reporting system. We extracted the death records (name, sex, certificate number, date of birth, date of death, cause of disease) and population data (distribution characteristics of the entire population) of Feicheng from 2013 to 2018 through the Feicheng Center for Disease Control and Prevention and the Local Public Security Bureau. The subjects of the study were individuals who died of malignant tumors among the residents of Feicheng City from 2013 to 2018. The study was approved by the Ethics Committee of the Feicheng Center for Disease Control and Prevention.

2.2. Quality control

The All Causes of Death Network Reporting System covered the total population of Feicheng City and adopted the "National Causes of Death Registration Report Information System" for direct network reporting. The completion rate of the entered death medical certificate was over 95%, and the error rate was less than 5%. According to the tenth edition of the International Classification of Diseases (ICD-10), the work commissioner coded the leading fatal diseases, and the proportion of coding errors did not exceed 5%. The underreporting rate of deaths was less than 5%, and quality control indicators met the requirements. The Feicheng Center for Disease Control and Prevention conducted an underreporting investigation of the cause of death at least once a year and filled in with the cancellation of household registration and abnormal death data from the public security department. Before data analysis, we performed data cleaning, duplicate checking, and logical verification.

2.3. Statistical analysis

Mortality, premature mortality, cause-eliminated life expectancy, years of potential life loss (PYLL), standardized years of potential loss of life (SPYLL), potential life loss rate (PYLLR), standardized rate of potential life loss (SPYLLR), average years of potential life lost (APYLL), and annual change percentage (APC) were calculated using Excel 2010 (Microsoft, Inc., Simonyi, USA) and SAS 9.2 software (SAS Institute, Inc., Cary, North Carolina). The age-standardized rates were calculated using the sixth national census (2010). Life expectancy and the cause of eliminated life expectancy were calculated using the life table. The calculation formulas for the leading indicators are as follows:

Premature mortality ${}_{69}q_{30}{}^{69} = 1 - \prod_{30}^{69}(1 - {}_5q_x{}^5)$ probability of death for the xth age group ${}_5q_x{}^5 = ({}_5M_x{}^5 \times 5)/(1 + {}_5M_x{}^5 \times 2.5)$ mortality rate in the xth age group M_x = number of deaths in the xth age group/population of the xth age group

$$PYLL = \sum_{i=1}^{e}(e - i + 0.5)d_i$$
$$PYLLR = PYLL/n \times 1000‰$$
$$SPYLL = \sum_{i=1}^{e}\left[PYLL_i \times \left(\frac{N_i}{n}\right)/\left(\frac{n_i}{n}\right)\right]$$
$$SPYLLR = SPYLL/n \times 1000‰$$
$$APYLL = PYLL/\sum_{i=1}^{e}d_i$$

Where e is the life expectancy (years), i is the age group, and d_i is the number of deaths in the ith age group. To eliminate the impact of the 0-year-old group and the high-age group on life loss, this study stipulates that life expectancy is 75 years. n is the total number of people in the ith age group, $\frac{N_i}{N}$ is the population composition ratio of the ith age group in the sixth national census, and $\frac{n_1}{n}$ is the actual population composition ratio of the ith age group.

$APC = 100 \times (e^{\beta} - 1)$, the log-linear regression method was used to calculate the regression coefficient β. $y = \alpha + \beta x + \varepsilon$, where y represents the dependent variable, that is, the natural logarithm of the research index. α represents the constant; x represents the independent variable, that is, the year; and ε represents the random error. The t-test was performed on the regression coefficient, and $P < .05$ indicates that the difference is statistically significant.[10]

3. Results

3.1. Mortality of cancer

From 2013 to 2018, 13,155 people died of cancer in Feicheng City. The mortality rate of cancer was 221.55/100,000 (men, 293.42/100,000; women, 148.70/100,000), and the standardized mortality rate was 166.37/100,000 (men, 228.90/100,000; women, 109.57/100,000). The mortality rate of male cancer patients was higher than that of females. The standardized mortality rate of cancer increased from 2013 to 2014 and then decreased year by year (APC = −2.27%, $t = -2.59$, $P = .06$). The standardized mortality rate of male cancer changed steadily (APC = −2.27%, $t = -2.56$, $P = .06$), and the standardized mortality rate of women showed a decreasing trend (APC = −2.47%, $t = -2.93$, $P = .04$) (Table 1).

Table 1

The mortality of cancer in Feicheng, 2013–2018 (1/10^5).

	Both		Male		Female	
Years	Mortality	Standardized mortality	Mortality	Standardized mortality	Mortality	Standardized mortality
2013	206.69	169.38	271.75	232.20	140.87	112.34
2014	220.48	174.92	288.94	240.63	151.01	116.24
2015	228.80	174.56	303.57	239.46	152.88	115.06
2016	232.42	170.99	310.08	234.28	153.70	112.32
2017	216.80	156.16	289.19	215.01	143.60	102.98
2018	223.99	154.47	296.88	213.05	150.29	101.56
APC (%)	1.01	−2.27	1.31	−2.27	0.50	−2.47
t	1.06	−2.59	1.28	−2.56	0.55	−2.93
P	.35	.06	.27	.06	.61	.04
Total	221.55	166.37	293.42	228.90	148.70	109.57

APC = annual change percentage.

3.2. Death order of leading cancers

In the death order of leading cancers, the top 5 malignant tumors were lung cancer, esophageal cancer, gastric cancer, liver cancer, and female breast cancer. Esophageal cancer ranked first among male cancers, and the fifth was colorectal cancer. The death order of female cancers was the same as that of the entire population. Among the top 5 malignant tumors, except for breast cancer, the mortality rate of the other 4 malignant tumors in men was higher than that in women (Tables 2, 3 and 4).

3.3. Trends in mortality of the leading cancer

From 2013 to 2018, the mortality rate of lung cancer in Feicheng City increased by 4.92% annually (t=4.92, P=.01), but the standardized mortality rate of esophageal cancer decreased by 6.85% annually (t=−3.55, P=.02). The standardized mortality rates of gastric cancer (APC=−5.73%, t=−2.90, P=.04) and liver cancer (APC=−6.39%, t=−3.31, P=.03) showed a decreasing trend. The mortality rate of male colorectal cancer was on the rise (APC=7.90%, t=-3.55, P=.02), and the mortality rate of female breast cancer has increased since 2013, declined in 2016, and then increased year by year (APC=3.05%, t=1.02, P=.37) (Tables 2–4).

3.4. Premature mortality of cancer

From 2013 to 2018, 7610 people aged 30 to 70 years (not including 70) died of cancer in Feicheng City. The premature mortality rate was 8.98% (men, 12.72%; women, 5.24%), and the premature mortality rate for men was higher than that for women. From 2013 to 2018, the premature mortality of cancer showed a decreasing trend, from 9.28% to 8.41% (APC=−2.47%, t=−3.10, P=.04). The premature mortality of cancer in men increased from 2013 to 2014 and then decreased annually (APC=−2.18%, t=−2.03, P=.11). The premature mortality of cancer among women decreased year by year until it rebounded slightly in 2018 (APC=−3.05%, t=−2.29, P=.08) (Fig. 1).

3.5. Trends in premature mortality of cancer

From 2013 to 2018, the premature mortality of esophageal cancer decreased from 2.26% to 1.64% (APC=6.67%, t=−3.01, P=.04). The premature mortality of liver cancer gradually declined until a slight rebound in 2018 (APC=−6.11%, t=−2.29, P=.08). The premature mortality of male esophageal cancer decreased year by year (APC=−5.82%, t=−2.97, P=.04), and the premature mortality of colorectal cancer changed steadily, fluctuating between 0.23% and 0.49% (APC=9.86%, t=1.65, P=.17). The premature mortality of female breast cancer fluctuated between 0.44% and 0.67% (APC=−4.26%, t=−0.41, P=.70) (Figs. 2–4).

3.6. Life expectancy and cause-eliminated life expectancy

From 2013 to 2018, the average life expectancy of residents in Feicheng was 78.63 years. Eliminating the impact of malignant

Table 2

The mortality of top five leading cancers in Feicheng, 2013–2018(1/10^5).

	Lung		Esophagus		Stomach		Liver		Breast (female)	
Years	Mortality	Standardized mortality	Mortality	Standardized mortality	Mortality	Standardized mortality	Mortality	Standardized mortality	Mortality	Standardized mortality
2013	45.66	37.61	52.66	42.89	31.15	25.27	28.72	23.27	10.22	7.96
2014	49.76	39.06	59.47	46.56	29.43	23.40	27.51	21.56	10.39	8.49
2015	55.66	42.74	54.24	40.34	34.14	26.03	25.86	20.09	11.20	9.21
2016	54.08	39.26	58.10	41.83	32.43	24.17	23.87	17.69	8.72	6.29
2017	55.76	39.63	50.72	35.61	28.03	19.85	21.58	15.67	11.56	9.47
2018	59.86	40.37	45.40	30.37	26.90	18.72	26.29	18.26	12.41	9.79
APC (%)	4.92	0.90	−3.25	−6.85	−2.66	−5.73	−3.54	−6.39	3.05	2.84
t	4.92	0.86	−1.61	−3.55	−1.32	−2.90	−1.70	−3.31	1.02	0.68
P	.01	.44	.18	.02	.26	.04	.16	.03	.37	.53
Total	53.47	39.81	53.44	39.36	30.35	22.74	25.63	19.39	10.75	8.51

APC = annual change percentage.

Table 3

The mortality of top five leading cancers among men in Feicheng, 2013–2018 (1/10^5).

	Esophagus		Lung		Stomach		Liver		Colorectum	
Years	Mortality	Standardized mortality	Mortality	Standardized mortality	Mortality	Standardized mortality	Mortality	Standardized mortality	Mortality	Standardized mortality
2013	74.13	62.62	63.25	55.08	43.71	36.47	41.09	34.02	9.27	8.83
2014	79.31	66.08	68.07	56.45	45.98	38.96	40.56	32.77	9.04	7.84
2015	77.00	61.35	77.00	61.35	49.33	38.83	38.30	30.66	10.23	8.03
2016	81.22	61.05	75.82	56.82	48.41	37.30	35.21	26.52	9.60	7.55
2017	70.59	51.32	80.42	59.22	40.11	29.97	33.09	24.91	13.04	9.96
2018	65.97	46.27	80.86	56.83	41.03	29.74	40.23	29.06	12.87	10.48
APC (%)	−2.47	−6.29	5.02	0.60	−2.08	−5.16	−2.27	−4.88	7.90	4.39
t	−1.52	−3.8	5.02	0.65	−1.06	−2.56	−1.12	−2.47	3.55	1.50
P	.20	.02	.01	.55	.35	.06	.33	.70	.02	.21
Total	74.68	57.32	74.24	57.82	44.77	34.95	38.07	29.68	10.67	8.74

APC = annual change percentage.

tumors, life expectancy could increase by 3.72 years. The average life expectancy of men was 75.53 years, which increased by 4.45 years after eliminating the impact of cancer. The average life expectancy of women was 81.85 years, and it increased by 2.73 years after eliminating the impact of cancer. From 2013 to 2018, the life expectancy of residents in Feicheng City fluctuated between 77.87 years and 79.38 years (APC = 0.30%, $t = 2.35$, $P = .08$). The change in loss of years due to cancer was not statistically significant (APC = 2.22%, $t = 0.58$, $P = .59$). The life expectancy of men increased by 0.40% per year ($t = 3.77$, $P = .02$). The change in the loss of years due to cancer was not statistically significant (APC = −2.96%, $t = -1.09$, $P = .34$). Women's life expectancy changed steadily (APC = 0.10%, $t = 0.89$, $P = .43$) (Table 5).

3.7. Trends in life loss rate caused by cancer

According to the analysis of the life loss rate caused by cancer of different ages in Feicheng from 2013 to 2018, the results showed that the life loss rate caused by cancer gradually increased with age, reaching a peak around 70 years of age. The rate of life loss in men was higher than that in women (Fig. 5). From 2013 to 2018, the rate of life loss due to liver cancer showed a decreasing trend (APC = −5.82% $t = -3.30$, $P = .03$). Among men, life expectancy showed an upward trend after eliminating the cause of death from esophageal, lung, gastric, and colorectal cancers. APC were 0.40% ($t = 3.10$, $P = .04$), 0.50% ($t = 3.46$, $P = .03$), 0.40% ($t = 3.46$, $P = .03$), and 0.40% ($t = 3.69$, $P = .02$), respectively. The rate of life loss due to liver cancer among women showed a downward trend (APC = −9.79%, $t = -3.94$, $P = .02$) (Tables 6, 7 and 8).

3.8. Analysis of potential years of life lost from cancer

The total life loss caused by cancer deaths in Feicheng City from 2013 to 2018 was 126,870.50 person-years, and the potential life loss rate was 22.51‰, and the average potential life loss was 13.30 years. Men's PYLLR was higher than that of women, while the opposite was true for APYLL. From 2013 to 2018, SPYLLR showed a downward trend (APC = −2.96%, $t = -3.72$, $P = .02$) and APYLL decreased by 1.98% annually ($t = -5.44$, $P = .01$) (Table 9). From 2013 to 2018, the PYLLR of lung cancer showed an upward trend (APC = 0.40%, $t = 3.58$, $P = .02$), and the PYLLR of esophageal cancer showed a downward trend (APC = −5.64%, $t = -3.65$, $P = .02$). The PYLL of men with gastric cancer decreased by 8.06% annually ($t = -2.94$, $P = .04$) (Table 10). The top 5 cancers in APYLL were leukemia, breast cancer, brain tumor, liver cancer, and ovarian cancer. The APYLL of liver cancer decreased year by year (APC = −3.44%, $t = -9.32$, $P < .01$), and the APYLL of leukemia changed steadily (APC = −0.60, $t = 0.27$, $P = .80$). The APYLL of liver cancer in men decreased each year (APC = −2.96%, $t = -3.42$, $P = .03$) (Table 11).

Table 4

The mortality of top five leading cancers among women in Feicheng, 2013–2018 (1/10^5).

	Lung		Esophagus		Stomach		Liver		Breast	
Years	Mortality	Standardized mortality	Mortality	Standardized mortality	Mortality	Standardized mortality	Mortality	Standardized mortality	Mortality	Standardized mortality
2013	27.81	22.03	30.87	24.76	18.40	14.78	16.15	12.67	10.22	7.96
2014	31.18	23.56	39.33	29.02	12.63	9.59	14.27	10.68	10.39	8.49
2015	34.00	25.89	31.15	25.89	18.73	14.16	13.23	9.89	11.20	9.21
2016	32.04	23.47	34.67	23.88	16.22	12.05	12.37	9.19	8.72	6.29
2017	30.83	21.79	30.63	21.18	15.82	10.58	9.94	6.82	11.56	9.47
2018	38.64	25.92	24.61	15.55	12.61	8.50	12.20	7.77	12.41	9.79
APC (%)	4.50	1.41	−4.97	−9.15	−3.82	−7.23	−7.04	−10.42	3.05	2.84
t	2.29	0.73	−1.54	−2.94	−0.92	−1.68	−3.02	−5.02	1.02	0.68
P	.08	.51	.20	.04	.41	.17	.04	.01	.37	.53
Total	32.42	23.66	31.91	22.75	15.73	11.51	13.02	9.40	10.75	8.51

APC = annual change percentage.

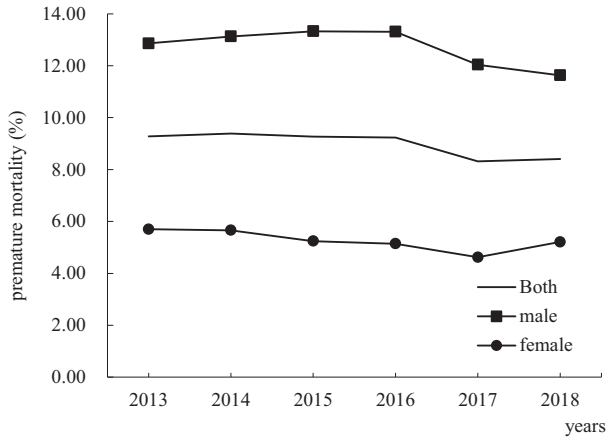

Figure 1. The premature mortality of cancer in Feicheng, 2013 to 2018. Black line: Both. Black square marked line: male. Black circle marked line: female.

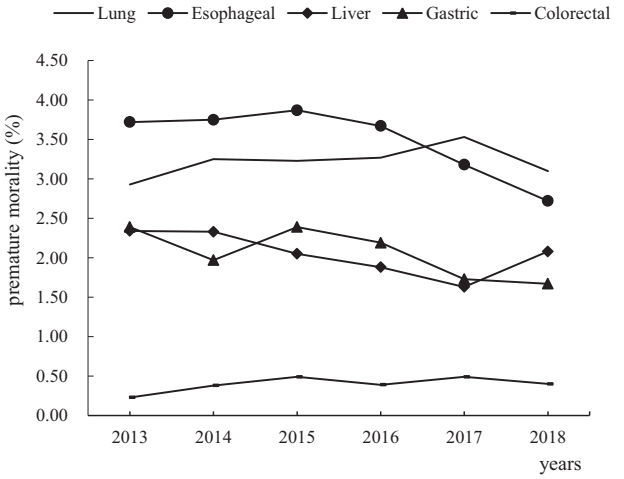

Figure 3. The premature mortality of the top 5 leading cancers among men in Feicheng, 2013 to 2018. Black line: Lung. Black circle marked line: Esophageal. Black diamond marking line: Liver. Black triangle mark line: Gastric. Black rectangle marking line: Colorectal.

4. Discussion

Our results showed that the mortality rate of cancer in Feicheng City from 2013 to 2018 was 221.55/100,000, and the standardized mortality rate was 166.37/100,000. The mortality rate of cancer in men is higher than that in women, and the results are consistent with those of related studies.[11,12] This may be attributed to unhealthy habits, such as smoking and drinking or greater pressure in the workplace, life, and society.[13,14] Tobacco smoking accounts for approximately 23% to 25% of all cancer-related deaths in China. [15,16] In 2010, more than half of Chinese adult men were currently smoking,[17] and smoking rates among adolescents and young adults were still rising.[18] A meta-analysis of alcohol and cancer mortality showed that all cancer mortality rates in men had a J-shaped relationship with alcohol consumption, but those in women did not.[19] Endocrine biology is known to affect cancer epidemiology and possibly cause female predominance in some cancers. However, these environmental and hormonal factors associated with sex-specific differences in cancer could interact with EXITS loci or their gene products to modulate cancer risk. A study from the Broad Institute of Harvard and MIT showed that biallelic expression of EXITS genes in women explained a portion of the reduced cancer incidence compared to men across many tumor types.[20] The standardized mortality rate of cancer increased from 2013 to 2014 and then decreased annually. However, a study in Hebei Province found that from 1973 to 2013, the mortality rate from cancer increased by 51.57%.[21] Another age-period cohort study showed that the cancer mortality rates of men (APC = 0.9%, 95% CI: 0.8–1.0) and women (APC = 0.8%, 95% CI: 0.7–0.9) showed an increasing trend from 1991 to 2009 in Serbia.[22] In this study, the top 5 leading cancers in the order of death were lung cancer, esophageal cancer, gastric cancer, liver cancer, and female breast

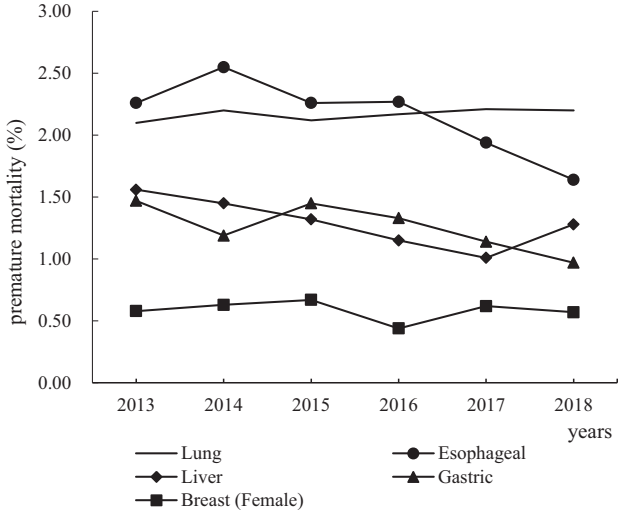

Figure 2. The premature mortality of the top 5 leading cancers in Feicheng, 2013 to 2018. Black line: Lung. Black circle marked line: Esophageal. Black diamond marking line: Liver. Black triangle mark line: Gastric. Black square marked line: Breast (Female).

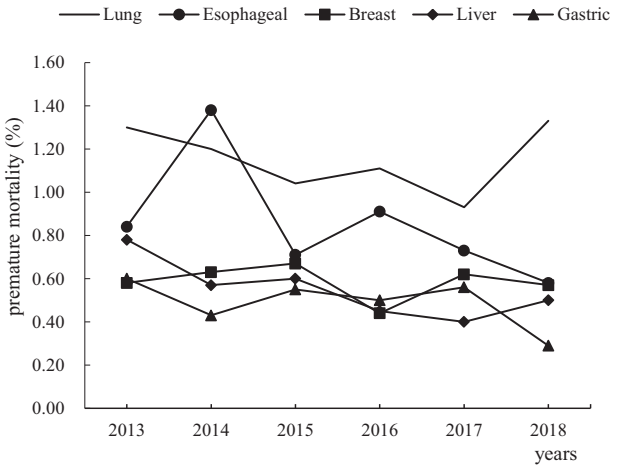

Figure 4. The premature mortality of the top 5 leading cancers among women in Feicheng, 2013 to 2018. Black line: Lung. Black circle marked line: Esophageal. Black square marked line: Breast. Black diamond marking line: Liver. Black triangle mark line: Gastric.

Table 5

Cause-eliminated life expectancy of cancer in Feicheng, 2013–2018.

	Male				Female				Both			
Years	Life expectancy	Cause eliminated life expectancy	Loss year	Loss rate (%)	Life expectancy	Cause eliminated life expectancy	Loss year	Loss rate (%)	Life expectancy	Cause eliminated life expectancy	Loss year	Loss rate (%)
2013	74.65	78.93	4.28	5.73	81.23	83.91	2.67	3.29	77.87	81.49	2.73	3.46
2014	74.94	80.56	5.62	7.50	81.54	84.45	2.91	3.57	78.21	82.03	3.82	4.88
2015	75.58	80.48	4.90	6.48	82.42	85.49	3.07	3.73	78.93	83.07	4.15	5.26
2016	75.36	80.11	4.76	6.31	81.96	84.76	2.79	3.41	78.57	82.43	3.86	4.91
2017	76.52	80.89	4.36	5.70	82.28	84.90	2.62	3.18	79.38	82.99	3.60	4.54
2018	76.02	80.09	4.07	5.35	81.58	84.01	2.43	2.98	78.76	82.11	3.35	4.25
APC (%)	0.40	0.20	−2.96	−3.34	0.10	0.00	−2.47	−2.66	0.30	0.20	2.22	2.12
t	3.77	1.17	−1.09	−1.24	0.89	0.21	−1.39	−1.57	2.35	1.07	0.58	0.55
P	.02	.31	.34	.28	.43	.85	.24	.19	.08	.34	.59	.61
Total	75.53	79.97	4.45	5.89	81.85	84.58	2.73	3.34	78.63	82.35	3.72	4.73

APC = annual change percentage.

cancer. According to GLOBOCAN2018, lung cancer was ranked first, followed by colorectal cancer.[1] Due to the regional characteristics of Feicheng City, the incidence of esophageal cancer was relatively high, ranking second only to lung cancer.[23] Since 2006, Feicheng People's Hospital has screened high-risk groups of 40 to 69 years old for upper gastrointestinal cancer, advocated early diagnosis and treatment, became more effective at screening.[24]

From 2013 to 2018, the standardized mortality rates of gastric cancer and liver cancer in Feicheng City decreased annually. Reducing the consumption of corn contaminated with aflatoxins and improving the quality of drinking water by removing cyanotoxins from water sources may lead to a decrease in liver cancer mortality. The main risk factors for liver cancer include HBV infection, aflatoxin contamination, and HCV infection.[25] Gastric cancer is mainly associated with *Helicobacter pylori* infection.[26] With the widespread inoculation of HBV and the improvement of residents' awareness of dietary hygiene, the incidence of these 2 cancers has decreased.[27,28,29] Although both mortality rates showed a downward trend, they were still the leading cause of death of malignant tumors in Feicheng residents. From 2013 to 2018, the mortality rate of male colorectal cancer in Feicheng City showed an upward trend, but the standardized rate changed steadily, which indicated that the increase in mortality of colorectal cancer was mainly due to population aging. The incidence of colorectal cancer is closely related to the increasing westernization of lifestyle, lack of exercise, rising prevalence of obesity, family genetic history, and diet.[30] There are differences in cancer mortality among different populations, which may be due to factors such as race, geographic region, economic development, and education level. Many differences are mainly due to the lack of resources related to treatment and prevention, which can be remedied through education and publicity, healthy lifestyle interventions, vaccination, and cancer screening.[30–34]

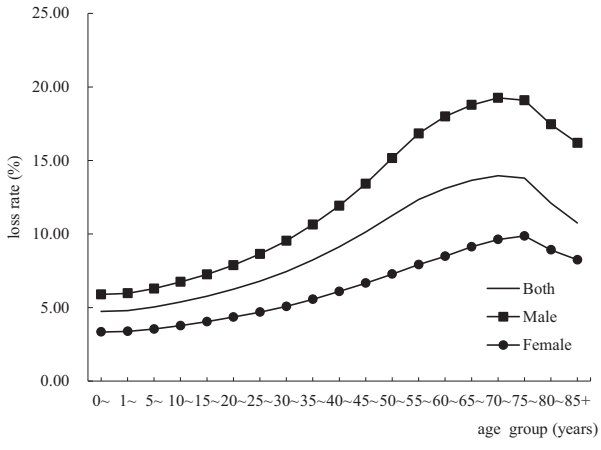

Figure 5. The trend of life expectancy loss caused by cancer in Feicheng, 2013 to 2018. Black line: Both. Black square marked line: male. Black circle marked line: female.

In this study, the premature mortality of cancer in Feicheng from 2013 to 2018 was 8.98% and showed a downward trend year by year (APC = −2.47%, $t = -3.10$, $P < .05$). However, a study in Sri Lanka found that the premature mortality of cancer increased from 3.5% to 5.0% from 2001 to 2010.[35] In this study, female breast cancer premature mortality fluctuated between 0.44% and 0.67%, ranking third among all the studied cancers. The incidence and mortality of breast cancer in women are relatively high, which is consistent with the conclusions of other studies.[36–38] In 2020, there were 2.26 million new breast cancer cases worldwide, and breast cancer replaced lung cancer as the world's first cancer.[39] Among female malignant tumors, breast cancer is the leading cause of premature death. In the future, it will be necessary to strengthen women's health knowledge education, improve the quality of medical and health services, actively carry out women's cancer investigation and treatment, and control the impact of breast cancer on women's health.

The life expectancy of the Chinese people in 2015 was 76.34 years, but it was still lower than the expectancy in some developed countries.[40,41] In this study, the average life expectancy of residents in Feicheng City from 2013 to 2018 was 78.63 years. Eliminating the impact of cancer, life expectancy could increase by 3.72 years. The life expectancy increased by 0.80 years after eliminating the cause of death from lung cancer, and 0.79 years after eliminating the impact of esophageal cancer. A study in Tianjin showed that after eliminating the impact of lung cancer, the life expectancy of residents increased the most, with men and women increased by 1.25 years and 0.97 years, respectively.[42] A study of gastric cancer showed that early detection of gastric adenocarcinoma could increase life expectancy.[43] These results indicate that malignant tumors seriously

Table 6

Cause-eliminated life expectancy of leading cancers in Feicheng, 2013–2018.

	Lung			Esophageal			Gastric			Liver			Breast (Female)		
Years	Cause eliminated life expectancy	Loss year	Loss rate (%)	Cause eliminated life expectancy	Loss year	Loss rate (%)	Cause eliminated life expectancy	Loss year	Loss rate (%)	Cause eliminated life expectancy	Loss year	Loss rate (%)	Cause eliminated life expectancy	Loss year	Loss rate (%)
2013	78.59	0.72	0.93	78.69	0.82	1.06	78.35	0.48	0.62	78.33	0.46	0.59	81.41	0.18	0.22
2014	78.97	0.76	0.97	79.12	0.91	1.17	78.66	0.45	0.57	78.64	0.43	0.54	81.72	0.18	0.22
2015	79.83	0.91	1.15	79.78	0.86	1.09	79.46	0.54	0.68	79.34	0.41	0.53	82.63	0.21	0.26
2016	79.35	0.78	1.00	79.41	0.85	1.08	79.05	0.48	0.62	78.93	0.36	0.46	82.11	0.15	0.18
2017	80.20	0.82	1.03	80.12	0.74	0.93	79.79	0.41	0.52	79.71	0.32	0.41	82.50	0.22	0.27
2018	79.55	0.79	1.00	79.36	0.60	0.76	79.12	0.36	0.46	79.13	0.37	0.47	81.80	0.22	0.27
APC (%)	0.30	1.51	1.21	0.20	-6.11	-6.48	0.20	-5.07	-5.16	0.20	-5.82	-5.82	0.10	3.67	3.67
t	2.19	0.78	0.63	1.67	-2.47	-2.75	1.97	-1.93	-1.99	2.18	-3.23	-3.30	0.94	1.00	0.94
P	.09	.48	.56	.17	.07	.05	.12	.13	.12	.10	.03	.03	.40	.37	.43
Total	79.43	0.80	1.01	79.42	0.79	1.01	79.08	0.45	0.57	79.02	0.39	0.50	82.04	0.19	0.24

APC = annual change percentage.

Table 7

Cause-eliminated life expectancy of leading cancers among men in Feicheng, 2013–2018.

	Esophageal			Lung			Gastric			Liver			Colorectum		
Years	Cause eliminated life expectancy	Loss year	Loss rate (%)	Cause eliminated life expectancy	Loss year	Loss rate (%)	Cause eliminated life expectancy	Loss year	Loss rate (%)	Cause eliminated life expectancy	Loss year	Loss rate (%)	Cause eliminated life expectancy	Loss year	Loss rate (%)
2013	75.66	1.00	1.34	75.52	0.87	1.17	75.23	0.58	0.77	75.23	0.58	0.77	74.79	0.14	0.18
2014	75.97	1.03	1.38	75.82	0.88	1.17	75.54	0.59	0.79	75.49	0.54	0.73	75.06	0.12	0.16
2015	76.62	1.04	1.37	76.65	1.07	1.41	76.25	0.67	0.88	76.12	0.54	0.71	75.72	0.14	0.19
2016	76.42	1.07	1.42	76.34	0.98	1.30	76.00	0.64	0.85	75.82	0.46	0.61	75.48	0.13	0.17
2017	77.44	0.92	1.20	77.56	1.04	1.36	77.04	0.52	0.68	76.97	0.45	0.59	76.70	0.18	0.23
2018	76.79	0.77	1.01	76.96	0.94	1.24	76.50	0.48	0.63	76.52	0.50	0.66	76.18	0.16	0.21
APC (%)	0.40	-4.50	-4.97	0.50	2.32	1.92	0.40	-3.82	-4.21	0.40	-4.02	-4.60	0.40	5.34	5.13
t	3.10	-1.99	-2.22	3.46	1.16	1.02	3.46	-1.45	-1.57	3.58	-2.46	-2.63	3.69	1.78	1.92
P	.04	.12	.09	.03	.31	.37	.03	.22	.19	.02	.07	.06	.02	.15	.13
Total	76.49	0.97	1.28	76.49	0.97	1.28	76.10	0.58	0.76	76.04	0.51	0.68	75.67	0.14	0.19

APC = annual change percentage.

Table 8

Cause-eliminated life expectancy of leading cancers among women in Feicheng, 2013–2018.

	Lung			Esophageal			Gastric			Liver			Breast		
Years	Cause eliminated life expectancy	Loss year	Loss rate (%)	Cause eliminated life expectancy	Loss year	Loss rate (%)	Cause eliminated life expectancy	Loss year	Loss rate (%)	Cause eliminated life expectancy	Loss year	Loss rate (%)	Cause eliminated life expectancy	Loss year	Loss rate (%)
2013	81.72	0.48	0.60	81.77	0.54	0.66	81.56	0.33	0.40	81.52	0.28	0.35	81.41	0.18	0.22
2014	82.06	0.52	0.63	82.20	0.66	0.81	81.74	0.20	0.24	81.77	0.23	0.28	81.72	0.18	0.22
2015	83.07	0.65	0.79	82.99	0.57	0.70	82.76	0.34	0.42	82.66	0.24	0.29	82.63	0.21	0.26
2016	82.49	0.53	0.64	82.51	0.54	0.66	82.24	0.28	0.34	82.18	0.21	0.26	82.11	0.15	0.18
2017	82.79	0.51	0.62	82.77	0.49	0.60	82.54	0.26	0.31	82.44	0.16	0.19	82.50	0.22	0.27
2018	82.15	0.57	0.70	81.93	0.35	0.43	81.77	0.19	0.23	81.76	0.18	0.22	81.80	0.22	0.27
APC (%)	0.10	1.71	1.51	0.10	-8.52	-8.52	0.10	-6.01	-6.11	0.10	-9.34	-9.79	0.10	3.67	3.67
t	0.88	0.63	0.56	0.47	-2.49	-2.48	0.68	-1.07	-1.06	0.70	-4.26	-3.94	0.94	1.00	0.94
P	.43	.56	.61	.67	.07	.07	.53	.35	.35	.52	.01	.02	.40	.37	.40
Total	82.39	0.54	0.66	82.37	0.52	0.64	82.11	0.26	0.32	82.06	0.22	0.26	82.04	0.19	0.24

APC = annual change percentage.

Table 9

The potential years of life lost from cancer in Feicheng, 2013–2018.

	Both					Male					Female				
Years	PYLL (person year)	SPYLL (person year)	PYLLR (‰)	SPYLLR (‰)	APYLL (year)	PYLL (person year)	SPYLL (person year)	PYLLR (‰)	SPYLLR (‰)	APYLL (year)	PYLL (person year)	SPYLL (person year)	PYLLR (‰)	SPYLLR (‰)	APYLL (year)
2013	21434.00	17372.34	22.85	18.52	14.10	14897.00	11996.12	31.25	25.17	14.23	9377.50	7617.87	20.33	16.51	19.78
2014	21497.00	16994.03	22.87	18.08	13.56	14654.50	11320.88	30.64	23.67	13.37	9776.50	8022.34	21.17	17.34	20.00
2015	21906.50	17206.55	23.23	18.25	13.27	15230.00	11711.36	31.76	24.43	13.10	9526.50	7795.98	20.56	16.82	19.52
2016	21957.50	17051.47	23.37	18.15	13.33	15152.50	11363.29	31.74	23.80	12.98	6805.00	5720.02	14.72	12.38	14.18
2017	20117.00	15432.30	21.46	16.46	13.12	13792.50	10244.90	29.00	21.53	12.58	6252.50	5226.53	13.54	11.32	14.31
2018	19958.50	14864.98	21.29	15.85	12.46	13205.00	9661.25	27.75	20.30	12.02	6681.50	5224.82	14.47	11.32	13.28
APC (%)	-1.59	-3.05	-1.49	-2.96	-1.98	-2.27	-3.92	-2.18	-3.92	-2.96	-9.15	-9.43	-9.15	-9.43	-9.06
t	-1.96	-3.61	-2.01	-3.72	-5.44	-2.18	-4.12	-2.19	-4.20	-8.32	-3.52	-4.11	-3.56	-4.16	-4.48
P	.12	.02	.12	.02	.01	.10	.02	.09	.01	<0.01	.02	.02	.02	.01	.01
Total	126870.50	98886.81	22.51	17.55	13.30	86787.50	66356.18	30.31	23.17	13.02	39723.00	32755.77	14.33	11.82	13.84

APC = annual change percentage, APYLL = average potential years of life lost, PYLL = potential years of life lost, PYLLR = potential life loss rate, SPYLL = standardized years of potential loss of life, SPYLLR = standardized rate of potential life loss.

Table 10

PYLLR of leading cancers in Feicheng, 2013–2018 (‰).

	Both					Male					Female				
Years	Lung	Esophageal	Liver	Gastric	Breast (Female)	Esophageal	Lung	Liver	Gastric	Colorectum	Lung	Breast	Esophageal	Liver	Gastric
2013	4.37	4.73	4.32	3.18	1.62	7.52	6.08	8.35	6.26	1.39	2.59	1.62	1.85	1.90	1.43
2014	4.53	5.04	3.80	2.63	2.26	7.46	6.29	6.21	4.33	0.91	2.71	2.26	2.53	1.28	0.87
2015	4.62	4.48	3.53	3.11	2.31	7.45	6.57	5.40	4.77	0.98	2.61	2.31	1.40	1.59	1.40
2016	4.77	4.64	3.02	3.17	1.66	7.53	6.63	4.63	4.81	0.98	2.85	1.66	1.65	1.35	1.47
2017	4.94	3.99	2.57	2.6	2.01	6.46	7.29	4.34	3.77	1.32	2.53	2.01	1.44	0.74	1.39
2018	4.70	3.60	3.33	2.29	2.11	5.99	6.19	5.36	3.78	0.99	3.16	2.11	1.14	1.25	0.75
APC (%)	1.92	-5.64	-7.23	-4.59	1.82	-4.40	1.51	-9.34	-8.06	-1.69	2.53	1.82	-10.68	-10.51	-4.97
t	2.93	-3.65	-2.47	-1.72	0.46	-3.12	0.98	-2.54	-2.94	-0.35	1.38	0.46	-2.42	-1.74	-0.67
P	.04	.02	.07	.16	.67	.04	.38	.06	.04	.74	.24	.67	.07	.16	.54
Total	4.66	4.41	3.43	2.83	1.99	7.07	6.51	5.41	4.39	1.00	2.74	1.99	1.67	1.35	1.22

APC = annual change percentage, PYLLR = potential life loss rate.

endanger human health and cause life loss, especially lung cancer, esophageal cancer, liver cancer, and gastric cancer.

The PYLL focus on the absolute number of years of survival lost by each cause of death. This indicator helps to understand the impact of the cause of death on the survival and working hours of the entire population.[44,45] The total life loss caused by cancer deaths in Feicheng from 2013 to 2018 was 126,870.50 person-years; the potential life loss rate was 22.51‰, and the average potential life loss was 13.30 years. Both SPYLLR (APC = −2.96%, $t = -3.72$, $P = .02$) and APYLL showed a downward trend (APC = −1.98%, $t = -5.44$, $P = .01$). In 2015, people aged 16 to 84 in the United States lost 8,739,939 person-years due to cancer deaths, which means a loss of $94.4 billion (95% CI: 91.7—97.3).[46] Moreover, premature death of cancer can lead to productivity losses. In 2012, the total cost of lost productivity due to cancer mortality in the 5 BRICS countries was $46.3 billion, accounting for 0.33% of the total gross domestic product. The YPLL of China was the largest, reaching 5.9 million years, and

Table 11

APYLL of leading cancers in Feicheng, 2013–2018 (years).

	Both					Male					Female				
Years	Leukemia	Breast (Female)	Brain	Liver	Ovarian (Female)	Leukemia	Brain	Liver	Colorectum	Pancreatic	Leukemia	Breast	Cervical	Brain	Colorectum
2013	22.25	17.38	18.33	16.81	14.17	22.10	22.5	16.51	15.41	12.50	22.50	17.38	18.50	14.61	13.75
2014	24.30	21.77	18.96	15.98	13.83	18.28	18.96	16.99	12.79	12.92	25.74	21.77	18.13	22.81	15.00
2015	27.50	20.58	17.84	15.92	12.95	28.03	17.70	16.39	11.99	12.18	25.50	20.58	20.00	18.03	13.17
2016	25.68	20.13	18.60	14.92	12.05	23.75	21.41	14.73	14.17	12.17	27.50	20.13	18.75	15.00	15.83
2017	22.17	19.38	21.70	14.32	22.50	16.25	20.11	14.84	13.35	13.99	28.93	19.38	17.5	19.38	18.69
2018	22.81	19.07	14.99	14.20	15.13	19.20	15.76	14.83	14.32	11.70	23.61	19.07	21.25	14.33	15.15
APC (%)	-0.60	0.30	-1.59	-3.44	5.02	-3.44	-3.92	-2.96	-0.20	-0.30	1.92	0.30	1.51	-2.18	3.87
t	-0.27	0.13	-0.52	-9.32	0.92	-0.70	-1.42	-3.42	-0.09	-0.16	0.83	0.13	0.86	-0.45	1.42
P	.80	.90	.63	<.01	.41	.52	.23	.03	.94	.88	.45	.90	.44	.68	.23
Total	24.01	19.75	18.24	15.43	14.53	21.49	18.78	15.92	13.67	13.09	25.88	19.75	18.99	16.96	15.10

APC = annual change percentage, APYLL = average potential years of life lost.

the total productivity loss was $28 billion.[47] In this study, the PYLLR of lung cancer ranked first among leading cancers, and it has been increasing yearly (APC=0.40%, $t=3.58$, $P=.02$). A study in Guangzhou showed that tobacco smoking and environmental pollution from industrial emissions were the leading risk factors for lung cancer.[48] We should strengthen the prevention and control of air pollution, implement a total ban on smoking in indoor public places, reduce industrial waste gas emissions, and use more energy-efficient kitchen range hoods to reduce the incidence of lung cancer. In the ranking of APYLL, leukemia was ranked first. The larger the APYLL, the earlier the death from the disease. Leukemia tends to occur in children and is the main malignant tumor that causes death in the younger age group.[49] A study in Colombia showed that, from 1997 to 2012, the PYLL of male cancer increased by 25.1% and that of female cancer increased by 31.1%. In childhood cancers, 48% to 50% of the years of life lost are caused by leukemia.[50] Cervical cancer APYLL ranked third. In recent years, the incidence of cervical cancer has shown a decreasing trend. Early detection, early diagnosis, and early treatment are associated with a relatively high survival rate. Currently, HPV vaccines are the first line of defense against cervical cancer.[51,52]

Despite our meaningful results, there are several limitations to our study. First, this study was limited to cancer-related deaths in Feicheng City. There are differences in different regions of China, so we must be cautious when making inferences across the country. Second, this study only obtained mortality information by age and sex but failed to determine the difference in mortality between urban and rural areas and could not analyze the impact of socioeconomic status, education level, and lifestyle factors on cancer mortality. Third, the leading cause of death of the selected subjects in this study was cancer, and deaths from complications were not considered. However, this issue requires further research. The last question was the misclassification of the diseases. Although we used a strict quality control strategy, there were still some uncertainties regarding the cause of death and misclassification.

In conclusion, residents in Feicheng City have lost 3.72 years of life due to malignant tumor deaths. Lung, esophageal, stomach, and liver cancers have a greater impact on the life expectancy of residents in Feicheng City. The mortality and PYLLR of lung cancer are on the rise. It is a cancer with the most severe disease burden in Feicheng City. The standardized mortality of esophageal cancer and gastric cancer declined, but the life years lost due to the 2 still accounted for 33.34% of all cancers. In women, the prevention of breast cancer should be paid more attention. In children, leukemia severely reduces their lifespan. We should focus on prevention, expand the screening coverage of leading cancers, increase the rate of early diagnosis, and reduce the disease burden of cancer.

Acknowledgments

We thank the Feicheng Center for Disease Control and Prevention and Feicheng Cancer Registry for providing the data for this study and thank all the staff members and village doctors for their support during the follow up.

Author contributions

Conceptualization: Jia Yang, Nan Zhang, Jialin Wang.
Data curation: Li Zhao, Zhenhua Du, Yanyan Li, Xia Li, Deli Zhao.
Formal analysis: Jia Yang.
Methodology: Jia Yang.
Writing – original draft: Jia Yang.
Writing – review & editing: Nan Zhang.

References

[1] Siegel RL, Miller KD, Jemal A. Cancer statistics, 2018. CA Cancer J Clin 2018;60:277–300.
[2] Chen W, Zheng R, Baade PD, et al. Cancer statistics in China, 2015. CA Cancer J Clin 2016;66:115–32.
[3] Organization WH. Global status report on noncommunicable diseases 2014. Women 2010;47:2562–3.
[4] Bin L. Tutorial for Outline of the Healthy China 2030 Plan. People's Medical Publishing House 2021:1-320.
[5] Liu P, Li C, Wang Y, et al. The impact of the major causes of death on life expectancy in China: a 60-year longitudinal study. BMC Public Health 2014;14:1193.
[6] Forster DP. Income distribution and life expectancy. BMJ 1992; 304:715–6.
[7] Sede PI, Ohemeng W. Socio-economic determinants of life expectancy in Nigeria (1980-2011). Health Econ Rev 2015;5:2.
[8] Tian K. The average life expectancy change of Chinese population and its influence on life insurance. Chin Insur 2011;7:24–7. (In Chinese).
[9] Brownlee J. Notes on the biology of a life-table. J Royal Statistical Society 1919;82:34–77.
[10] Clegg LX, Hankey BF, Tiwari R, et al. Estimating average annual percent change in trend analysis. Stat Med 2009;28:3670–82.
[11] Chen W, Zheng R, Zhang S, et al. Cancer incidence and mortality in China, 2013. Cancer Lett 2017;401:63–71.
[12] Rosso T, Bertuccio P, La Vecchia C, et al. Cancer mortality trend analysis in Italy, 1980–2010, and predictions for 2015. Tumori 2015;101:664–75.
[13] Xu Z, Qi F, Wang Y, et al. Cancer mortality attributable to cigarette smoking in 2005, 2010 and 2015 in Qingdao, China. PLoS One 2018;13: e0204221.
[14] Alattas M, Ross CS, Henehan ER, et al. Alcohol policies and alcohol-attributable cancer mortality in U.S. States. Chem Biol Interact 2020; 315:108885.
[15] Wang JB, Jiang Y, Liang H, et al. Attributable causes of cancer in China. Ann Oncol 2012;23:2983–9.
[16] Chen ZM, Peto R, Iona A, et al. Emerging tobacco-related cancer risks in China: a nationwide, prospective study of 0.5 mil-lion adults. Cancer 2015;121:3097–106.
[17] Li Q, Hsia J, Yang G. Prevalence of smoking in China in 2010. N Engl J Med 2011;364:2469–70.
[18] Zhang J, Ou JX, Bai CX. Tobacco smoking in China: prevalence, disease burden, challenges and future strategies. Respirology 2011; 16:1165–72.
[19] Jin M, Cai S, Guo J, et al. Alcohol drinking and all cancer mortality: a meta-analysis. Ann Oncol 2013;24:807–16.
[20] Dunford A, Weinstock DM, Savova V, et al. Tumor-suppressor genes that escape from X-inactivation contribute to cancer sex bias. Nat Genet 2017;49:10–6.
[21] Liang D, Li D, Liu J, et al. Trends and patterns of cancer mortality in North China (Hebei Province), 1973–2013. Sci Rep 2018;8:311.
[22] Ilic M, Ilic I. Cancer mortality in Serbia, 1991–2015: an age-period-cohort and joinpoint regression analysis. Cancer Commun (Lond) 2018;38:10.
[23] Sun X, Zhao D, Liu Y, et al. The long-term spatial-temporal trends and burden of esophageal cancer in one high-risk area: a population-registered study in Feicheng. China PLoS One 2017;12:e0173211.
[24] Chen R, Liu Y, Song G, et al. Effectiveness of one-time endoscopic screening programme in prevention of upper gastrointestinal cancer in China: a multicentre population-based cohort study. Gut 2021;70:251–60.
[25] Fei FR, Hu RY, Gong WW, et al. Analysis of mortality and survival rate of liver cancer in Zhejiang Province in China: a general population-based study. Can J Gastroenterol Hepatol 2019;2019:1074286.
[26] Morais S, Ferro A, Bastos A, et al. Trends in gastric cancer mortality and in the prevalence of Helicobacter pylori infection in Portugal. Eur J Cancer Prev 2016;25:275–81.
[27] Yu SZ, Chen G, Zhi XL, et al. Primary liver cancer: natural toxins and prevention in China. J Toxicol Sci 1998;23:143–7.

[28] Liang X, Bi S, Yang W, et al. Epidemiological serosurvey of hepatitis B in China—declining HBV prevalence due to hepatitis B vaccination. Vaccine 2009;27:6550–7.
[29] Rahman R, Asombang AW, Ibdah JA. Characteristics of gastric cancer in Asia. World J Gastroenterol 2014;20:4483–90.
[30] Cho YA, Lee J, Oh JH, et al. Genetic risk score, combined lifestyle factors and risk of colorectal cancer. Cancer Res Treat 2019;51:1033–40.
[31] Islami F, Miller KD, Siegel RL, et al. Disparities in liver cancer occurrence in the United States by race/ethnicity and state. CA Cancer J Clin 2017;67:273–89.
[32] McGuinn LA, Ghazarian AA, Ellison GL, et al. Cancer and environment: definitions and misconceptions. Environ Res 2012;112:230–4.
[33] Su M, Zhang N, Cai Y, et al. Work and income changes after cancer in rural China: a cross-sectional survey. Cancer Med 2019;8:7859–68.
[34] Quian Quiroga R, Garcia H. Single-trial event-related potentials with wavelet denoising. Clin Neurophysiol 2003;114:376–90.
[35] Ediriweera DS, Karunapema P, Pathmeswaran A, et al. Increase in premature mortality due to non-communicable diseases in Sri Lanka during the first decade of the twenty-first century. BMC Public Health 2018;18:584.
[36] Li T, Mello-Thoms C, Brennan PC. Descriptive epidemiology of breast cancer in China: incidence, mortality, survival and prevalence. Breast Cancer Res Treat 2016;159:395–406.
[37] Pham TM, Sikdar KC, Kaposhi B, et al. Premature mortality due to breast cancer among Canadian women: an analysis of a 30-year period from 1980 through 2010. Eur J Public Health 2018;28:348–52.
[38] Rocha-Brischiliari SC, Oliveira RR, Andrade L, et al. The rise in mortality from breast cancer in young women: trend analysis in Brazil. PLoS One 2017;12:e0168950.
[39] Sung H, Ferlay J, Siegel RL, et al. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin 2021;71:209–49.
[40] Gu X, Zheng R, Xia C, et al. Interactions between life expectancy and the incidence and mortality rates of cancer in China: a population-based cluster analysis. Cancer Commun (Lond) 2018;38:44.
[41] Jiang J, Luo L, Xu P, et al. How does social development influence life expectancy? A geographically weighted regression analysis in China. Public Health 2018;163:95–104.
[42] Xu ZL, Zhang H, Wang DZ, et al. Analysis on cancer deaths and cause-eliminated-life-expectancy among residents of Tianjin, 2015. Chin J Epidemiol 2017;38:231–4. (In Chinese).
[43] Chen WY, Cheng HC, Wang JD, et al. Factors that affect life expectancy of patients with gastric adenocarcinoma. Clin Gastroenterol Hepatol 2013;11:1595–600.
[44] Andersson TM, Dickman PW, Eloranta S, et al. The loss in expectation of life after colon cancer: a population-based study. BMC Cancer 2015; 15:412.
[45] Gardner JW, Sanborn JS. Years of potential life lost (YPLL)–what does it measure? Epidemiology 1990;1:322–9.
[46] Islami F, Miller KD, Siegel RL, et al. National and state estimates of lost earnings from cancer deaths in the United States. JAMA Oncol 2019;5: e191460.
[47] Pearce A, Sharp L, Hanly P, et al. Productivity losses due to premature mortality from cancer in Brazil, Russia, India, China, and South Africa (BRICS): a population-based comparison. Cancer Epidemiol 2018;53: 27–34.
[48] Lin X, Bloom MS, Du Z, et al. Trends in disability-adjusted life years of lung cancer among women from 2004 to 2030 in Guangzhou, China: a population-based study. Cancer Epidemiol 2019;63:101586.
[49] de Blank PM, Ostrom QT, Rouse C, et al. Years of life lived with disease and years of potential life lost in children who die of cancer in the United States, 2009. Cancer Med 2015;4:608–19.
[50] De Vries E, Meneses MX, Piñeros M. Years of life lost as a measure of cancer burden in Colombia, 1997-2012. Biomedica 2016;36:547–55.
[51] Arbyn M, Weiderpass E, Bruni L, et al. Estimates of incidence and mortality of cervical cancer in 2018: a worldwide analysis. Lancet Glob Health 2020;8:e191–203.
[52] Yuanyue L, Baloch Z, Shanshan L, et al. Cervical cancer, human papillomavirus infection, and vaccine-related knowledge: awareness in Chinese women. Cancer Control 2018;25:1073274818799306.