

Cancer incidence and mortality in Hebei province, 2013

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Abstract

To estimate the numbers of new cancer cases and deaths in Hebei province in 2013 and to investigate the real cancer burden in Hebei province to develop strategies for cancer prevention and control.

Data on new cancer cases and deaths in 2013 were collected from 31 population-based cancer registries of Hebei province. All data were checked and evaluated based on data quality criteria from the “Chinese Guideline for Cancer Registration” and “Cancer Incidence in Five Continents Volume IX” by the International Agency for Research on Cancer/International Association of Cancer Registration (IARC/IACR). Qualified data from 21 registries were used for analysis after evaluation. Data analysis was stratified by areas (urban/rural), gender, age group, and cancer type. New cancer cases and deaths in Hebei province were estimated using age-specific rates and the corresponding provincial population. The 10 most common cancers in different groups and the cumulative rates were calculated. The Chinese population census in 2000 and the population of Segi were used for age-standardized incidence/mortality rates.

The covered populations included 11, 185,626 people (5,709,393 in males and 5,476,233 in females) from 21 qualified cancer registries, accounting for 15.25% of Hebei provincial population. The major indicators of quality control, that is, the percentage of cases morphologically verified (MV%), percentage of cancer cases identified with a death certificate only (DCO%), and the mortality to incidence rate ratio (M/I), were 75.56%, 3.23%, and 0.65, respectively. In 2013, it was estimated that there were approximately 164,100 newly diagnosed cancer cases and 105,200 cancer deaths in Hebei province. The incidence rate of cancer was 225.36/100,000 (248.03/100,000 in males, 201.73/100,000 in females), and the age-standardized incidence rates by Chinese standard population (ASIRC) and the world standard population (ASIRW) were 182.81/100,000 and 181.36/100,000, respectively. The cancer incidence and ASIRC were 225.49/100,000 and 173.84/100,000 in urban areas and 225.27/100,000 and 189.31/100,000 in rural areas, respectively. The cancer mortality rate was 145.46/100,000 (177.85/100,000 in males and 111.70/100,000 in females). Age-standardized mortality rates by Chinese standard population (ASMRC) and world standard population (ASMRW) were 119.09/100,000 and 118.73/100,000, respectively. The cancer mortality rate in rural areas (152.64/100,000) was higher than that in urban areas (135.71/100,000). The most common cancers were lung cancer, stomach cancer, esophageal cancer, liver cancer, breast cancer, and colorectal cancer. Lung cancer, stomach cancer, liver cancer, esophageal cancer, and colorectal cancer were the major causes of cancer death in Hebei province.

The coverage of cancer registration population has rapidly increased and may reveal the cancer burden in Hebei province more comprehensively. The cancer burden in Hebei province is heavy, and prevention and control measures should be enhanced.

Abbreviations: ASIRC = age-standardized incidence rates by Chinese standard population, ASMRC = age-standardized mortality rates by Chinese standard population, DCO% = percentage of cancer cases identified with a death certificate only, IARC = International Agency for Research on Cancer, M/I = mortality to incidence rate ratio, MV% = percentage of cases morphologically verified, TADR = truncated age-standardized rate.

Keywords: Cancer, cancer registry, Hebei province, incidence, mortality

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1. Introduction

Cancer registration is internationally recognized as a method to collect cancer information. It is also the most basic and most important statistical system in China. Hebei province has approximately 6% of the total national population, is located in northern China along the Taihang Mountain chain, and has been considered a high-risk area for upper gastrointestinal cancer since the 1970s. Among the Hebei Provincial cancer registries, the Cixian cancer registry was established in 1973, and its data were published in *Cancer Incidence in Five Continents (CI5VIII and CI5X)*. The Shexian cancer registry was established in 2000, and its data were published in the *Chinese Cancer Registry Annual Report (2008–2013)*. Hebei Provincial Cancer Registry Center, which was established in 2009, is in charge of population-based cancer registries and has the responsibility of data collection, evaluation, and publication in Hebei province. The Hebei Provincial Cancer Registry Center requested data from 2013 from all population-based cancer registries in Hebei province, and the datasets were used to update the annual estimation for new cancer cases and deaths in Hebei province after data evaluation and analysis. The investigation of cancer incidence and mortality that was conducted in Hebei province in 2013 aimed to monitor changes in cancer rates and make developing strategies on cancer prevention and control.

2. Material and methods

2.1. Data source

Thirty-one cancer registries in Hebei province submitted cancer data for 2013 in 2016. Twenty-one registries were qualified and accepted for analysis after evaluation. They included 5 cities (Baoding, Qinhuangdao, Cangzhou, Shijiazhuang, and Shuangqiao district of Chengde) and 16 counties (Cixian, Shexian, Qianxi, Wuan, Zanhuang, Fengning, Xinji, Xingtai, Zhangbei, Anguo, Haixing, Yanshan, Neiqiu, Renxian, Xuanhua, and Shenze), covering a population of 11,185,626 (5,709,393 males and 5,476,233 females), which accounted for 15.25% of the total Hebei provincial population. Cancer registries collected information on new cancer cases from hospitals, community health centers, Basic Medical Insurance for Urban Residents, the New Rural Cooperative Medical System, and the Vital Statistics System (for cases only identified by death certificate). Population information was collected from the local statistical bureau or household register department in the local public security bureau. All cancer cases were classified by the *International Classification of Diseases for Oncology, 3rd edition (ICD-O-3)* and the *International Statistical Classification of Diseases and Health Related Problems 10th Revision (ICD-10)*.

2.2. Quality control

All data were checked and evaluated according to the criteria of data quality from the “*Chinese Guideline for Cancer Registration*”^[1] and “*Cancer Incidence in Five Continents Volume IX*”^[2] by the International Agency for Research on Cancer/International Association of Cancer Registration (IARC/IACR). The percentage of cases morphologically verified (MV%), the percentage of cancer cases identified with a death certificate only (DCO%), and the mortality to incidence rate ratio (M/I) were used to evaluate the completeness, validity, and reliability of cancer statistics. The MV% reflected the reliability of cancer case diagnoses. An overly high MV% suggested that hospital cancer

cases were an overrepresented source, and other collection methods were limited, whereas a low MV% showed that the morphological types could not be obtained and was not up to the standard. The DCO% index indicated that cancer patients had no cancer diagnosis and treatment records or that we were unable to obtain their diagnostic information. When the DCO% was zero, this meant a particular cancer registry area did not supplement the incidence database from the mortality database. However, a higher DCO% level predicated poorer data validity. M/I evaluated completeness. When it was higher than 0.8, this suggested the underreporting of incidence cases, whereas when it was lower than 0.6, this reflected the underreporting of deaths. The data of 21 cancer registries included in the final analysis met the following criteria: the MV% was at least 66%; the DCO% was lower than 15%; and the M/I was between 0.6 and 0.8.

2.3. Statistical analysis

Cancer data of registries in Hebei province were stratified by area (urban/rural), gender, age group (0, 1–4, 5–84 by 5 years, and 85 + years), and cancer site. Cancer incident cases and deaths were estimated using age specific rates, which were stratified by area (urban/rural), gender (male/female), and age. The Chinese population census in 2000 and the population of Segi were used to obtain age-standardized rates (ASR) of incidence/mortality. Software including MS-Excel and IARCcrgTools 2.05 issued by IARC and IACR was used for data checking and evaluation.^[3] SAS software (Version 9.3) was used to calculate incidence and mortality rates. New cancer cases and deaths were estimated using stratified rates and provincial population in 2013.

3. Results

3.1. Data quality

Overall indicators of MV% and DCO% from all 21 cancer registries were 75.56% and 3.23%, respectively, with an M/I ratio of 0.65. The indicators MV%, DCO%, and M/I ratio were 73.92%, 4.09%, and 0.60, respectively, in urban areas and 76.76%, 2.59%, and 0.68, respectively, in rural areas. The quality evaluation for major cancers is presented in Table 1.

3.2. Incidence

An estimated 164,100 new cancer cases (91,400 in males and 72,700 in females) were diagnosed in Hebei province in 2013. The crude incidence rate of all cancers was 225.36/100,000 (248.03/100,000 in males and 201.73/100,000 in females). The age-standardized incidence rates by Chinese standard population (ASIRC) and by world standard population (ASIRW) were 182.81/100,000 and 181.36/100,000, respectively, with a cumulative incidence rate (0–74 years of age) of 20.84%. The crude incidence rate and ASIRW were 225.49/100,000 and 170.52/100,000, respectively, in urban areas and 225.27/100,000 and 189.46/100,000, respectively, in rural areas (Table 2).

3.3. Age-specific incidence rate

The age-specific incidence rate was relatively lower before 40 years of age, after which it then increased dramatically and finally peaked in the age group of 85+ years. The pattern was similar between urban and rural areas, except the age-specific incidence rate peaked at the age of 80 years in urban areas. By comparing

Table 1
Quality evaluation of cancer registration data in Hebei province, 2013.

Site	All areas			Urban			Rural		
	M/I	MV%	DCO%	M/I	MV%	DCO%	M/I	MV%	DCO%
Oral and pharynx	0.30	78.74	2.36	0.32	85.82	4.26	0.28	69.91	0.00
Nasopharynx	0.46	76.04	3.13	0.37	79.07	4.65	0.53	73.58	1.89
Esophagus	0.67	76.33	1.70	0.69	78.40	4.45	0.67	75.84	1.05
Stomach	0.76	77.15	3.03	0.66	74.97	4.17	0.79	77.83	2.68
Colon and rectum	0.44	77.15	2.92	0.45	74.92	3.58	0.42	79.58	2.19
Liver	0.90	45.29	4.75	0.89	48.29	4.69	0.91	43.20	4.79
Gallbladder, etc.	0.68	66.16	3.03	0.77	55.21	6.25	0.59	76.47	0.00
Pancreas	0.82	58.03	5.05	0.87	55.91	2.27	0.77	60.19	7.87
Larynx	0.60	79.56	1.46	0.55	85.71	0.00	0.63	75.31	2.47
Trachea, bronchus, and lung	0.75	74.28	4.75	0.75	69.89	6.18	0.74	78.05	3.52
Other organs in chest	0.33	75.00	1.14	0.37	83.05	1.69	0.24	58.62	0.00
Bone	0.66	62.37	2.69	0.61	69.64	0.00	0.68	59.23	3.85
Skin melanoma	0.39	100.00	0.00	0.31	100.00	0.00	0.43	100.00	0.00
Breast	0.24	85.43	0.81	0.29	83.14	0.91	0.19	88.00	0.71
Cervix	0.23	88.00	1.19	0.27	86.38	2.55	0.20	88.86	0.45
Uterus	0.30	83.58	1.87	0.23	87.45	2.09	0.36	79.75	1.65
Ovary	0.29	78.45	2.76	0.41	81.35	4.15	0.16	75.15	1.18
Prostate	0.42	63.86	4.42	0.39	64.77	5.18	0.50	60.71	1.79
Testis	0.38	75.00	0.00	1.00	50.00	0.00	0.17	83.33	0.00
Kidney	0.33	74.94	1.81	0.36	73.75	2.50	0.27	76.87	0.68
Bladder	0.35	76.79	2.23	0.33	78.54	1.37	0.37	75.11	3.06
Brain, CNS	0.64	62.45	3.65	0.65	75.00	3.05	0.63	55.63	3.97
Thyroid gland	0.08	86.14	1.51	0.08	86.73	1.55	0.08	84.91	1.42
Lymphoma	0.44	88.61	4.11	0.44	96.25	2.41	0.44	77.61	6.56
Leukemia	0.66	91.54	5.38	0.82	89.09	8.64	0.54	93.33	3.00
Other cancers	1.65	67.02	3.53	1.20	71.09	6.25	2.07	63.13	0.93
Total	0.65	75.56	3.23	0.60	73.92	4.09	0.68	76.76	2.59

CNS=central nervous system, DCO%=percentage of cancer cases identified with a death certificate only, M/I=mortality to incidence rate ratio, MV%=percentage of cases morphologically verified.

the age-specific incidence rate between urban and rural areas, urban areas had higher incidence rate than that in rural areas, except for the 45 to 74 and 85+ age groups. Most age groups of females in urban areas had higher incidence rates than females in rural areas under 55 years of age (Table 3, Fig. 1).

3.4. Incidence of major cancers

3.4.1. Cancer incidence of the 10 most common cancers.

Cancers of the lung, stomach, esophagus, liver, and breast were the 5 most common cancers for both genders, with 36,400, 24,100, 14,660, 14,400, and 13,880 estimated new cases, respectively. In males, lung cancer was the most common cancer, followed by stomach cancer, liver cancer, esophageal cancer, and colorectal cancer. Breast cancer was the most common cancer in

females, followed by lung cancer, stomach cancer, esophageal cancer, and colorectal cancer (Table 4).

3.4.2. Cancer incidence of the 10 most common cancers in urban areas.

In urban areas, lung cancer was the most frequently diagnosed cancer, with 18,500 incident cases, followed by breast cancer, liver cancer, colorectal cancer, and stomach cancer. The top 5 cancers were in the lung, liver, stomach, colorectum, and esophagus in males. In females, cancers of the breast, lung, colorectum, thyroid, and stomach were the most common (Table 5).

3.4.3. Cancer incidence of the 10 most common cancers in rural areas.

Lung cancer was the most common cancer, followed by stomach cancer, esophageal cancer, liver cancer, and breast

Table 2
The cancer incidence in Hebei province, 2013.

Areas	Gender	Estimated cases	Crude incidence (1/10 ⁵)	ASIRC (1/10 ⁵)	ASIRW (1/10 ⁵)	Cumulative rate		TASR (1/10 ⁵)
						0-64, %	0-74, %	
All areas	Both	164,100	225.36	182.81	181.36	10.57	20.84	294.63
	Male	91,400	248.03	207.41	208.00	11.13	24.14	306.41
	Female	72,700	201.73	160.60	156.83	9.99	17.61	282.78
Urban	Both	76,900	225.49	173.84	170.52	9.48	19.11	265.10
	Male	41,700	241.25	194.74	192.91	9.19	21.47	252.34
	Female	35,200	209.40	158.42	152.93	9.78	17.07	277.94
Rural	Both	87,200	225.27	189.31	189.46	11.39	22.16	317.20
	Male	49,700	252.93	216.60	218.68	12.68	26.17	349.41
	Female	37,500	195.98	162.72	160.87	10.14	18.06	286.31

ASIRC=age-standardized incidence rates by Chinese standard population (using China standard population, 2000), ASIRW=age-standardized incidence rates by world standard population (using World standard population), TASR=truncated age-standardized rate (using World standard population).

Table 3

Age-specific incidence rates of overall cancers in Hebei province, 2013 (1/10⁵).

Age groups	All areas			Urban			Rural		
	Both	Male	Female	Both	Male	Female	Both	Male	Female
0–	3.31	5.25	1.34	4.39	4.18	4.64	2.84	5.74	0.00
1–	7.99	8.62	7.27	7.00	8.23	5.66	8.44	8.79	8.04
5–	5.51	5.62	5.39	6.82	7.86	5.69	4.82	4.47	5.22
10–	7.36	6.98	7.81	6.18	9.03	3.01	8.03	5.87	10.64
15–	7.84	8.02	7.64	9.33	10.51	8.11	6.85	6.40	7.33
20–	12.73	10.38	15.14	13.13	10.82	15.57	12.44	10.05	14.83
25–	21.98	21.51	22.46	19.01	16.66	21.34	24.39	25.35	23.39
30–	46.15	31.41	61.44	52.49	33.91	71.38	39.91	29.00	51.45
35–	57.77	37.49	79.51	61.44	33.34	90.23	54.49	41.04	69.53
40–	128.31	96.29	161.30	129.04	90.83	168.06	127.73	100.56	155.92
45–	218.02	191.07	245.82	201.40	160.98	243.60	231.11	215.02	247.55
50–	307.28	312.81	301.52	300.35	288.23	313.10	312.05	329.82	293.62
55–	509.18	570.96	446.26	432.43	465.80	399.82	569.80	651.04	484.33
60–	783.99	925.46	638.45	658.86	701.79	609.99	878.45	1109.66	658.08
65–	942.48	1212.30	689.40	854.23	1062.81	662.77	1003.42	1313.59	708.11
70–	1111.50	1388.80	832.85	1069.89	1394.29	795.26	1150.68	1384.43	874.65
75–	1363.42	1809.93	984.96	1444.04	1928.82	1055.77	1288.11	1705.24	915.41
80–	1672.69	2267.44	1182.35	1853.92	2916.36	1145.72	1514.89	1812.81	1220.40
85+	1841.84	2425.88	1342.99	1804.59	2675.29	1046.88	1902.43	2009.30	1813.89

cancer (17,900, 17,600, 11,400, 7300, and 5990 new cases, respectively). The most common sites of cancer in males were the stomach, lung, esophagus, liver, and colorectum, whereas in females, they were the breast, lung, stomach, esophagus, and cervix (Table 6).

3.5. Mortality

It was estimated that 105,200 (65,100 male and 40,100 female) patients died from cancer in Hebei province in 2013. The crude mortality rate of all cancers was 145.46/100,000 (177.85/100,000 in males and 111.70/100,000 in females). The age-standardized mortality rates by Chinese standard population (ASMRC) and the world standard population (ASMRW) were 119.09/100,000 and 118.73/100,000, respectively. Among deaths in individuals aged 0 to 74 years, the cumulative mortality rate was 12.53%. The crude cancer mortality rate (152.64/100,000) and ASMRW (134.02/100,000) in rural areas were

higher than in urban areas (135.71/100,000 and 101.52/100,000, respectively) (Table 7).

3.6. Age-specific mortality rate

The age-specific mortality rate was relatively lower before 40 years of age and then dramatically increased, peaking at 85+ years of age (Table 8, Fig. 2). The mortality rate in rural areas was higher than in urban areas after 45 years of age. The mortality rate at the age group of 85+ years in rural areas was the highest. In males, the age-specific mortality in urban areas was lower than that in rural areas in the age groups of 45 to 79 and 85+ years. In females, the mortality in rural areas was higher than in urban areas after 45 years of age.

3.7. Mortality for major cancers

3.7.1. Cancer deaths among the 10 most common cancers.

Lung cancer was the leading cause of cancer death in Hebei province, followed by cancers of stomach, liver, esophagus, and colorectum, with mortality rate of 37.14, 26.10, 17.68, 14.11, and 7.06/100,000, respectively. Lung cancer and stomach were the leading cause of cancer death in Hebei province in males and females. In males, liver cancer was the 3rd cause of cancer, followed by esophageal cancer and colorectal cancer. But in females, esophageal cancer was the 3rd cause, followed by liver cancer and breast cancer (Table 9).

3.7.2. Cancer deaths among the 10 most common cancers in urban areas.

Lung cancer was the leading cause of cancer death in urban areas, followed by cancers of liver, stomach, colorectum, and breast with deaths of 14,000, 6300, 4300, 3100, and 2230, respectively. In males, lung cancer, liver cancer, stomach cancer, colorectal cancer, and esophageal cancer were the top 5 leading cause of cancer death. Although they were lung cancer, breast cancer, liver cancer, stomach cancer, and colorectal cancer in females (Table 10).

3.7.3. Cancer death among the 10 most common cancers in rural areas.

Stomach cancer was the leading cause of cancer

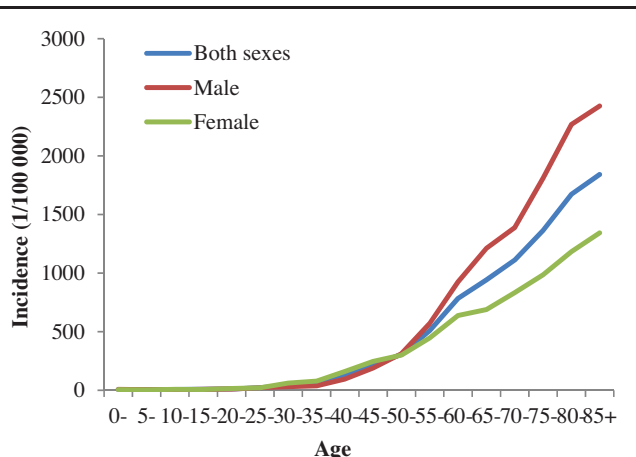


Figure 1. Age-specific cancer incidence rates in Hebei province, 2013.

Table 4
The top 10 cancer incidence in Hebei province, 2013.

Rank	Site	Both sexes			Male			Female			
		Estimated cases	Incidence (1/100,000) (%)	ASIRC (1/100,000)	Estimated cases	Incidence (1/100,000) (%)	ASIRC (1/100,000)	Estimated cases	Incidence (1/100,000) (%)	ASIRC (1/100,000)	
1	Lung (C33-C34)	36,400	49.66	22.04	39.85	22.04	39.85	13,600	37.34	18.51	29.97
2	Stomach (C16)	24,100	34.47	15.30	27.54	19.85	40.60	12,400	34.09	16.90	26.44
3	Esophagus (C15)	14,660	21.00	9.32	16.63	28.09	23.04	6,600	19.08	9.46	14.84
4	Liver (C22)	14,400	19.59	8.69	15.61	26.57	21.83	5,260	15.19	7.53	11.59
5	Breast (C50)	13,880	18.65	8.28	15.15	18.15	7.32	5,200	14.24	7.06	11.08
6	Colorectum (C18-21)	12,100	16.24	7.20	13.10	6.74	5.76	4,400	12.33	6.11	9.98
7	Cervix (C53)	4,400	6.03	2.68	4.95	6.45	2.60	3,900	10.72	5.31	8.31
8	Thyroid (C73)	4,480	5.94	2.63	5.30	5.39	2.17	3,200	8.78	4.35	6.88
9	Lymphoma (C81-C85, 88, 90, 96)	4,240	5.65	2.51	4.71	4.47	1.80	3,080	8.25	4.09	7.35
10	Leukemia (C91-C95)	3,430	4.65	2.06	4.27	4.36	1.76	2,400	6.61	3.28	5.45
Total	All	164,100	225.36	100.00	182.81	248.03	100.00	72,700	201.73	100.00	160.60

ASIRC=age-standardized incidence rates by Chinese standard population (China population, 2000).

Table 5
The top 10 cancer incidence in urban areas of Hebei province, 2013.

Rank	Site	Both sexes			Male			Female			
		Estimated cases	Incidence (1/100,000) (%)	ASIRC (1/100,000)	Estimated cases	Incidence (1/100,000) (%)	ASIRC (1/100,000)	Estimated cases	Incidence (1/100,000) (%)	ASIRC (1/100,000)	
1	Lung (C33-C34)	18,500	54.24	24.05	40.84	28.78	55.51	7,700	45.92	21.93	35.54
2	Breast (C50)	7,890	23.27	10.32	18.16	12.65	24.12	6,500	38.72	18.49	27.87
3	Liver (C22)	7,100	20.67	9.17	15.64	11.32	22.00	2,700	16.07	7.68	11.58
4	Colorectum (C18-21)	6,800	20.02	8.88	15.14	9.90	19.04	2,200	13.13	6.27	11.22
5	Stomach (C16)	6,500	19.22	8.52	14.61	5.45	10.51	1,800	10.96	5.23	8.03
6	Thyroid (C73)	3,200	9.54	4.23	8.14	8.98	3.72	1,800	10.62	5.07	7.67
7	Esophagus (C15)	3,260	9.47	4.20	7.12	8.06	3.34	1,700	10.19	4.87	7.73
8	Lymphoma (C81-C85, 88, 90, 96)	2,700	7.87	3.49	6.19	7.43	6.07	1,700	10.02	4.79	8.02
9	Kidney (C64-C66, 68)	1,770	5.06	2.25	3.80	6.72	5.25	1,400	8.23	3.93	6.47
10	Uterus (C54-C55)	1,700	5.04	2.24	3.85	6.01	5.10	1,100	6.74	3.22	5.22
Total	All	76,900	225.49	100.00	173.84	241.25	100.00	35,200	209.40	100.00	158.42

ASIRC = age-standardized incidence rates by Chinese standard population (China population, 2000).

Table 6
The top 10 cancer incidence in rural areas of Hebei province, 2013.

Rank	Both sexes				Male				Female				
	Site	Estimated cases	Incidence (1/100,000)	ASIRC (1/100,000)	Site	Estimated cases	Incidence (1/100,000)	ASIRC (1/100,000)	Site	Estimated cases	Incidence (1/100,000)	ASIRC (1/100,000)	
1	Lung (C33–C34)	17,900	46.30	20.55	38.73	12,800	65.08	25.73	54.91	5900	30.92	15.78	25.48
2	Stomach (C16)	17,600	45.69	20.28	37.85	12,000	61.10	24.16	52.34	5900	30.63	15.63	25.11
3	Esophagus (C15)	11,400	29.48	13.09	24.45	7100	36.27	14.34	30.92	4800	25.17	12.84	20.73
4	Liver (C22)	7300	18.79	8.34	15.66	5200	26.34	10.41	22.32	4300	22.29	11.38	18.05
5	Breast (C50)	5990	15.25	6.77	12.74	2800	14.00	5.54	12.10	2700	14.05	7.17	11.57
6	Colorectum (C18–21)	5300	13.45	5.97	11.36	1100	5.73	2.27	5.05	2500	12.87	6.57	10.55
7	Cervix (C53)	2700	6.83	3.03	5.71	1100	5.37	2.12	5.05	2100	10.80	5.51	8.95
8	Brain, CNS (C70–C72)	1810	4.69	2.07	4.13	1000	5.13	2.03	4.40	1500	7.73	3.94	6.26
9	Leukemia (C91–C95)	1840	4.65	2.08	4.33	940	4.80	1.90	4.17	1000	5.40	2.75	4.61
10	Lymphoma (C81–C85, 88, 90, 96)	1540	4.02	1.78	3.42	760	3.86	1.53	3.37	880	4.60	2.35	4.13
Total	All	87,200	225.27	100.00	189.31	49,700	252.93	100.00	216.60	37,500	195.98	100.00	162.72

ASIRC = age-standardized incidence rates by Chinese standard population (China population, 2000), CNS = central nervous system.

death in rural areas followed by cancers of lung, esophagus, liver, and colorectum in both genders and males. The top 4 leading causes of cancer death in females were stomach cancer, lung cancer, esophagus cancer, and liver cancer, but the 5th was breast cancer (Table 11).

4. Discussion

The Hebei Provincial Cancer Registry is a very important part of National Central Cancer Registry (NCCR) of China, which is responsible for collecting cancer data from all local registries, evaluating these data, and releasing them in Hebei province. In 2008, the National Program of Cancer Registries was launched by the Ministry of Health of China through a central financing mechanism which has continually supported the Hebei Provincial Cancer Registry. Since then, the number of population-based registries in Hebei province has increased from 2 in 2008 to 31 in 2013. This year, 31 cancer registries in Hebei province submitted cancer data from 2013. Twenty-one registries covering 11,185,626 populations were qualified and accepted after evaluation, up 12 registries from last year. The coverage of cancer registration populations has rapidly increased and may reveal the cancer burden in Hebei province more comprehensively. This study describes the incidence and mortality rates of cancer and estimates new cancer cases and cancer deaths in 2013 in Hebei province for making measures on cancer prevention and control.

This study showed that the crude incidence rate and ASIRC of cancers were 225.36/100,000 and 182.81/100,000, respectively, with 164,100 estimated new cancer cases in 2013 in Hebei province, which was lower than the incidence level in 2012 (258.12/100,000 and 210.65/100,000, respectively).^[4] The cancer mortality rate in Hebei Cancer Registries areas in 2013 was lower than the level in 2012. The trend of an age-specific incidence and mortality in Hebei province was similar to that in China.^[5] This study collected data from 21 cancer registries, which accounted for 15.25% of the Hebei provincial population. The coverage of registrations in Hebei province has expanded substantially, and these registries were distributed evenly, which made them more representative.

The 5 most common cancers (lung cancer, stomach cancer, esophageal cancer, liver cancer, and breast cancer) in 2013 were basically the same in Hebei province in 2012 (lung cancer, stomach cancer, breast cancer, esophageal cancer, and liver cancer) but differed from the national cancer spectrum, which was typical and relatively stable. Lung cancer was the leading cause of cancer death in 2013 in Hebei province, followed by stomach cancer, liver cancer, esophageal cancer, and colorectal cancer. They were consistent with cancer in Hebei province in 2012 and similar to the national cancer spectrum.

The age-standardized incidence and mortality rates by Chinese standard population of esophageal cancer in Hebei Cancer Registries in 2012 were 1.13 and 1.08 times higher than the national rates of esophageal cancer. The ASIRC and ASMRC of stomach cancer were 1.25 and 1.41 times higher than national levels, respectively. This indicated that cancer of the upper gastrointestinal tract was still the major causes of cancer death in Hebei province. Hebei province may therefore be a high-risk area for cancer of the upper gastrointestinal cancer in China. The incidence and mortality rates of esophageal cancer in Cixian are the highest in China and even the world. Shexian was a high-incidence area of stomach cancer in Hebei province. Due to persistent efforts at cancer control,

Table 7

The cancer mortality in Hebei province, 2013.

Areas	Gender	Estimated deaths	Crude mortality (1/10 ⁵)	ASMRC (1/10 ⁵)	ASMRW (1/10 ⁵)	Cumulative rate		TASR (1/10 ⁵)
						0–64, %	0–74, %	
All areas	Both	105,200	145.46	119.09	118.73	4.93	12.53	136.56
	Male	65,100	177.85	152.27	151.93	6.16	16.21	169.98
	Female	40,100	111.70	87.86	87.28	3.65	8.89	102.21
Urban	Both	46,300	135.71	102.64	101.52	4.26	10.28	118.59
	Male	27,900	161.67	130.96	129.56	5.06	13.03	140.43
	Female	18,400	109.20	78.17	76.80	3.40	7.72	95.35
Rural	Both	58,900	152.64	133.35	134.02	5.44	14.33	150.24
	Male	37,200	189.54	169.54	170.20	7.06	18.61	193.68
	Female	21,700	113.58	97.64	98.33	3.84	9.93	107.13

ASMRC=age-standardized mortality rates by Chinese standard population (using China standard population, 2000), ASMRW=age-standardized mortality rates by world standard population (using World standard population), TASR=Truncated age-standardized rate (using World standard population).

Table 8

Age-specific mortality of overall cancers in Hebei province, 2013 (1/10⁵).

Age group	All areas			Urban			Rural		
	Both	Male	Female	Both	Male	Female	Both	Male	Female
0–	1.32	1.31	1.34	4.39	4.18	4.64	0.00	0.00	0.00
1–	3.23	3.51	2.91	5.39	4.12	6.79	2.23	3.24	1.07
5–	3.46	3.84	3.03	3.18	5.24	0.95	3.61	3.13	4.18
10–	2.06	1.90	2.23	2.38	3.61	1.00	1.87	0.98	2.96
15–	3.85	4.40	3.28	5.33	6.57	4.06	2.87	2.99	2.75
20–	4.49	5.74	3.22	4.01	3.89	4.12	4.85	7.13	2.58
25–	6.74	7.75	5.71	3.93	2.19	5.66	9.01	12.15	5.76
30–	14.78	15.23	14.31	16.11	15.99	16.25	13.46	14.50	12.37
35–	20.31	18.20	22.58	22.41	18.57	26.34	18.45	17.88	19.09
40–	45.71	47.39	43.97	47.62	48.83	46.38	44.20	46.27	42.05
45–	93.21	107.92	78.03	84.07	92.79	74.95	100.40	119.95	80.43
50–	127.44	158.34	95.22	123.83	151.37	94.86	129.93	163.16	95.46
55–	252.06	320.48	182.37	214.30	269.03	160.81	281.88	359.67	200.04
60–	408.13	538.65	273.85	318.85	389.79	238.09	475.53	661.24	298.51
65–	642.87	880.82	419.68	482.97	639.43	339.37	753.28	1044.39	476.13
70–	878.31	1127.68	627.73	722.02	954.99	524.78	1025.49	1265.37	742.23
75–	1411.84	1898.28	999.52	1214.44	1601.24	904.64	1596.25	2159.82	1092.72
80–	1953.40	2525.63	1481.62	1908.52	2779.85	1327.71	1992.48	2347.52	1641.53
85+	2529.94	3066.04	2072.04	2180.54	2890.74	1562.50	3098.25	3358.82	2882.35

the mortality rate of esophageal cancer has shown a clear negative trend over the past 40 years in Hebei province: it decreased 40.19% from 48.69/100,000 in 1973–1975 to 29.12/100,000 in 2010–2012^[6] and it decreased 76.65% from

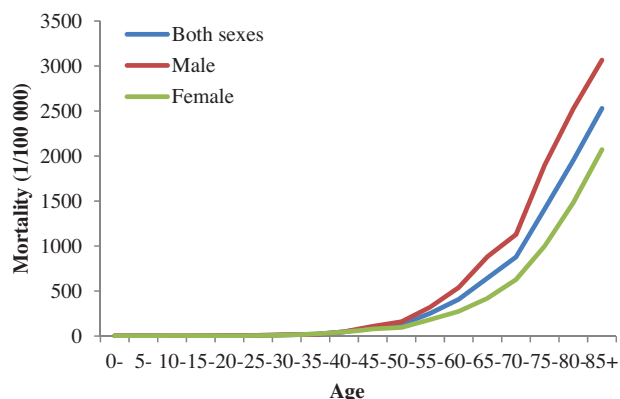


Figure 2. Age-specific cancer mortality rates in Hebei province, 2013.

1973–1975 to 2013. Moreover, esophageal cancer was the only cancer whose incidence and mortality rates decreased in Hebei province. This revealed that we have achieved great success in the screening, early detection and treatment of esophageal cancer in Hebei province. However, continuing efforts must be expanded. Health education, promotion, and early detection should thus be cancer strategy priorities.

The ASIRC and ASMRC for lung cancer were 1.10 and 1.05 times higher than the national levels. Moreover, it has shown a clear increasing trend over the past 40 years in Hebei province.^[7] It increased by 183.29% from 1973 to 2013, making it the leading cause of death in Hebei province. Baoding and Shijiazhuang cities are areas of heavy air pollution and the population accounted for approximately 69.79% of urban registration population in Hebei province. The Beijing–Tianjin–Hebei region is a high occurrence area for haze and is one of the most polluted areas in China.^[8] Baoding differs from the other cities of Hebei province; industrial emission was the largest contributor and supplied 38.1% and 41.9% of PM2.5 in January and February in 2013, respectively. PM2.5 mainly originated from southern Hebei with the fractions of 70.8% and 66.4% to Shijiazhuang.^[9] The American Cancer

Table 9
The top 10 cancer mortality in Hebei province, 2013.

Rank	Site	Both sexes				Male				Female					
		Estimated deaths	Mortality (1/100,000)	ASMRC (1/100,000)	(%)	Estimated deaths	Mortality (1/100,000)	ASMRC (1/100,000)	(%)	Estimated deaths	Mortality (1/100,000)	ASMRC (1/100,000)	(%)		
		Site	Site	Site	Site	Site	Site	Site	Site	Site	Site	Site	Site		
1	Lung (C33–C34)	27,200	37.14	25.53	30.30	Lung (C33–C34)	17,800	47.83	26.90	40.88	Lung (C33–C34)	9,400	25.99	23.26	20.40
2	Stomach (C16)	18,100	26.10	17.95	21.30	Stomach (C16)	12,300	34.87	19.61	29.78	Stomach (C16)	5,800	16.96	15.19	13.24
3	Liver (C22)	12,900	17.68	12.16	14.29	Liver (C22)	9,200	24.68	13.88	20.64	Esophagus (C15)	3,560	10.39	9.30	8.04
4	Esophagus (C15)	9,860	14.11	9.70	11.46	Esophagus (C15)	6,300	17.67	9.94	15.08	Liver (C22)	3,700	10.39	9.30	8.10
5	Colorectum (C18–21)	5,300	7.06	4.86	5.82	Colorectum (C18–21)	3,000	7.78	4.37	6.82	Breast (C50)	3,300	8.98	8.04	7.13
6	Breast (C50)	3,360	4.48	3.08	3.66	Leukemia (C91–C95)	1,530	4.03	2.27	3.70	Colorectum (C18–21)	2,300	6.32	5.66	4.90
7	Pancreas (C25)	2,380	3.20	2.20	2.61	Pancreas (C25)	1,420	3.77	2.12	3.23	Cervix (C53)	1,010	2.81	2.52	2.16
8	Leukemia (C91–C95)	2,290	3.08	2.11	2.77	Brain, CNS (C70–C72)	1,090	3.03	1.70	2.59	Pancreas (C25)	960	2.61	2.34	2.03
9	Brain, CNS (C70–C72)	1,900	2.65	1.82	2.25	Lymphoma (C81–C85, 88, 90, 96)	1,150	3.01	1.69	2.61	Uterus (C54–C55)	930	2.61	2.34	2.03
10	Lymphoma (C81–C85, 88, 90, 96)	1,880	2.50	1.72	2.07	Bladder (C67)	820	2.21	1.24	1.98	Brain, CNS (C70–C72)	810	2.25	2.01	1.91
Total	All	105,200	145.46	100.00	119.09	All	65,100	177.85	100.00	152.27	All	40,100	111.70	100.00	87.86

ASMRC = age-standardized mortality rates by Chinese standard population (China population, 2000), CNS = central nervous system.

Table 10

The top 10 cancer mortality in urban areas in Hebei province, 2013.

Rank	Site	Both sexes				Male				Female					
		Estimated deaths	Mortality (1/100,000)	ASMRC (1/100,000)	(%)	Estimated deaths	Mortality (1/100,000)	ASMRC (1/100,000)	(%)	Estimated deaths	Mortality (1/100,000)	ASMRC (1/100,000)	(%)		
		Site	Site	Site	Site	Site	Site	Site	Site	Site	Site	Site	Site		
1	Lung (C33–C34)	14,000	40.93	30.16	30.67	Lung (C33–C34)	9,000	51.94	32.13	41.91	Lung (C33–C34)	5,000	29.68	27.18	20.96
2	Liver (C22)	6,300	18.50	13.63	13.94	Liver (C22)	4,600	26.47	16.37	21.15	Breast (C50)	2,200	13.30	12.18	9.84
3	Stomach (C16)	4,300	12.70	9.36	9.53	Stomach (C16)	2,900	16.74	10.36	13.46	Liver (C22)	1,700	10.36	9.49	7.29
4	Colorectum (C18–21)	3,100	9.07	6.68	6.78	Colorectum (C18–21)	1,900	10.86	6.71	8.88	Stomach (C16)	1,400	8.57	7.85	6.00
5	Breast (C50)	2,230	6.67	4.91	5.10	Esophagus (C15)	1,500	8.56	5.29	6.79	Colorectum (C18–21)	1,200	7.25	6.64	5.02
6	Esophagus (C15)	2,260	6.56	4.83	4.84	Leukemia (C91–C95)	900	5.18	3.20	4.60	Esophagus (C15)	760	4.52	4.14	3.09
7	Pancreas (C25)	1,380	4.05	2.98	3.03	Pancreas (C25)	820	4.76	2.94	3.82	Ovary (C56)	570	3.37	3.08	2.47
8	Leukemia (C91–C95)	1,310	3.82	2.81	3.34	Lymphoma (C81–C85, 88, 90, 96)	710	4.09	2.53	3.40	Pancreas (C25)	560	3.33	3.05	2.30
9	Lymphoma (C81–C85, 88, 90, 96)	1,190	3.48	2.56	2.67	Prostate (C61)	550	3.17	1.96	2.57	Lymphoma (C81–C85, 88, 90, 96)	480	2.86	2.62	2.06
10	Brain, CNS (C70–C72)	770	2.26	1.66	1.74	Kidney (C64–C66, 68)	440	2.55	1.58	2.07	Cervix (C53)	460	2.73	2.50	1.97
Total	All	46,300	135.71	100.00	102.64	All	27,900	161.67	100.00	130.96	All	18,400	109.20	100.00	78.17

ASMRC = age-standardized mortality rates by Chinese standard population (China population, 2000), CNS = central nervous system.

Table 11
The top 10 cancer mortality in rural areas of Hebei province, 2013.

Rank	Site	Both sexes			Male			Female				
		Estimated deaths	Mortality (1/100,000)	ASMRC (1/100,000)	Estimated deaths	Mortality (1/100,000)	ASMRC (1/100,000)	Estimated deaths	Mortality (1/100,000)	ASMRC (1/100,000)		
1	Stomach (C16)	13,800	35.96	31.46	9,400	47.97	25.31	42.79	4400	23.25	20.47	20.19
2	Lung (C33-C34)	13,200	34.35	29.86	8,800	44.87	23.67	40.01	4400	23.22	20.44	19.86
3	Esophagus (C15)	7600	19.66	12.88	4800	24.26	12.80	21.88	2800	14.79	13.02	12.74
4	Liver (C22)	6600	17.08	11.19	4600	23.38	12.34	20.15	2000	10.41	9.17	8.88
5	Colorectum (C18-21)	2200	5.59	3.66	1100	5.55	2.93	5.18	1100	5.75	5.06	4.82
6	Brain, CNS (C70-C72)	1130	2.93	1.92	690	3.53	1.86	3.06	1100	5.62	4.95	4.75
7	Breast (C50)	1130	2.87	1.88	630	3.20	1.69	3.02	550	2.87	2.53	2.34
8	Pancreas (C25)	1000	2.58	1.69	600	3.05	1.61	2.79	540	2.81	2.47	2.32
9	Leukemia (C91-C95)	980	2.53	1.66	440	2.23	1.18	1.91	440	2.30	2.02	2.21
10	Lymphoma (C81-C85, 88, 90, 96)	690	1.78	1.17	400	2.05	1.08	2.05	400	2.08	1.83	1.77
Total	All	58,900	152.64	100.00	37,200	189.54	100.00	169.54	21,700	113.58	100.00	97.64

ASMRC = age-standardized mortality rates by Chinese standard population (China population, 2000), CNS = central nervous system.

Society (ACS) showed that every 10 μg/m³ increase in fine particles (PM_{2.5}) was associated with an 8% to 14% increase in lung cancer.^[10] Therefore, air pollution is a serious harm to human health. Smoking tobacco is definitively established as the dominant risk factor for lung cancer.^[11,12] Smoke increases lung cancer risk 5- to 10-fold, with a clear dose-response relationship. Exposure to environmental tobacco smoke among nonsmokers increases lung cancer risk approximately 20%.^[13] Overall, 9632 residents aged 15 to 69 years in 18 counties (cities, districts) of Hebei province were randomly selected to conduct a sample survey this year. The study showed that the cigarette smoking rate of both genders was 28%, whereas it was 50% for males.^[14] Although health lifestyle action in Hebei province achieved some success over 3 years, the overall situation is still not optimistic. Therefore, lung cancer screenings should be carried out and expanded to control this cancer in Hebei province.

The ASIRC of breast cancer in Hebei province was slightly lower than the national level, but the ASMRC was 1.11 times higher. The mortality rates of breast cancer in Hebei province increased by 53.85% from 1973-1975 to 2010-2011^[15] and by 78.94% from the 1970 to 2013. As a whole, the burden of breast cancer was still heavy in Hebei province. A wide-scale screening program for breast cancer should be developed in Hebei province to increase the rates of early detection and treatment and reduce the mortality rate.

In conclusion, this study fully reflects real cancer levels in Hebei province, revealing that the cancer burden there is heavy. The most common cancers in Hebei province were lung cancer, stomach cancer, esophageal cancer, liver cancer, breast cancer, and colorectal cancer. We should still strengthen cancer screening, early diagnosis, and early treatment for Hebei provincial residents to reduce the morbidity and mortality from major malignant tumors.

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