

# Annual report on status of cancer in China, 2010

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**Objective:** Population-based cancer registration data in 2010 were collected, evaluated and analyzed by the National Central Cancer Registry (NCCR) of China. Cancer incident new cases and cancer deaths were estimated.

**Methods:** There were 219 cancer registries submitted cancer incidence and death data in 2010. All data were checked and evaluated on basis of the criteria of data quality from NCCR. Total 145 registries' data were qualified and accepted for cancer statistics in 2010. Pooled data were stratified by urban/rural, area, sex, age group and cancer site. Cancer incident cases and deaths were estimated using age-specific rates and national population. The top ten common cancers in different groups, proportion and cumulative rate were also calculated. Chinese census in 2000 and Segi's population were used for age-standardized incidence/mortality rates.

**Results:** All 145 cancer registries (63 in urban and 82 in rural) covered a total of 158,403,248 population (92,433,739 in urban and 65,969,509 in rural areas). The estimates of new cancer incident cases and cancer deaths were 3,093,039 and 1,956,622 in 2010, respectively. The morphology verified cases (MV%) accounted for 67.11% and 2.99% of incident cases were identified through death certifications only (DCO%) with mortality to incidence ratio (M/I) of 0.61. The crude incidence rate was 235.23/100,000 (268.65/100,000 in males, 200.21/100,000 in females), age-standardized incidence rates by Chinese standard population (ASIRC, 2000) and by world standard population (ASIRW) were 184.58/100,000 and 181.49/100,000 with the cumulative incidence rate (0-74 years old) of 21.11%. The cancer incidence and ASIRC were 256.41/100,000 and 187.53/100,000 in urban areas whereas in rural areas, they were 213.71/100,000 and 181.10/100,000, respectively. The crude cancer mortality in China was 148.81/100,000 (186.37/100,000 in males and 109.42/100,000 in females), age-standardized incidence rates by Chinese standard population (ASMRC, 2000) and by world standard population (ASMRW) were 113.92/100,000 and 112.86/100,000, and the cumulative incidence rate (0-74 years old) was 12.78%. The cancer mortality and ASMRC were 156.14/100,000 and 109.21/100,000 in urban areas, whereas in rural areas, they were 141.35/100,000 and 119.00/100,000 respectively. Lung cancer, gastric cancer, colorectal cancer, liver cancer, esophageal cancer, pancreas cancer, encephaloma, lymphoma, female breast cancer and cervical cancer, were the most common cancers, accounting for 75% of all cancer cases in urban and rural areas. Lung cancer, gastric cancer, liver cancer, esophageal cancer, colorectal cancer, pancreatic cancer, breast cancer, encephaloma, leukemia and lymphoma accounted for 80% of all cancer deaths.

**Conclusions:** The coverage of cancer registration population had a rapid increase and could reflect cancer burden in each area and population. As the basis of cancer control program, cancer registry plays an irreplaceable role in cancer epidemic surveillance, evaluation of cancer control programs and making anti-cancer strategy. China is facing serious cancer burden and prevention and control should be enhanced.

**Keywords:** Cancer registry; incidence; mortality; epidemiology; China



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## Introduction

Population-based cancer registry collects the data on cancer incident cases and deaths from covered population to describe and surveillance the cancer epidemics in certain areas. The cancer registration data are not only applied for cancer control planning, implementation and evaluation on cancer prevention and control but also for scientific research (1). Since 2006, when Disease Prevention and Control Bureau, Health and Family Planning Commission of China started to publish cancer statistics annually, National Central Cancer Registry (NCCR) of China has been responsible for collecting data from all local registries, calculating the statistical items accurately, and analyzing the data of cancer incident cases and deaths from registration areas, then released the updated data in Cancer Registry Annual Report (2). The cancer statistic data have been broadly utilized in scientific researches, clinical trials and decision of cancer prevention and control strategies.

## Materials and methods

### Data source

The NCCR collected cancer registration data from population-based cancer registries in China. Total 219 registries submitted cancer registration data in 2010 to NCCR. They were distributed in 28 provinces, autonomous regions or municipalities. The registries identified new cancer cases from all hospitals, community health centres, medical insurance and death registries (for cases only identified by death certification). Registries obtained information on cancer deaths from the death surveillance system, which collects death information from hospitals and the Civil Administration Bureau with available cremation records. Population information was collected from local statistic bureau or household register department in local public security bureau.

### Quality control

Submitted data were checked and evaluated by NCCR based on "Guideline for Chinese Cancer Registration" and referring to relevant data quality criterion of "Cancer Incidence in Five Continents Volume IX" by International Agency for Research on Cancer/International Association of Cancer Registries (IARC/IACR) (3). Proportion of MV%, percentage of cancer cases identified with DCO%, M/I, percentage of uncertified cancer (UB%) and percentage of

cancer with undefined or unknown primary site (secondary) (O&U%) were used to evaluate the completeness, validity and reliability of cancer statistics.

### Statistical analysis

Cancer incident cases and deaths were stratified by areas (urban/rural), region (eastern, middle, western), cancer type, sex (male, female), and age (grouped by 0, 1-4, 5-9, ..., 80-84, 85 years old and above). Age-specific rate was used for estimates of incidence and death in 2010. Crude incidence rate, mortality, proportion and cumulative rate were calculated using the national population in 2010. The 2000 Chinese census population and world Segi's population were applied for the calculation of age-standardized rates. Database software, including MS-FoxPro, MS-Excel, SAS and IARCrgTools issued by IARC/IACR (4), were used for data check, evaluation and calculation.

## Results

### Data quality

There were 145 registries accepted by this annual report distributed in 28 provinces, including 63 cities and 82 counties covered 158,403,248 of populations, including 80,355,188 males and 78,048,060 females, accounted for 11.86% of whole national population in 2010.

The overall indicators of MV%, DCO%, and M/I ratio were 67.11%, 2.99% and 0.61, respectively. They were 71.51%, 2.49% and 0.59 in urban registries, compared to 60.65%, 3.72% and 0.64 in rural. The quality evaluation for major cancers is presented in *Table 1*.

### Incidence and mortality of overall cancers

#### Incidence

It was estimated there were 3,093,039 new cases diagnosed as cancer in 2010. The crude incidence rate of all cancers was 235.23/100,000 (268.65/100,000 in males and 200.21/100,000 in females). The age-standardized incidence rates were 184.58/100,000 and 181.49/100,000 by Chinese population (ASIRC) and World population (ASIRW), respectively. Among the patients aged 0-74 years, the cumulative incidence rate was 21.11%. The crude cancer incidence rate and age-standardized rates in urban areas were higher than that of rural areas. The crude incidences in males and females were higher in urban than that in rural. However, after adjusted by age, cancer incidences

**Table 1** Quality evaluation for China cancer registers in 2010

Sites	ICD-10	All			Urban			Rural		
		MV%	DCO%	M/I	MV%	DCO%	M/I	MV%	DCO%	M/I
Lip, oral cavity & pharynx but nasopharynx	C00-10, C12-14	81.05	2.27	0.41	85.29	1.92	0.41	73.32	2.90	0.40
Nasopharynx	C11	72.67	1.73	0.45	77.00	1.79	0.47	66.70	1.65	0.43
Esophagus	C15	74.56	2.53	0.71	74.32	2.03	0.72	74.72	2.85	0.71
Stomach	C16	75.33	3.11	0.68	78.43	2.27	0.68	72.09	3.99	0.69
Colorectum	C18-21	79.51	1.95	0.46	81.38	1.63	0.46	75.34	2.67	0.47
Liver	C22	36.71	5.07	0.86	41.54	4.72	0.85	31.62	5.45	0.87
Gallbladder and extrahepatic ducts	C23-C24	51.35	3.27	0.71	50.93	3.64	0.74	52.28	2.44	0.65
Pancreas	C25	44.40	4.39	0.86	45.22	4.01	0.88	42.72	5.17	0.80
Larynx	C32	74.97	3.06	0.53	80.75	1.90	0.49	64.89	5.07	0.60
Trachea, bronchus and lung	C33-C34	51.87	4.25	0.80	58.80	3.77	0.81	41.92	4.94	0.77
Other thoracic organs	C37-C38	61.59	2.32	0.46	65.85	2.45	0.47	51.01	2.02	0.41
Bone	C40-C41	51.27	4.68	0.72	58.01	3.81	0.68	43.91	5.63	0.77
Melanoma of skin	C43	90.35	0.72	0.42	91.98	0.85	0.41	86.56	0.40	0.45
Breast	C50	88.40	0.72	0.24	90.54	0.53	0.23	83.79	1.13	0.26
Cervix uteri	C53	86.78	0.78	0.25	88.74	0.71	0.22	83.74	0.89	0.28
Uterus & Unspecified	C54-55	82.71	1.56	0.32	88.16	1.11	0.27	74.61	2.23	0.39
Ovary	C56	80.03	1.57	0.41	81.67	1.43	0.44	76.73	1.86	0.35
Prostate	C61	72.03	1.50	0.43	74.65	1.43	0.41	62.19	1.79	0.49
Testis	C62	82.89	1.14	0.19	88.06	1.39	0.17	71.69	0.60	0.24
Kidney & unspecified urinary organs	C64-66,68	76.40	1.50	0.35	79.67	1.31	0.34	65.01	2.15	0.37
Bladder	C67	79.63	1.81	0.38	83.63	1.31	0.38	70.88	2.91	0.39
Brain, central nervous system	C70-C72	50.52	3.76	0.57	59.43	2.96	0.56	38.44	4.85	0.60
Thyroid	C73	90.25	0.32	0.07	92.67	0.29	0.07	83.18	0.42	0.09
Lymphoma	C81-85, 88,90,96	91.26	1.46	0.58	91.63	1.18	0.57	90.42	2.08	0.61
Leukemia	C91-C95	92.23	1.77	0.69	92.08	1.18	0.66	92.46	2.72	0.74
All other site		66.92	4.25	0.52	69.89	3.87	0.53	60.79	5.02	0.51
All site	All Sites	67.11	2.99	0.61	71.51	2.49	0.59	60.65	3.72	0.64

MV, morphological verification; DCO, death certification only; M/I, mortality to incidence ratio.

for men in urban and rural were conversed. More new cancer cases occurred in eastern areas than middle areas and western areas, however, crude incidence rates in three areas were not greatly different (*Table 2*).

#### Age-specific incidence rate

Cancer incidence was relatively lower before 39 years old, then increased dramatically after 40 years old, and finally peaked after 80 years and then slightly decreased after 85 years (*Table 3, Figure 1*). The pattern was similar

between urban and rural areas. Comparing the age-specific incidence rate between urban and rural areas, except age from 55-64 years, urban had higher incidence rates in most of age groups. Group of 80 years was higher in urban areas than in rural areas, but lower in the age-group of 40-74 years. Before age of 70 years, most age groups of males in rural had higher incidence rate than that in urban. However, in females, the incidences were higher in urban than that in rural areas in every age group after 25 years (*Table 3, Figure 1*).

**Table 2** The incidence of cancer registries in China in 2010

Area	Sex	No. of cases	Incidence rate (1/10 <sup>5</sup> )	ASIR China (1/10 <sup>5</sup> )*	ASIR world (1/10 <sup>5</sup> )**	Cumulative rate 0-74 (%)
All	Both	3,093,039	235.23	184.58	181.49	21.11
	Male	1,807,921	268.65	216.53	215.12	25.33
	Female	1,285,118	200.21	154.44	149.66	16.84
Urban areas	Both	1,699,483	256.41	187.53	183.91	21.19
	Male	975,653	287.56	214.50	212.82	24.76
	Female	723,830	223.74	162.52	156.91	17.50
Rural areas	Both	1,393,556	213.71	181.10	178.54	21.02
	Male	832,268	249.42	218.53	217.54	26.00
	Female	561,288	176.29	145.47	141.38	16.12
Eastern areas	Both	1,284,993	233.66	181.34	177.85	20.67
	Male	729,523	259.17	208.05	206.31	24.37
	Female	555,470	206.91	156.88	151.53	16.99
Middle areas	Both	1,007,587	238.47	187.50	184.63	21.76
	Male	582,165	270.04	217.11	216.12	25.82
	Female	425,422	205.58	159.39	154.67	17.63
Western areas	Both	800,459	233.77	186.18	183.61	20.98
	Male	496,233	282.09	229.68	228.36	26.25
	Female	304,226	182.71	143.79	140.02	15.61

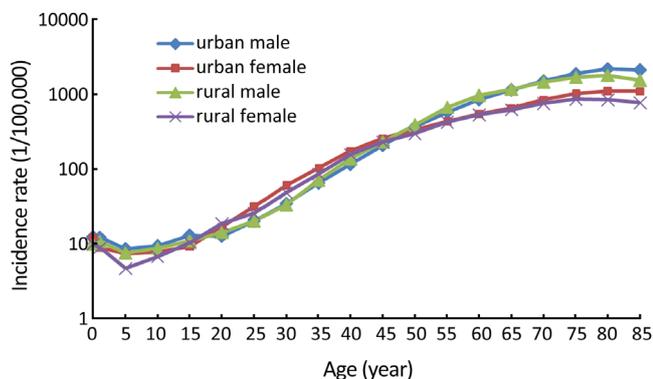
\*, age-standardized incidence rate (China population 2000); \*\*, age-standardized incidence rate (Segi's population).

**Table 3** Age-specific incidence rate for all cancers (ICD-10: C00-C97) in cancer registration areas in 2010 (1/10<sup>5</sup>)

Age groups (year)	All areas			Urban			Rural		
	Both	Male	Female	Both	Male	Female	Both	Male	Female
Total	235.23	268.65	200.21	256.41	287.56	223.74	213.71	249.42	176.29
0-	11.34	11.50	11.17	12.25	12.50	11.94	9.89	9.86	9.93
1-	10.35	11.58	8.87	10.69	12.24	8.83	9.84	10.62	8.92
5-	7.23	8.09	6.22	7.98	8.50	7.36	6.21	7.52	4.67
10-	8.28	9.09	7.32	8.62	9.36	7.76	7.82	8.74	6.75
15-	10.86	11.81	9.84	11.10	12.79	9.23	10.65	10.92	10.37
20-	15.67	13.50	17.86	14.91	12.70	17.09	16.29	14.15	18.49
25-	24.06	20.11	28.06	25.63	20.04	31.33	22.84	20.16	25.55
30-	43.30	33.65	53.33	46.81	34.52	59.75	40.65	32.99	48.54
35-	80.93	68.01	94.46	84.10	64.57	104.44	78.27	70.88	86.04
40-	145.60	125.82	166.15	144.90	114.68	175.67	146.29	136.57	156.60
45-	231.78	219.38	244.63	233.57	207.75	259.54	230.00	230.61	229.34
50-	348.70	377.81	318.13	353.44	368.83	337.33	343.81	387.06	298.18
55-	524.61	618.77	428.52	505.60	577.10	431.57	547.40	669.52	424.92
60-	718.76	895.84	535.56	696.36	845.22	539.01	747.50	962.40	531.23
65-	901.02	1155.14	642.10	904.94	1,140.83	657.36	895.80	1,174.85	622.49
70-	1,150.04	1,496.72	807.14	1,189.59	1,522.22	852.26	1,100.13	1,463.60	751.78
75-	1,358.08	1,812.59	950.90	1,433.09	1,905.18	1,018.25	1,261.32	1,695.89	862.17
80-	1,448.13	2,023.44	992.48	1,572.81	2,208.76	1,098.22	1,280.86	1,793.25	841.59
85-	1,296.64	1,846.27	967.60	1,464.85	2,097.65	1,108.91	1,069.95	1,536.74	766.46

## Mortality

It was estimated there were 1,956,622 died from cancer in 2010. The crude mortality of all cancers in China was 148.81/100,000 (186.37/100,000 in males and 109.42/100,000 in females). The age-standardized mortalities were 113.92/100,000 and 112.86/100,000 by Chinese population (ASMR) and World population (ASMRW),



**Figure 1** Age-specific cancer incidence rates in urban and rural areas, 2010.

respectively. Among the patients aged 0-74 years, the cumulative incidence rate was 12.78%. The crude cancer incidence rate and age-standardized rates in urban areas were higher than that in rural areas. The crude cancer mortalities were higher in urban than in rural. However, after adjusted by age, mortalities were conversed both in males and females. More cancer deaths occurred in eastern areas than middle areas and western areas, however, western areas had higher mortalities than eastern and middle areas (*Table 4*).

## Age-specific mortality

The cancer mortality was relatively lower before 50 years and then dramatically increased reaching peak after 85 years (*Table 5, Figure 2*). The mortality in rural areas was highest in the age-group of 80-84 years. The age-specific mortality in urban men was lower than that in rural in most of age-groups before 80 years old. In female, the mortality in urban was higher than that in rural only for age group over 75 years.

## Incidence and mortality for major cancers

### Cancer incidence of the ten most common cancers

Lung cancer was the most common cancer in all areas,

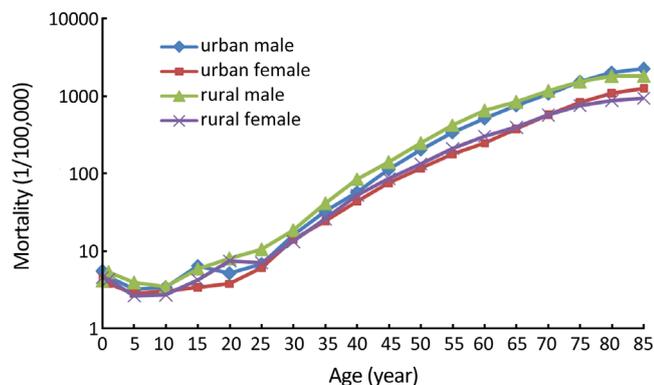
**Table 4** Cancer mortality in cancer registration areas in 2010

Area	Sex	No. of cases	Incidence rate (1/10 <sup>5</sup> )	ASMR China (1/10 <sup>5</sup> )*	ASMR world (1/10 <sup>5</sup> )**	Cumulative rate 0-74 (%)
All	Both	1,956,622	148.81	113.92	112.86	12.78
	Male	1,254,232	186.37	149.37	148.43	16.80
	Female	702,390	109.42	79.88	78.82	8.70
Urban areas	Both	1,034,936	156.14	109.21	108.15	12.08
	Male	653,285	192.55	141.70	140.86	15.68
	Female	381,651	117.97	78.22	77.05	8.35
Rural areas	Both	921,686	141.35	119.00	118.02	13.61
	Male	600,947	180.09	158.06	157.18	18.16
	Female	320,739	100.74	81.36	80.45	9.10
Eastern areas	Both	817,610	148.67	111.44	110.19	12.44
	Male	515,047	182.98	145.28	143.97	16.26
	Female	302,563	112.70	79.37	78.29	8.59
Middle areas	Both	614,496	145.44	112.30	111.23	12.68
	Male	394,008	182.76	146.84	145.97	16.62
	Female	220,488	106.55	79.09	77.95	8.66
Western areas	Both	524,516	153.18	119.90	119.21	13.46
	Male	345,177	196.22	158.99	158.60	17.89
	Female	179,339	107.71	81.54	80.74	8.94

\*, age-standardized mortality rate (China population 2000); \*\*, age-standardized mortality rate (Segi's population).

**Table 5** Age-specific mortality in cancer registration areas in 2010 (1/10<sup>5</sup>)

Age group (year)	All areas			Urban			Rural		
	Both	Male	Female	Both	Male	Female	Both	Male	Female
All	148.81	186.37	109.42	156.14	192.55	117.97	141.35	180.09	100.74
0-	4.76	5.01	4.48	5.04	5.54	4.43	4.33	4.14	4.55
1-	4.49	4.91	3.99	4.25	4.64	3.79	4.84	5.31	4.28
5-	3.15	3.49	2.74	3.02	3.19	2.83	3.31	3.89	2.63
10-	3.17	3.41	2.90	3.22	3.37	3.05	3.11	3.45	2.71
15-	5.06	6.17	3.85	5.01	6.47	3.39	5.10	5.89	4.25
20-	6.26	6.71	5.81	4.46	5.14	3.80	7.73	7.96	7.48
25-	7.76	8.86	6.65	6.44	6.75	6.12	8.78	10.49	7.05
30-	15.50	17.38	13.54	14.97	15.92	13.96	15.90	18.50	13.22
35-	31.40	37.27	25.25	28.52	32.68	24.19	33.81	41.11	26.14
40-	60.10	71.51	48.25	50.87	57.75	43.86	69.18	84.78	52.65
45-	103.84	126.45	80.40	93.95	112.85	74.95	113.67	139.58	85.99
50-	175.78	224.37	124.73	160.65	202.75	116.59	191.43	246.63	133.20
55-	285.41	376.66	192.29	259.25	339.08	176.59	316.76	422.41	210.81
60-	424.34	569.82	273.83	384.13	511.41	249.59	475.94	646.61	304.19
65-	590.32	790.97	385.89	573.23	759.42	377.82	613.06	834.42	396.27
70-	839.02	1,112.23	568.79	823.48	1,074.75	568.65	858.63	1,160.90	568.95
75-	1,142.97	1,528.57	797.52	1,151.83	1,522.71	825.94	1,131.54	1,535.96	760.09
80-	1,405.63	1,921.42	997.11	1,484.32	2,020.92	1,083.87	1,300.06	1,797.84	873.32
85+	1,471.68	2,055.97	1,121.89	1,606.50	2,242.07	1,249.02	1,289.97	1,826.81	940.94



**Figure 2** Age-specific cancer mortality rates in urban and rural areas, 2010.

followed by female breast cancer, stomach cancer, liver cancer and esophageal cancer with estimated new cases of 605,946, 208,192, 404,565, 358,840, and 287,632, respectively. Lung cancer was the most frequently diagnosed cancer in males followed by stomach cancer, liver cancer, esophageal cancer and colorectal cancer. Breast cancer was the most common

cancers in females followed by lung cancer, colorectal cancer, stomach cancer and liver cancer (Table 6).

**Cancer death of the ten most common cancers**

Lung cancer was the leading cause of death in China followed by liver cancer, stomach cancer, esophageal cancer and colorectal cancer with estimated deaths of 486,555, 312,432, 287,851, 208,473, and 132,110, respectively. In males, lung cancer was the leading cause followed by liver cancer, stomach cancer, esophageal cancer and colorectal cancer; while in females, lung cancer was still the leading cause followed by stomach cancer, liver cancer, esophageal cancer and breast cancer (Table 7).

**Cancer incidence of the ten most common cancers in urban areas**

In urban areas, lung cancer was the most frequently diagnosed cancer, followed by female breast cancer, stomach cancer, colorectal cancer and liver cancer with the estimated new cases of 348,107, 127,707, 193,832, 176,942, and 166,166, respectively. The most common sites of cancer

**Table 6** The top ten cancer incidence in China in 2010

Rank	Both			Male			Female								
	Site	Cases	Incidence (1/10 <sup>5</sup> ) %	ASIR* (1/10 <sup>5</sup> )	Site	Cases	Incidence (1/10 <sup>5</sup> ) %	ASIR* (1/10 <sup>5</sup> )	Site	Cases	Incidence (1/10 <sup>5</sup> ) %	ASIR* (1/10 <sup>5</sup> )			
1	Lung (C33-C34)	605,946	46.08	19.59	35.23	Lung (C33-C34)	416,333	61.86	23.03	49.27	Breast (C50)	208,192	32.43	16.20	25.89
2	Female breast (C50)	208,192	32.43	6.83	25.89	Stomach (C16)	287,844	42.77	15.92	34.05	Lung (C33-C34)	189,613	29.54	14.75	21.66
3	Stomach (C16)	404,565	30.77	13.08	23.71	Liver (C22)	268,757	39.94	14.87	32.21	Colorectum (C18-21)	117,486	18.30	9.14	13.63
4	Liver (C22)	358,840	27.29	11.60	21.35	Esophagus (C15)	204,449	30.38	11.31	24.05	Stomach (C16)	116,721	18.18	9.08	13.55
5	Esophagus (C15)	287,632	21.88	9.30	16.71	Colorectum (C18-21)	157,355	23.38	8.70	18.75	Liver (C22)	90,083	14.03	7.01	10.41
6	Colorectum (C18-21)	274,841	20.90	8.89	16.14	Bladder (C67)	46,102	6.85	2.55	5.49	Esophagus (C15)	83,183	12.96	6.47	9.46
7	Cervix (C53)	76,884	11.98	2.49	9.84	Pancreas (C25)	40,394	6.00	2.23	4.78	Cervix (C53)	76,884	11.98	5.98	9.84
8	Uterus (C54-55)	47,751	7.44	1.54	5.84	Brain, CNS (C70-C72)	39,782	5.91	2.20	5.10	Uterus (C54-55)	47,751	7.44	3.72	5.84
9	Ovary (C56)	41,516	6.47	1.34	5.22	Prostate (C61)	38,373	5.70	2.12	4.56	Ovary (C56)	41,516	6.47	3.23	5.22
10	Brain, CNS (C70-C72)	78,933	6.00	2.55	5.03	Leukemia (C91-C95)	37,523	5.58	2.08	5.10	Thyroid (C73)	41,213	6.42	3.21	5.62

\*, age-standardized incidence rate (China population).

**Table 7** The top ten cancer mortality in China in 2010

Rank	Both			Male			Female								
	Site	Cases	Mortality (1/10 <sup>5</sup> ) %	ASMR* (1/10 <sup>5</sup> )	Site	Cases	Mortality (1/10 <sup>5</sup> ) %	ASMR* (1/10 <sup>5</sup> )	Site	Cases	Mortality (1/10 <sup>5</sup> ) %	ASMR* (1/10 <sup>5</sup> )			
1	Lung (C33-C34)	486,555	37.00	24.87	27.93	Lung (C33-C34)	336,786	50.04	26.85	39.79	Lung (C33-C34)	149,769	23.33	21.32	16.62
2	Liver (C22)	312,432	23.76	15.97	18.43	Liver (C22)	231,950	34.47	18.49	27.69	Stomach (C16)	87,833	13.68	12.50	9.83
3	Stomach (C16)	287,851	21.89	14.71	16.64	Stomach (C16)	200,018	29.72	15.95	23.70	Liver (C22)	80,482	12.54	11.46	9.15
4	Esophagus (C15)	208,473	15.85	10.65	11.95	Esophagus (C15)	148,865	22.12	11.87	17.54	Esophagus (C15)	59,608	9.29	8.49	6.52
5	Colorectum (C18-21)	132,110	10.05	6.75	7.55	Colorectum (C18-21)	76,646	11.39	6.11	9.10	Breast (C50)	55,500	8.65	7.90	6.56
6	Female breast (C50)	55,500	8.65	2.91	6.56	Pancreas (C25)	34,509	5.13	2.75	4.08	Colorectum (C18-21)	55,464	8.64	7.90	6.12
7	Pancreas (C25)	57,735	4.39	2.95	3.32	Leukemia (C91-C95)	26,212	3.89	2.09	3.45	Pancreas (C25)	23,226	3.62	3.31	2.58
8	Brain, CNS (C70-C72)	46,740	3.55	2.39	2.91	Brain, CNS (C70-C72)	26,029	3.87	2.08	3.27	Cervix (C53)	21,626	3.37	3.08	2.60
9	Leukemia (C91-C95)	45,653	3.47	2.33	3.00	Lymphoma (C81-85,88,90,96)	22,178	3.30	1.77	2.70	Brain, CNS (C70-C72)	20,711	3.23	2.95	2.55
10	Cervix (C53)	21,626	3.37	1.11	2.60	Bladder (C67)	17,386	2.58	1.39	2.05	Leukemia (C91-C95)	19,441	3.03	2.77	2.56

\*, age-standardized mortality rate (China population).

were lung, stomach, liver, colon-rectum and esophagus in males, while were breast, lung, colon-rectum, stomach and liver in females (*Table 8*).

#### **Cancer death of the top ten most common cancers in urban areas**

Lung cancer was the leading cause of cancer death in urban areas for both men and women with number of deaths and mortalities of 192,438, 56.72/100,000, 87,481, 27.04/100,000, respectively. Other cancer types with high mortality in men were liver cancer, stomach cancer, esophageal cancer and colorectal cancer. In women, stomach cancer was the second cause of cancer death, followed by liver cancer, colorectal cancer and breast cancer (*Table 9*).

#### **Cancer incidence of the ten most common cancers in rural areas**

*Table 10* shows the ten most common cancer incidence rates in rural areas. Lung cancer had been becoming the most frequently diagnosed cancer (257,839 new cases with incidence rate of 39.54/100,000), followed by stomach cancer, liver cancer, esophagus cancer and female breast cancer. The most common sites of cancer in men were lung, stomach, liver, esophagus and colon-rectum, while in women, were breast, lung, stomach, esophagus and liver.

#### **Cancer death of the top ten most common cancers in rural areas**

Lung cancer was the leading cause of cancer death in rural areas for both men and women. The number of deaths on lung cancer in rural was 206,636 with mortality of 31.69/100,000. The other cancer types with high mortality were liver cancer, stomach cancer, esophageal cancer and colorectal cancer in male; stomach cancer, liver cancer, esophageal cancer and breast cancer in female (*Table 11*).

## **Discussion**

In 2010, the program registries covered by the National Program of Cancer Registry were 193. When NCCR called for data submission, total 219 registries reported registration data including voluntary registries. The population coverage of these registries was over 200 millions, accounted for 15% of national populations. A couple of registries are established every year under financial support from national program. In 2013, the number of registries has been increased to about 250. IARC/IACR recently released the new version of "Cancer

Incidence in Five Continents, Volume X" (<http://ci5.iarc.fr/CI5-X/ci5-X.htm>). There were 12 registries from mainland China accepted for the publication.

In order to ensure the quality of registration data, NCCR processes the data based on the national criteria issued in program protocol. The incidence, mortality and population have to keep reasonable levels compared to past data and similar areas. If unexplicable, data would be sent back to registries to check. The indicators of completeness, comparability and invalidity, such as, MV%, DCO%, M/I ratio, UB% and O&U% were evaluated for each registry's data to judge if submitted data are valid or not. Through the double evaluations in provincial and national level, 154 registries were qualified and accepted for final database. The valid data were pooled and analyzed for cancer statistics in 2010. This is the first time that cancer incident new cases and cancer deaths were estimated based on the available data making results more practical.

The results showed the estimated cancer incident cases were 3.09 millions and 1.96 cancer deaths in 2010 with the incidence rate of 235.23/100,000 and mortality of 148.81/100,000. Compared to the figures in 2009, both incidence and mortality were slightly lower (5). The reason of the decrease might be the dramatic increase of coverage of population. However, the cancer spectrum was as same as that in the previous year. In this study, the data were stratified by areas (eastern, middle, and western) and it was found that the incidence and mortality were not quite different for overall cancers. Although the number of registries has been double than in 2009, coverage in western areas was still so limited and the representativeness was needed to be evaluated (6).

Urban China had a higher cancer incidence and lower mortality than rural and the cancer patterns are quite different (7,8). It hints different cancer control strategies should be implemented according to different cancer statistics. Lung cancer becomes the most common cancer and the leading cancer death both in urban and rural areas, and especially, in rural, it has replaced liver cancer or stomach cancer as the first killer before. Recently, IARC published an updated issue about air pollution and cancer to firstly identify air pollution is strongly associated with cancer. It was estimated that more than half of the lung cancer deaths are attributable to ambient fine particles in China (<http://www.iarc.fr/en/publications/books/sp161/index.php>). However, the etiology of lung cancer in rural should be emphasized. Same as lung cancer, breast cancer has become the most common cancer in women in rural

**Table 8** The top ten cancer incidence in urban areas of China in 2010

Rank	Both					Male					Female				
	Site	Cases	Incidence (1/10 <sup>5</sup> )	ASIR* (1/10 <sup>5</sup> )	% (1/10 <sup>5</sup> )	Site	Cases	Incidence (1/10 <sup>5</sup> )	ASIR* (1/10 <sup>5</sup> )	% (1/10 <sup>5</sup> )	Site	Cases	Incidence (1/10 <sup>5</sup> )	ASIR* (1/10 <sup>5</sup> )	% (1/10 <sup>5</sup> )
1	Lung (C33-C34)	348,107	52.52	20.48	36.62	Lung (C33-C34)	238,816	70.39	24.48	51.22	Breast (C50)	127,707	39.47	17.64	30.50
2	Female breast (C50)	127,707	39.47	7.61	30.50	Stomach (C16)	137,509	40.53	14.09	29.60	Lung (C33-C34)	109,291	33.78	15.10	22.52
3	Stomach (C16)	193,832	29.24	11.41	20.72	Liver (C22)	123,924	36.52	12.70	27.69	Colorectum (C18-21)	75,583	23.36	10.44	15.94
4	Colorectum (C18-21)	176,942	26.70	10.41	18.91	Colorectum (C18-21)	101,359	29.87	10.39	22.05	Stomach (C16)	56,323	17.41	7.78	11.99
5	Liver (C22)	166,166	25.07	9.78	18.27	Esophagus (C15)	81,167	23.92	8.32	17.31	Liver (C22)	42,242	13.06	5.84	8.80
6	Esophagus (C15)	109,683	16.55	6.45	11.50	Bladder (C67)	29,703	8.75	3.04	6.43	Cervix (C53)	42,173	13.04	5.83	10.70
7	Cervix (C53)	42,173	13.04	2.48	10.70	Prostate (C61)	28,670	8.45	2.94	6.08	Esophagus (C15)	28,516	8.81	3.94	5.76
8	Prostate (C61)	28,670	8.45	1.69	6.08	Pancreas (C25)	24,396	7.19	2.50	5.23	Thyroid (C73)	26,791	8.28	3.70	7.30
9	Ovary (C56)	25,000	7.73	1.47	6.01	Lymphoma (C81- 85,88,90,96)	24,279	7.16	2.49	5.60	Ovary (C56)	25,000	7.73	3.45	6.01
10	Uterus (C54-55)	24,763	7.65	1.46	5.73	Kidney (C64-66,68)	23,290	6.86	2.39	5.15	Uterus (C54-55)	24,763	7.65	3.42	5.73

\*, age-standardized incidence rate (China population).

**Table 9** The top ten cancer mortality in urban areas in of China, 2010

Rank	Both					Male					Female				
	Site	Cases	Mortality (1/10 <sup>5</sup> )	ASMR* (1/10 <sup>5</sup> )	% (1/10 <sup>5</sup> )	Site	Cases	Mortality (1/10 <sup>5</sup> )	ASMR* (1/10 <sup>5</sup> )	% (1/10 <sup>5</sup> )	Site	Cases	Mortality (1/10 <sup>5</sup> )	ASMR* (1/10 <sup>5</sup> )	% (1/10 <sup>5</sup> )
1	Lung (C33-C34)	279,919	42.23	27.05	28.88	Lung (C33-C34)	192,438	56.72	29.46	41.04	Lung (C33-C34)	87,481	27.04	22.92	17.31
2	Liver (C22)	142,388	21.48	13.76	15.46	Liver (C22)	104,689	30.86	16.03	23.26	Stomach (C16)	41,921	12.96	10.98	8.47
3	Stomach (C16)	134,956	20.36	13.04	14.09	Stomach (C16)	93,035	27.42	14.24	19.94	Liver (C22)	37,699	11.65	9.88	7.67
4	Colorectum (C18-21)	83,312	12.57	8.05	8.58	Esophagus (C15)	60,544	17.84	9.27	12.90	Colorectum (C18-21)	35,359	10.93	9.26	6.98
5	Esophagus (C15)	80,798	12.19	7.81	8.35	Colorectum (C18-21)	47,953	14.13	7.34	10.33	Breast (C50)	32,765	10.13	8.59	7.19
6	Female breast (C50)	32,765	10.13	3.23	7.19	Pancreas (C25)	21,355	6.29	3.27	4.57	Esophagus (C15)	20,254	6.26	5.31	3.90
7	Pancreas (C25)	36,465	5.50	3.52	3.77	Leukemia (C91-C95)	14,479	4.27	2.22	3.53	Pancreas (C25)	15,110	4.67	3.96	2.99
8	Leukemia (C91-C95)	24,315	3.67	2.35	2.94	Lymphoma (C81- 85,88,90,96)	14,038	4.14	2.15	3.14	Ovary (C56)	11,375	3.52	2.98	2.51
9	Prostate (C61)	12,367	3.64	1.19	2.58	Brain, CNS (C70-C72)	12,443	3.67	1.90	2.91	Brain, CNS (C70-C72)	11,255	3.48	2.95	2.56
10	Brain, CNS (C70-C72)	23,698	3.58	2.29	2.73	Prostate (C61)	12,367	3.64	1.89	2.58	Cervix (C53)	10,950	3.38	2.87	2.48

\*, age-standardized mortality rate (China population).

**Table 10** The top ten cancer incidence in rural areas of China, 2010

Rank	Site	Both				Male				Female					
		Cases	Incidence (1/10 <sup>5</sup> )	ASIR* (1/10 <sup>5</sup> )	%	Site	Cases	Incidence (1/10 <sup>5</sup> )	%	ASIR* (1/10 <sup>5</sup> )	Site	Cases	Incidence (1/10 <sup>5</sup> )	%	ASIR* (1/10 <sup>5</sup> )
1	Lung (C33-C34)	257,839	39.54	18.50	33.39	Lung (C33-C34)	177,517	53.20	21.33	46.75	Breast (C50)	80,485	25.28	14.34	20.78
2	Stomach (C16)	210,733	32.32	15.12	27.37	Stomach (C16)	150,335	45.05	18.06	39.51	Lung (C33-C34)	80,322	25.23	14.31	20.49
3	Liver (C22)	192,674	29.55	13.83	24.74	Liver (C22)	144,833	43.40	17.40	37.21	Stomach (C16)	60,398	18.97	10.76	15.51
4	Esophagus (C15)	177,949	27.29	12.77	23.10	Esophagus (C15)	123,282	36.95	14.81	32.40	Esophagus (C15)	54,667	17.17	9.74	13.97
5	Female breast (C50)	80,485	25.28	5.88	20.78	Colorectum (C18-21)	55,996	16.78	6.73	14.65	Liver (C22)	47,841	15.03	8.52	12.20
6	Colorectum (C18-21)	97,899	15.01	7.03	12.67	Brain, CNS (C70-C72)	19,805	5.94	2.38	5.32	Colorectum (C18-21)	41,903	13.16	7.47	10.77
7	Cervix (C53)	34,711	10.90	2.49	9.08	Bladder (C67)	16,399	4.91	1.97	4.33	Cervix (C53)	34,711	10.90	6.18	9.08
8	Uterus (C54-55)	22,988	7.22	1.65	5.92	Pancreas (C25)	15,998	4.79	1.92	4.20	Uterus (C54-55)	22,988	7.22	4.10	5.92
9	Brain, CNS (C70-C72)	38,455	5.90	2.76	5.15	Leukemia (C91-C95)	15,944	4.78	1.92	4.62	Brain, CNS (C70-C72)	18,650	5.86	3.32	4.98
10	Ovary (C56)	16,516	5.19	1.19	4.32	Nasopharynx (C11)	13,760	4.12	1.65	3.53	Ovary (C56)	16,516	5.19	2.94	4.32

\*, age-standardized incidence rate (China population).

**Table 11** The top ten cancer mortality in rural areas of China, 2010

Rank	Site	Both				Male				Female					
		Cases	Mortality (1/10 <sup>5</sup> )	ASMR* (1/10 <sup>5</sup> )	%	Site	Cases	Mortality (1/10 <sup>5</sup> )	%	ASMR* (1/10 <sup>5</sup> )	Site	Cases	Mortality (1/10 <sup>5</sup> )	%	ASMR* (1/10 <sup>5</sup> )
1	Lung (C33-C34)	206,636	31.69	22.42	26.61	Lung (C33-C34)	144,348	43.26	24.02	38.09	Lung (C33-C34)	62,288	19.56	19.42	15.64
2	Liver (C22)	170,044	26.08	18.45	21.75	Liver (C22)	127,261	38.14	21.18	32.69	Stomach (C16)	45,912	14.42	14.31	11.55
3	Stomach (C16)	152,895	23.45	16.59	19.82	Stomach (C16)	106,983	32.06	17.80	28.40	Liver (C22)	42,783	13.44	13.34	10.81
4	Esophagus (C15)	127,675	19.58	13.85	16.43	Esophagus (C15)	88,321	26.47	14.70	23.30	Esophagus (C15)	39,354	12.36	12.27	9.79
5	Colorectum (C18-21)	48,798	7.48	5.29	6.26	Colorectum (C18-21)	28,693	8.60	4.77	7.54	Breast (C50)	22,735	7.14	7.09	5.78
6	Female breast (C50)	22,735	7.14	2.55	5.78	Brain, CNS (C70-C72)	13,586	4.07	2.26	3.64	Colorectum (C18-21)	20,105	6.31	6.27	5.03
7	Brain, CNS (C70-C72)	23,042	3.53	2.50	3.06	Pancreas (C25)	13,154	3.94	2.19	3.46	Cervix (C53)	10,676	3.35	3.33	2.73
8	Cervix (C53)	10,676	3.35	1.16	2.73	Leukemia (C91-C95)	11,733	3.52	1.95	3.31	Leukemia (C91-C95)	9,605	3.02	2.99	2.72
9	Leukemia (C91-C95)	21,338	3.27	2.32	3.01	Lymphoma (C81-85,88,90,96)	8,140	2.44	1.35	2.17	Brain, CNS (C70-C72)	9,456	2.97	2.95	2.49
10	Pancreas (C25)	21,270	3.26	2.31	2.75	Nasopharynx (C11)	6,574	1.97	1.09	1.69	Uterus (C54-55)	9,063	2.85	2.83	2.33

\*, age-standardized mortality rate (China population).

areas. The changes of lifestyle, diet and environment have impacted on both urban and rural women.

China is facing critical health issues caused by cancer with over 3 million new cases and nearly 2 million cancer deaths annually. Risk factors, such as air pollution, infection, and changes of diet habit and lifestyle, maintain high level in Chinese, so that, the cancer burden is getting serious. Cancer control strategies, including health education, health promotion, early detection and cancer screening, should be treated as priority in public health. As the fundamental work, cancer registration plays an important role on cancer control and should be emphasized.

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### References

1. Parkin DM. The evolution of the population-based cancer registry. *Nat Rev Cancer* 2006;6:603-12.
2. National Office for Cancer Prevention and Control, National Center for Cancer Registry, Disease Prevention and Control Bureau, MOH. Chinese Cancer Registry Annual Report (2012). Beijing: Military Medical Science Press, 2012:12.
3. Curado MP, Edwards B, Shin HR, et al. Cancer Incidence in Five Continents. Vol. IX. IARC Scientific Publications No.160. Lyon: IARC, 2008:1-837.
4. Ferlay J. The IARC crgTools Programs. Available online: <http://wwwiacrcomfr/iarcrcrgtooshtmIACR 2006>
5. National Office for Cancer Prevention and Control, National Center for Cancer Registry, Disease Prevention and Control Bureau, MOH. Chinese Cancer Registry Annual Report (2011). Beijing: Military Medical Science Press, 2011:12.
6. Li GL, Chen WQ. Representativeness of population-based cancer registration in China--comparison of urban and rural areas. *Asian Pac J Cancer Prev* 2009;10:559-64.
7. Chen WQ, Zheng RS, Zeng HM, et al. Trend analysis and projection of cancer incidence in China between 1989 and 2008. *Zhonghua Zhong Liu Za Zhi* 2012;34:517-24.
8. Zeng HM, Zheng RS, Zhang SW, et al. Trend analysis of cancer mortality in China between 1989 and 2008. *Zhonghua Zhong Liu Za Zhi* 2012;34:525-31.

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