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Report of incidence and mortality in China cancer registries, 2009

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Objective: The National Central Cancer Registry (NCCR) collected cancer registration data in 2009 from local cancer registries in 2012, and analyzed to describe cancer incidence and mortality in China.

Methods: On basis of the criteria of data quality from NCCR, data submitted from 104 registries were checked and evaluated. There were 72 registries' data qualified and accepted for cancer registry annual report in 2012. Descriptive analysis included incidence and mortality stratified by area (urban/rural), sex, age group and cancer site. The top 10 common cancers in different groups, proportion and cumulative rates were also calculated. Chinese population census in 1982 and Segi's population were used for age-standardized incidence/mortality rates.

Results: All 72 cancer registries covered a total of 85,470,522 population (57,489,009 in urban and 27,981,513 in rural areas). The total new cancer incident cases and cancer deaths were 244,366 and 154,310, respectively. The morphology verified cases accounted for 67.23%, and 3.14% of incident cases only had information from death certifications. The crude incidence rate in Chinese cancer registration areas was 285.91/100,000 (males 317.97/100,000, females 253.09/100,000), age-standardized incidence rates by Chinese standard population (ASIRC) and by world standard population (ASIRW) were 146.87/100,000 and 191.72/100,000 with the cumulative incidence rate (0-74 age years old) of 22.08%. The cancer incidence and ASIRC were 303.39/100,000 and 150.31/100,000 in urban areas whereas in rural areas, they were 249.98/100,000 and 139.68/100,000, respectively. The cancer mortality in Chinese cancer registration areas was 180.54/100,000 (224.20/100,000 in males and 135.85/100,000 in females), age-standardized mortality rates by Chinese standard population (ASMRC) and by world standard population (ASMRW) were 85.06/100,000 and 115.65/100,000, and the cumulative incidence rate (0-74 age years old) was 12.94%. The cancer mortality and ASMRC were 181.86/100,000 and 80.86/100,000 in urban areas, whereas in rural areas, they were 177.83/100,000 and 94.40/100,000 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. The cancer spectrum showed difference between urban and rural areas, males and females. The main cancers in rural areas were cancers of the stomach, followed by esophageal cancer, lung cancer, liver cancer and colorectal cancer, whereas the main cancer in urban areas was lung cancer, followed by liver cancer, gastric cancer and colorectal cancer.

Conclusions: The coverage of cancer registration population has been increasing and data quality is improving. As the basis of cancer control program, cancer registry plays an important role in making anti-cancer strategy in medium and long term. As cancer burdens are different between urban and rural areas in China, prevention and control should be implemented based on practical situation.

Key Words: 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, Ministry of Health 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, analyzing the data of cancer incident cases and deaths from registration areas, and then releasing the updated data in Cancer Registry Annual Report (2). The cancer statistics data have been broadly utilized in scientific researches, clinical trials and decision of cancer prevention and control strategies.

Materials and methods

Data source

There were 104 cancer registries from 26 provinces submitted cancer registration data in 2009, including 46 urban registries and 58 rural registries. The coverage population of all 104 registries was 109,476,347 (55,654,485 men and 53,821,862 women), accounting for 8.20% of whole national population by the end of 2009. The total cancer incident cases were 284,470 (160,958 for male and 123,512 for female) and deaths were 174,879 (110,311 for male and 64,568 for female), respectively.

Quality control

Proportion of morphological verification (MV%), percentage of cancer cases identified with death certification only (DCO%), mortality to incidence ratio (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 registration data. According to NCCR acceptable criterion, the following standards should be reached: MV% higher than 66%, DCO% less than 15% and M/I ratio between 0.6 and 0.8.

One of the advantages of cancer registration data was timely report of cancer. However, for the completeness, validity and reliability of cancer statistics (3), the time gap between data updating and analyzing might exist. NCCR ruled that every registry should upload the cancer registry data of 2009 before July 1, 2012, which was 30 months after cancer diagnosis.

Statistical analysis

The quality of data was assessed based on "Guideline of Chinese Cancer Registration" and referred to the criteria for "Cancer Incidence in Five Continents Volume IX" (4) by the International Agency for Cancer Registry (IACR), the International Agency for Research on Cancer (IARC). Once the cancer registration data met the criteria of quality on completeness, comparability and validity, it would be accepted as qualified data for analysis.

Crude incidence and mortality rates were calculated stratified by cancer type, sex, area (urban/rural) and age (grouped by 0, 1-4, 5-9, ⋯ 80-84, 85 years old and above), age-standardized to the 1982 Chinese population and world Segi's population. Proportion and cumulative rate were also calculated. Database software, including MS-FoxPro, MS-Excel, SAS and IARC issued by IARC/IACR (5) were used for data check, evaluation and analysis.

Results

Data pooling and quality evaluation

Total 72 registries, including 31 from urban and 41 from rural areas, met the criteria for data quality and then were pooled for national database in 2009. The population coverage of valid database was 85,470,522 (43,231,554 in male and 42,238,968 in female), with 57,489,009 in urban areas (67.26%) and 27,981,513 in rural areas (32.74%). The total cancer incident cases and deaths were 244,366 and 137,462, respectively (*Table 1*).

The overall indicators of MV%, DCO%, and M/I ratio were 67.23%, 3.14% and 0.63, respectively. They were 68.96%, 3.03% and 0.60 in urban registries, compared to 62.91%, 3.43% and 0.71 in rural. The quality evaluation for each cancer registry was presented in *Table 2*.

Incidence and mortality of overall cancers

Incidence rate

The crude incidence rate of all cancers in registration areas was 285.91/100,000 (317.97/100,000 in males and 253.09/100,000 in females). The age-standardized incidence rate was 146.87/100,000 and 191.72/100,000 by Chinese

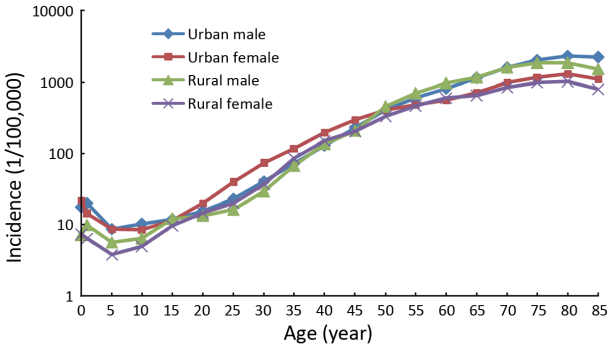

Figure 1 Age-specific cancer incidence rates in urban and rural areas, 2009

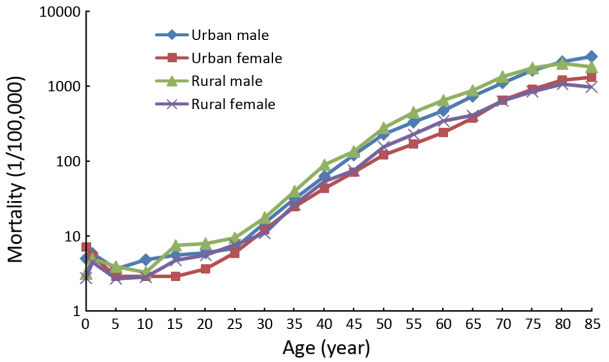

Figure 2 Age-specific cancer mortality rates in urban and rural areas, 2009

population (ASIRC) and World population (ASIRW), respectively. Among the patients aged 0-74 years, the cumulative incidence rate was 22.08%. The crude cancer incidence rate and age-standardized rates in urban areas were higher than those of rural areas. Although the crude incidence in male was much higher in urban areas than in rural areas, the ASRs were similar (*Table 3*).

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 old (*Table 4*, *Figure 1*). The pattern was similar between urban and rural areas. Comparing the age-specific incidence rate between urban and rural areas, the cancer incidence in male before 39 years old and after 80 years old was higher in urban areas than that in rural areas, but lower in the age group of 40-74 years. However, in females, the incidences were higher in urban areas than that in rural areas in every age group except for age group 60 (*Table 4*, *Figure 1*).

Mortality

The crude mortality in cancer registration areas was 180.54/100,000 (224.20/100, 000 in male and 135.85/100,000 in female). The age-standardized rates by Chinese population and World population were 85.06/100,000 and 115.65/100,000, respectively. The cumulative mortality (0-74 years) rate was 12.94%. Urban areas had higher cancer mortality of 181.86/100,000 than that of rural areas (177.83/100,000), and mortalities close in males. After age standardization, the mortality rate in rural areas was higher than that in urban areas both in males and females (*Table 5*).

Age-specific mortality

The cancer mortality was relatively lower before 50 years old. The rate was dramatically increasing after 50 years old, and reached peak after 85 years old (*Table 6* and *Figure 2*). The mortality rate was highest in the age group of 80-84 years in rural areas. The age-specific mortality in urban areas was lower than that in rural in most of age groups. In males, the mortality in urban was higher than in rural only for age group over 80 years and it occurred in females for age over 70 years.

Incidence and mortality for major cancers

Cancer incidence rates for the 10 most common cancers

Lung cancer was the most common cancer in cancer registration areas, followed by stomach cancer, colorectal cancer, liver cancer and esophageal cancer. The 10 most common cancers accounted for 76.39% of all new cases with 84.14% in males and 77.57% in females, respectively. Lung cancer was the most frequently diagnosed cancers in males followed by stomach cancer, liver cancer, colon-rectum cancer and esophageal cancer. And breast cancer was the most frequently diagnosed cancers followed by lung cancer, colorectal cancer, stomach cancer and liver cancer in females (*Table 7*).

Cancer mortality rates for the 10 most common cancers

Lung cancer was the leading cause of death in cancer registration areas followed by stomach cancer, liver cancer, esophageal cancer and colorectal cancer. The 10 most

Table 1 Distribution for total population, new case and death number in each registry in 2009

Cancer registry	Category 1. urban; 2. rural	Total population			New case number			Cancer death		
		Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
Beijing	1	7,645,186	3,859,586	3,785,600	23,339	11,784	11,555	13,544	969	5,575
Qianxi	2	361,312	182,138	179,174	767	503	264	421	313	108
Shexian	2	394,944	205,168	189,776	1,286	802	484	957	634	323
Cixian	2	634,333	322,621	311,712	1,866	1,064	802	1,302	825	477
Baoding	1	948,612	478,051	470,561	2,143	1,104	1,039	1,302	695	607
Yangquan	1	683,165	346,023	337,142	1,403	807	596	913	582	331
Yangcheng	2	383,165	192,119	191,046	1,272	728	544	785	504	281
Chifeng	1	1,203,006	613,725	589,281	2,051	1,186	865	1,325	797	528
Shenyang	1	3,497,815	1,722,976	1,774,839	10,801	5,598	5,203	6,891	4,051	2,840
Dalian	1	2,266,224	1,136,772	1,129,452	9,313	4,903	4,410	4,743	2,959	1,784
Zhuanghe	2	915,660	461,826	453,834	2,314	1,310	1,004	1,539	972	567
An'shan	1	1,471,775	731,916	739,859	4,724	2,434	2,290	2,958	1,791	1,167
Benxi	1	955,409	475,113	480,296	2,459	1,376	1,083	1,638	1,023	615
Dandong	1	767,011	378,794	388,217	2,389	1,282	1,107	1,636	974	662
Donggang	2	640,853	323,798	317,055	1,432	885	547	1,141	691	450
Dehui	2	943,395	479,486	463,909	1,975	1,062	913	1,182	687	495
Yanji	2	440,957	215,260	225,697	766	447	319	464	315	149
Daoli District, Harbin	1	713,264	351,071	362,193	1,953	1,069	884	1,056	638	418
Nangang District, Harbin	1	1,020,233	508,921	511,312	2,389	1,246	1,143	1,660	1,005	655
Shangzhi	2	616,046	314,864	301,182	1,254	724	530	653	410	243
Shanghai	1	6,181,334	3,084,496	3,096,838	25,366	13,321	12,045	16,933	9,840	7,093
Jintan	2	545,000	262,407	282,593	1,561	987	574	1,242	838	404
Suzhou	1	2,392,087	1,183,716	1,208,371	8,381	4,838	3,543	4,504	2,835	1,669
Haian	2	936,785	463,612	473,173	2,638	1,583	1,055	2,108	1,332	776
Qidong	2	1,114,951	548,805	566,146	3,516	2,172	1,344	2,928	1,899	1,029
Haimen	2	1,016,228	501,407	514,821	3,612	2,077	1,535	2,617	1,709	908
Lianyungang	1	886,862	452,358	434,504	1,994	1,108	886	1,306	825	481
Donghai	2	1,117,858	579,751	538,107	2,083	1,283	800	1,506	979	527
Guanyun	2	1,015,229	534,502	480,727	1,995	1,204	791	1,596	1,068	528
Chuzhou District, Huai'an	1	1,174,877	609,088	565,789	2,828	1,728	1,100	1,925	1,179	746
Huaiyin District, Huai'an	1	900,027	465,502	434,525	2,013	1,342	671	1,399	937	462
Xuyi	2	759,450	388,180	371,270	1,764	1,097	667	1,077	678	399
Jinhu	2	352,292	176,689	175,603	967	572	395	688	424	264
Sheyang	2	965,817	494,682	471,135	3,052	1,734	1,318	2,213	1,388	825
Jianhu	2	805,465	410,369	395,096	2,150	1,312	838	1,681	1,099	582
Dafeng	2	724,147	363,326	360,821	2,014	1,167	847	1,597	975	622
Yangzhong	2	272,046	134,758	137,288	1,043	576	467	873	532	341

Table 1 (*continued*)

Table 1 (*continued*)

Cancer registry	Category 1. urban; 2. rural	Total population			New case number			Cancer death		
		Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
Hangzhou	1	6,753,509	3,403,893	3,349,616	22,625	12,690	9,935	11,592	7,571	4,021
Jiaxing	1	509,367	253,819	255,548	1,564	853	711	912	573	339
Jiashan	2	382,475	189,692	192,783	1,349	774	575	958	638	320
Haining	2	653,957	322,969	330,988	1,666	915	751	994	638	356
Shangyu	2	771,321	383,462	387,859	2,127	1,345	782	1,466	981	485
Xianju	2	490,070	255,438	234,632	1,282	813	469	998	675	323
Feixi	2	858,895	449,882	409,013	1,955	1,346	609	1,269	920	349
Maanshan	1	633,477	323,834	309,643	1,721	1,038	683	1,143	770	373
Tongling	1	433,545	221,375	212,170	1,046	644	402	697	471	226
Changle	2	673,717	355,091	318,626	1,474	872	602	828	569	259
Xiamen	1	1,160,135	583,873	576,262	3,851	2,255	1,596	2,145	1,448	697
Zhanggong District, Ganzhou	1	420,759	212,159	208,600	904	560	344	567	366	201
Linqu	2	817,857	417,434	400,423	2,043	1,245	798	1,443	958	485
Wenshang	2	762,828	388,454	374,374	1,405	873	532	1,130	724	406
Feicheng	2	733,501	358,739	374,762	2,298	1,387	911	1,488	989	499
Yanshi	2	602,266	306,192	296,074	1,117	583	534	748	429	319
Linzhou	2	1,080,241	557,392	522,849	2,744	1,462	1,282	1,701	1,057	644
Xiping	2	858,002	434,899	423,103	1,628	926	702	1,258	767	491
Wuhan	1	4,832,174	2,484,622	2,347,552	12,590	6,978	5,612	6,961	4,504	2,457
Yunmeng	2	524,801	261,237	263,564	942	558	384	767	503	264
Hengdong	2	713,458	373,923	339,535	1,217	732	485	728	456	272
Guangzhou	1	3,968,216	2,014,580	1,953,636	13,062	7,169	5,893	8,133	5,093	3,040
Sihui	2	413,363	211,351	202,012	947	563	384	601	400	201
Zhongshan	1	1,468,391	732,333	736,058	2,937	1,783	1,154	1,881	1,289	592
Liuzhou	1	1,038,208	533,050	505,158	2,435	1,396	1,039	1,357	862	495
Fusui	2	444,332	236,000	208,332	759	525	234	529	391	138
Jiulongpo District, Chongqing	1	798,618	402,961	395,657	1,458	914	544	1,220	841	379
Qingyang District, Chengdu	1	534,701	277,154	257,547	1,434	845	589	880	583	297
Ziliujing District, Zigong	1	357,600	179,873	177,727	916	597	319	462	330	132
Yanting	2	610,103	31,699	293,604	2,317	1,481	836	1,850	1,177	673
Jingtai	2	233,609	119,953	113,656	395	228	167	244	159	85
Liangzhou District, Wuwei	1	990,583	524,276	466,307	2,837	1,886	951	2,024	1,382	642
Xining	1	882,839	439,175	443,664	1,492	971	521	844	585	259
Xinyuan	2	271,944	138,895	133,049	568	330	238	300	192	108

Table 2 Quality evaluation for China cancer registers in 2009

Cancer site	All areas			Urban			Rural		
	MV%	DCO%	M/I	MV%	DCO%	M/I	MV%	DCO%	M/I
Oral and pharngeal	82.02	1.93	0.42	82.92	1.80	0.41	78.55	2.42	0.44
Nasopharynx	71.99	3.05	0.55	72.37	2.91	0.55	70.65	3.54	0.56
Esophagus	75.29	2.62	0.76	70.94	3.59	0.75	78.59	1.88	0.77
Stomach	76.14	2.95	0.71	73.18	3.24	0.70	79.93	2.58	0.73
Colon, rectum	80.26	2.02	0.48	80.23	2.03	0.48	80.39	2.00	0.51
Liver	34.10	5.91	0.91	38.11	6.08	0.91	27.46	5.63	0.91
Gallbladder	47.64	4.39	0.79	47.41	4.73	0.81	48.56	3.02	0.72
Pancreas	37.96	4.71	0.91	38.39	4.57	0.91	36.62	5.16	0.91
Throat	76.69	2.93	0.52	78.86	2.54	0.47	67.96	4.49	0.72
Lung	50.76	4.88	0.85	55.03	4.71	0.86	38.68	5.35	0.84
Other organs in chest	59.19	2.79	0.53	60.69	2.87	0.54	52.76	2.45	0.49
Bone	53.86	6.50	0.72	57.66	6.24	0.65	47.58	6.94	0.84
Skin melanoma	86.62	0.64	0.52	85.41	0.27	0.54	91.49	2.13	0.41
Breast	87.88	0.87	0.24	88.46	0.75	0.23	85.19	1.40	0.29
Cervix	86.72	1.19	0.25	86.49	1.05	0.24	87.23	1.50	0.28
Uterus	84.17	1.89	0.33	87.51	1.46	0.27	73.78	3.22	0.49
Ovary	79.40	1.55	0.43	80.19	1.65	0.45	76.38	1.16	0.38
Prostate	71.17	1.70	0.42	72.07	1.45	0.40	63.08	3.97	0.65
Testis	82.57	0.00	0.19	82.23	0.00	0.17	84.09	0.00	0.25
Kidney	76.61	1.22	0.33	78.56	1.14	0.32	59.92	1.95	0.45
Bladder	77.97	1.84	0.39	79.62	1.84	0.38	70.15	1.83	0.47
Brain	51.01	3.41	0.60	57.40	2.90	0.54	34.48	4.75	0.76
Thyroid	89.73	0.37	0.08	90.13	0.34	0.08	87.51	0.58	0.11
Lymphoma	92.32	0.95	0.56	92.90	0.81	0.53	89.55	1.61	0.70
Leukemia	93.72	1.50	0.75	94.38	1.45	0.71	91.68	1.68	0.88
Other cancers	66.46	3.38	0.50	66.84	2.80	0.46	64.79	5.92	0.63
Total	67.23	3.14	0.63	68.96	3.03	0.60	62.91	3.43	0.71

Table 3 The incidence of cancer (ICD10:C00-C97) register in China in 2009

Areas	Genders	Cancer cases	Crude incidence ($1/10^5$)	ASIRC* ($1/10^5$)	ASIRW** ($1/10^5$)	Cumulative rate 0-74(%)
All areas	Both	244,366	285.91	146.87	191.72	22.08
	Male	137,462	317.97	165.92	220.33	25.68
	Female	106,904	253.09	129.49	166.04	18.64
Urban	Both	174,418	303.39	150.31	195.74	22.23
	Male	95,705	330.19	165.50	219.84	25.25
	Female	78,713	276.15	137.09	175.03	19.44
Rural	Both	69,948	249.98	139.68	182.88	21.76
	Male	41,757	293.10	166.94	220.94	26.65
	Female	28,191	205.25	113.07	146.24	16.83

*Age-standardized incidence rate (China population); **Age-standardized incidence rate (World population)

Table 4 Age-specific incidence rate for all cancers (ICD10:C00-C97) in cancer registration areas in 2009 ($1/10^5$)

Age groups	All areas			Urban			Rural		
	Both	Male	Female	Both	Male	Female	Both	Male	Female
Total	285.91	317.97	253.09	303.39	330.19	276.15	249.98	293.10	205.25
0-	14.84	13.45	16.39	19.52	17.41	21.84	7.21	7.13	7.29
1-	13.72	15.93	11.25	17.08	19.76	14.14	8.26	9.85	6.42
5-	7.06	7.42	6.66	8.68	8.69	8.66	4.79	5.65	3.82
10-	7.79	8.53	6.98	9.31	10.13	8.43	5.69	6.35	4.95
15-	11.35	11.88	10.79	11.63	11.85	11.40	10.84	11.93	9.66
20-	16.45	14.69	18.32	17.53	15.25	19.98	13.85	13.31	14.40
25-	26.97	20.97	33.20	30.99	23.11	39.19	17.92	16.10	19.79
30-	47.96	36.44	59.68	56.32	40.51	72.35	32.79	29.08	36.59
35-	87.07	69.42	104.94	93.01	70.83	115.36	75.27	66.62	84.09
40-	154.53	129.54	180.03	160.50	127.28	194.29	142.54	134.06	151.24
45-	242.12	219.47	265.60	258.82	225.01	294.03	204.43	206.89	201.89
50-	394.78	410.88	378.17	397.66	397.39	397.94	387.43	444.91	327.38
55-	544.27	618.08	469.99	532.91	590.48	475.99	571.44	682.07	455.18
60-	708.64	852.04	564.77	676.21	803.12	551.87	778.69	953.84	593.72
65-	906.78	1,138.27	680.68	910.72	1,129.70	702.82	898.92	1,154.64	634.66
70-	1,245.46	1,583.13	935.09	1,264.31	1,578.32	980.66	1,200.13	1,594.34	822.40
75-	1,511.13	1,965.73	1,107.20	1,564.46	2,019.92	1,155.87	1,372.63	1,822.38	982.80
80-	1,635.25	2,178.17	1,204.36	1,745.02	2,311.08	1,284.78	1,357.54	1,825.34	1,008.41
85-	1,397.50	2,008.61	1,010.75	1,531.08	2,192.74	1,101.64	1,049.00	1,500.23	781.80

Table 5 Cancer mortality in cancer registration areas in 2009

Area	Sex	Deaths	Mortality rate ($1/10^5$)	ASMRC* ($1/10^5$)	ASMRW** ($1/10^5$)	Cumulative rate 0-74 (%)
All areas	Both	154,310	180.54	85.06	115.65	12.94
	Male	96,927	224.20	110.89	151.69	16.94
	Female	57,383	135.85	60.53	82.18	9.06
Urban	Both	104,551	181.86	80.86	110.57	12.12
	Male	64,768	223.45	104.57	143.96	15.71
	Female	39,783	139.57	58.61	80.00	8.69
Rural	Both	49,759	177.83	94.40	126.73	14.78
	Male	32,159	225.73	124.60	168.01	19.62
	Female	17,600	128.14	64.93	87.08	9.89

*Age-standardized mortality rate (China population); **Age-standardized mortality rate (World population)

common cancer of death cause accounted for 84.27% of all cancer death. 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, colon-rectum cancer and breast cancer (*Table 8*).

Cancer incidence of the 10 most common cancers in urban areas

In urban areas, lung cancer was the most frequently diagnosed cancers, followed by colorectal cancer, stomach cancer, breast cancer and liver cancer. The 10 most common cancer accounted for 73.93% (82.26% in males and 75.93%

Table 6 Age-specific mortality in cancer registration areas in 2009 ($1/10^5$)

Age group	All areas			Urban			Rural		
	Both	Male	Female	Both	Male	Female	Both	Male	Female
Total	180.54	224.20	135.85	181.86	223.45	139.57	177.83	225.73	128.14
0-	4.84	4.28	5.46	5.99	4.98	7.10	2.97	3.17	2.73
1-	5.34	5.54	5.12	5.67	5.87	5.46	4.80	5.01	4.55
5-	3.29	3.74	2.80	3.27	3.62	2.89	3.33	3.90	2.69
10-	3.55	4.16	2.89	3.90	4.81	2.91	3.08	3.28	2.86
15-	4.94	6.26	3.53	4.25	5.54	2.91	6.21	7.58	4.72
20-	5.41	6.52	4.24	4.86	5.96	3.68	6.74	7.90	5.55
25-	7.11	7.73	6.47	6.44	6.92	5.94	8.62	9.56	7.66
30-	13.82	15.88	11.72	13.54	14.93	12.13	14.32	17.60	10.97
35-	29.75	34.14	25.30	28.00	31.35	24.61	33.23	39.65	26.68
40-	59.81	72.29	47.06	53.54	63.25	43.66	72.40	90.39	53.92
45-	99.07	124.35	72.85	96.53	120.24	71.84	104.80	133.68	75.14
50-	187.82	242.65	131.28	176.03	228.63	122.06	217.83	278.00	154.95
55-	277.05	366.06	187.46	250.07	330.76	170.30	341.52	447.88	229.74
60-	403.54	532.88	273.77	357.27	473.64	243.24	503.47	656.16	342.23
65-	582.92	783.63	386.89	548.80	732.17	374.73	650.90	881.89	412.18
70-	905.10	1,182.75	649.90	871.53	1,114.49	652.06	985.79	1,341.92	644.56
75-	1,252.48	1,662.80	887.89	1,248.09	1,632.73	903.04	1,263.89	1,742.36	849.16
80-	1,576.77	2,087.30	1,171.58	1,621.38	2,119.42	1,216.45	1,463.91	2,002.06	1,062.26
85+	1,634.30	2,297.25	1,214.74	1,768.54	2,475.90	1,309.44	1,284.07	1,804.02	976.18

in females) of all cancers. The most common sites of cancer were lung, stomach, colon-rectum, liver and esophagus in males, while were breast, lung, colon-rectum, stomach and liver in females (*Table 9*).

Cancer mortality of the 10 most common cancers in urban areas

Lung cancer was the leading cause of cancer death in urban registration areas for both men and women. The top 10 cancers accounted for 82.38% (86.86% for males and 79.97% for females) of all mortality induced by malignant tumors. Other cancer types with high mortality in men were liver cancer, stomach cancer, colorectal cancer and esophageal cancer. In women, colorectal cancer was the second cause of cancer death, followed by stomach cancer, liver cancer and breast cancer (*Table 10*)

Cancer incidence of the 10 most common cancers in rural areas

Table 11 showed the 10 most common cancer incidence rate in rural areas. Stomach cancer was the most frequently diagnosed cancers, followed by lung cancer, esophagus cancer, liver cancer and colorectal cancer. The 10 most common cancers accounted for 84.73% (90.25% in males and 82.71% in females) of all registered new cases. The most common sites of cancer were stomach, lung, esophagus, liver and colon-rectum in males, while were stomach, lung, esophagus, breast and liver cancer in females.

Cancer mortality of the 10 most common cancers in rural areas

Lung cancer was the leading cause of cancer death in rural registration areas for both men and women. The 10 most common cancers of death accounted for 88.76% (92.10% in males and 85.89% in females) of all cancer mortality. The other cancer types with high mortality were liver cancer, stomach cancer, colorectal cancer and esophageal cancer in males, and lung cancer, colorectal cancer, stomach cancer, liver cancer and breast cancer in females (*Table 12*).

Discussion

The year of 2009 is the first year launched National Program of Cancer Registry by the Ministry of Health in

Table 7 Top 10 cancer incidence rates in cancer registration areas in 2009

Rank	Both				Male				Female			
	Site	Incidence rate ($1/10^5$)	%	ASIRC* ($1/10^5$)	Site	Incidence rate ($1/10^5$)	%	ASIRC* ($1/10^5$)	Site	Incidence rate ($1/10^5$)	%	ASIRC* ($1/10^5$)
1	Lung (C33-34)	53.57	18.74	25.34	Lung (C33-34)	70.40	22.14	34.75	Breast (C50)	42.55	16.81	23.16
2	Stomach (C16)	36.21	12.67	17.85	Stomach (C16)	49.61	15.60	25.37	Lung (C33-34)	36.34	14.36	16.41
3	Colon, rectum (C18-21)	29.44	10.30	14.21	Liver (C22)	41.99	13.21	22.49	Colon, rectum (C18-21)	26.42	10.44	12.29
4	Liver (C22)	28.71	10.04	14.78	Colon, rectum (C18-21)	32.38	10.18	16.23	Stomach (C16)	22.50	8.89	10.62
5	Esophagus (C15)	22.14	7.74	10.88	Esophagus (C15)	30.44	9.57	15.62	Liver (C22)	15.11	5.97	7.11
6	Breast (C50)	21.21	7.42	11.64	Prostate (C61)	9.92	3.12	4.34	Esophagus (C15)	13.64	5.39	6.27
7	Pancreas (C25)	7.28	2.55	3.35	Bladder (C67)	9.78	3.08	4.70	Cervix (C53)	12.96	5.12	7.42
8	Lymphoma (C81-85, 88, 90, 96)	6.68	2.34	3.75	Pancreas (C25)	8.24	2.59	4.01	Thyroid (C73)	10.09	3.99	6.50
9	Bladder (C67)	6.61	2.31	3.03	Lymphoma	7.71	2.42	4.46	Uterus (C54-55)	8.77	3.46	4.69
10	Thyroid (C73)	6.56	2.29	4.21	Kidney (C64-66, 68)	7.07	2.22	3.82	Ovary (C56)	7.95	3.14	4.54
	Top 10	218.40	76.39	109.05	Top 10	267.55	84.14	135.81	Top 10	196.32	77.57	99.01

*Age-standardized incidence rate (China population)

Table 8 The 10 most common cancer mortality rates in cancer registration areas in 2009

Rank	Both				Male				Female			
	Site	Mortality rate ($1/10^5$)	%	ASMRC* ($1/10^5$)	Site	Mortality rate ($1/10^5$)	%	ASMRC* ($1/10^5$)	Site	Mortality rate ($1/10^5$)	%	ASMRC* ($1/10^5$)
1	lung	45.57	25.24	20.61	Lung	61.00	27.21	29.15	Lung	29.77	21.91	12.58
2	Liver	26.04	14.42	13.06	Liver	37.96	16.93	19.91	Stomach	16.91	12.45	7.19
3	Stomach	25.88	14.33	11.86	Stomach	34.64	15.45	16.79	Liver	13.84	10.19	6.28
4	Esophagus	16.77	9.29	7.75	Esophagus	23.29	10.39	11.42	Colon, rectum	12.69	9.34	5.09
5	Colon, rectum	14.23	7.88	6.15	Colon, rectum	15.73	7.02	7.28	Breast	10.24	7.54	4.94
6	Pancreas	6.61	3.66	2.98	Pancreas	7.45	3.32	3.59	Esophagus	10.11	7.44	4.22
7	Breast	5.13	2.84	2.52	lymphoma	5.00	2.23	3.43	Pancreas	5.75	4.23	2.41
8	Leukemia	4.28	2.37	2.88	Leukemia	4.59	2.05	2.37	Gallbladder	3.79	2.79	1.50
9	Brain	3.87	2.15	2.29	Prostate	4.19	1.87	1.58	Brain	3.55	2.61	1.99
10	Lymphoma	3.75	2.08	1.86	Brain	4.19	1.87	5.59	Leukemia	3.55	2.61	2.34
	Top 10	152.14	84.27	71.96	Top 10	198.04	88.33	98.11	Top 10	110.20	81.12	48.55

*Age-standardized mortality rate (China population)

Table 9 The 10 most common cancer incidence rates in urban areas in 2009

Rank	Both				Male				Female			
	Site	Incidence rate (1/10^5)	(%)	ASIRC* (1/10^5)	Site	Incidence rate (1/10^5)	(%)	ASIRC* (1/10^5)	Site	Incidence rate (1/10^5)	(%)	ASIRC* (1/10^5)
1	Lung	58.81	19.38	26.46	Lung	77.14	23.36	36.32	Breast	51.91	18.80	27.32
2	Colon, rectum	35.78	11.79	16.51	Stomach	40.93	12.40	19.91	Lung	40.17	14.55	17.22
3	Stomach	30.20	9.95	14.15	Liver	39.42	11.94	20.32	Colon, rectum	32.15	11.64	14.29
4	Liver	26.63	8.78	13.13	Colon, rectum	39.35	11.92	18.89	Stomach	19.28	6.98	8.69
5	breast	25.94	8.55	13.79	Esophagus	21.24	6.43	10.46	Liver	13.62	4.93	6.05
6	Esophagus	14.21	4.68	6.65	Prostate	13.31	4.03	5.57	Cervix	13.35	4.83	7.58
7	Thyroid	8.25	2.72	5.21	Bladder	12.00	3.63	5.51	Thyroid	12.57	4.55	7.97
8	Lymphoma	8.21	2.70	4.47	Kidney	9.47	2.87	4.94	Uterus	9.83	3.56	5.09
9	Pancreas	8.19	2.70	3.59	Lymphoma	9.39	2.84	5.31	Ovary	9.37	3.39	5.15
10	Bladder	8.11	2.67	3.55	Pancreas	9.36	2.83	4.33	Brain	7.44	2.69	4.53
	Top 10	224.31	73.93	107.50	Top 10	271.61	82.26	131.58	Top 10	209.68	75.93	103.90

*Age-standardized incidence rate (China population)

Table 10 The 10 most common cancer mortality rates in urban areas in 2009

Rank	Both				Male				Female			
	Site	Mortality rate (1/10^5)	(%)	ASMRC* (1/10^5)	Site	Mortality rate (1/10^5)	(%)	ASMRC* (1/10^5)	Site	Mortality rate (1/10^5)	(%)	ASMRC* (1/10^5)
1	Lung	50.32	27.67	21.49	Lung	67.11	30.03	30.39	Lung	33.24	23.81	13.20
2	Liver	24.15	13.28	11.51	Liver	35.43	15.85	17.76	Colon, rectum	15.22	10.90	5.75
3	Stomach	21.15	11.63	9.07	Stomach	27.87	12.47	12.66	Stomach	14.31	10.26	5.74
4	Colon, rectum	17.09	9.40	6.98	Colon, rectum	18.94	8.48	8.31	Liver	12.69	9.09	5.39
5	Esophagus	10.59	5.82	4.65	Esophagus	15.80	7.07	7.39	Breast	11.94	8.55	5.41
6	Pancreas	7.42	4.08	3.19	Pancreas	8.43	3.77	3.87	Pancreas	6.40	4.58	2.54
7	Breast	5.99	3.29	2.78	Leukemia	5.33	2.39	3.45	Esophagus	5.30	3.80	2.04
8	Leukemia	4.56	2.50	2.91	Lymphoma	5.32	2.38	2.62	Gallbladder	4.57	3.28	1.71
9	Lymphoma	4.37	2.40	2.05	Prostate	5.30	2.37	1.86	Ovary	4.19	3.00	1.97
10	Gallbladder	4.18	2.30	1.68	Bladder	4.56	2.04	1.72	Leukemia	3.76	2.70	2.38
	Top 10	149.82	82.38	66.30	Top 10	194.10	86.86	90.02	Top 10	111.62	79.97	46.12

*Age-standardized mortality rate (China population)

China. There were 52 new cancer registries established on the basis of existed 43 registries, supported by central finance through the program. According to the requirement of data submission from NCCR, total 95 registries should submit cancer registration data of 2009 in 2012. Till June of 2012, there were 104 cancer registries submitted data, a great increase compared to last year. In the year of 2012, total 222 registries runs cancer registration, covering 200 millions of population, making the recent goal achieved. It is supposed the number of registries is going to increase in the coming years. NCCR would focus on improving data quality, as well as expand the coverage in order to

Table 11 The 10 most common cancer incidence rates in rural areas 2009

Rank	Both				Male				Female			
	Site	Incidence rate (1/10^5)	(%)	ASIRC* (1/10^5)	Site	Incidence rate (1/10^5)	(%)	ASIRC* (1/10^5)	Site	Incidence rate (1/10^5)	(%)	ASIRC* (1/10^5)
1	Stomach	48.57	19.43	26.31	Stomach	67.27	22.95	37.56	Stomach	29.17	14.21	15.12
2	Lung	42.80	17.12	22.69	Lung	56.68	19.34	31.08	Lung	28.39	13.83	14.49
3	Esophagus	38.44	15.38	20.57	Esophagus	49.18	16.78	27.22	Esophagus	27.31	13.31	13.97
4	Liver	32.98	13.19	18.52	Liver	47.24	16.12	27.33	Breast	23.12	11.27	13.69
5	Colon, rectum	16.40	6.56	8.89	Colon, rectum	18.20	6.21	10.17	Liver	18.19	8.86	9.57
6	Breast	11.51	4.60	6.84	Pancreas	5.97	2.04	3.26	Colon, rectum	14.53	7.08	7.63
7	Cervix	5.96	2.38	3.54	Brain	5.66	1.93	3.90	Cervix	12.14	5.92	7.18
8	Brain	5.49	2.20	3.67	Bladder	5.29	1.80	2.86	Uterus	6.55	3.19	3.77
9	Pancreas	5.41	2.16	2.81	Leukemia	4.77	1.63	4.00	Brain	5.32	2.59	3.43
10	Leukemia	4.25	1.70	3.41	Lymphoma	4.28	1.46	2.67	Ovary	5.02	2.45	3.15
	Top 10	211.81	84.73	117.25	Top 10	264.53	90.25	150.04	Top 10	169.76	82.71	92.01

[a]Age-standardized incidence rate (China population)

Table 12 The 10 most common cancer mortality rates in rural areas 2009

Rank	Both				Male				Female			
	Site	Mortality rate (1/10^5)	(%)	ASMRC* (1/10^5)	Site	Mortality rate (1/10^5)	(%)	ASMRC* (1/10^5)	Site	Mortality rate (1/10^5)	(%)	ASMRC* (1/10^5)
1	Lung	35.81	20.14	18.49	Lung	48.58	21.52	26.16	Lung	22.56	17.61	11.09
2	Stomach	35.60	20.02	18.25	Stomach	48.41	21.45	26.07	Stomach	22.31	17.41	10.63
3	Liver	29.91	16.82	16.54	Liver	43.11	19.10	24.65	Esophagus	20.09	15.68	9.39
4	Esophagus	29.47	16.57	14.91	Esophagus	38.51	17.06	20.57	Liver	16.23	12.66	8.34
5	Colon, rectum	8.34	4.69	4.17	Colon, rectum	9.20	4.07	4.88	Colon, rectum	7.46	5.82	3.50
6	Pancreas	4.94	2.78	2.51	Pancreas	5.45	2.41	2.93	Breast	6.71	5.24	3.80
7	Brian	4.19	2.36	2.62	Brian	4.74	2.10	3.02	Pancreas	4.41	3.44	2.10
8	Leukemia	3.72	2.09	2.82	Leukemia	4.32	1.91	3.35	Brain	3.63	2.83	2.23
9	Breast	3.36	1.89	1.92	Lymphoma	3.10	1.37	1.80	Cervix	3.42	2.67	1.88
10	Lymphoma	2.48	1.40	1.40	Bladder	2.49	1.10	1.21	Uterus	3.23	2.52	1.73
	Top 10	157.84	88.76	83.65	Top 10	207.90	92.10	114.64	Top 10	110.05	85.89	54.69

*Age-standardized mortality rate (China population)

build up cancer surveillance system nationwide laying the foundations for cancer control.

To ensure accepted data valid, NCCR processes the data carefully based on the national criteria issued in program protocol. The incidence, mortality and population have to be reasonable compared with the levels in similar situation, for example, location, socioeconomic status and lifestyle. The indicators of completeness and invalidity, such as MV%, DCO%, M/I ratio, UB% and O&U% were evaluated for every registry's data. Through the double evaluations in provincial and national level, 72 registries were identified qualified, and 32 were invalid. The valid data were pooled and analyzed to be the final result of annual report in 2009.

The statistics showing cancer incidence and mortality in 2009 were very close to the figures in 2008 (6). Although the included registries were quite different with the ones in last year, the overall incidence and mortality are reasonably

stable, indicating that the pooled data was valid and could represent national cancer burden in national level. The representativeness of cancer registry in different groups, such as urban, rural, region, should be evaluated (7).

The cancer patterns are quite different between urban and rural areas in China (8). In urban areas, lung cancer, female breast cancer and colorectal cancer are major cancers with higher incidence rates than in rural areas. However, cancers from digestive system, such as, esophageal cancer, stomach cancer and liver cancer are common cancers in rural areas. Overall cancer incidence in urban areas is higher and mortality is lower than those in rural areas (8,9). The difference is due to limitation of medical resources, relative low level of cancer diagnosis and treatment, and lack of health education in counties. In urban areas, the cancer spectrum is tending to the characteristics of developed countries. The burdens of lung cancer, colorectal cancer and female breast cancer keep increasing. Cancer in rural areas still remains the cancer patterns of developing countries. Thus, the emphasis of cancer control should concern the differences and implement efficient strategies based on the results of cancer surveillance.

So far, Ministry of Health is working on action plan on prevention and control for non-communicable diseases in the twelfth 5 years. Cancer is one of the major diseases seriously threatening people's health in China. The emphasis in rural areas would focus on professional training in primary care centers, health education/promotion, early diagnosis/treatment, especially, for common cancers in rural areas, such as esophageal cancer, stomach cancer, cervical cancer and liver cancer. In cities, behavioral intervention, such as tobacco control and healthy lifestyle, should be enhanced and cancer screening on high risk groups should be carried out in order to achieve the goal of reducing cancer mortality in the short period.

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