

## ORIGINAL ARTICLE

**Female breast cancer incidence and mortality in China, 2013**

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**Abstract**

**Background:** Breast cancer is the most common cancer among women. Population-based cancer registration data from the National Central Cancer Registry were used to analyze and evaluate the incidence and mortality rates in China in 2013, providing scientific information for cancer prevention and control.

**Methods:** Pooled data were stratified by area (urban/rural), gender, and age group. National new cases and deaths were estimated using age-specific rates and the corresponding population in 2013. The Chinese population in 2000 and Segi's world population were used to calculate age-standardized rates.

**Results:** The estimated number of new breast cancer cases was about 278 800 in China in 2013. The crude incidence, age-standardized rate of incidence by Chinese standard population, and age-standardized rate of incidence by world standard population were 42.02/100 000, 30.41/100 000, and 28.42/100 000, respectively. The estimated number of breast cancer deaths was about 64 600 in China in 2013. The crude mortality, age-standardized rate of mortality by Chinese standard population, and age-standardized rate of mortality by world standard population were 9.74/100 000, 6.54/100 000, and 6.34/100 000, respectively. Both incidence and mortality were higher in urban than in rural areas. Age-specific breast cancer incidence significantly increased with age, particularly after age 20, and peaked at 50–55 years, while age-specific mortality increased rapidly after 25 years, peaking at 85+ years.

**Conclusions:** Breast cancer is the most common cancer in Chinese women, especially women in urban areas. Comprehensive measures are needed to reduce the heavy burden of breast cancer.

**Introduction**

Breast cancer is the most common cancer and the fifth most common cause of death among women in the world. According to GLOBOCAN 2012, it was estimated that there were 1.67 million new cases and 0.52 million deaths from breast cancer in 2012, accounting for 25.1% of all new cancer cases and 14.7% of all cancer deaths in women, respectively.<sup>1</sup> In China, an estimated 268 600 women were diagnosed and 69 500 died of breast cancer in 2015, accounting for 15.1% of all new cancer cases and 6.9% of all cancer deaths in women, respectively.<sup>2</sup>

In this study, an overview of the breast cancer epidemic was conducted, using 2013 statistics for analysis, including estimated incidence and mortality rates by area and age

group. These statistics provide basic information for policy-makers to implement scientific strategies for breast cancer prevention and control.

**Methods****Incidence and mortality data**

The National Central Cancer Registry (NCCR) is responsible for cancer data collection, evaluation, and publication from local population-based cancer registries. Cancer information is reported to registries from local hospitals and community health centers, including Basic Medical Insurance for Urban Residents and the New-Rural

Cooperative Medical System. The Vital Statistical Database was linked with the cancer incidence database to identify cases with a death certificate only (DCO) and follow-up. By 1 June 2016, 347 cancer registries (126 cities, 221 counties) from 31 provinces had submitted 2013 data to NCCR, accounting for 21.11% of the national population. After data quality evaluation, 255 population-based cancer registries distributed over 29 provinces (88 cities, 167 counties) were selected for this study, including 114 860 339 men and 111 634 151 women, accounting for 16.65% of the national population. All cancer cases were classified according to the International Classification of Diseases for Oncology, third edition (ICD-O-3) and the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10). Invasive cases of breast cancer (ICD10: C50) were extracted and analyzed from the overall cancer database.

### Population data

The population was estimated based on fifth and sixth National Population Census data provided by the National Statistics Bureau of China, taking into account changes in age composition, gender ratio, and the proportion of urban and rural transformation released by the National Bureau of Statistics (<http://data.stats.gov.cn/>). The 2013 national population was stratified by area (urban/rural), gender, and 19 age groups (0–, 1–4, 5–84 by 5 years, 85+ years). Changes in age-specific death probability were also adjusted for when calculating the population. Linear changes were assumed in each age group between the fifth and sixth population censuses.

### Statistical analysis

Incidence and death, proportions, crude, standardized, accumulated, truncated, and age-specific incidence and mortality rates were calculated by area, gender and age group. The number of new cases and deaths were estimated using the five-year age-specific cancer incidence/mortality rates and the corresponding populations. The Chinese population in 2000 and Segi's world population were used to calculate age-standardized rates. The cumulative risk of developing or dying from cancer before 75 years of age (in the absence of competing causes of death) was calculated and presented as a percentage. Software including MS-Excel, IARCcrgTools 2.05 issued by International Agency for Research on Cancer (IARC) and International Association of Cancer Registries (IACR) were used for data checking and evaluation. SAS version 9.2 (SAS Institute, Cary, NC, USA) was used to calculate incidence and mortality rates.

**Table 1** The quality control index of breast cancer in China in 2013

Areas	M/I	MV%	DOC%	UB%
All	0.24	87.94	0.41	0.28
Urban areas	0.23	88.88	0.42	0.27
Rural areas	0.26	86.41	0.40	0.30

DOC, death certificate only; M/I, mortality to incidence; MV, morphological verification; UB, unknown basis of diagnosis.

### Results

A total of 255 population-based cancer registries with qualified cancer statistics were selected for this study. The percentage of morphological verification (MV%), DCO%, mortality to incidence (M/I) ratio, and percentage of unknown basis of diagnosis (UB%) of breast cancer in 2013 were 87.94%, 0.41%, 0.24, and 0.28, respectively. In urban areas, the MV%, DCO%, M/I ratio, and UB% were 88.88%, 0.42%, 0.23, and 0.27, respectively. In rural areas, they were 86.41%, 0.40%, 0.26 and 0.30 (Table 1).

### Incidence

The number of new breast cancer cases was estimated at about 278 800, accounting for 17.07% of all new cancer cases, making breast cancer the most common female cancer in China in 2013. The crude incidence, age-standardized rate of incidence by Chinese standard population (ASRIC), and age-standardized rate of incidence by world standard population (ASRIW) of breast cancer were 42.02/100 000, 30.41/100 000, and 28.42/100 000, respectively. In patients aged 0–74, the cumulative incidence rate was 3.07%, while for those aged 35–64, the truncated age-standardized rate of the incidence by Segi's world standard population (T-ASRIW) was 71.42/100 000 (Table 2).

The estimated number of new breast cancer cases in urban areas in 2013 was about 184 900, accounting for 19.32% of all new cancer cases. The crude incidence, ASRIC, and ASRIW in urban areas were 51.65/100 000, 35.55/100 000, and 33.36/100 000, respectively. The cumulative incidence rate was 3.64% and the T-ASRIW was 82.60/100 000. The estimated number of new breast cancer cases in rural areas in 2013 was about 93 900, accounting for 13.88% of all new cancer cases. The crude incidence, ASRIC, and ASRIW in rural areas were 30.73/100 000, 23.72/100 000, and 22.07/100 000, respectively (Table 2). Breast cancer was the most common and the second most common female cancer in urban and rural areas in China in 2013, respectively. The incidence rate was higher in urban than in rural areas.

In 2013, the age-specific incidence of breast cancer in China was low in women aged under 30 years, but then rapidly increased, peaking at 55–60 years (Table 3).

**Table 2** Breast cancer incidence in China in 2013

Areas	Cases ( $n \times 10^4$ )	Crude rate (1/10 <sup>5</sup> )	Ratio (%)	ASRIC (1/10 <sup>5</sup> )	ASRIW (1/10 <sup>5</sup> )	Cumulative rate 0–74 (%)	TASR 35–64 (1/10 <sup>5</sup> )	Rank
All	27.88	42.02	17.07	30.41	28.42	3.07	71.42	1
Urban areas	18.49	51.65	19.32	35.55	33.36	3.64	82.60	1
Rural areas	9.39	30.73	13.88	23.72	22.07	2.36	56.75	2

ASRIC, age-standardized rate (using China standard population, 2000); ASRIW, age-standardized rate (using World standard population); TASR, truncated age-standardized rate (using World standard population).

**Table 3** Age specific incidence rate of breast cancer in China in 2013 (1/100 000)

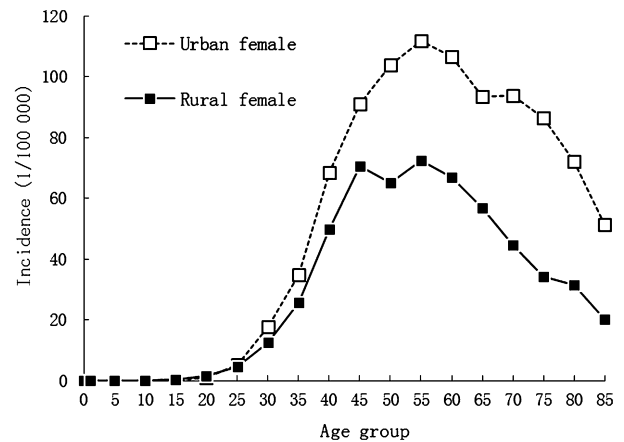
Age group	All areas	Urban areas	Rural areas
All	42.02	51.65	30.73
0	0.00	0.00	0.00
1	0.00	0.00	0.00
5	0.02	0.00	0.03
10	0.08	0.05	0.10
15	0.25	0.25	0.26
20	1.19	0.89	1.43
25	4.97	5.28	4.70
30	15.77	17.73	12.48
35	31.03	34.73	25.57
40	60.69	68.60	49.74
45	82.02	91.12	70.72
50	87.91	104.04	65.12
55	94.70	111.75	72.35
60	88.32	106.71	67.03
65	76.26	93.46	56.97
70	71.73	93.95	44.53
75	63.56	86.43	34.31
80	53.69	72.27	31.48
85	36.99	51.25	20.11

Among different regions, the age-specific incidence rates varied with a similar curve. In urban areas, incidence peaked at 55–60 years, while in rural areas incidence was higher at 45–50 and 55–60 years than in the other age groups. The age-specific incidence rate was significantly higher in urban than in rural areas in most age groups (Fig 1).

## Mortality

The estimated number of cancer deaths was about 64 600, accounting for 7.85% of all cancer deaths, making breast cancer the fifth most common cause of cancer death in China in 2013. The crude mortality, ASRMC, and ASRMW of breast cancer were 9.74/100 000, 6.54/100 000, and 6.34/100 000, respectively. In patients aged 0–74 years, the cumulative mortality rate was 0.70%, while for those aged 35–64, the truncated ASRMW (T-ASRMW) was 13.29/100 000 (Table 3).

Breast cancer deaths in urban areas were estimated at about 40 100, accounting for 9.00% of all cancer deaths.

**Figure 1** Breast cancer incidence in China in 2013.

The crude mortality, ASRMC, and ASRMW in urban areas were 11.19/100 000, 7.14/100 000, and 6.96/100 000, respectively. Breast cancer deaths in rural areas were estimated at about 24 600, accounting for 6.50% of all cancer deaths. The crude mortality, ASRMC, and ASRMW in rural areas were 8.05/100 000, 5.80/100 000, and 5.59/100 000, respectively (Table 4). Breast cancer was the fourth and the sixth most common cause of female cancer death in urban and rural areas in 2013 in China, respectively.

In 2013, the age-specific mortality of breast cancer in China was similar to age-specific incidence: it was low in women aged under 35 years, and rapidly increased, peaking at age 85+ (Table 5). The age-specific mortality rates were similar among different regions. In urban areas, the mortality rate increased rapidly after the age of 35 and peaked at 85+ years; in rural areas, the mortality rate increased rapidly after the age of 35, but only gradually increased after the age of 55. The mortality rate was higher in rural than in urban areas in most age groups (Fig 2).

## Discussion

This study provides the most up-to-date information of breast cancer based on 257 population-based cancer registries in China. In 2013, breast cancer was the most

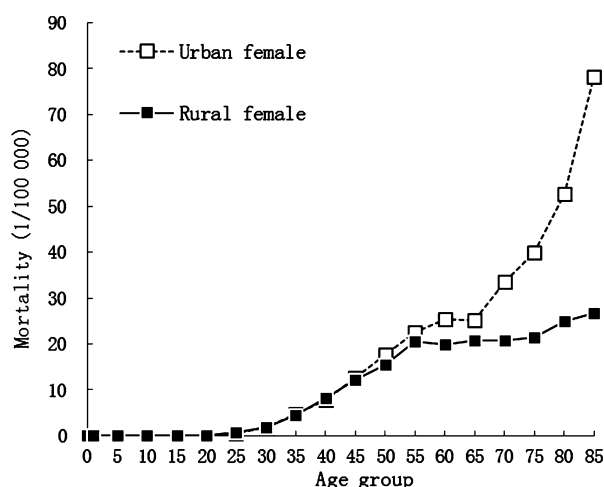
**Table 4** Breast cancer mortality in China in 2013

Areas	Cases ( $n \times 10^4$ )	Crude rate (1/10 <sup>5</sup> )	Ratio (%)	ASRMC (1/10 <sup>5</sup> )	ASRMW (1/10 <sup>5</sup> )	Cumulative rate 0–74(%)	TASR 35–64(1/10 <sup>5</sup> )	Rank
All	6.46	9.74	7.85	6.54	6.34	0.70	13.29	5
Urban areas	4.01	11.19	9.00	7.14	6.96	0.76	13.89	4
Rural areas	2.46	8.05	6.50	5.80	5.59	0.63	12.54	6

ASRMC, age-standardized rate (using China standard population, 2000); ASRMW, age-standardized rate (using World standard population); TASR, truncated age-standardized rate (using World standard population).

**Table 5** Age specific mortality of breast cancer in China in 2013 (1/100 000)

Age group	All areas	Urban areas	Rural areas
ALL	9.74	11.19	8.05
0	0.00	0.00	0.00
1	0.03	0.05	0.00
5	0.02	0.00	0.03
10	0.00	0.00	0.00
15	0.03	0.00	0.06
20	0.13	0.16	0.11
25	0.61	0.58	0.64
30	1.87	1.81	1.95
35	4.64	4.77	4.45
40	7.99	7.86	8.17
45	12.41	12.53	12.26
50	16.76	17.68	15.47
55	21.69	22.54	20.59
60	22.83	25.31	19.95
65	23.13	25.15	20.87
70	27.81	33.60	20.72
75	31.85	39.96	21.48
80	40.05	52.61	25.04
85	54.64	78.15	26.81

**Figure 2** Breast cancer mortality in China in 2013.

common cancer and the fifth leading cause of cancer death in women. Both incidence and mortality rates were higher in urban than in rural areas.

Breast cancer is the most common cancer in women the world. It is the most common cause of cancer death in women in less developed regions, but is now also the second most common cause of cancer death (after lung cancer) in women in developed regions.<sup>1</sup> According to GLOBOCAN 2012, the ASRIW and ASRMW in 2012 were 43.1/100 000 and 12.9/100 000, respectively. The corresponding rates in China were relatively lower, at 22.1/100 000 and 5.4/100 000, respectively.<sup>1</sup> However, the trend shows that both incidence and mortality rates have increased in recent years.<sup>2</sup> Emphasis on the prevention of breast cancer risk factors and implementation of effective cancer screening is still required.

The incidence and mortality rates of breast cancer were higher in urban than in rural areas, similar to results of previous studies.<sup>3,4</sup> High education level, high body mass index, psychological depression, and a high intake of milk products are risk factors for breast cancer in urban areas.<sup>5</sup> With the rapid development of society and the growth of urbanization, more and more people are inclined to lead sedentary lifestyles with increasingly westernized dietary habits.<sup>6</sup> The prevalence of obesity was significantly higher in urban than rural areas for several years in China, which may have had an impact on the high incidence rate in urban areas.<sup>7</sup> Furthermore, the inequality in healthcare services and the differences in medical-care-seeking behavior between urban and rural areas may also contribute to the different incidence rates. The gap between mortality rates in urban and rural areas was much smaller, likely the result of the more favorable healthcare access system and much higher survival rates.<sup>8</sup> The difference in incidence between urban and rural areas is a reminder to women in urban areas to perform breast self-exams regularly and to avoid contact with behavior-related risk factors.

The incidence rate increased rapidly after the age of 30 and reached a peak at 55–59. Breast cancer screening is a critical approach to reduce both incidence and mortality rates by detecting precancerous lesions in women of child-bearing age; women diagnosed through screening are always detected at more favorable cancer stages.<sup>9</sup> Breast cancer screening has been extensively implemented in developed countries.<sup>10,11</sup> According to a United States Preventive Services Task Force review, breast cancer mortality

is generally reduced with mammography screening and advanced cancer is reduced by screening in women 50 years or older.<sup>12</sup> In 2009–2011 and 2012–2014, a “two-cancer” (breast cancer and cervical cancer) screening program was implemented for women aged 35–59 and 35–64 years, respectively, in rural China, and in some urban areas, such as Beijing, breast cancer screening on the resident child-bearing aged population was also conducted.<sup>13</sup> However, considering the high breast tissue density in Chinese women<sup>14</sup> and the inequality of resource allocation in China, large-scale population-based randomized controlled trials are required to evaluate the effectiveness of mammography, ultrasonography, and breast palpation methods for the examination of Chinese women nationwide.

Updated registration data on breast cancer incidence and mortality provides basic information for cancer surveillance. Breast cancer is the most common cancer in women in China. Although breast cancer incidence and mortality rates in China are not excessively high compared with world rates, the burden of this disease is heavy relative to the large Chinese population. As evidenced by the high incidence rates relatively low mortality rates, breast cancer is the most prevalent cancer in China.<sup>15</sup> Comprehensive control measures, such as a healthy diet and lifestyle, high-quality screening, and improved medical services may play an important role in control of the disease. More resources need to be directed to women of childbearing age in urban areas.

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## Disclosure

No authors report any conflict of interest.

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