



## Incidence and mortality of gastric cancer in China

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### Abstract

Gastric cancer is one of the most frequent cancers in the world; almost two-thirds of gastric cancer cases and deaths occur in less developed regions. In China, based on two national mortality surveys conducted in 1970s and 1990s, there is an obvious clustering of geographical distribution of gastric cancer in the country, with the high mortality being mostly located in rural areas, especially in Gansu, Henan, Hebei, Shanxi and Shaanxi Provinces in the middle-western part of China. Despite a slight increase from the 1970s to early 1990s, remarkable declines in gastric cancer mortality were noticed in almost the entire population during the last decade in China. These declines were largely due to the dramatic improvements in the social-economic environment, lifestyle, nutrition, education and health care system after economic reforms started two decades ago. Nevertheless, gastric cancer will remain a significant cancer burden currently and be one of the key issues in cancer prevention and control strategy in China. It was predicted that, in 2005, 0.3 million deaths and 0.4 million new cases from gastric cancer would rank the third most common cancer. The essential package of the prevention and control strategy for gastric cancer in China would focus on controlling *Helicobacter pylori* (*H. pylori*) infection, improving educational levels, advocating healthy diet and anti-tobacco campaign, searching for cost-effective early detection, diagnosis and treatment programs including approaches for curable management and palliative care.

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**Key words:** Gastric cancer; Incidence; Mortality

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### GASTRIC CANCER IN THE WORLD

Gastric cancer is one of the most frequent cancers in the world, in both men and women. In the year 2002, the age standardized incidence rate was 22.0 per 100 000 in men, and 10.4 per 100 000 in women, and mortality rate was 16.3 per 100 000 in men, and 7.9 per 100 000 in women, according to the latest global estimation-GLOBOCAN 2002<sup>[1]</sup>. Despite a marked decrease, especially in mortality rate in many countries, the absolute number of gastric cancer cases and deaths is still a big burden of the local health program, since the world population and life expectancy are increasing. In 2002, it was estimated that there were 0.9 million new gastric cancer cases (0.60 million in men and 0.33 million in women) and 0.7 million deaths (0.45 million in men and 0.25 in women) from gastric cancer in the world. In men, gastric cancer ranks the third among the commonest cancers in incidence rate (after cancers of lung and prostate) and the second in mortality rate (after lung cancer), while in women, it is the fifth most common cancer in incidence and the fourth in mortality (after cancers of breast, cervix, lung and/or colon-rectum)<sup>[1]</sup>.

In terms of geographic distribution, almost two-thirds of gastric cancer cases and deaths occur in less developed regions. High rates apply to Japan, China, Korea, Central and South America, Eastern Europe, and parts of the Middle East, and low rates to North America, Australia and New Zealand, Northern Europe, and India<sup>[1,2]</sup>. Five-year relative survivals of around 20% or less are frequently reported. The incidence ratios of men to women generally range between 1.5 and 2.5, with higher ratios for intestinal than diffuse cancers and in high-risk populations<sup>[2]</sup>.

### NATIONAL GASTRIC CANCER MORTALITY PATTERN IN THE 1970s AND 1990s

In China, two national mortality surveys were conducted in 1973-1975 and 1990-1992, respectively, both organized by the National Office for Cancer Prevention of Control, the Ministry of Public Health, China. These two surveys showed the detail pattern and distribution of mortality rates for cancers in China at that time<sup>[3-7]</sup>. The first mortality survey was a nation-wide study. An atlas was published based on the survey results<sup>[4]</sup>, providing a visual geographic distribution of gastric cancer profile in early 1970s. A map of the gastric cancer mortality distribution for males is shown in (Figure 1) as an example. An obvious clustering of geographical distribution of gastric cancer appears in China, with the high mortality

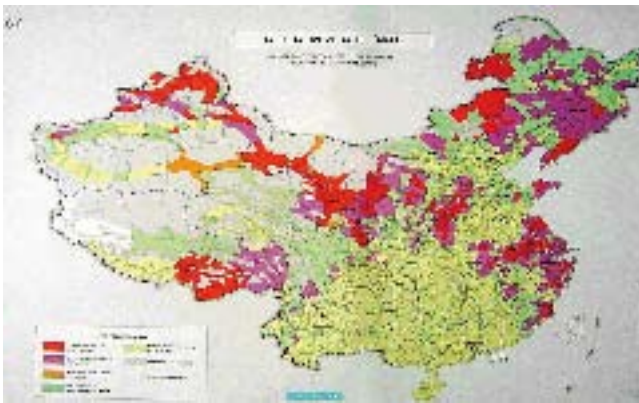


Figure 1 Mortality rates of gastric cancer in men in China, 1973-1975<sup>[4]</sup>.

Table 2 Changes in the age-standardized mortality rates of gastric cancer between 1973 and 1975 and between 1990 and 1992 in China (rate per 100 000)

Area	Year 1973-1975			Year 1990-1992			Changes (%)		
	Men	Women	Total	Men	Women	Total	Men	Women	Total
Whole country	27.1	13.0	19.8	30.1	13.8	21.8	11.0	6.3	10.0
Urban	27.3	13.3	20.1	21.2	9.8	15.3	-22.2	-26.7	-23.8
Rural	26.7	12.6	19.4	33.7	15.4	24.4	26.4	22.1	25.8

being mostly located in the north (Liaodong Peninsula, Shandong Peninsula, Yangtze River Delta and middle-western provinces along Taihang Mountain and 'Hexi Zoulang').

The second mortality survey covered 10% of the whole population that proved as a representative sample to reflect national cancer profile<sup>[5-7]</sup>. The crude mortality rate of gastric cancer in China was 25.2 per 100 000 (32.8 per 100 000 in men and 17.0 per 100 000 in women), which accounted for 23.2% of the total cancer deaths in 1990-1992, making gastric cancer the first leading cause of cancer death<sup>[8]</sup>. The geographic variety in the distribution was similar to that in the first survey in the 1970s. Table 1 shows the first 20 areas with high mortality rates for the gastric cancer (rates adjusted by the 1982 national census population). Most of these high-risk areas are located in rural areas, especially in Gansu, Henan, Hebei, Shanxi and Shaanxi Provinces in the middle-western part of China.

By comparing the above two national mortality surveys, an increasing trend for the age-standardized mortality rates of gastric cancer was shown in the entire population in China during the two decades. Nevertheless, the increase only appeared in rural areas, while a decreasing trend was noticed in urban population<sup>[9,10]</sup> (Table 2). In terms of age-specific mortality rates, a decreasing trend was noticed among almost all age groups (except age group 70-79 years) in urban residents, while an increasing trend was seen among most of age groups (except age group 30-44 years) in rural areas<sup>[10]</sup>. Nevertheless, with almost two-thirds of the population reside in rural areas, gastric cancer was still the first most common cancer in the entire population in China during 1970s and early 1990s,

Table 1 The first 20 areas with high mortality rate for gastric cancer in China - according to the second national mortality survey in 1990-1992 (rate per 100 000)

Area	Rate	Area	Rate
Wuwei town, Gansu	117.78	Jiyuan town, Henan	66.59
Yangcheng county, Shanxi	104.01	Zhangye town, Gansu	64.43
Pingshun county, Shanxi	96.95	Jiaxian county, Shaanxi	64.36
Changle county, Fujian	93.38	Tianchang county, Anhui	63.04
Shexian county, Hebei	85.64	Tianzhu Tibet Autho county, Gansu	59.18
Lujiang county, Anhui	84.46	Putian county, Fujian	58.83
Zanghuang county, Hebei	77.67	Linxian county, Henan	58.56
Neixiang county, Henan	77.45	Wudu county, Gansu	58.54
Yuanqu county, Shanxi	74.22	Tianjian Dist., Fuzhou city, Fujian	57.52
Linze county, Gansu	66.69	Xianju county, Zhejiang	53.99

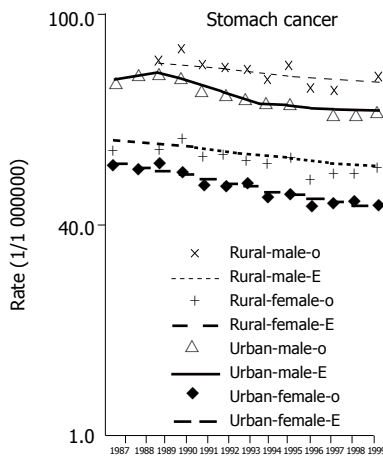
although it dropped to the third in urban areas.

In addition to the above two national mortality surveys, there were a few publications on gastric cancer mortality trends at local levels, either in big cities such as Beijing, Shanghai, or in high-risk areas such as in Henan and Hebei Provinces<sup>[11-14]</sup>. Similarly, the mortality rates of gastric cancer remain high although there was a slight decreasing trend during different time periods among those areas. Therefore, gastric cancer is still the major common cancer and a big burden for local health resources and facilities.

## GASTRIC CANCER INCIDENCE AND MORTALITY PATTERNS AT THE NATIONAL LEVEL IN RECENT YEARS

Based on a routine mortality reporting system, covering 10% of the Chinese population, from the Ministry of Public Health which was submitted to the World Health Organization<sup>[15]</sup>, the gastric cancer mortality trends in China were analyzed from 1987 to 1999, using the joinpoint model. The trends were further combined with the ratio of incidence to mortality from data in seven cancer registries in China that were published in the 8<sup>th</sup> edition of Cancer Incidence in Five Continents<sup>[16]</sup>, to estimate and project the mortality and incidence for gastric cancer in 2000 and 2005 (by site, age, sex and area) at the national level, using the log-linear regression model with Poisson distribution assumption. These results have been serially published recently<sup>[17-19]</sup>.

According to the data from the Center of Health Information Statistics (CHIS) under the Ministry of Public Health, gastric cancer mortality rates were higher in rural than urban areas, and in men than in women. During 1987-1999, slight but significant declines in mortality were noticed in almost the entire subpopulation (except in urban men before 1991) and for most age groups (except age group 15-34) in rural areas (Figures 2 and 3). In 2000, 0.3 million deaths and 0.4 million new cases were estimated for gastric cancer, similar to what was projected in 2005, while the latter had a slight decrease in men but increase in women (Table 3). In 2005, in terms of incidence rates, gastric cancer would rank the third among the most common cancers in China (after cancers of lung

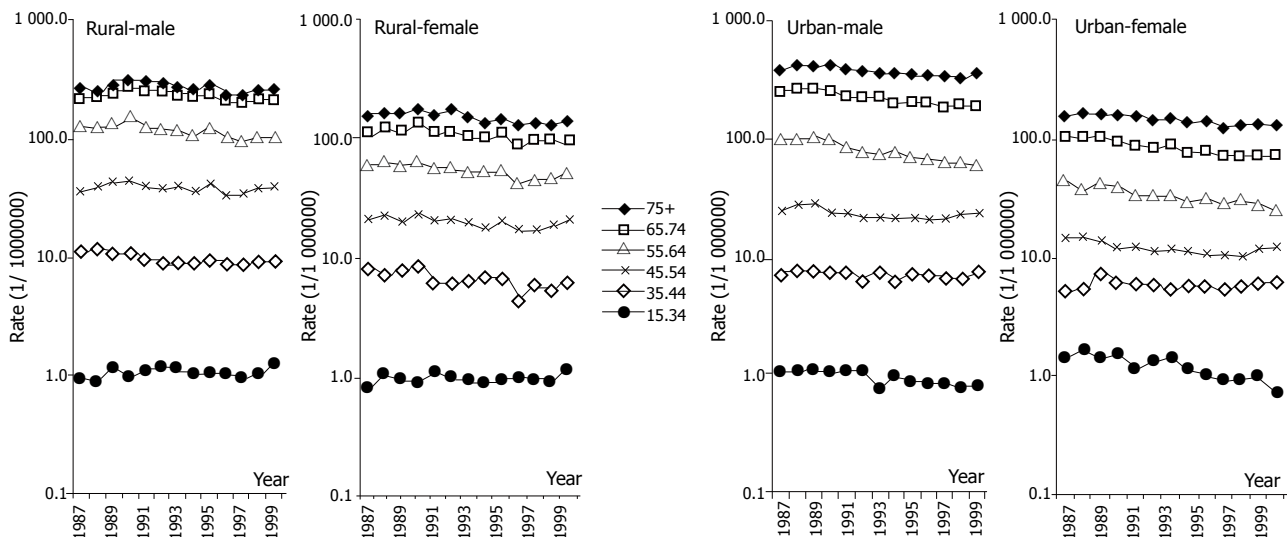


**Figure 2** Time trends for age-standardized mortality rates (both observed and expected by model) of gastric cancer during 1987-1999 in China, by areas (rural and urban) and sex (per 100 000)

**Table 3** Gastric cancer incidence and mortality in China in 2000 and 2005

	Men		Women	
	Year 2000	Year 2005	Year 2000	Year 2005
Mortality (per 100 000)				
rates				
Age 45-54	45.5	43.3	20.5	19.0
Age 55-64	109.4	89.4	46.6	40.1
Age 65-74	229.4	198.3	104.6	91.3
Age 75+	289.6	261.9	133.3	116.3
ASR <sup>1</sup>	32.7	28.8	15.0	13.3
Number of deaths	200 518	197 222	95 942	97 843
Incidence (per 100 000)				
rates				
Age 45-54	70	66.7	31.6	29.3
Age 55-64	145.7	119	62.1	53.4
Age 65-74	264.3	228.5	120.5	105.2
Age 75+	288.8	261.2	133	116
ASR <sup>1</sup>	41.9	37.1	19.5	17.4
Number of cases	256 256	253 110	121 485	123 883

<sup>1</sup>ASR: Age-standardized rate (adjusted by the world standard population).



**Figure 3** Time trends for age-specific mortality rates of gastric cancer during 1987-1999 in China, by areas (rural and urban) and sex, in CHIS data (rates per 100 000).

and liver in men and after cancers of breast and lung in women)<sup>[19]</sup>.

### FACTORS INFLUENCING THE GASTRIC CANCER PATTERN IN CHINA

Despite a slight increase from 1970s to early 1990s, remarkable declines in gastric cancer mortality were shown during the last decade in China. These declines were largely due to the dramatic improvements in the social-economic environment, lifestyle, nutrition, education and health care system after economic reforms started two decades ago. These include better socio-economic circumstances, higher educational levels, better refrigeration, reduced consumption of salted, smoked, and chemically preserved foods, eating more fruit and vegetables and remarkably improved sanitary conditions of the house and living standards, supplement intake nutrients such as vitamin C, vitamin E, beta-carotene, selenium and decreased intake of nitrosamine, which was strongly suspected as a major

risk factor for gastric cancer<sup>[20-31]</sup>. *H pylori* infection, which is defined by the World Health Organization as a definite gastric carcinogen, is linked to crowded living conditions, family size, sharing a bedroom, low socio-economic status, low educational level and poor sanitation, and infrequent hand washing before meals. The prevalence of *H pylori* infection has reduced dramatically due to the improved socio-economic status and lifestyle changes during last decades, especially among urban areas. In addition, widespread prescription of antibiotics may be responsible for reducing *H pylori* infection. Finally, some locally popular customs, such as drinking green tea, consuming tofu, and ginger have been suggested to have a possible protective effect on gastric cancer<sup>[32-35]</sup>.

However, huge demographic changes in China make the total number of incident cases and deaths from gastric cancer slightly declined in men between 2000 and 2005, while the number increased in women, despite the significant declining trends in rates among all age groups (Table 2)<sup>[17-19]</sup>.

## CONCLUSION

It is estimated that gastric cancer currently ranks the third among most common cancers, and will remain a significant cancer burden in China during the next decade. It will be, undoubtedly, one of the keys in cancer prevention and control strategy in China. The essential package would focus on controlling *H pylori* infection, improving educational levels, advocating healthy diet and anti-tobacco campaign, searching for cost-effective early detection, diagnosis and treatment programs including approaches for curable management and palliative care<sup>[56]</sup>.

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