

• ESOPHAGEAL CANCER •

# Epidemiology of gastroenterologic cancer in Henan Province, China

Jian-Bang Lu, Xi-Bin Sun, Di-Xin Dai, Shi-Kuan Zhu, Qiu-Ling Chang, Shu-Zheng Liu, Wen-Jie Duan

**Jian-Bang Lu, Xi-Bin Sun, Qiu-Ling Chang, Wen-Jie Duan,** Henan Cancer Research Institute, Zhengzhou 450003, Henan Province, China

**Di-Xin Dai, Shi-Kuan Zhu, Shu-Zheng Liu,** Henan Tumor Hospital, Zhengzhou 450003, Henan Province, China

**Supported by** the National Medical Science and Technique Foundation of China during the 9<sup>th</sup> Five-Year Plan Period, No.96-906-01-01 and Science Research Fund of Henan Province, No. 971200101

**Correspondence to:** Dr. Jian-Bang Lu, Department of Epidemiology, Henan Cancer Research Institute, Dongming Road 127, Zhengzhou 450003, Henna Province, China. hncjbl@sohu.com

**Telephone:** +86-371-5962654

**Received:** 2002-07-23 **Accepted:** 2002-10-17

## Abstract

**AIM:** To estimate the mortality rates of gastroenterologic cancers for the period between 1974 and 1999, in Henan Province, China and its epidemiologic features.

**METHODS:** Information on death of patients with cancer was provided by the county-city registries. Population data were provided by the local police bureau. All the deaths of cancer registered were classified according to the three-digit rubric of the ICD-9. Cancer mortality rates reported herein were age-adjusted, using the world population as standard and weighted piecewise linear regression analysis.

**RESULTS:** Total cancer age-adjusted mortality rates were 195.91 per 100 000 for males and 124.36 per 100 000 for females between 1996 and 1998. During the period of 1974-1999, a remarkable decrease took place in esophageal carcinoma, stomach cancer remained essentially stable and liver cancer, a moderate increase. Colorectal cancer was slightly increased over the last two decades.

**CONCLUSION:** The population-based cancer registry can give an accurate picture of cancer in Henan Province, by providing a set of analyses of selected cancer mortality data as a source of reference for researchers in cancer, public health and health care services.

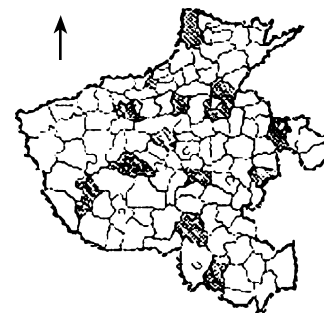
Lu JB, Sun XB, Dai DX, Zhu SK, Chang QL, Liu SZ, Duan WJ. Epidemiology of gastroenterologic cancer in Henan Province, China. *World J Gastroenterol* 2003; 9(11): 2400-2403  
<http://www.wjgnet.com/1007-9327/9/2400.asp>

## INTRODUCTION

China is one of the countries with the highest esophageal cancer and gastric cancer risk over the past century which is still the leading cause of deaths worldwide<sup>[1-9]</sup>. The aim of this study was to estimate the mortality of digestive tract cancers in Henan Province.

Promotion of cancer control programs requires accurate data on cancer incidence and mortality from population-based registries. In 1977, we reviewed all causes of death between

1974 and 1976 retrospectively and enlisted the participation in this survey of the 15 cancer registries from 1983 to 1999 in Henan Province which was inhabited with about 9 million people, one-tenth of the province's total population. The geographical locations of these units are shown in Figure 1.



**Figure 1** Geographical locations of the participating county and city registries of Henan Province, China.

## MATERIALS AND METHODS

Information on death of patients with cancer was provided by the county-city registries, that consisted of the rural doctors and the local hospital doctors. Information was requested on demographic factors such as place of residence, age, sex, date of birth, and primary site of cancer as well as different diagnostic methods used such as radiology, cytology, and histology. Population data were provided by the local police bureau, consisting of the total population and the age-sex structure at the end of each year in each site studied.

All cancer deaths registered were classified according to the three-digit rubric of the ICD-9<sup>[10]</sup>. To facilitate comparison on an international basis, cancer mortality rates reported herein were age-adjusted, using the world population as standard. The direct standardization method was used to calculate various age groups from 5-years to 80 years and older. Cancer mortality trends from 1974 to 1999 were determined for more than 4 anatomic sites in males and females using weighted piecewise linear regression analysis.

## RESULTS

The total cancer age-adjusted mortality rates were 193.68 per 100 000 for males and 133.29 per 100 000 for females in 1974-1976, and 218.29 per 100 000 and 125.52 per 100 000 in 1986-1988, and 195.91 per 100 000 and 124.36 per 100 000 in 1996-1998, respectively, accounting for 13.12 % for males and 10.71 % for females in 1974-1976, and 19.78 % and 15.82 % in 1986-1988, and 22.37 % and 17.25 % in 1996-1998, respectively of all cancer deaths. The major cancers diagnosed in Henan Province among males and females are presented in Table 1. The main cancers in men included esophagus, stomach, liver and lung cancers, and the main cancers in women included esophagus, stomach, liver, lung, cervical and breast cancers. In general in Henan Province, men had higher mortality rates than women.

**Table 1** Estimated cancer mortality rates<sup>1</sup> for males and females in Henan Province based on 15 selected registries

Site <sup>2</sup>	Years	Male		Female	
		ADM <sup>1</sup>	%	ADM <sup>1</sup>	%
All sites	1974-76	193.68	100.00	133.29	100.00
(140-208)	1986-88	218.29	100.00	125.52	100.00
	1996-98	195.91	100.00	124.36	100.00
Esophagus	1974-76	70.06	45.62	36.34	36.65
(150)	1986-88	67.78	31.04	35.99	32.14
	1996-98	43.77	25.70	25.73	24.19
Stomach	1974-76	36.02	19.89	19.79	15.01
(151)	1986-88	63.45	30.39	31.90	24.97
	1996-98	51.56	26.85	31.71	24.19
Colon/rectum	1974-76	6.47	3.92	6.14	4.48
(153-154)	1986-88	6.33	3.36	6.23	4.83
	1996-98	7.89	4.12	8.41	5.04
Liver (155)	1974-76	17.54	11.53	8.21	7.70
	1986-88	26.63	14.96	11.48	10.93
	1996-98	32.02	16.37	16.16	14.58

1: Age-adjusted mortality, standardized using world standard population. 2: Numbers in parentheses are ICD-9.

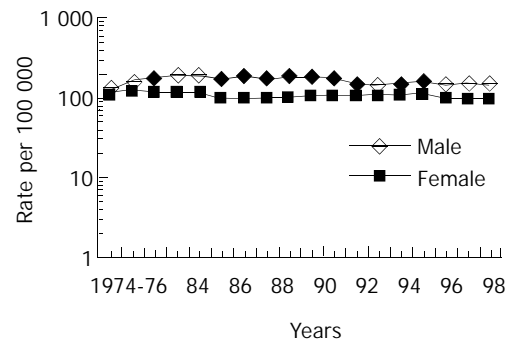
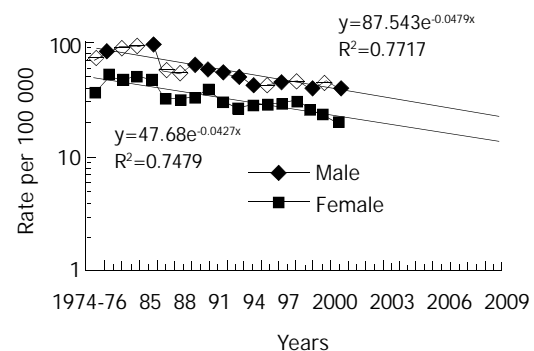
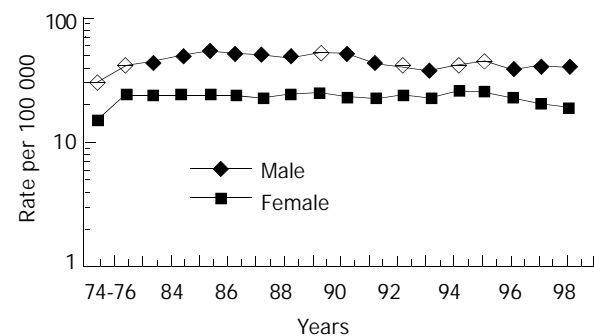
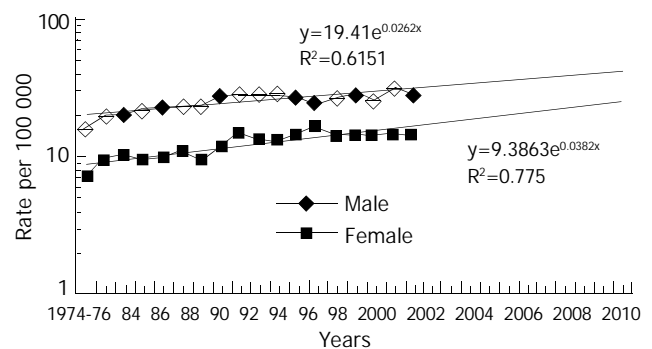
Table 2 illustrates urban-rural comparisons for selected cancer deaths from 1983 -1985 and 1997 in Henan Province, which included 12 counties and three cities. In Henan Province, rural areas had higher cancer mortality rates than urban areas, except for liver cancer in males.

**Table 2** Urban and rural differences in mortality rates<sup>1</sup> of cancer from selected sites in Henan Province, China (1980's and 1990's)

Site <sup>2</sup>	Sex	Urban area		Rural area	
		1983-85	1997	1983-85	1997
All sites	M	170.09	149.52	208.80	190.34
(140-208)	F	99.89	52.83	126.99	103.07
Esophagus	M	78.74	12.10	87.63	50.03
(150)	F	45.62	5.48	57.29	25.58
Stomach	M	35.13	21.01	54.06	49.66
(151)	F	17.35	4.05	31.86	23.52
Colon/Rectum	M	8.10	8.92	6.38	9.17
(153-154)	F	5.48	2.36	4.36	4.81
Liver (155)	M	30.47	38.48	23.40	36.10
	F	11.11	9.43	11.28	17.06

1: Age-adjusted mortality, standardized using world standard population. 2: Numbers in parentheses are ICD-9.

Cancer mortality rates at all sites did not change over the past two decades (Figure 2). During the period of 1974 -1999, marked changes took place in Henan Province in cancer mortality rates at certain sites. Esophageal carcinoma markedly declined, esophageal cancer mortality rates decreased over the period studied for males from approximately 70 per 100 000 in 1974-1976 to 43 per 100 000 in 1996-1998, and for females from approximately 36 per 100 000 to 25 per 100 000, respectively (Figure 3). Stomach cancer remained essentially stable (Figure 4), liver cancer have markedly increased (Figure 5). Colorectal cancer was the fifth most frequently diagnosed cancer in Henan Province. Men were diagnosed with this cancer slightly more frequently than women. Mortality rates for colorectal cancer have slightly increased over the last two decades (Table 1).

**Figure 2** Total cancer mortality in Henan Province, China, 1974-1999.**Figure 3** Age-adjusted mortality of esophageal cancer in Henan Province, China, 1974-1999.**Figure 4** Age-adjusted mortality of stomach cancer in Henan Province, China, 1974-1999.**Figure 5** Age-adjusted mortality of liver cancer in Henan Province, China, 1974-1999.

## DISCUSSION

Generally, genetic factors, per se, do not produce marked mortality changes over a short period of time, unless a specific

genetic factor present in the population interacts with a newly introduced agent in the environment. Thus marked changes in mortality rates, either increased or decreased, usually indicate that a new environmental agent has been introduced into or removed from the population in question. Compared with many other countries<sup>[11-18]</sup>, all cancer mortality in Henan Province varied slightly over the past 25 years. Although mortality rates varied widely in specific cancers, cancers of the esophagus, stomach, liver and lung accounted for over 86 % of all cancer deaths in Henan Province. Cervical cancer and breast cancer made up 81 % of deaths in women. In general in Henan Province, men had higher mortality rates than women, and rural areas had higher mortality rates than urban areas, except for lung cancer.

Cancer mortality rates at all sites have been associated with many factors, including diet and nutrition<sup>[19-23]</sup>, occupational exposure to toxic chemicals, tobacco and alcohol use, and certain viruses<sup>[24-31]</sup>. We found that lower socio-economic status, environmental pollution around the residential areas, lampblack in rooms, lower body mass index (BMI), more pickled food intake, cigarette smoking, alcohol drinking, mental-trauma and depression were risk factors of esophageal cancer. It also showed that the subjects having histories of upper digestive tract operation, dysplasia of esophagus and family histories of carcinoma had markedly increased risks for developing esophageal cancer<sup>[32]</sup>. Over the last 20 years, the dietary change occurred in Linzhou which was associated with the incidence and mortality decrease of esophageal cancer in the past ten years<sup>[33,34]</sup>. Cancer mortality rates at all sites remained essentially stable for males during the period studied, from approximately 193 per 100 000 in 1974-1976 to 195 per 100 000 in 1996-1998. Cancer mortality rates of females decreased over the last two decades from 133.29 per 100 000 in 1974-1976 to 124.36 per 100 000 in 1996-1998.

At the time of this study, esophageal cancer mortality rates decreased over the period studied for males, from approximately 70 per 100 000 in 1974-1976 to 43 per 100 000 in 1996-1998, and for females, from 36 per 100 000 in 1974-1976 to 24 per 100 000 in 1996-1998. Stomach cancer mortality rates did not change substantially during the period studied. Inversely, gastric cancer incidence and mortality rates showed a consistent decline in recent decades world-wide<sup>[12-15,21,22,35]</sup>. Liver cancer mortality rates for males markedly increased over the last two decades, from 17 per 100 000 in 1974-1976 to 32 per 100 000 in 1996-1998, for females from 8 per 100 000 in 1974-1976 to 16 per 100 000 in 1996-1998. Primary liver carcinoma (PLC) incidence and death rates in Australia increased in the past two decades<sup>[36]</sup>. Based on selected cancer registries around the world, developing countries have experienced PLC increases in incidence whereas developed countries have experienced declines<sup>[37]</sup>.

The data analyzed in this report were age-adjusted using world standard population and stratified for sex and places. In temporary variation, the patterns presented were descriptive in nature. Secular trend in esophageal cancer and live cancer for both sexes in 1974-2010 with regression was used for spatial analysis.

At the end of the 20th century, cancer was the second leading cause of death in Henan Province. In the new century cancer will be the number one killer in Chinese.

Future cancer control research must aim to reduce cancer risk, incidence and mortality, and improve the quality of life<sup>[38]</sup>.

## CONCLUSIONS

The role of population-based cancer registry is to collect the data which give an accurate picture of cancer in a population, in order to understand and control the impact of cancer on

that population. The cancer registry data can also be used to plan medical facilities and requirements needed for cancer control.

## ACKNOWLEDGEMENTS

We thank the doctors from the 15 counties and cities for their assistance in data collection.

## REFERENCES

- 1 **Ke L.** Mortality and incidence trends from esophagus cancer in selected geographic areas of China circa 1970-90. *Int J Cancer* 2002; **102**: 271-274
- 2 **Zhang W, An F, Lin H.** A case-control study on the risk factors of esophageal cancer in Jieyang City of Guangdong in China. *Zhonghua Liuxing Bingxue Zazhi* 2001; **22**: 442-445
- 3 **Botterweck AA, Schouten LJ, Volovics A, Dorant E, van Den Brandt P.** Trends in incidence of adenocarcinoma of the oesophagus and gastric cardia in ten European countries. *Int J Epidemiol* 2000; **29**: 645-654
- 4 **Desoubaux N, Le Prieur A, Launoy G, Maurel J, Lefevre H, Guillois JM, Gignoux M.** Recent time trends in cancer of the oesophagus and gastric cardia in the region of Calvados in France, 1978-1995: a population based study. *Eur J Cancer Prev* 1999; **8**: 479-486
- 5 **Adanja B, Gledovic Z, Pekmezovic T, Vlainic H, Jarebinski M, Zivaljevic V, Pavlovic M.** Mortality trends of malignant tumours of digestive organ in Belgrade, Yugoslavia, 1975-1997. *Dig Liver Dis* 2000; **32**: 386-391
- 6 **Wijnhoven BP, Louwman MW, Tilanus HW, Goebergh JW.** Increased incidence of adenocarcinomas at the gastro-oesophageal junction in Dutch males since the 1990s. *Eur J Gastroenterol Hepatol* 2002; **14**: 115-122
- 7 **Blaser MJ, Saito D.** Trends in reported adenocarcinomas of the oesophagus and gastric cardia in Japan. *Eur J Gastroenterol Hepatol* 2002; **14**: 107-113
- 8 **Hansen S, Wiig JN, Giercksky KE, Tretli S.** Esophageal and gastric carcinoma in Norway 1958-1992: incidence time trend variability according to morphological subtypes and organ subsites. *Int J Cancer* 1997; **71**: 340-344
- 9 **Wolfgarten E, Rosendahl U, Nowroth T, Leers J, Metzger R, Holscher AH, Bollschweiler E.** Coincidence of nutritional habits and esophageal cancer in Germany. *Onkologie* 2001; **24**: 546-551
- 10 **World Health Organization:** International classification of diseases (ICD-9); 1 st ed. Geneva: WHO 1976
- 11 **Coleman MP, Esteve J, Damiecki P, Arslan A, Renaard H.** Trends in cancer incidence and mortality. *Lyon IARC Scientific Publications* 1993
- 12 **Newnham A, Quinn MJ, Babb P, Kang JY, Majeed A.** Trends in oesophageal and gastric cancer incidence, mortality and survival in England and Wales 1971-1998/1999. *Aliment Pharmacol Ther* 2003; **17**: 655-664
- 13 **Ruiz Ramos M, Nieto Garcia MA, Mayoral Cortes JM.** Mortality caused by cancer in Andalusia: trends and geographic distribution. *Aten Primaria* 2001; **28**: 634-641
- 14 **Corella D, Guillen M.** Dietary habits and epidemiology of gastric carcinoma. *Hepatogastroenterology* 2001; **48**: 1537-1543
- 15 **Gaudi I, Kasler M.** The course of cancer mortality in Hungary between 1975-2001. *Magy Onkol* 2002; **46**: 291-295
- 16 **Terry MB, Gaudet MM, Gammon MD.** The epidemiology of gastric cancer. *Semin Radiat Oncol* 2002; **12**: 111-127
- 17 **Brooks-Brunn JA.** Esophageal cancer: an overview. *Medsurg Nurs* 2000; **9**: 248-254
- 18 **Bae JM, Jung KM, Won YJ.** Estimation of cancer deaths in Korea for the upcoming years. *J Korean Med Sci* 2002; **17**: 611-615
- 19 **Harvard Center for Cancer Prevention, Harvard School of Public Health.** Harvard report on cancer prevention. Volume 1. Causes of human cancer. *Cancer Causes Control* 1996; **7**: 3-59
- 20 **Palli D, Russo A, Decarli A.** Dietary patterns, nutrient intake and gastric cancer in a high-risk area of Italy. *Cancer Causes Control* 2001; **12**: 163-172
- 21 **Brown LM, Devesa SS.** Epidemiologic trends in esophageal and gastric cancer in United States. *Surg Oncol Clin N Am* 2002; **11**:

- 235-256
- 22 **Holtmann G.** Reflux disease: the disorder of the third millennium. *Eur J Gastroenterol Hepatol* 2001; **13**(Suppl 1): S5-11
  - 23 **Mayne ST, Navarro SA.** Diet, obesity and reflux in the etiology of adenocarcinomas of the esophagus and gastric cardia in humans. *J Nutr* 2002; **132**(11Suppl): 3467S-3470S
  - 24 Waste-management Education & Research Consortium (WERC), College of Engineering, New Mexico State University (NMSU). *Cancer incidence rates in Eddy and Lea counties New Mexico 1970-1994*. 1998
  - 25 **Tomeo CA, Colditz GA, Willett WC, Giovannucci E, Platz E, Rockhill B, Dart H, Huneter DJ.** Harvard report on cancer prevention Volume 3. Prevention of colon cancer in the United States. *Cancer Causes Control* 1999; **10**:167-180
  - 26 **Colditz GA, Atwood KA, Emmons RR, Nonson WC, Willett D, Trichopoulos Hunter DJ.** Harvard report on cancer prevention. Volume 4. Harvard cancer risk index. *Cancer Causes Control* 2000; **11**: 477-488
  - 27 **Bulbulyan MA, Ilychova SA, Zahm SH, Astashevsky SV, Zaridze DG.** Cancer mortality among women in the Russian printing industry. *Am J Ind Med* 1999; **36**: 166-171
  - 28 **Tovar-Guzman VJ, Barquera S, Lopez-Antunano FJ.** Mortality trends in cancer attributable to tobacco in Mexico. *Salud Publica Mex* 2002; **44**(Suppl 1): S20-28
  - 29 **Yu MC, Yuan JM, Govindarajan S, Ross RK.** Epidemiology of hepatocellular carcinoma. *Can J Gastroenterol* 2000; **14**: 703-709
  - 30 **Cacoub P, Geffray L, Rosenthal E, Perronne C, Veyssier P, Raguin G.** Mortality among human immunodeficiency virus-infected patients with cirrhosis or hepatocellular carcinoma due to hepatitis C virus in France Departments of Internal Medicine/Infections Diseases, in 1995 and 1997. *Clin Infect Dis* 2001; **32**: 1207-1214
  - 31 **El-Serag HB.** Epidemiology of hepatocellular carcinoma. *Clin Liver Dis* 2001; **5**: 87-107
  - 32 **Lu JB, Lian SY, Sun XB, Zhang ZX, Dai DX, Li BY, Cheng LP, Wei JR, Duan WJ.** A case-control study on the risk factors of esophageal cancer in Linzhou. *Zhouhua Liuxingbingxue Zazhi* 2000; **21**: 434-436
  - 33 **Lu JB, Lian SY, Sun XB, Zhang ZX, Dai DX, Li BY, Cheng LP, Wei JR, Duan WJ.** Dietary changes and the trends in morbidity and mortality on esophageal cancer in Linzhou. *Zhongguo Gonggong Weisheng* 2001; **17**: 60-61
  - 34 **Lu JB, Sun XB, Dai DX, Lian SY, Chang QL, Liu SZ, Li BY.** Prevalence trends of esophageal cancer in Henan in 1974-1999. *Zhongliu Fangzhi Zazhi* 2002; **9**: 118-120
  - 35 **Parkin DM, Whelan SL, Ferlay J, Young J, eds.** Cancer incidence In Five Continents, *IARC Scientific Publications No.143*. Lyon: International Agency for Research on Cancer, 1997
  - 36 **Law MG, Roberts SK, Dore GJ, Kaldor JM.** Primary hepatocellular carcinoma in Australia, 1978-1997: increasing incidence and mortality. *Med J Aust* 2000; **173**: 403-405
  - 37 **McGlynn KA, Tsao L, Hsing AM, Devesa SS, Praumeni JF Jr.** International trends and patterns of primary liver cancer. *Int J Cancer* 2001; **94**: 290-296
  - 38 **Barbara K.** Rimer. Cancer control research 2001. *Cancer Causes Control* 2000; **11**: 257-270

Edited by Ma JY and Wang XL