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ORIGINAL RESEARCH

Urban-Rural Disparity in *Helicobacter Pylori* Infection–Related Upper Gastrointestinal Cancer in China and the Decreasing Trend in Parallel with Socioeconomic Development and Urbanization in an Endemic Area

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Abstract

BACKGROUND Globally China has the largest urban-rural disparity in socioeconomic development, and the urban-rural difference in upper gastrointestinal cancer (UGIC) is similar to the difference between developed and developing countries.

OBJECTIVES To describe urban-rural disparity in UGIC and to emphasize prevention by socioeconomic development and urbanization in China.

METHODS Age-standardized incidence rates (ASRs) of cancers in 2012 were compared between urban Shijiazhuang city and rural Shexian County, and trends from 2000-2015 in Shexian County were analyzed.

FINDINGS Compared with urban Shijiazhuang city, the ASR of gastroesophageal cancers in rural Shexian County was 5.3 times higher in men (234.1 vs 44.2/100,000, $P < .01$) and 9.1 times higher in women (107.7 vs 11.8/100,000, $P < .01$). This rural-urban disparity in UGIC is associated with differences in socioeconomic development in annual gross domestic product (GDP) per capita of US$2700 vs US$6965, in urbanization rate of 48% vs 100%, and in adult *Helicobacter pylori* infection prevalence of 75% vs 50%. From 2000-2015, the GDP per capita in Shexian County increased from US$860 to US$3000, urbanization rate increased from 22.4% to 54.8%, and prevalence of *H pylori* infection among 3- to 10-year-old children decreased from 60% to 46.1% ($P < .01$). Meanwhile, the biennial ASR of esophagogastric cancer decreased 42% in men, from 313.5 to 182.1 per 100,000 ($P < .01$), and 57% in women, from 188.6 to 80.4 per 100,000 ($P = .00$). However, lung, colorectal, and gallbladder cancers and leukemia in both sexes and breast, ovary, thyroid, and kidney cancer in women increased significantly. Despite this offset, ASR of all cancers combined decreased 25% in men (from 378.2 to 283.0/100,000, $P = .00$) and 19% in women (from 238.5 to 193.6/100,000, $P = .00$).

CONCLUSIONS Urban-rural disparity in UGIC is related to inequity in socioeconomic development. Economic growth and urbanization is effective for prevention in endemic regions in China and should be a policy priority.

Denggui Wen and Xiaoduo Wen contributed equally to the paper.
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All authors had access to the data and a role in writing the manuscript.
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INTRODUCTION

In China, the former Soviet Union–style central economy planning system implemented from 1949 until 1980 had invested more in urban industry development than in rural living condition improvement. This has created multidimensional urban-rural inequalities in social determinants of health. According to the National Health Service Survey 2003, safe drinking water is available to 96% of the population of large cities but to <30% in poor rural areas. Ninety percent of residents in large cities have sanitation toilets, compared with <10% in poor rural areas.[1] Although economic reform has lifted millions of people out of extreme poverty in recent decades, the urban-rural income gap has widened, with the rural residents having an annual average per capita disposable income less than a third of urban residents in 2010 (US$898 vs US$2900).[2] These inequities are associated with significant differences in prevalence of *Helicobacter pylori* infection. As reported by a nationwide collaborative survey in China between 2002-2004, the prevalence of *H pylori* infection among rural and urban residents was 73.4% vs 65.4% ($P < .01$).[3] A more recent systematic review reported that the mean prevalence of *H pylori* infection was 66% for rural Chinese populations and 47% for urban Chinese populations.[4] Because *H pylori* infection has been established as the most important carcinogen of upper gastrointestinal cancer (UGIC),[5] a huge urban-rural disparity in *H pylori* infection–related cancers has been reported. For example, in China, although the age of rural populations was significantly younger and the population numbered 149.1 million less than the urban population by the middle of 2015 (611,060,000 vs 760,160,000),[6] the numbers of newly diagnosed esophageal and gastric cancer cases in 2015, as estimated by the Chinese National Cancer Registry (CNCR), were 3 and 2 times more among rural than among urban populations (364,100 vs 113,800 and 444,000 vs 235,200, respectively).[7] The urban-rural disparities in these *H pylori* infection–related cancers are significantly larger than that in all cancers combined, which was 213.6 vs 191.5 per 100,000.[7] CNCR also estimated that the 5-year relative survival for new cancer cases diagnosed between 2003 and 2005 in rural China was about half that of their urban counterparts for all cancers combined (21.8% vs 39.5%), because of a scarcity of medical resources for early diagnosis and adequate treatment.[8] Despite such grave social inequities, specific policy is lacking. Using age-standardized incidence rates by population-based tumor registration, this paper describes the urban-rural disparity in *H pylori* infection–related cancers in relation to unfair distribution of social determinants of health and examines the hypothesis that a decreasing trend of these cancers is associated with socioeconomic development and urbanization in an endemic region. Our aim is to emphasize the role of socioeconomic development among disadvantaged populations and make it a policy priority.

MATERIALS AND METHODS

Shexian County. Shexian County of Hebei Province is located 250 km southwest of Shijiazhuang city in the Taihang Mountain range, from 36° 17' to 36° 55' north latitude (Supplementary Fig. 1 in the online version at doi:10.1016/j.aogh.2017.09.004). Its population was 408,995 in 2012. It is a northern neighbor of Linxian County and a northwestern neighbor of Cixian County. All 3 counties have been noted for endemic rates of esophagogastric cancers.[9] Shexian consists of a county town and 580 villages. The economy of the county town relies on employment in the industry of power generating and steel making, agricultural product refinery, food manufacture, and tourism, and the rural population is engaged in growing rice, wheat, persimmon, Chinese prickly ash, and walnut. A quarter of the Shexian population, mainly young or middle-aged villagers, move between the village and the county town doing seasonal jobs. Diet in Shexian consists of a self-made staple foods of rice or steamed buns flavored by dishes of vegetables, pork, or eggs. Physical activities for villagers mean manual labor. But in the county town, people aged 60 or older walk or jog in the morning or evening.

As in most of China, health care in Shexian has been hospital centered. From 1949 until 2010, only government or public employees were protected by public medical insurance programs. For villagers, only basic medicine was provided free of charge by a rural corporative medical program.