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Gastric Cancer in South Korea

Background: Rags to Riches

South Korea is a country that has undergone a transformation like no other. A brutal 35 year Japanese occupation followed by a devastating civil war had left the newly-divided country as one of the poorest in the world, with an income per head comparable with the poorest parts of Africa. Since, the country has soared from the ashes of the Korean War to become a high-income, high-tech, G20 economy. The Economist states¹:

'By the end of 2011 it will be richer than the European Union average, with a gross domestic product per person of \$31,750, calculated on a basis of purchasing-power parity (PPP), compared with \$31,550 for the EU. South Korea is the only country that has so far managed to go from being the recipient of a lot of development aid to being rich within a working life.'

This remarkable economic growth did not occur in isolation to improvements in public health: it fuelled, and was in turn fuelled by, considerable gains in the health and quality of life of its citizens. Wide-ranging improvements were made in almost every aspect of a person's life starting with the most basic of infrastructure. Within a generation, squalid slums were replaced with sanitary housing units with sewage systems, electricity and running water. People became vastly better nourished and educated and in no time, health had become a fundamental right of every citizen and not a privilege as it had once been².

Epidemiological Shift

What was the effect of all these changes on the pattern of health and disease in the population? First and foremost, there has been a dramatic reduction in the burden of disease from infectious diseases, diseases associated with poverty and a lack of sanitation. In the post-war period, the main causes of death had been of respiratory origin: namely tuberculosis, bronchitis and pneumonia. These have since decreased in importance as both fatality and incidence have shown a rapid decline².

Soil transmitted helminth (STH) infections such as ascariasis were also highly prevalent at the time causing a great deal of morbidity. Screening data from 1971 showed that the overall intestinal helminth egg-positive proportion among randomly selected Koreans was an astonishing 84.3%³. To address this problem, a national control program targeting STH infections was put into place in 1969. This involved national screening and mass drug administration in schoolchildren, environmental sanitation and health education⁴.

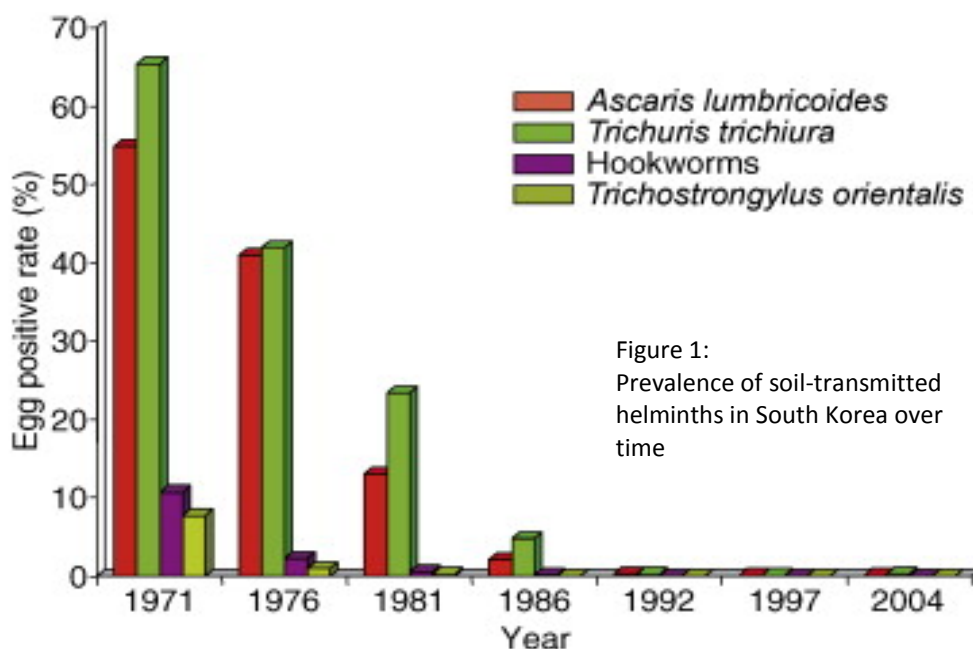


Figure 1:
Prevalence of soil-transmitted
helminths in South Korea over
time

Figure 1 shows the success
of such interventions⁵:

Intestinal protozoan and tapeworm infections were similarly eradicated or reduced to negligible levels⁵.

A New Threat

In a short space of time, infectious diseases have largely been replaced by chronic, non-communicable diseases typical of the developed world. In 2009, the ten leading causes of death included cancer, cerebrovascular disease, heart disease, suicides, diabetes, traffic accidents, chronic respiratory diseases, liver disease, pneumonia and hypertensive disease. These ten causes accounted for 70.4% of all causes of mortality⁶. Cancer has been the leading cause of death in Korea since 1983⁷. Furthermore, the mortality rate from cancer has been on an upward trend from 111.9 per 100,000 in 1996 to 140.5 in 2009⁶.

Cancer is of course an umbrella term encompassing a wide range of different conditions and in S.Korea, gastric cancer is arguably the one causing the greatest amount of morbidity. Although the age-standardized mortality and incidence of gastric cancer has been declining in the last two decades, it still remains the most commonly diagnosed cancer in Korea since 1999 when nationwide data on cancers was first reported⁸.

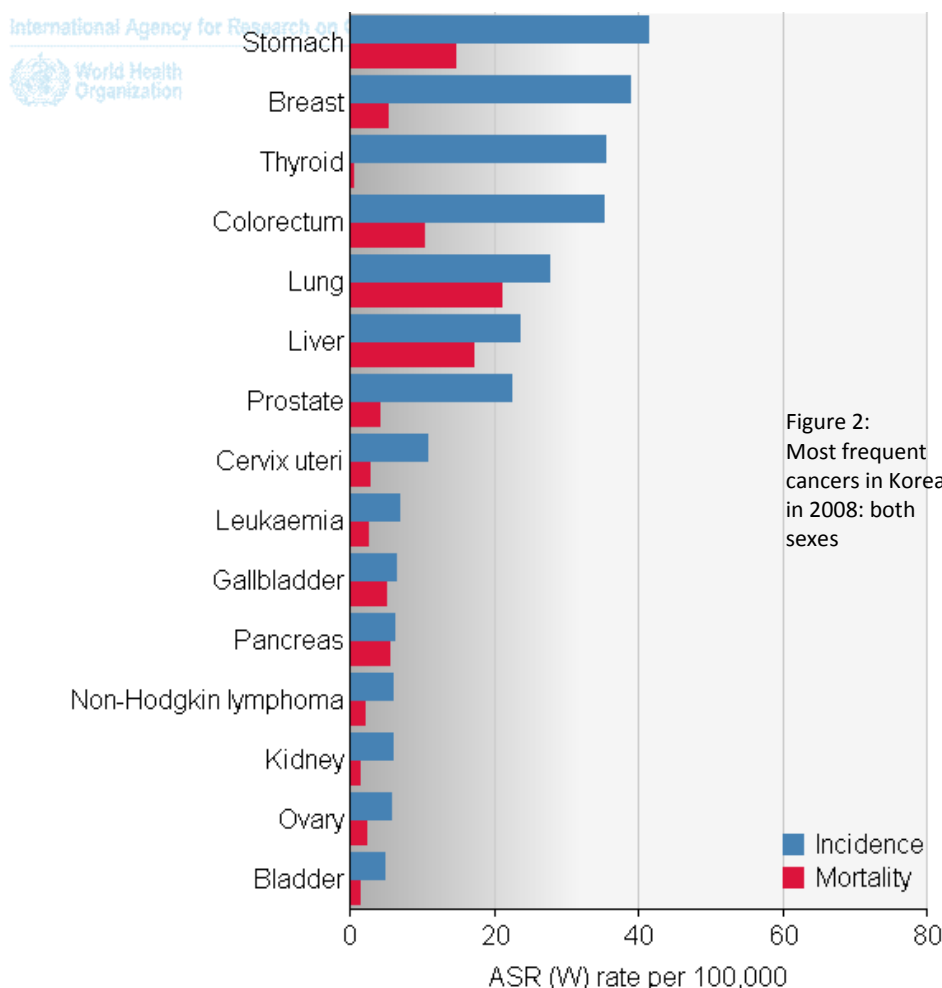
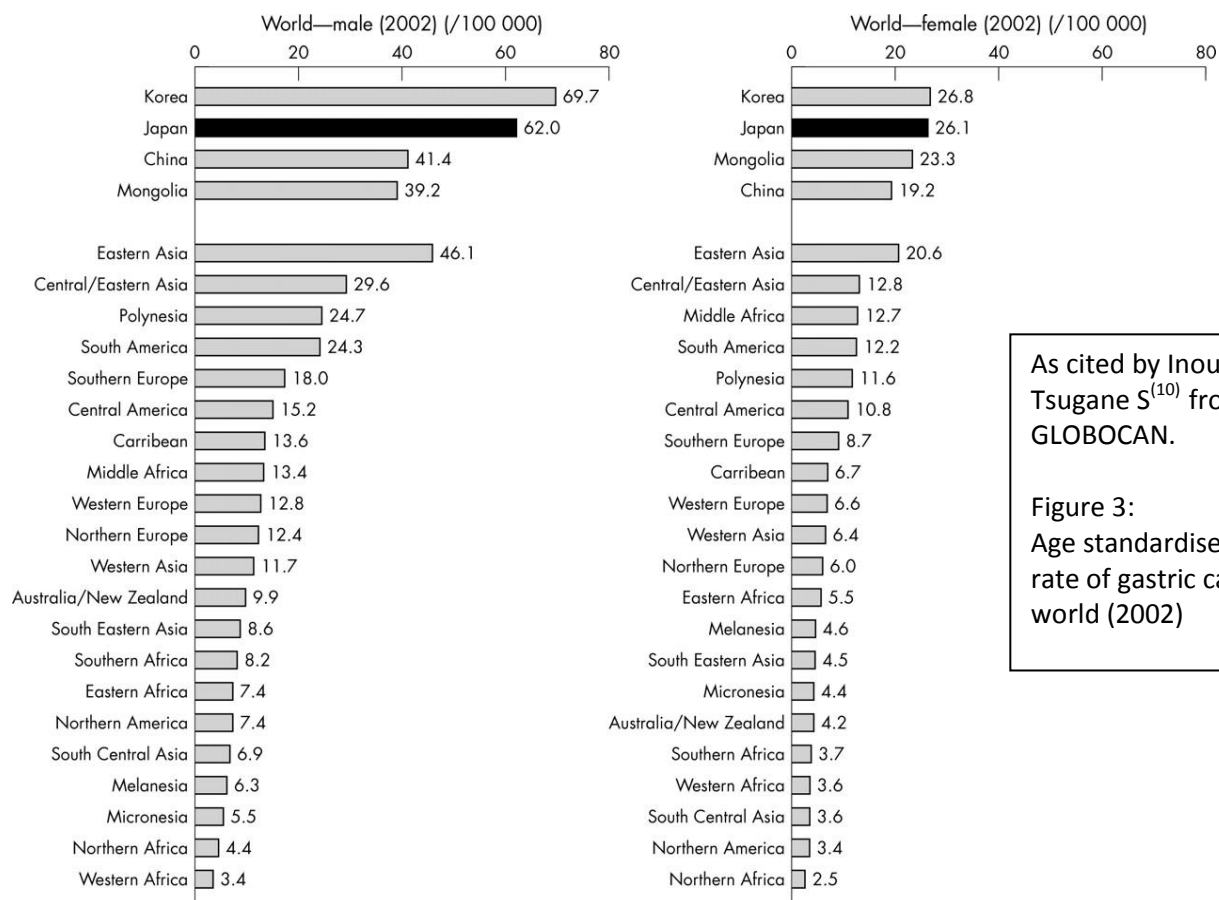


Figure 2 shows that gastric cancer is not only one of the most common cancers but also one of the biggest causes of mortality⁹.

Figure 2:
Most frequent
cancers in Korea
in 2008: both
sexes

Even within East Asia, the region of the world with the highest incidence of gastric cancer, S.Korea has been shown to have the highest rates in both sexes¹⁰.



As cited by Inoue M and Tsugane S⁽¹⁰⁾ from GLOBOCAN.
Figure 3: Age standardised incidence rate of gastric cancer in the world (2002)

To explain why gastric cancers are so common in S. Korea it is necessary to look at the risk factors that the Korean population is exposed to.

Risk factors:

Helicobacter pylori

Infection with the bacterium *Helicobacter pylori* is a well-established risk factor for gastric cancer having been classified as a class-1 carcinogen by the WHO in 1984¹¹. More than 50% of the world’s population is infected with it (80-90% in developing countries), making it one of the most common bacterial infections in the world. Although estimates vary, a meta-analysis involving 12 case-control studies put the relative risk of developing gastric cancer when infected with H. pylori as high as 5.9¹².

A Korean cross-sectional study¹³ showed that, the prevalence of H. pylori in the Korean population had decreased significantly from 67% in 1998 to 56% in 2005. Moreover, the decrease in prevalence was greatest in the lowest age-band: the 16-19s with a dramatic reduction of 45.8% in 1998 to 12.5% in 2005. This implies that the infection is declining rapidly as the number of newly-infected has plummeted with time. This reduction follows the pattern of other infectious diseases which have all shown marked declines following improvements in living standards and hygiene.

Although the prevalence of H. pylori is still relatively high compared to countries like the UK, with a prevalence rate of 30-40%¹⁴, it does not explain why gastric cancer rates are so disproportionately high in S.Korea, especially compared to other countries that have much higher rates of H. pylori.

Tobacco Smoking

Tobacco smoking, another widely acknowledged risk factor for gastric cancer, remains an important risk factor for the Korean population. During the peak years of industrialization (the 1980-90s), smoking rates reached 'epidemic' proportions of almost 80% in men as shown by the graph cited by Suh I¹⁵ from the Korean Association of Smoking and Health.

Trends in smoking prevalence in Korea (20 years of age and older)

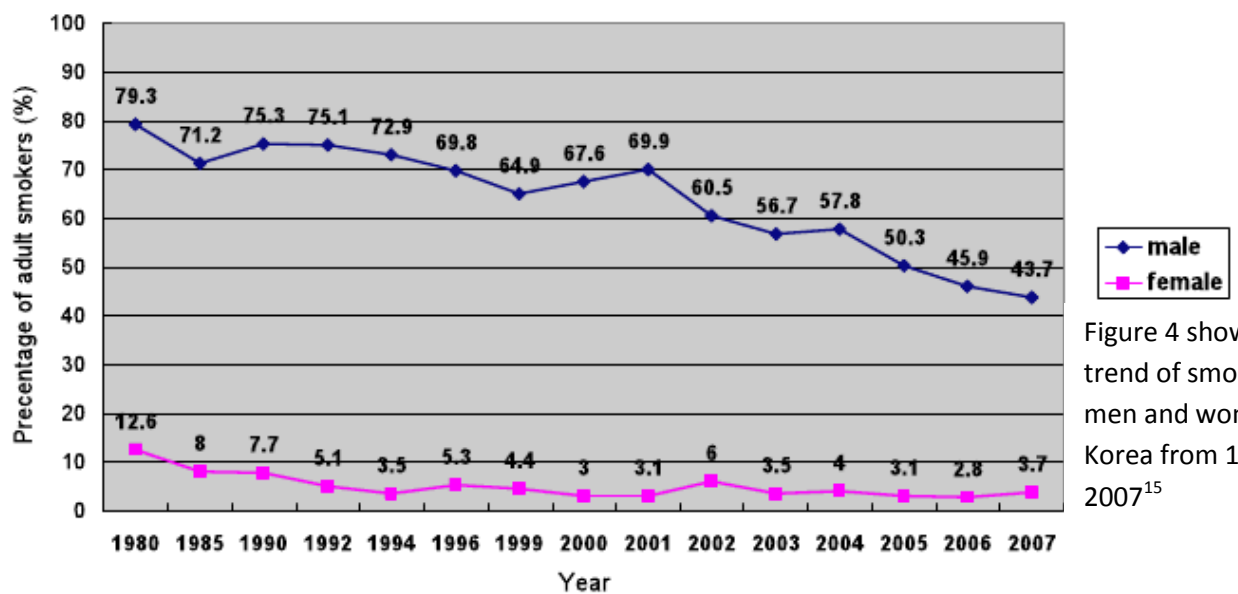


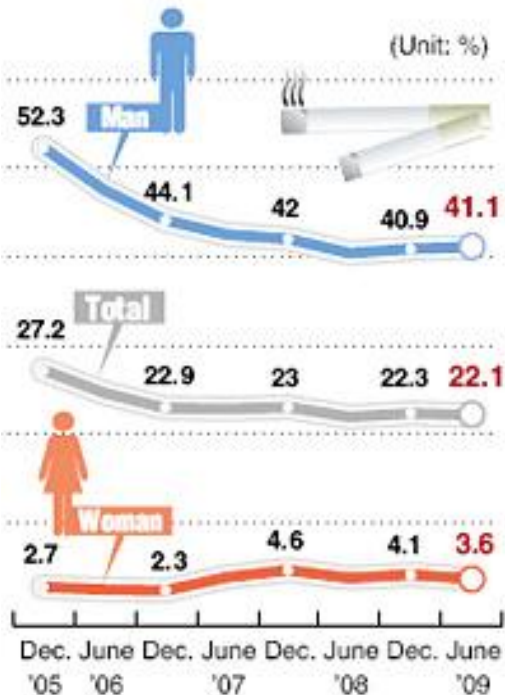
Figure 4 showing the trend of smoking in men and women in Korea from 1980-2007¹⁵

Source: Korean Association of Smoking and Health (KASH), Gallup Korea.

Fortunately, there has since been a rapid decrease in the rate of smoking in both men and women as shown by the graph above. This decline can be attributable to the government policies which were put in place in to tackle the 'epidemic' of smoking.

In 1995, the enactment of the Health Promotion Act brought about several anti-smoking policies such as banning tobacco sales via vending machines and restricting smoking in public buildings and places. By 1999, almost all public buildings in S.Korea had divided smoking and non-smoking areas. A media blitz soon followed with anti-smoking campaigns featuring television stars starting in 2000. Additionally, the Ministry of Health and Welfare started progressively to tax tobacco as part of a more comprehensive anti-smoking policy. In December 2004, a new tobacco tax was introduced resulting in a 29% increase in the price of tobacco products¹⁶.

Male Smoking Rate Rising Again



Although the past success of such policies in reducing smoking rates is evident, there are now signs that smoking rates are levelling off and even increasing in men: figure 5¹⁷.

This is a problem as the average number of smokers in S.Korea still remains significantly higher than any other Organization for Economic Co-operation and Development country. As of 2010, almost 43% of S.Korean men smoked compared to the OECD average of 28%¹⁸.

The stark disparity in smoking prevalence in men and women may go some way in explaining the more than 2.5 fold difference in incidence of gastric cancer in men and women as shown in figure 3. This large discrepancy may be due to cultural factors such as the public perception that it is acceptable for men to smoke. Therefore, public health promotions aimed at changing such public perceptions may be required to tackle the issue holistically.

Figure 5 showing the trends in smoking in men and women

The Diet

The two risk factors discussed above may go some way in explaining why the prevalence of gastric cancer is so high in S.Korea but it is clearly not the full story. Why are rates so disproportionately high in this country when compared to others that have both a higher prevalence of smoking and H. pylori infections? The answer is simple: the diet. The Korean diet with its high levels of smoked, salted and pickled foods is another important environmental risk factor that Koreans are exposed to on a daily basis.

Several studies have shown high salt intake to be a risk factor for gastric cancer^{19, 20}. This is thought to be through three different mechanisms: by damaging the gastric mucosa, enhancing the carcinogenic effects of gastric carcinogens and by facilitating H. pylori infections²¹. A systematic review highlighted the need for salt consumption to be limited to less than 6g/day for adults in order to prevent cancer²² and the World Health Organisation recommends a daily salt intake of less than 5g²³.

Salt intake in the Korean population is reported to be one of the highest in the world with the average daily intake of 13.4 g in 2005²⁴. While most of the salt consumed in the West is from processed foods, in Koreans, it surprisingly comes from the traditional diet. Kimchi, a fermented traditional side dish that is eaten with almost every meal, is reported to be responsible for 20% of the salt intake²⁴. The high use of salt in Kimchi has a historical and cultural context to it as its original purpose for that of preservation. A Korean case-control trial²⁵ showed other foods in the Korean diet associated with increased gastric cancer risk including broiled fish, soybean paste stew and hot pepper soybean stew. Analysis by cooking methods showed that gastric cancer risk from the same foods varied with cooking methods. Stewing, broiling and pickling, which are common in Korean cuisine, were associated with an increased risk.²⁵

Some foods have been shown to have a protective effect. Results from 31 studies have shown a reduction in risk of developing gastric cancer with increasing consumption of citrus fruits and vegetables, particularly raw and green ones²⁶. Soy foods, which are commonly consumed in Korean cuisine, are another such

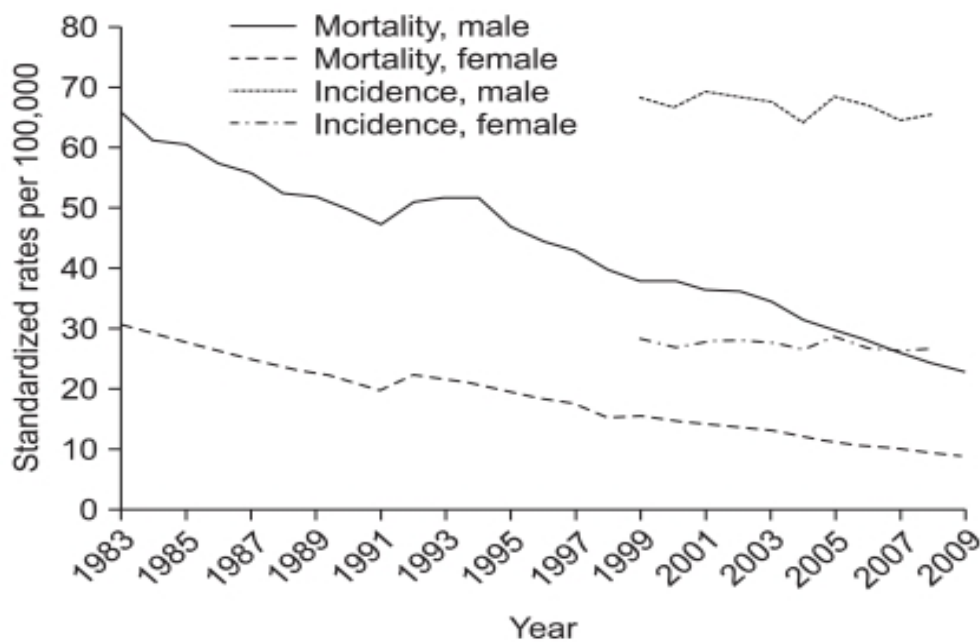
example. This may be due to their high isoflavones content, which are anti-oxidants known to reduce the risk of gastric cancer. However, when soy foods are eaten fermented, their protective effects are annulled and they become a risk factor for developing gastric cancer. In the Korean population, more fermented soy foods are consumed than non-fermented ones²⁷.

As dietary patterns are often an inherent part of a person's culture it is both unrealistic and impractical to advocate a total cessation of cooking methods and the consumption of foods that lead to a higher risk of gastric cancer. However, much can be done to promote a healthier diet including encouraging the reduction of salt used in cooking and increasing the consumption of foods shown to have a protective effect. For example, public health campaigns could raise awareness of the benefits of eating non-fermented soy foods and the dangers of eating too much fermented ones.

Cancer control Schemes

The Korean government has been active in dealing with cancer since 1989 when the Ministry of Health and Welfare (MOHW) first established the National Cancer Centre (NCC). The NCC has since been working in close collaboration with the MOHW in formulating and implementing national cancer control programs including the development of cancer prevention programs and national cancer screening guidelines. These programs have turned out to be very effective in improving public awareness about the importance of primary cancer prevention, early detection and of palliative care activities. In 2006, the NCC along with the MOHW announced 10 codes for cancer prevention with guidelines the public should follow in their everyday lives including advice on health dietary practices, exercise and medical check-ups for early detection⁷. These strategies involving lifestyle modifications are examples of primary prevention where the aim is to prevent the occurrence of the disease in the population by avoiding the risk factors such as smoking.

Secondary prevention focuses on detecting the condition before it causes significant morbidity through interventions such as screening and surveillance. The National Cancer Screening Program (NCSP) of Korea was started in 1999 and has since been expanding its target population and target cancers. It currently provides medical care recipients and national health insurance beneficiaries within the lower 50% income bracket with free screening services for 5 common cancers: stomach, liver, colorectal, breast and cervical. The NCSP recommends biennial gastric cancer screening for men and women over 40 with direct upper gastrointestinal screening and/or gastroscopy⁷. Figure 6 shows that mortality rates from gastric cancer have been steadily on the decrease probably due to earlier detection and treatment. The incidence rates have shown much more modest reductions with fluctuations. This may be due to increasing uptake of screening in the population and not actual changes in incidence rates.



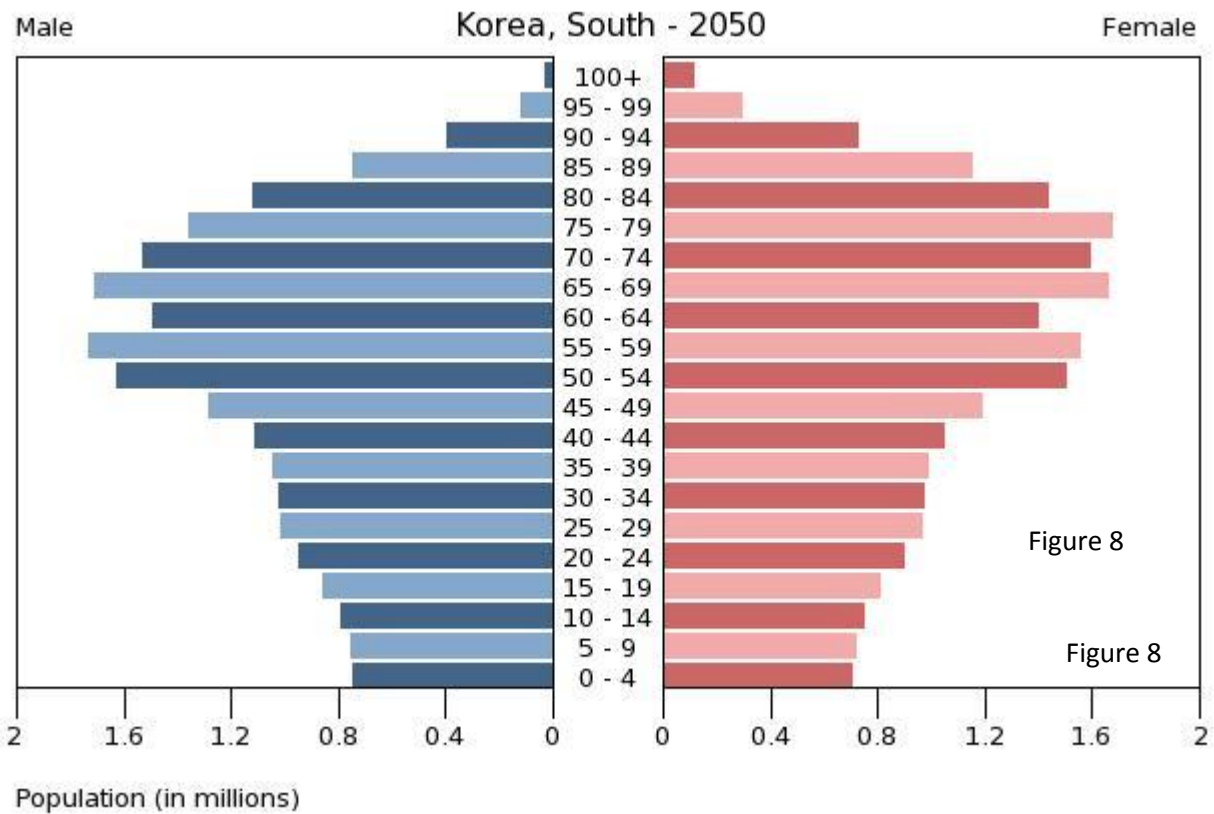
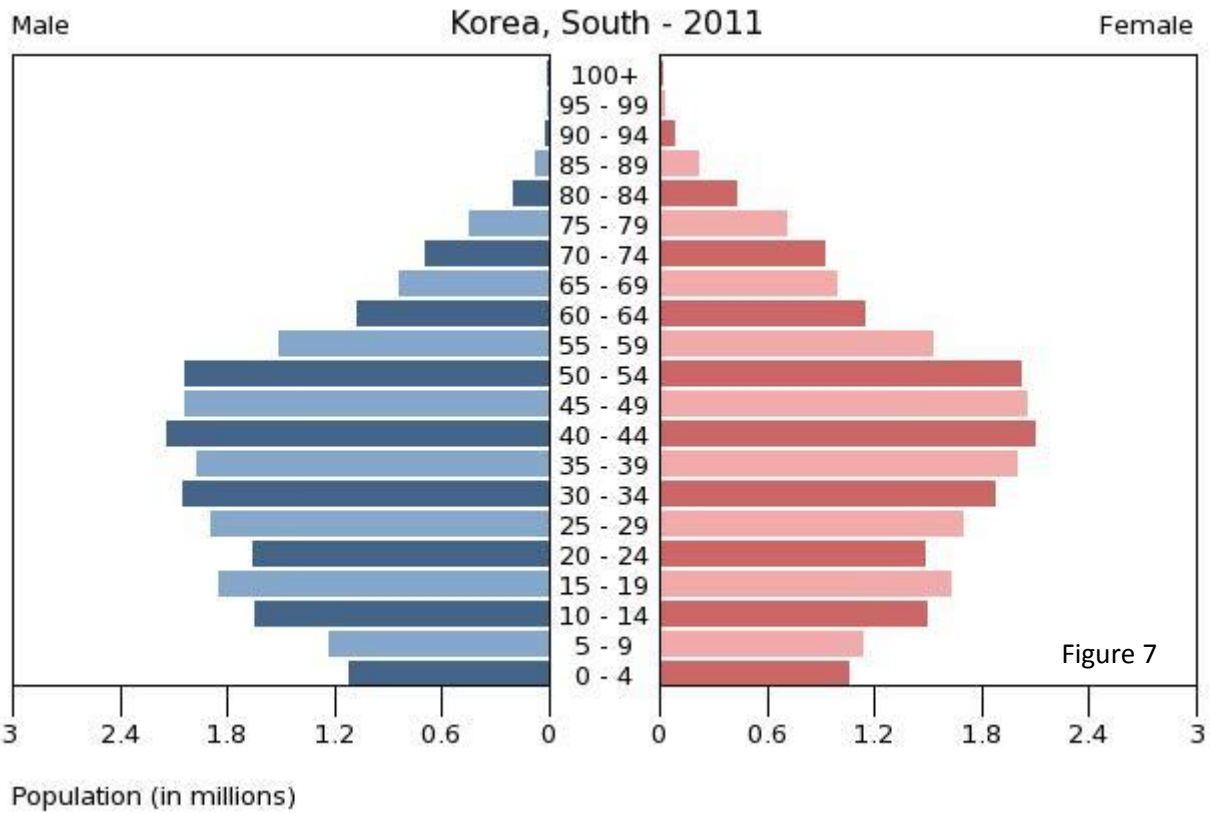
As cited by Shin A, Kim J and Park S²⁴ from the Korean Statistical Information Service (in Korean)

Figure 6: Age standardized Incidence (1999-2008) and mortality (1983-2009) of gastric cancer in Korea.

Current and Future Challenges

One of the challenges of countries with rural populations like S.Korea is dealing with the inequalities between the capital city and the regional provinces in terms of cancer related resources. This includes things like medical facilities and physicians. To deal with this problem, the government started to designate national university affiliated hospitals in each province as Regional Cancer Centres (RCC) in 2004. They are provided with financial support to strengthen their cancer care infrastructure and also are eligible for research grants. The responsibilities of RCCs are threefold: firstly to provide complete clinical services for cancer patients in their regions, secondly to assist the implementation of national cancer control programs at the regional level and finally to perform population-based clinical research involving local residents and cancer patients⁷. This decentralized form of health-care delivery has made significant contributions towards reducing inequity and inequality in cancer care in Korea.

S.Korea is a country that is currently undergoing a demographic shift at as blistering a speed as its past development. It is aging rapidly, driven by a combination of increasing longevity and declining fertility rates. According to the United Nations definitions, the country became an aging society in 2000 with more than 7% of the population being over 65. It is expected to become an aged society in 2018 with more than 14% of the population over 65 and a super-aged society by 2026 with at least 20% of its people being classified as senior citizens²⁸. This has profound implications on the impact of chronic non-communicable diseases such as gastric cancer. Even as rates are falling, the absolute numbers and the burden of disease from gastric cancer are set to rise as the increased cumulative risk of gastric cancer in people leads to more cases²⁹. A comparison of figures 7 and 8³⁰ highlights this future challenge. In 2050, the proportion of the population in or above the 40-44 age band, from when screening for gastric cancer begins, is significantly higher. This will place a sharply heavier burden not only on screening services but also those of treatment. Steps need to be taken early to ensure that the facilities and workforce can cope with the increasing demand in the years ahead.



Conclusion:

In only one generation, S. Korea has made a rapid epidemiological transition from being a destitute country struggling with the rampant spread of infectious diseases to a high-income country now shouldering the burden of chronic non-communicable diseases. Gastric cancer has emerged as one of the greatest public health challenges facing the Korean population in the 21st Century. Although much progress has been made in bringing it under control, the country must now take pre-emptive steps in preparing for the future challenges of an equally rapid demographic transition in the years to come.

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