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The changing gender differences in life expectancy in Korea 1970–2005

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ABSTRACT

Women live much longer than men in Korea, with remarkable gains in life expectancy at birth for the past decades. The gender differential has steadily increased over time, reaching a peak of more than 8 years in 1980s, and decreased thereafter to 6.7 years in 2005. Studies to investigate the pattern and contributing factors to changes in the life expectancy gender gap have been mostly from Western countries, and there has been no such study in Asian countries, except in Japan. We therefore aimed to examine age- and cause-specific contributions to the changing gender differentials in life expectancy in Korea, in particular the decline of the gap, using a decomposition method. Between 1970 and 1979 when the gender gap in life expectancy widened, faster mortality decline among women in ages 20–44 explained 66% of the total increase in the gender gap, which would be due to substantial improvements in reproductive health among women and excess male mortality in occupational injuries and transport accidents. Although greater survival advantage among elderly women over 70 contributed to further increase in the gender gap, the contributions from younger ages with the ages 15–64 contributing the most (−2 years) resulted in the overall reduction of the gender gap which began in 1992 and continued to 2005. Among causes of death, liver diseases (−0.5 years, 38% of the total decline), transport accidents (−0.4 years, 31%), hypertensive diseases (−0.3 years, 19%), stroke (−0.1 years, 11%), and tuberculosis (−0.1 years) contributed the most to the overall 1.4 years reduction in the gender gap. However, changes in mortality from lung cancer (+0.3 years), suicide (+0.3 years), chronic lower respiratory diseases (+0.2 years), and ischemic heart diseases (+0.1 years) contributed to widening the gap during the same period. In sum, while smoking-related causes of death have contributed most to the narrowing gap in most other industrialized countries, these causes contributed toward increasing the gender gap in Korea. Instead, liver disease, hypertension-related diseases, and transport accidents were major contributing causes of death to the narrowing of gender differentials in life expectancy in Korea.

Introduction

Women have generally had longer life expectancy at birth than men over the past two centuries (Tabutin & Willems, 1998, pp. 17–52) as life expectancy has steadily increased in both sexes (Oeppen & Vaupel, 2002). However, the male-female life expectancy gap has varied across time and country. Gaps were relatively small in the late 1800s but grew rapidly through most of the 20th century due to substantial rises in male mortality (Tabutin & Willems, 1998, pp. 17–52). A reversal of this pattern has been observed in more recent years among many industrialized countries where the gender differential in life expectancy has declined since the 1980s (Conti et al., 2003; Spijker, van Popperl, & van Wilssen, 2007, pp. 61–92; Trovato & Heyen, 2006; Trovato & Lalu, 1996).

As excess male mortality has been usually attributed to sex differentials in trends of behavioral and social risk factors such as smoking, heavy drinking, violence and occupational hazards (Lopez, 1983), the increased participation of women over 20th century in social, economic and political activities has been anticipated by some to result in a flattening of mortality gradients between men and women (Nathanson, 1995). Among possible risk factors, gender differences in cigarette smoking have been considered the most likely factor in accounting for the recent trend of the narrowing life expectancy gap between males and females (Pampel, 2002, 2005; Waldron, 1986).

The timing of narrowing the gender gap in life expectancy and relative contributions of major causes of death to changes in the

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gender differential in life expectancy therefore vary across countries even with similar epidemiologic transitions (Trovato & Heyen, 2006). For example, while the gender differential in life expectancy has narrowed in several developed countries including Canada, Sweden, and the US, it continues to rise in Japan (Trovato & Heyen, 2003, 2006; Trovato & Lalu, 2007). A previous study reported that the male-female difference in cardiovascular diseases mortality were common causes of death responsible for narrowing the gender gap in life expectancy in Canada, US, England/Wales, Germany, Italy, France, and Japan. On the other hand, the gender differential in cancer mortality contributed to narrowing the gender gap in life expectancy in Canada, US, England/Wales, and France and to widening the gap in Germany, Italy, and Japan. Similarly, gender differentials in accidents, violence and suicide mortality contribute to widening the gender gap in Japan, while these same causes contributed to narrowing the gender gap in the other countries (Trovato & Heyen, 2006).

In Korea, while life expectancy in both men and women shows a remarkably strong increase in the past several decades (1970–2005), the gender gap steadily increased until 1979, remained relatively stable between 1979 and 1992, and then showed a noticeable decrease until 2005 (Fig. 1). No studies have investigated the causes of death contributing to changes in the life expectancy gender gap in Asian countries, except in Japan (Glei & Horiuchi, 2007; Trovato & Heyen, 2006). In addition, changes in life expectancy also depend on age patterns of mortality over time and major causes of death vary across age groups. A difference in life expectancy in one age group does not necessarily mean that the mortality differences would be identical in magnitude and even in direction at all other ages. The objective of our study is therefore to understand which age groups and cause of deaths have contributed to the changes in the gender gap in life expectancy in Korea between 1970 and 2005. Quantifying the extent to which certain age groups and causes of death have contributed to the widening and narrowing in the gender gap in Korea since the industrialization would be a first step in understanding the individual and social determinants of the male-female mortality differences. It may also help formulating public health policies to increase life expectancy in both men and women in Korea and other countries with similar social and epidemiologic transitions.

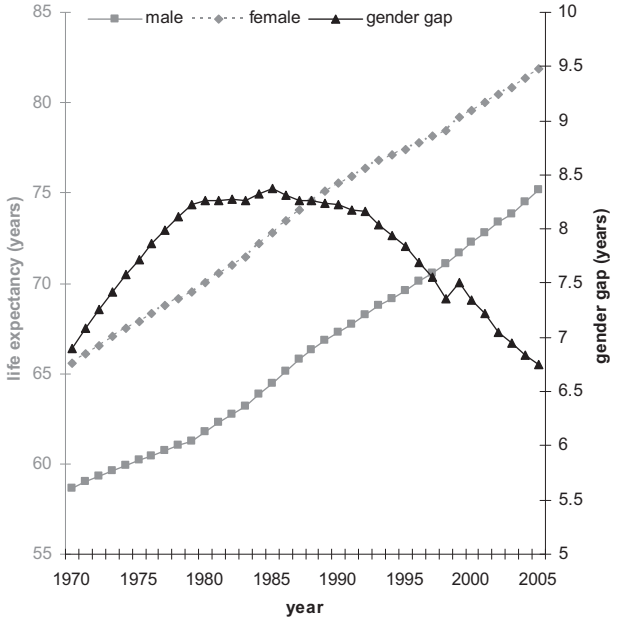

Fig. 1. Life expectancy at birth among Korean men and women and the gender gap between 1970 and 2005.

Methods

Data

Life table and annual mortality data were obtained from the Korean Statistical Information Service provided by the Statistics Korea. Life table data were available since 1970 and mortality statistics with cause of death information since 1983. We calculated annual life expectancy at birth for males and females between 1970 and 2005 using standard demographic techniques. Causes of death were coded according to the International Classification of Diseases, 10th Revision (ICD-10) for all years by Statistics Korea using the conversion table published by the WHO. We analyzed 26 specific causes of death (see Table 1) with relevance to the gender differential, which were collapsed from more detailed causes list (results from the detailed causes of death available from the authors upon request). Since mortality data in 1970s and early 1980s lack information on cause of death, it was not possible to examine the cause-specific contribution to the gender differences in life expectancy before 1983. Since the research used publicly available, aggregated data, it was not subject to ethical review.

Statistical analysis

Life expectancy is a summary of age-specific mortality rates, and thus differences in life expectancy between any two populations (e.g., males and females) are a function of differences in mortality rates at specific ages. For each age group we used Arriaga's method (Arriaga, 1984) to estimate how many years of the overall gender gap in life expectancy at birth are due to gender differences in age-specific mortality rates. The effect (in years), ${}_n\Delta_x$, of mortality differences between men and women between ages x and $x+n$ on the difference in life expectancy at birth in a given year is calculated as

$$
{}_n\Delta_x = \left[\frac{l_x^{\text{Men}}}{l_0^{\text{Men}}} \times \left(\frac{{}_nL_x^{\text{Women}}}{l_x^{\text{Women}}} - \frac{{}_nL_x^{\text{Men}}}{l_x^{\text{Men}}}\right)\right] + \left[\frac{T_{x+n}^{\text{Women}}}{l_{x+n}^{\text{Women}}} \times \frac{\frac{l_x^{\text{Men}} l_{x+n}^{\text{Women}}}{l_x^{\text{Women}}} - l_{x+n}^{\text{Men}}}{l_0^{\text{Men}}}\right] \quad (1)
$$

where l_x is the number surviving to age x out of a synthetic cohort (l_0 is the cohort size, typically 100,000 in a period life table), ${}_nL_x$ is the number of person-years lived between ages x and $x+n$, and T_{x+n} is the total number of person-years lived above age x. The first term on the right of Eq. (1) is the direct effect of gender difference in the number of years lived between ages x and $x+n$. The direct effect is the product of the fraction of the cohort surviving to age x in men (l_x/l_0) multiplied by the difference in the average number of person-years lived from ages x to $x+n$ (${}_nL_x/l_x$) between men and women. There is also an indirect effect of mortality differences *within* an age interval. Lower age-specific mortality among women in the age interval $(x, x+n)$ also means there are additional women survivors (relative to men) at the end of the age interval that will contribute to life expectancy at birth. Mortality differences between ages $(x, x+n)$ will therefore contribute indirectly to the overall gender gap even if no gender differences in age-specific mortality exist at ages above $x+n$. However, because there are likely to be gender differences in mortality at most ages, there is also an additional interaction effect due to fact that additional