Transitions in Mortality from Cardiovascular Disease in Hong Kong, Shanghai and Taipei City:

Trends, Patterns, and Contribution to Improvement of Life Expectancy

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Objective:

The significant decline of mortality due to cardiovascular disease (CVD) played an important role in the improvement of life expectancy in western countries since the late 1960s (AIHW 2010; Vallin and Mesle 2004). Chinese population is the world's largest race, and one of the world's most remarkable mortality declines occurred in the past half century. Thus, the question emerges that whether the trends and patterns of CVD mortality in Hong Kong, Shanghai, and Taipei City are same as those in the developed world or CVD mortality in these three areas have unique patterns. This paper aims to understand the trends and patterns of mortality due to cardiovascular disease (CVD) in Hong Kong, Shanghai, and Taipei City based on the analysis of both underlying causes of death (UCD) and multiple causes of death (MCD). Additionally, we aim at highlighting the role of mortality from CVD in the changes in life expectancy.

Background:

Mortality from CVD plays a critical role of mortality transition in theoretical perspective, including the epidemiologic transition, the nutrition transition, and the health transition. Firstly, the decrease of mortality due to CVD and other chronic diseases resulted in the epidemiologic transition from the third stage "The age of degenerative and man-made diseases" to the fourth stage "The age of delayed degenerative diseases", characterized by rapid mortality declines in advanced ages that caused by a postponement of the ages at which degenerative disease tend to kill (Olshansky and Ault 1986). Secondly, CVD mortality, including its risk factors such as obesity is a very important health and demographic outcome by the nutrition transition (Popkin 2003; Popkin 2006). For example, when the nutrition transition shift from the 3 stage to the 4 the stage, people increase the consumption of fat, sugar, and processed foods and reduce the physical exercises due to the advancement of technology for work and leisure, resulting in increasing obesity, hypertension, and diabetes that are main risk factors of CVD and other non-communicable diseases. Therefore, the prevalence and mortality of these diseases rise. Thirdly, the health transition theory emphasis the cultural, social and behavioural determinants on health, highlighting these factors other than medical interventions and income (Caldwell 1990). CVD is highly relevant to behaviours including smoking, consumption of fat and sugar, lack of physical exercises. Older people are much more likely to report having a long-term CVD condition than the younger people. In Australia, for example, the proportion of having a long-term CVD condition has reached about 65% among people who aged 75 and over (AIHW 2010). In other words, even if they may not die from CVD in the future, many people suffer from CVD for

long time. It can be concluded that CVD is a critical disease impacting on population health and the burden of CVD is still very high. To sum up, CVD mortality have a crucial role in theoretical perspective of mortality transition.

Additionally, the competing risk theory argues that death from a given cause declines at some point in time, resulting in that at some ages the risk of dying from other causes will increase (Olshansky and Ault 1986). However, many diseases have a pathological relationship with each other. For instance, diabetes will lead to the pathological change in artery including coronary artery, resulting the increasing the risk of ischemic heart disease. In other words, several diseases may contribute to the process of death jointly. Moreover, selecting UCD is affected by how doctors fill death certificates, and the rules of selection of UCD. It has been reported that there are differences in selecting UCD based on ICD-9 and ICD-10 (Goldacre et al. 2008; SEB 2005). Analysis of mortality from CVD based on UCD may underestimate the burden of mortality due to CVD. It is because even if in some cases, CVD is not selected as UCD, CVD may also have pathological relationship between the selected UCD, and contribute to the process of death. More importantly, analysis based on MCD can help us to examine the phenomena of co-morbidity. In short, analyzing mortality from CVD based on both UCD and MCD will help us to improve the knowledge of mortality and morbidity of the diseases,

Moreover, the study of CVD mortality in Hong Kong, Shanghai, and Taipei City has important meaning in the empirical perspective. As Hong Kong, Shanghai, and Taipei City are the most modernized areas in Greater China Region, their routes of mortality decline may be followed by other lagged areas in the region. In addition, these three cities are under different political circumstances, and experienced different social and economic changes during the past three decades. Additionally, the transition of health care systems in these three cities is different as well. Therefore, the comparative study on the routes of lowering mortality from CVD in the three cities may provide more information on the effect of social, economic factors on the transition of mortality, helping other areas to low mortality and improve population health status.

Data:

The study uses the individual mortality databases from official death surveillance system in Hong Kong, Shanghai, and Taipei City from the mid-1970s to 2008. Causes of death were classified based on International Classification of diseases (ICD) in the studied areas. Mortality data in Shanghai and Taipei will be examined based on both UCD analysis and MCD analysis. Population data in Shanghai are deducted by census and data from registered permanent residence, while those in Taipei City are obtained from Taiwan-Fukien demographic fact book, Republic of China. Census and Statistics Department in Hong Kong published population data by age and sex every year.

Changes in mortality from CVD in the three cities: a preliminary result:

Life expectancy has further improved in Hong Kong, Shanghai, and Taipei City during the past 3 decades (Figure 1). The main purpose of this paper is to assess the contribution of CVD mortality on improvement of life expectancy in these three cities. However, the trends and patterns of CVD mortality are different in the three cities (Figure 2). Mortality from CVD in Hong Kong and Taipei City decreased significantly during the whole period, while that in Shanghai begun to decline in the mid-1990s.

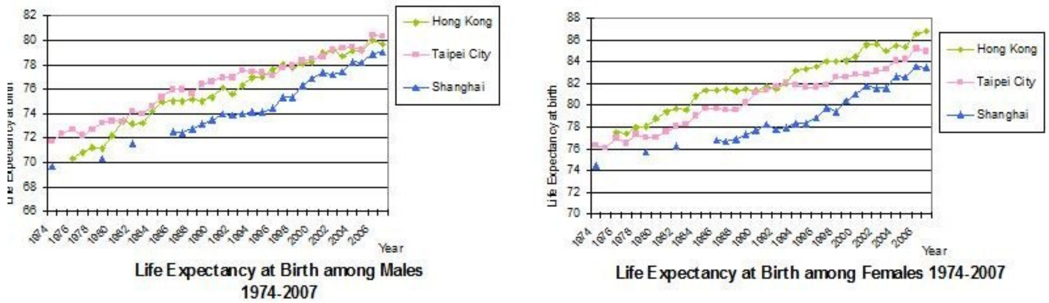

Figure 1 Changes in Life Expectancy in Hong Kong, Taipei City, and Shanghai: 1974-2007

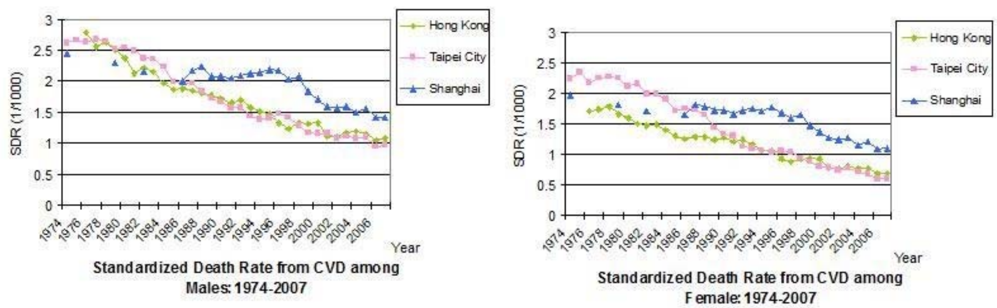

Figure 2 Standardised Death Rate from CVD in Hong Kong, Taipei City, and Shanghai: 1974-2007

Figure 3 shows that mortality from CVD contributed to the improvement of life expectancy most among people aged 55-79 in three cities. Taipei City benefited most from the decline in CVD mortality (3.89 years) from 1974-2007, while Shanghai only gained 1.88 years from the reduction of CVD mortality. Further analysis by different phases shows that the pattern of mortality from CVD in Shanghai during 1997-2007 was similar to that in Taipei City during 1987-1997. We argued that the pattern of CVD mortality in Shanghai may around 10-15 years later than that in Taipei City. Shanghai accelerated the decrease in CVD mortality since the mid-1990s when the city experienced rapid economic development after the Privatization reform.

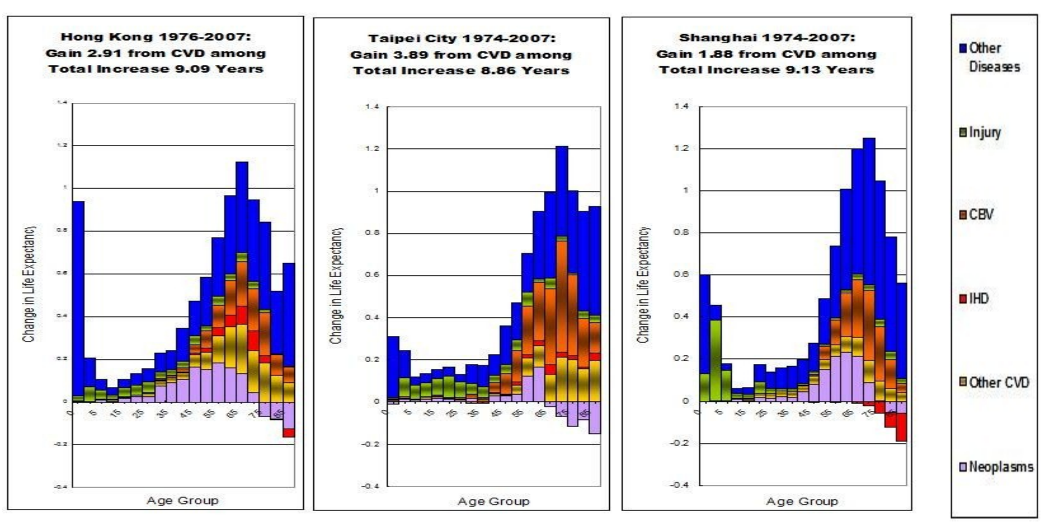

Figure 3 Contribution of Cause of Death to Increase in Life Expectancy: the mid-1970s to 2007

Among different types of CVD mortality, cerebrovascular mortality (CBV) was the principle contributor to the increase of life expectancy (1.21 in Hong Kong, 2.51 in Taipei City, 1.44 in Shanghai), while the corresponding figure for ischemic heart disease (IHD) were 0.30 in Hong Kong, 0.19 in Taipei City, and -0.30 in Shanghai. However, IHD mortality had started to make positive contribution to life expectancy since the late 1990s.

Difference in patterns of CVD mortality based on UCD analysis and MCD analysis:

From 1992-2007, CVD mortality based on MCD analysis contributed more to the increase of life expectancy than that based on UCD analysis (Figure 4). However, in different age groups, the patterns were different. For example, among the oldest, CVD mortality based on MCD was worse than that based on UCD in Taipei City. More detailed analysis based on MCD may be conducted in the future.

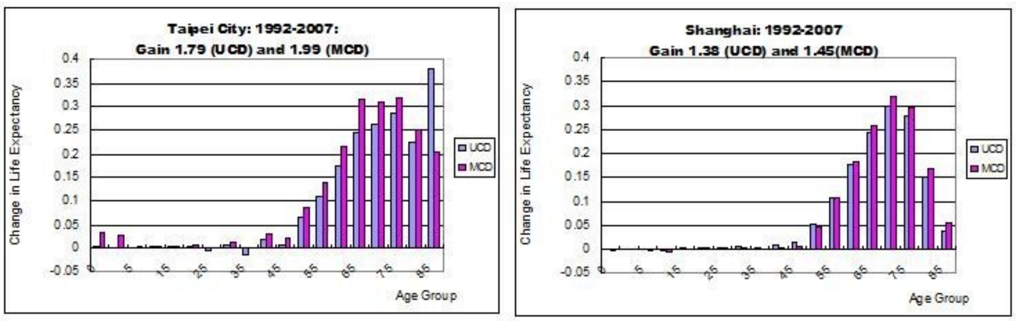

Figure 4 Contribution of CVD Mortality to Increase in Life Expectancy based on Underlying-Cause-Death Analysis (UCD) and Multiple-Cause-Death Analysis (MCD): 1992-2007

Discussions:

Mortality from CVD in Hong Kong, Taipei City and Shanghai all experienced the declining trends during the past 3 decades. The decrease in mortality from IHD began later than that from CBV. As well, the pattern of CVD mortality in Shanghai was a delay pattern compared with that in Hong Kong and Taipei City. Indeed, mortality from CVD in Shanghai did not improve during the mid-1980s to the mid-1990s when Shanghai experienced the State owned enterprise reform and Privatization. But afterwards with the rapid economy development, mortality from CVD in Shanghai accelerated to go down. The privatization reform may have the negative effect on mortality from CVD in Shanghai, which had been observed in Eastern European countries.

Hong Kong, Taipei City and Shanghai moved from the third stage to the fourth stage in the epidemiological transition in sequence, attributed to the decline in CVD mortality. Economic development played a critical role in the transition and mortality decline. However, CVD has become a treatable disease due to the advancement of treatment and prevention. Best performance of CVD mortality in Taipei City could be attributed to equity of health service delivery (e.g. National Health Insurance Program).

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