

# Preventive healthcare: The Singapore way

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## Abstract

Singapore healthcare system is among the top ranks in world today. The emphasis is on preventive healthcare. This is the most effective way for financial sustainability of healthcare especially in a rapidly aging society. Many chronic diseases today have socio-economic origins. In the debate on nature versus nurture, nurture needs more attention to be paid.

## Introduction

Singapore seems to spend very little on healthcare. Household expenditure on healthcare in 2017/18 was 5.5% of total household expenditure (Singapore Ministry of Health website). Government healthcare expenditure in 2017 was less than 3% of GDP. In contrast, the countries of the Organization of Economic Cooperation and Development (OECD) spend about 9% of GDP on average; the USA alone is about 17%. Yet, Singapore excels in health outcomes. In 2000, the World Health Organisation (WHO) ranked Singapore 6<sup>th</sup> out of 191 countries in terms of health status [1]. In 2014, the Economist Intelligence Unit (EIU) ranked Singapore 2<sup>nd</sup> out of 166 countries in terms of health outcomes (online). In 2013, Harvard Professor William Haseltine, after studying the Singapore healthcare system, published a book titled “Affordable excellence: How to create and manage sustainable healthcare systems” [2]. The infant mortality rate in Singapore hovering around 2 per 1000 live births is among the lowest in the world. Health adjusted life expectancy in Singapore around 74 years is among the highest in the world. What is the secret? It is primarily preventive healthcare.

There are many factors that contribute to this both directly and indirectly.

1. Healthcare financing system. As a British colony Singapore inherited the British-style free healthcare financed by general taxation. Singapore, however, deviated from this very early and established self-responsibility and medical savings account system as a corner stone in healthcare. Affordability and sustainability are the key considerations. This is a well discussed topic [3]. Self-responsibility in healthcare financing plays a critical role preventive healthcare [4].

2. Maintaining excellent sanitation conditions. For example, the government issues a grade label (A, B, C) to restaurants depending on their sanitary conditions. Restaurants have to display this prominently for the customers to see. Fear of losing customers pushes restaurants to work for an A label. Another example is regular checks and fines (where applicable) on stagnant water for dengue management.

3. Exercise corners in every housing (apartment) block and park. People who go for a walk in a park get tempted to use exercise apparatus provided in exercise corners.

4. Transport system. Hefty car prices, artificially raised to reduce traffic congestion, forces people to use the public transport system that requires walking some distances on a daily basis. Singapore public transport system is among the best now.
5. Exercise programs for school kids who are over-weight. Compulsory national service for all male Singapore citizens and permanent residents introduces fitness to half the population at a young age.
6. Smoking restrictions. Cigarette prices are kept high and smoking is prohibited in many places in Singapore. Smokers have to walk at least 5 meters away from a smoking-prohibited building for a smoke. But it is not easy to find such a spot without entering another smoking-restricted area.
7. Early intervention. The latest is fighting diabetes to curb rising healthcare costs in an aging population. The majority population in Singapore is Chinese (74.3% in 2018). Although the incidence of diabetes among the majority population is much lower (9.7%) than that of Indian (17.2%) and Malay (16.6%) populations, the government has decided to act early. Regular fogging and other checks for dengue management is another example.

This is not an exhaustive list. For example, increasing education level of the population is an important contributor to preventive healthcare. What is important to be noted is that expenditure involved in implementing many of these programs is not counted under healthcare. For example, expenditure on walkways across the island that are being constructed gets classified under construction expenditure. Therefore, direct expenditure on healthcare does not necessarily reflect the true healthcare landscape of Singapore.

### **Health-related risk behaviour**

One way to assess preventive healthcare in action is to make a comparison of health-related risk behaviours among the people of different countries. Such behaviours include smoking, excessive alcohol consumption, lack of physical activity resulting in over-weight and obesity, unhealthy diet, and poor oral hygiene.

My former student Yang Shu Wen [5] and I carried out a study to examine how health-related risk behaviours changed over successive generations (birth cohorts) in four countries that represent different shares of private expenditure in total health expenditure; England (18.3%), Australia (32.5%), Hong Kong (48%), and Singapore (67.4%) (WHO statistics 2010). Here I provide a summary of the results and skip the technical details.

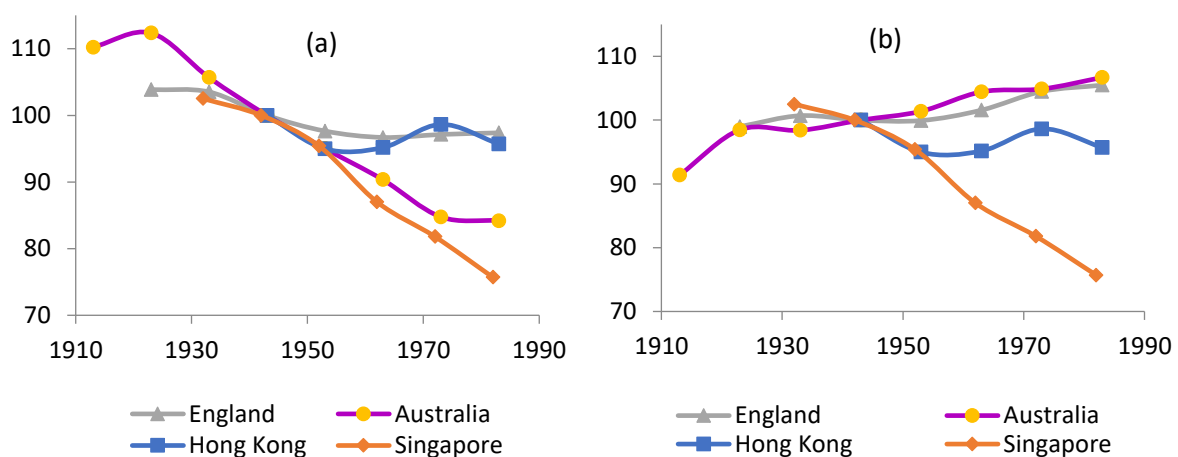
We were able to obtain data by age on smoking, excessive alcohol consumption, over-weight and obesity, and physical inactivity from different health surveys conducted in different years. Although the definitions used on these measures are not exactly the same in the four countries, they are sufficient to drive the point home. To isolate the cohort trends on these indicators we utilized the age-period-cohort (APC) regression technique. This is a popular technique used in epidemiological studies. Typically, these three variables are represented by binary (dummy) variables in the regression. However, age, period (current year) and cohort (birth year) are perfectly colinear because one can be derived from the other two. One way to solve this problem is to represent the period effect by some variables instead of period dummies. For this we used per capita income, which by itself an important determinant of health outcomes. Using

this technique, we can remove the age effect simply by differencing the data over two time periods. Then run a regression on growth rate of per capita income and cohort dummies. This provides the estimated cohort coefficients in the differenced form  $\hat{\delta}_k = \hat{\gamma}_k - \hat{\gamma}_{k-1}$ , ( $k=1,2,\dots,K$ ). From this we can work out an index of cohort effects by setting  $\hat{\gamma}_0 = 100$  and obtain the rest of  $\hat{\gamma}_k$  to provide the cohort profile.

As for smoking all the four countries show a declining pattern of smoking over successive birth cohorts with Hong Kong and Singapore showing steeper drops. This general trend is to be expected given the anti-smoking campaigns in many countries. Interestingly alcohol consumption does not show a systematic drop over different birth cohorts across all the four countries. This is understandable because alcohol is likely to be both a tonic and toxin [6].

What is most interesting are the results on physical inactivity, the lack of sufficient physical exercise within a defined period like a week. Figure 1 (a) shows the inactivity index by birth cohort after removing age and income effects. It shows a steady downward trend in Australia and Singapore indicating that physical activity levels have gone up over successive generations. In England and HK the index tapers off. There is still an important missing control variable from this analysis.

It came to my notice when I was walking in parks in Melbourne that many people who walk there are already over-weight. It could be that they have been advised by their physicians or peers to be more physically active because of already detected health issues. Therefore, to obtain a more accurate picture on physical exercise as a preventive healthcare measure we have to remove the effect of over-weight and obesity from the data as well. Figure 1 (b) shows the resulting cohort index. It is interesting to observe that the downward trend of the physical inactivity index (or the increase in physical exercise) in Singapore is not related to obesity. In contrast Figure 1 (b) shows an upward trend in physical inactivity levels in Australia and England. What these indicate is that people in these countries resort to physical exercise largely because of over-weight problems. Hong Kong results are not very informative.



**Figure 1.** Physical inactivity index (vertical axis) by birth cohort (horizontal axis). (a) After removing age and income effects, (b) After removing age, income, and obesity effects

## Conclusion

The World Health Organization has been advocating preventive healthcare for a long time. The proposed methods include direct interventions such as vaccination for disease prevention and health promotion by increasing health literacy. While these are all in place in Singapore, what is most noteworthy are the indirect contributors for better health of the population in Singapore. Root causes of many chronic diseases such as diabetes, cancer and cardio-vascular conditions are socio-economic. Therefore, the study of social epidemiology plays a critical role in designing preventive healthcare measures.

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