Age-Standardised Death Rate for Singapore

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Introduction

Over the last decade, Singapore residents have generally experienced improvements in their health and mortality. Life expectancy at birth[1] has risen (Chart 1), while the age-specific death rates (ASDRs) have declined (Chart 2). In comparison, the crude death rate (CDR) has been rising over the last five years. After declining from 4.4 deaths per 1,000 residents in 2004 to 4.3 deaths in 2009, the resident CDR rebounded to 4.7 deaths per 1,000 residents in 2014 (Chart 3). So, why has the CDR been rising in spite of improvements in mortality in recent years?
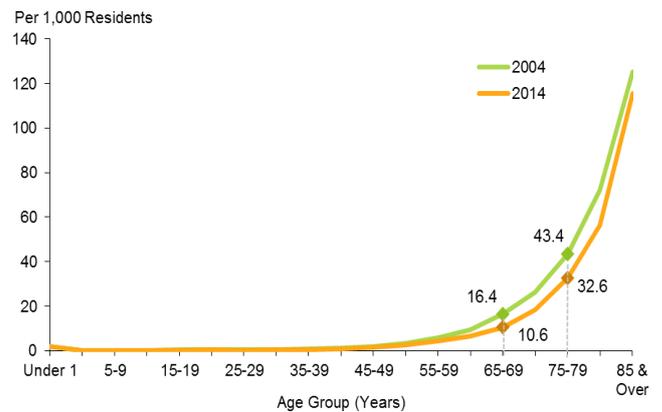
CHART 2   RESIDENT AGE-SPECIFIC DEATH RATE

Per 1,000 Residents

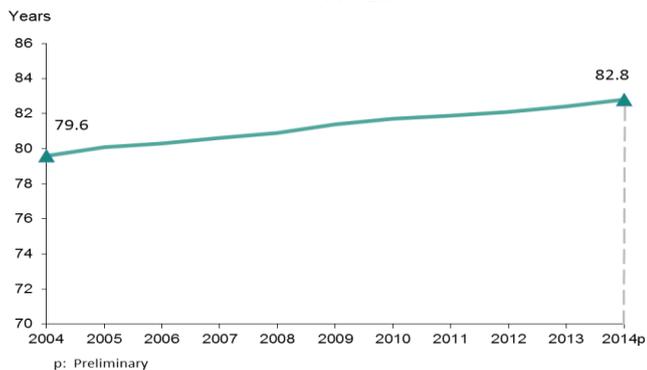CHART 1   RESIDENT LIFE EXPECTANCY AT BIRTH

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CHART 3   RESIDENT CRUDE DEATH RATE

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1   Life expectancy at birth refers to the average number of years a person at birth could expect to live if the age-specific mortality rates of a given year were held constant over his/her lifetime. It does not take into account future changes in mortality. This indicator is commonly used to sum up the mortality experience of a population, taking into account the population's age and sex structure.

Crude death rate does not factor in age structure of the population...

The CDR is defined as the number of deaths per 1,000 population in a reference period. It is a summary indicator and a crude measure of mortality which does not take into account the age structure of the population. The population age structure can influence the number of deaths.

For example, a younger population will have fewer deaths than an older population, other things being equal. Hence, comparisons between populations with different age structures, such as those between different countries and over time, based on the CDR may not be meaningful.

With the ageing Singapore resident population, the higher number of deaths at the older ages caused the CDR to rise in recent years. This trend will become more pronounced when the baby boomers reach their 80s and if the baby dearth continues, coupled with a slowdown in immigration.

...but age-specific death rates do

The ASDR is defined as the number of deaths in a given age group, per 1,000 population in the same age group, during a reference period. Hence, the ASDRs factor in the population age structure, allowing further insights into the mortality patterns within each age group as well as facilitating comparisons across different populations and over time.

Improvements in health and mortality in Singapore are reflected in lower ASDRs, as fewer deaths occurred within each age group over the years. For example, the death rate fell from 16 deaths for every 1,000 residents aged 65-69 years in 2004 to 11 deaths in 2014 (Chart 2). The death rates also declined for those aged 75-79 years from 2004 to 2014. Unlike the CDR, however, ASDRs do not offer a summary index.

Age-standardised death rate offers a summary index and factors in age structure of the population

The age-standardised death rate (ADR) provides a summary indicator that removes the influence of the population age structure. It is derived by multiplying the ASDRs of the reference population by the proportion of the corresponding age group out of a "standard" population.

A "standard" population, or an index or base population, is any population chosen to fix the age structure so as to eliminate its effect on mortality trends.

Thus, the ADR enables meaningful comparison of death rates between populations with different age structures and over time, by relating the ASDRs to a "standard" population. It can be interpreted as a *hypothetical* overall death rate if the "standard" population were subject to the observed ASDRs.

The ADR may change depending on the "standard" population chosen. Hence, while it provides a *hypothetical* overall death rate to facilitate comparisons, it does not replace the observed CDR and ASDRs.

Singapore's resident age-standardised death rate is declining

Using the age structure of the Singapore resident population as at June 2003[2] as the "standard" population, the resident ADR exhibited a downtrend since 1990, in line with the improvements in health and mortality.

Over the last decade, the ADR fell from 4.2 deaths per 1,000 residents in 2004, to 3.6 deaths in 2009, and further to 3.2 deaths in 2014 (Chart 4). It follows that the uptick in CDR in the recent half-decade was mainly due to the aging resident population.

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2   The year 2003 was selected as data on resident population exclude residents who have been away from Singapore for a continuous period of 12 months or longer as at the reference period from 2003 onwards.

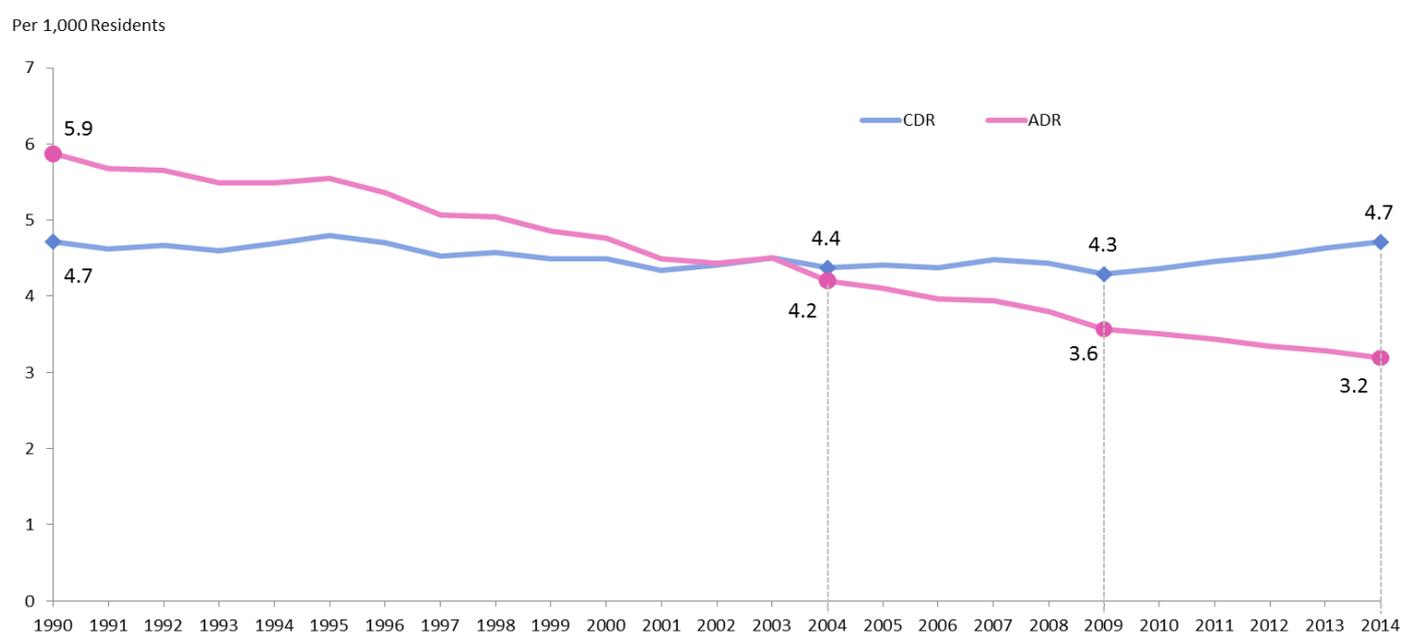CHART 4   RESIDENT CRUDE DEATH RATE AND AGE-STANDARDISED DEATH RATE

Per 1,000 Residents

TABLE 1   SUMMARY OF VARIOUS DEATH RATES

Crude Death Rate (CDR)	Age-Specific Death Rate (ASDR)	Age-Standardised Death Rate (ADR)
• Refers to the number of deaths per 1,000 population • A summary indicator of mortality • Does not take into account the age structure of the population • A lower CDR may not indicate better mortality conditions	• Refers to the number of deaths in an age group per 1,000 population of the same age group • Takes into account the age structure of the population • Facilitates comparison across populations with differing age structures and over time • An improvement in mortality translates into a downward and rightward shift in the ASDR curve	• A summary indicator of mortality that removes effects of age structure variations in population composition • Computed by multiplying the ASDRs of the reference population by the proportion of the corresponding age group out of a "standard" population • May change depending on the "standard" population chosen

Singapore's downtrend in age-standardised death rate was the steepest among selected countries

The World Health Organisation (WHO) maintains a Mortality Database where ADRs are calculated for Singapore and other countries[3] based on the world standard population[4]. According to WHO's data, besides Singapore, declining ADR is observed for selected developed countries between 1990 and 2010 (Chart 5).

Among the 7 selected countries, Japan's ADR was consistently the lowest, with Hong Kong's ADR trailing closely behind. While Singapore's ADR was the highest in 1990, we experienced the steepest downtrend over the next two decades. By 2010, our ADR was the fourth lowest, trailing behind Japan, Hong Kong and Australia while ahead of Sweden, the United Kingdom and the United States.

Concluding Remarks

Given the usefulness, age-standardised death rate will be compiled for the Singapore resident population and analysed in the annual *Population Trends*[5] publication released by the Singapore Department of Statistics from the 2015 issue onwards. The historical time series will also be made available in the publication and on the SingStat website[6].

CHART 5   INTERNATIONAL COMPARISON OF AGE-STANDARDISED DEATH RATE
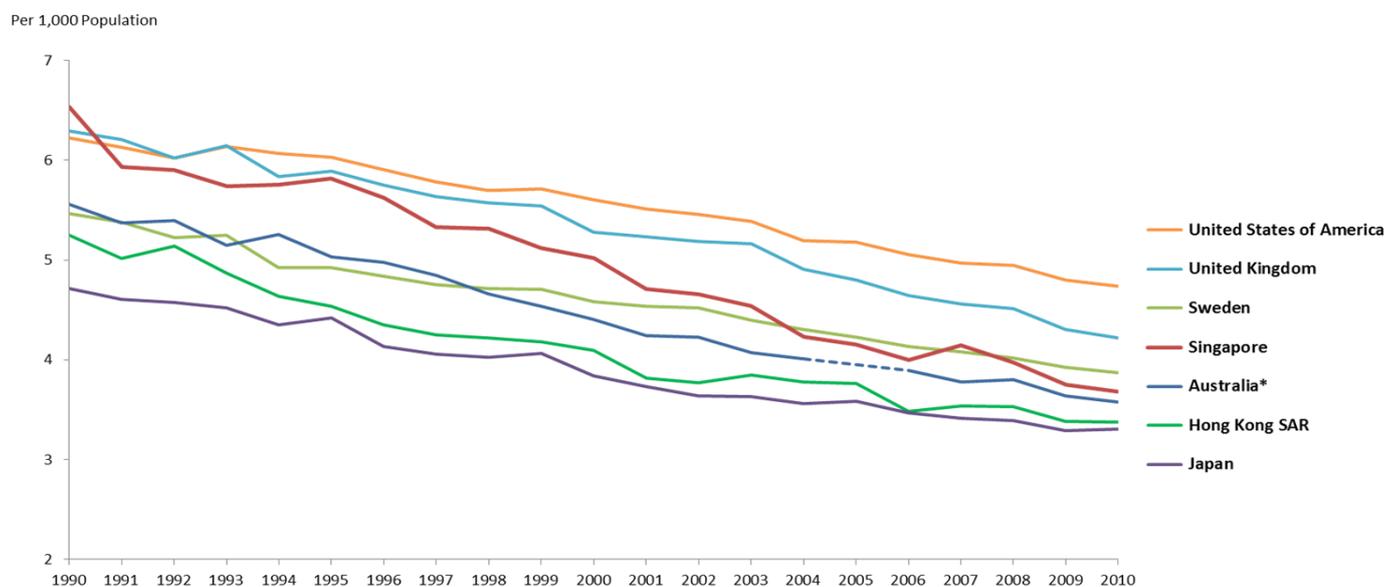
Source : World Health Organisation Mortality Database
* 2005 data is not available.

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3   World Health Organisation Mortality Database (July 2014):
    Indicator 8013 "Age Standardised Death Rate per 100 000 – Total deaths all causes, all ages - both sexes"
    (http://apps.who.int/healthinfo/statistics/mortality/whodpms/)
4   Age composition of the World Standard Population is available at
    http://apps.who.int/healthinfo/statistics/mortality/whodpms/definitions/pop.htm
5   This publication is accessible via
    http://www.singstat.gov.sg/publications/publications-and-papers/population-and-population-structure/population-trends
6   www.singstat.gov.sg/tablebuilder