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ORIGINAL ARTICLE

Suicide in Hong Kong: epidemiological profile and burden analysis, 1981 to 2001

Objective. To describe changes of the epidemiological profile of suicides in Hong Kong, and the burden of suicides in terms of years of life lost between 1981 and 2001.

Design. Retrospective study.

Setting. Hong Kong.

Participants. Data on registered deaths of the Hong Kong population from 1981 to 2001 were retrieved from records of the Census and Statistics Department of the Government of the Hong Kong Special Administrative Region.

Main outcome measures. Crude, standardised, age- and sex-standardised suicide rates; years of life lost; suicide method used; and rank among leading causes of death.

Results. Suicide ranked sixth in the leading cause of deaths and represented about 3% of all deaths each year. The suicide rate has increased from 9.6 per 100 000 to 15 per 100 000 between 1981 and 2001. The total years of life lost due to suicide increased by 96.0%, from about 9900 years in 1981 to 19 400 years in 2001, whereas the figure for all causes of death decreased by 14.0%, from 274 600 years to 236 700 years. The total share of years of life lost attributable to suicide deaths has increased from 3.6% to 8.1% and is still increasing, especially among the middle age-groups (30-59 years). The use of charcoal burning as a suicide method has increased from 6.0% before 1998 to more than 28.0% in 2001.

Conclusion. The burden on the years of life lost due to suicide is underestimated and overlooked. The increase of suicides in recent years has had a significant impact on the years of life lost and can be used as a useful indicator of performance in Hong Kong.

Key words:
Hong Kong: Suicide

1981年至2001年自殺在香港的流行病學狀況及負擔分析

目的：描述1981至2001年間，自殺在香港的流行病學狀況的改變，並以生命年期折損為單位，描述自殺帶來的負擔。

設計：回顧性研究。

安排：香港。

參與者：根據香港特別行政區政府統計處的紀錄，抽取在香港由1981至2001年間的登記死亡數字。

主要結果測量：原始、標準化、年齡及按性別標準化的自殺率；生命年期折損；自殺的方法，以及在主要死亡原因中的排行。

結果：自殺是第六大死亡原因，佔全年死亡數字3%。自殺率在1981至2001年間，由每10萬人中9.6人，上升至每10萬人中15人。自殺引致的生命年期折損增加96.0%，即由1981年的約9900年，上升至2001年的約19400年；同期所有死亡原因的整體生命年期折損下降14.0%，由274 600年下降至236 700年。自殺死亡帶來的生命年期折損比例，由3.6%上升至8.1%，並正繼續上升，尤其是在中年組別（30至59歲）。以燒炭方式自殺的比率，由1998年前的6.0%，上升至2001年的超過28.0%。

結論：自殺帶來的生命年期折損負擔被低估及忽略。近年自殺數字的上升對生命年期折損有重大的影響，並且可以作為香港整體表現的有用指標。
Introduction
The World Health Organization (WHO) recently reported that more than one million suicide deaths occurred worldwide in 2000,1 which corresponded to a global suicide mortality rate of approximately 14.5 per 100 000, or one suicide every 40 seconds. Suicide is the 13th leading cause of death worldwide. Among people in the 15- to 44-year age-group, self-inflicted injuries are the fourth leading cause of death and the sixth leading cause of ill-health and disability.2 In Hong Kong, suicide has become the sixth leading cause of death overall and the leading cause of death for teenagers in the 15- to 24-year age-group. Every person who kills himself or herself causes tremendous distress to family members, friends, and the community as a whole. These groups are profoundly affected emotionally, socially, and economically. The economic cost associated with self-inflicted death or injury is estimated to be billions of US dollars a year.1

Also, the socio-economic profile of suicides is very different from the western countries and has been undergone significant changes for the past few years.3-10 In this article, we describe the changes in the epidemiological profile of suicides and the burden of suicide in Hong Kong. Firstly, we estimate the impact of premature mortality for Hong Kong suicide deaths from 1981 to 2001 in terms of years of life lost (YLL), as used by the WHO. Secondly, we study the age- and sex-standardised suicide mortality rate and assess its effect on the overall suicide rate. Finally, we explore the increasing use of charcoal burning as a suicide method.

Data and methods
Since 1997, data on registered deaths between 1981 and 2001 were made available from the Census and Statistics Department of the Government of Hong Kong (from 1997 onwards, the Government of the Hong Kong Special Administrative Region of China).11 Because Hong Kong has a well-developed reporting system to record vital life events (ie births and deaths), the coverage of data is almost complete and the quality of the data is high. Data on suicide deaths were extracted from these records, as identified by the external cause codes from E950 to E959 under the 10th revision of the International Statistical Classification of Diseases and Related Health Problems (ICD-10)13 for 2001.

Assessing the socio-economic impact on suicide deaths requires a proxy to estimate the burden on each suicide death. To make our compilation comparable with other WHO member states, we adopted the YLL to estimate this burden, using a standard life table.14 The number of YLL for each death is equal to the life expectancy at the age of dying and is modified by various ‘discount factors’ according to the standard of the Global Burden of Disease study.15 To calculate the number of YLL for suicide, the number of YLL per death at each age is multiplied by the number of deaths at each age and then summed across all ages (Box). To study the trends of suicide deaths from 1981 to 2001 in Hong Kong, we calculated three types of suicide death rate: crude rates, standardised rates, and age-specific rates. We also examined the distribution of suicides by method.

All published data on suicide deaths in Hong Kong have so far underestimated the suicide rate. Two different death data files are available from the Census and Statistics Department: those of known deaths (deaths that occurred and were recorded in each calendar year) and those of registered deaths (deaths registered in each calendar year but which may have occurred in previous years). Most researchers have analysed suicide data from the files of known deaths. However, a significant proportion of suicide deaths are not recorded in these files, mainly because of the reporting delay from the Coroner’s Office to the Registry of Birth and Death and to the Census and Statistics Department. The Census and Statistics Department currently imposes a cut-off date in June (May before 1998) to stop counting deaths from the previous year reported by the Registry of Births and Deaths. All other deaths reported after June (May before 1998) will thus not be recorded as a known death with the relevant ICD-9 classification code. As a result, all suicide deaths in one year will actually not be classified as a known death in that year. In general, the proportion of deaths with an undetermined death code is relatively low (about 1%-2% of all deaths); however, the proportion of suicide deaths among these uncoded deaths is large (20%-30%), because many suicides in the last 3 months of the calendar year may not be reported to the Registry of Births and Deaths before its cut-off date.5,16

The formula for YLL has been generalised from a single death at age a to include a parameter K to remove non-uniform age-weights (age-weighting modulation factor). The general formula for computing YLL at age a is:

$$YLL(a) = \frac{KKCe^r}{r + \beta} \cdot \left[ e^{\beta a} \cdot [e^{\beta a} - 1] - e^{\beta a} \cdot [e^{\beta a} - 1] - \frac{1}{r + \beta} \cdot \left[ e^{\beta a} - 1 \right] \right]$$

where $r$ is the discount rate, $\beta$ is the parameter from the age-weighting function, $C$ is a constant, and $L$ is the standard expectation of life at age a. For standard YLL used in the Global Burden of Disease Study, $r$ is 0.03, $\beta$ is 0.04, $K$ is 1, and $C$ is 0.1658. The number of YLL at age a in the population is the multiple of YLL(a) and the number of deaths at age a years, and the total YLL is the sum of YLL across ages.

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It is important to use the files of registered deaths to determine the number of deaths in each calendar year and to study suicidal behaviour in Hong Kong. The percentage of underreporting varied from 5% to 18% during the period 1981 to 1997. For example, there were 645 suicide deaths recorded in the files of known deaths in 1997, whereas a total of 784 suicide deaths were recovered from the files of registered deaths: the percentage of underreporting was about 18%. To provide a more accurate figure of suicide deaths, we have retrieved data on all suicide deaths in a particular year from the files of registered deaths.

**Results**

**Increase in suicide rates**

The total number of deaths from all causes increased from 24,978 in 1981 to 33,378 in 2001, while the total number of suicide deaths more than doubled, from 498 to 1019. As a pro-
portion of total number of deaths, suicide increased from 2.0% to 3.0%. The suicide rate increased by 56.9%, from 9.65 to 15.14 per 100 000 from 1981 to 2001 (Fig 1). When standardised by age and sex (not shown), the rate remained around the 1981 level in 1998, but rose by 10.8% from 11.39 in 2000 to 12.63 in 2001—or 30.9% above the base-year level of 1981. Approximately 46% of the increase can be attributed to the ageing population, because older adults have a higher suicide rate than that of the general population (Table 1), as reflected by the age-specific suicide rates (Fig 2). However, the age profile of suicide deaths is changing gradually: the rate for adults older than 60 years has been decreasing slowly since 1997—from 30 to 25 per 100 000 in 2001—whereas the rate for 25- to 59-year-olds has increased substantially since 1997, by more than 30%.

**Increase in years of life lost**

The ranking for suicide among the top leading causes of death in Hong Kong has gone up gradually from ninth in 1981 to eighth in 1991 and sixth in 2001 (Table 2a). The increase in rank in terms of YLL due to suicide in the same years also increased from eighth in 1981 to fifth in 1991 and fourth in 2001 (Table 2b). The total number of YLL due to suicide increased by 96.0% from about 9900 in 1981 to 19 400 in 2001, whereas the total number of YLL due to other causes decreased by 14.0% from 274 600 to 236 700 during the same period as a result of overall improvement of health care and reduction of mortality. The total share of YLL constituted by suicide deaths has increased from 3.6% to 8.1% and has been increasing since 1997 (Fig 3). It is obvious that suicide has become an important cause of YLL in Hong Kong.

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**Table 2a. Ten leading causes of death in terms of absolute number of deaths, Hong Kong, 1981, 1991, and 2001**

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<td>1</td>
<td>Diseases of the circulatory system</td>
<td>Neoplasm</td>
<td>Neoplasm</td>
</tr>
<tr>
<td>2</td>
<td>Neoplasm</td>
<td>Diseases of the circulatory system</td>
<td>Diseases of the circulatory system</td>
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<tr>
<td>3</td>
<td>Diseases of the respiratory system</td>
<td>Diseases of the respiratory system</td>
<td>Diseases of the respiratory system</td>
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<tr>
<td>4</td>
<td>Injury and poisoning (excludes suicide)</td>
<td>Diseases of the genito-urinary system</td>
<td>Diseases of the genito-urinary system</td>
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<tr>
<td>5</td>
<td>Symptoms, signs and ill-defined conditions</td>
<td>Diseases of the digestive system</td>
<td>Diseases of the digestive system</td>
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<tr>
<td>6</td>
<td>Diseases of the digestive system</td>
<td>Infectious and parasitic diseases</td>
<td>Infectious and parasitic diseases</td>
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<td>7</td>
<td>Diseases of the genito-urinary system</td>
<td>Injury and poisoning (excludes suicide)</td>
<td>Injury and poisoning (excludes suicide)</td>
</tr>
<tr>
<td>8</td>
<td>Infectious and parasitic diseases</td>
<td>Suicide</td>
<td>Suicide</td>
</tr>
<tr>
<td>9</td>
<td>Suicide</td>
<td>Symptoms, signs and ill-defined conditions</td>
<td>Symptoms, signs and ill-defined conditions</td>
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<tr>
<td>10</td>
<td>Certain conditions originating in the perinatal period</td>
<td>Infectious and parasitic diseases</td>
<td>Infectious and parasitic diseases</td>
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**Table 2b. Ten leading causes of death in terms of years of life lost, Hong Kong, 1981, 1991, and 2001**

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<td>1</td>
<td>Neoplasm</td>
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<tr>
<td>2</td>
<td>Diseases of the circulatory system</td>
<td>Diseases of the circulatory system</td>
<td>Diseases of the circulatory system</td>
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<tr>
<td>3</td>
<td>Diseases of the respiratory system</td>
<td>Diseases of the respiratory system</td>
<td>Diseases of the respiratory system</td>
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<tr>
<td>4</td>
<td>Injury and poisoning (excludes suicide)</td>
<td>Diseases of the genito-urinary system</td>
<td>Diseases of the genito-urinary system</td>
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<tr>
<td>5</td>
<td>Certain conditions originating in the perinatal period</td>
<td>Diseases of the digestive system</td>
<td>Diseases of the digestive system</td>
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<tr>
<td>6</td>
<td>Diseases of the digestive system</td>
<td>Infectious and parasitic diseases</td>
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<tr>
<td>7</td>
<td>Diseases of the genito-urinary system</td>
<td>Injury and poisoning (excludes suicide)</td>
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<tr>
<td>8</td>
<td>Infectious and parasitic diseases</td>
<td>Suicide</td>
<td>Suicide</td>
</tr>
<tr>
<td>9</td>
<td>Suicide</td>
<td>Symptoms, signs and ill-defined conditions</td>
<td>Symptoms, signs and ill-defined conditions</td>
</tr>
<tr>
<td>10</td>
<td>Congenital anomalies</td>
<td>Infectious and parasitic diseases</td>
<td>Congenital anomalies</td>
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Suicide methods used
The pattern of suicide methods varied over the study period (Fig 4). The most striking trend since 1998 has been the increase of charcoal burning as a suicide method (ie carbon monoxide poisoning), although jumping (eg from windows) is still the most commonly used method because of its accessibility and lethality, accounting for 40.0% of suicide deaths in 2001. Charcoal burning increased from 6.0% before 1998 to about 28.0% in 2001, and has already replaced the traditional...
method of hanging as the second most commonly used suicide method. The use of charcoal burning has increased most among the middle age-groups, but its prevalence among the elderly has essentially remained the same. Finally, there is no statistically significantly sex difference in the suicide method used (not shown).

Comparison with other countries
Table 1 highlights the comparison between the age-specific suicide rates by sex in Hong Kong and in selected countries. In 2001, the region-specific suicide death rate for Western Pacific region based on the WHO classification system was 18.3 deaths per 100 000—24.4% higher than that of Hong Kong. However, the suicide rate of Hong Kong is relatively higher than that of most developed countries with a low mortality risk, such as the United States and countries in Europe. Furthermore, the sex ratio of suicide in Hong Kong and other Asian countries is smaller than that of their western counterparts. The suicide rate in the 15- to 24-year age-group is relatively lower than that of peers in Australia, New Zealand, Canada, and the United States. However, the suicide rates of older adults in Hong Kong and other Asian countries are much higher than those of peers in western countries.

Discussion
As measured by health performance indicators, the quality of the population’s health in Hong Kong is among the best in the world. Hong Kong has one of the highest life expectancies at birth (78 for men and 82 for women in 2001) and a very low infant mortality rate (only 2 per 1000 live births in 2001). Nevertheless, the overall increase in the territory’s suicide rate is disturbing, particularly among people who are in their prime productive and reproductive years. The recent increase in suicide rates among these age-groups may be due to unexpected financial difficulties. During the past 5 years or so, the economy of Hong Kong has been severely hit by the Asian financial crisis, the terrorist attacks and scandals on corporate governance in the United States, and the recent outbreak of avian influenza and severe acute respiratory syndrome. Also, because of these incidents, the local unemployment rate is at a record level of 8.3% and is expected to rise even higher. The unemployed is over-represented among suicide deaths and joblessness has been shown to be an adverse factor in mental well-being. Financial debt is mainly caused by negative equities, business or investment failures, unmanageable spending, impulsive gambling, or unemployment. Another contributory factor to the increase in suicide rate among the middle age-group has been the change over the past two decades in family structure and marital distribution in Hong Kong. The crude divorce rate increased from 0.4 cases per 1000 in 1981 to 2.4 cases per 1000 in 2002, and the number of single men and women has increased as well. Studies have shown that the suicidal propensity among

![Fig 4. Distribution of suicide deaths by methods, Hong Kong, 1981 to 2001](image-url)
single-parent families is much higher than that among other groups. The recent poor socio-economic environment has made life even more difficult for single-parent families. Although the suicide rate has increased significantly since the change of Hong Kong’s sovereignty in 1997, the factor of political change appears to be not a major concern.

Despite the increase in the overall suicide rate, the elderly suicide rate has declined since 1997 and the trend is fairly stable. The government, non-governmental organisations, and research institutes have been spending a great deal of effort in preventing elderly suicides since 1997. Increasing public awareness, conducting research studies, training frontline health care professionals, and increasing advocacy on the well-being of the elderly seem to have contributed to this decline and have to be commended.

On the other hand, the increase in suicide rates among young adults and middle age-groups is aggravating. It is believed that an intact family structure provides a strong source of social regulation and integration for youth, which, in turn, reduces the risk of suicide. Furthermore, marriage is likely to generate a sense of social integration, thereby lowering proneness toward suicide. However, we have witnessed a continual decline of family support and a disintegration of the family structure in Hong Kong, and it is sad that family support is no longer serving such unrepresented among those who committed suicide—about 48% of the 25- to 59-year age-group. It is important to have a more concerted community effort to reduce the suicide rate, especially among the unemployed group, which seems to be more vulnerable than others. Contact between unemployed people and welfare agencies would be important in identifying individuals with high suicide risk. There is also a need to support the delivery of suicide prevention services and to build up a referral network between the various service providers. Frontline workers, gatekeepers, and general practitioners need to be informed about current knowledge on the prevention, diagnosis, and treatment of suicidal behaviour—particularly the knowledge of when to refer and to whom. Early detection and treatment of suicide attempters and those with psychiatric disorders could help reduce suicide rates. Psychiatric services need to be accessible, responsive, and acceptable to the public.

Jumping is still the most commonly used method in Hong Kong, which is understandable because more than 80% of the Hong Kong population lives in skyscrapers. Deaths from burning charcoal—a widely accessible material—in a confined space, such as in an apartment, have increased since the first known case, in 1998. It acts as a substitute to other suicide methods. Furthermore, extensive press coverage on suicide deaths by charcoal burning may be linked to its popularity as a suicide method. Limiting access to lethal substances may help prevent their use in suicide: warning signs with suicide hotline numbers printed on charcoal bags have been shown to be effective. Legislation and public education on the control of dangerous drugs also deserve more attention.

The decline in the total number of YLL from all causes during the study period suggests that fewer and fewer deaths are occurring at young ages, despite the fact that more deaths among the elderly population occur because of population ageing. The decrease of YLL due to other causes makes the increasing YLL of suicide deaths even more disturbing. We should not underestimate the adverse effect of suicide deaths, particularly of those in the middle age-groups, on the economic and health performance in Hong Kong. More research efforts and evidence-based prevention measures should be targeted at the people in the 25- to 39-year and 40- to 59-year age-groups.

We need a concerted effort to deal with the rising suicide problem in Hong Kong. The media should be informed of the possible social imitation effect of suicide. Intervention programmes should involve the community. Promotion of mental health by strengthening family and social support and by enhancing employment opportunities would help reduce the number of suicides. In addition, interventions need to be based on more knowledge and empirical research, and evaluation of their effectiveness and efficacy must be built into future intervention or prevention strategies.

References


S.K. Yee Medical Foundation now invites applications from registered institutions and associations for support of project proposals which meet any of the Foundation’s objects which are as follows:

(a) To establish medical services for the poor and sick and provide equipment and apparatus for such services;
(b) To provide medical education;
(c) To acquire and/or construct maintain and/or alter any buildings or works necessary or convenient for the above-mentioned objects or any of them;
(d) To assist, promote, establish, contribute, manage, control or support any charitable institutions or associations providing medical services for the poor and sick.

Eligibility to Apply
Registered institutions and associations eligible to apply to the Foundation for a donation or grant are:
(a) those managing or intending to establish medical services for the poor and sick;
(b) those providing medical education; and
(c) charitable organizations providing medical services.

Notes:
1. Medical includes dental and medical social work.
2. Research projects which will benefit the poor and sick will be considered.
3. Projects normally funded by The Research Grants Council of Hong Kong, Health Services Research Committee and AIDS Trust Fund will not be considered.

Application Procedures
Application forms are obtainable from Unit 1708, Office Tower, Convention Plaza, 1 Harbour Road, Wan Chai, Hong Kong in person during office hours, by mail with self-addressed and stamped envelope, or by fax (25111833), or from the Foundation’s website http://www.skyymedicalfoundation.org.

Completed forms and required documents should reach the same address by 19 January 2004.

(Office Hours: Mon.-Fri. 9 a.m. - 1 p.m.; 2 p.m. - 5:30 p.m.; Sat. 9 a.m. - 12 noon)