

## Trends in Cancer Incidence Among Singapore Malays: A Low-risk Population

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### Abstract

**Introduction:** Inspection of trends in cancer incidence in ethnically or geographically diverse populations is important for the understanding of cancer patterns and also to provide clues for aetiological studies. There is little information on cancer incidence among Malays, a low-risk population. The population-based cancer registration system in Singapore offers the opportunity in this regard. **Materials and Methods:** A review of all newly diagnosed cancer cases among Singapore Malay residents in the period 1968 to 1997 was conducted to determine the time trends using data from Singapore Cancer Registry. Age-standardised incidence rates and average annual percentage change, using Poisson regression, were calculated. **Results:** During the 30-year study period, a total of 9101 incident cases of cancer were diagnosed among Malays in Singapore. The 3 most common sites of cancer were lung, liver and colorectum in males; and breast, colorectum and ovary in females in the period 1983 to 1997. Leukaemia was among the top 10 cancer sites in both sexes. Malays generally experienced lower cancer incidence rates compared to Chinese, but rates have been increasing at 1.5% to 2% annually. Statistically significant increases in incidence were observed for most of the cancer sites. The incidence of nasopharyngeal carcinoma increased, while there were no significant changes in the general population. **Conclusion:** The relatively lower cancer risk among Singapore Malays might be attributed to genetic factors or closer adherence to a more traditional lifestyle. This study provides a baseline for comparisons with other populations with diverse cancer risk patterns in order to obtain a better understanding of possible aetiological factors.

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**Key words:** Cancer, Incidence rates, Singapore Malays, Southeast Asia, Time trends

### Introduction

Cancer is now one of the most common causes of death in the world. Inspection of changes in cancer incidence in ethnically or geographically diverse populations is important for the understanding of cancer patterns and also to provide clues for aetiological studies. To our knowledge, no published data on trends in cancer incidence has so far been documented among the Malay population, a group similar in origin to the Filipinos and Indonesians,<sup>1</sup> which have lower cancer risks compared to the West.<sup>2</sup> The Republic of Singapore, a small multi-ethnic city-state in Southeast Asia, provides a unique opportunity to document trends in cancer incidence in such a population. "Malays" in Singapore comprise all persons of Malay or Indonesian origin, including Malays, Javanese, Boyanese, Bugis, and others<sup>3</sup> and are considered as belonging to the same stock or ethnological origin and having "common bonds of

culture, customs and language".<sup>4</sup> At the time of the 1990 census Malays made up 14% of the Singapore population of 2.7 million, while Chinese formed 77% and Indians 7%.<sup>5</sup> Most of the Malays are Muslim, and their religion characterises the socio-cultural practices of the group. Compared to the other 2 major ethnic groups, Malays have tended to maintain their traditional lifestyle despite living in a modern city-state. In general, a smaller proportion of Malays are found in the middle and upper income groups compared to Chinese.<sup>6</sup>

In the past three decades, the Malay population has also enjoyed the improvement of health and medical services in Singapore, as part of the fruits of economic progress and prosperity. These include the increased doctor to population ratio, number of hospitals, and improved primary care which is provided through a widely distributed network of government polyclinics and private general practitioners.<sup>7</sup> Infant

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mortality rates among Malays fell from 28.7 per 1000 live births in 1970 to 8.4 per 1000 in 1990. The expectation of life at birth in the Malay population was 72 years in 1989 compared to 66 years in 1970. The Malays, who have the youngest age structure, exhibited a relatively low overall mortality rate, which was about 451.6 per 100,000 in 1975 and 423.6 per 100,000 in 1995. Among the major ethnic groups, Malays tended to have intermediate mortality rates owing to heart disease, stroke and diabetes, whereas the cancer rates were lowest.<sup>8,9</sup>

Singapore also provides a particularly favourable environment for monitoring cancer incidence, where a stable and well-functioning cancer registry system has been in operation since 1968. Using data from the Singapore Cancer Registry, Lee et al<sup>10</sup> have described trends in cancer incidence among Singapore Chinese for the 15-year period 1968 to 1982. Numbers in Malays were too small for detailed interpretation of time trends at that time. Now that incidence data are available for the 30-year period 1968 to 1997, the additional numbers of cases in Malays have made possible a comprehensive review of incidence from 1968 to 1997. This current study proposes to document the cancer incidence rates, patterns and trends among Singapore Malays. It is hoped that the data will serve as a useful baseline for comparisons with other Malay populations in Southeast Asia and beyond.

## Materials and Methods

Incidence data among Malays during the period 1968 to 1997 were provided by the Singapore Cancer Registry, a population-based registry covering the entire resident population of Singapore. The procedures, sources of data and details of coding practices have been described.<sup>11</sup> Population denominators for incidence rates were estimated from censuses carried out in 1970, 1980 and 1990, with age-, sex-specific annual

estimates derived by linear interpolation between these years and extrapolation for 1968 to 1970 as well as 1990 to 1997. Incidence rates were adjusted for age using the direct method on the basis of the UICC 'World' population.<sup>12</sup>

Estimation of trends across individual calendar years to obtain average annual percentage changes was performed by fitting a Poisson (log-linear) regression model, i.e.  $\text{Log}(\text{rate}) = a_i + b * (\text{year})$ .<sup>13</sup> This method also allowed for significance testing using deviance chi-square tests.

## Results

During the 30-year study period (1968 to 1997), a total of 9101 incident cases of cancer were diagnosed among Malay residents in Singapore. Indeed, from Table 1, it can be seen that in the last 30 years, less than 10% of all cancer cases were in Malays, which is low relative to their proportion in the general population. The 10 most frequent cancer sites in males and females during the period 1968 to 1997 are shown in Tables 2a and 2b. For males, lung cancer was the most frequent malignancy followed by cancer of liver, colorectum, stomach and leukaemia in 1968 to 1982. In 1983 to 1997, cancer of colorectum moved to second place, after lung. The other relatively frequent cancers in males were the liver, prostate and leukaemia in 1983 to 1997. For females, the 5 most common sites of cancer were breast, cervix, ovary, colorectum and stomach, although in different ranking order in the 2 periods. Non-Hodgkin's lymphoma climbed in rank in females, while cancer of the liver was not among the top 10 sites in 1983 to 1997. The relative proportion of leukaemia among Malays was higher than that among Chinese (2.1% for Chinese in 1988 to 1992).<sup>14</sup>

Figures 1a and 1b show the age-standardised incidence rates per 100,000 person-years for selected cancers in males and females, respectively, for the six 5-year periods from 1968 to

Table 1. Cases of Cancer\* for Major Ethnic Groups, 1968-1997

	1968-1972	1973-1977	1978-1982	1983-1987	1988-1992	1993-1997	Total
<b>Males</b>							
Malay	355 (5.1)	510 (6.0)	611 (6.1)	792 (6.9)	1034 (7.7)	1265 (7.9)	4567 (6.9)
Chinese	6200 (89.1)	7493 (88.2)	8881 (88.6)	10,128 (87.8)	11,757 (87.8)	14,013 (87.9)	58,472 (88.1)
Indian	404 (5.8)	489 (5.8)	536 (5.3)	612 (5.3)	604 (4.5)	662 (4.2)	3307 (5.0)
<b>Females</b>							
Malay	368 (7.4)	410 (6.7)	572 (7.2)	739 (7.4)	1013 (8.0)	1342 (8.7)	4444 (7.8)
Chinese	4468 (89.3)	5484 (89.7)	7042 (89.0)	8845 (89.2)	11,184 (88.7)	13,597 (87.7)	50,620 (88.7)
Indian	168 (3.4)	222 (3.6)	294 (3.7)	337 (3.4)	408 (3.2)	566 (3.7)	1995 (3.5)

\*Number in parentheses denotes percentage of all cases for the respective calendar period

Table 2a. Ten Most Frequent Cancers in Malay Males, 1968-1997

Cancer site	1968-1982		1983-1997	
	No. of cases	%	No. of cases	%
Lung	280	18.97	676	21.87
Liver	212	14.36	283	9.16
Colorectum	128	8.67	366	11.84
Leukaemia	91	6.17	167	5.40
Stomach	110	7.45	144	4.66
Prostate	54	3.66	194	6.28
Non-Hodgkin's lymphoma	60	4.07	168	5.44
Nasopharynx	74	5.01	143	4.63
Bladder	39	2.64	121	3.91
Skin (incl. Melanoma)	55	3.73	103	3.33
All sites	1476		3091	

Table 2b. Ten Most Frequent Cancers in Malay Females, 1968-1997

Cancer site	1968-1982		1983-1997	
	No. of cases	%	No. of cases	%
Breast	243	18.00	772	24.95
Colorectum	102	7.56	290	9.37
Ovary	133	9.85	258	8.34
Cervix uteri	135	10.00	227	7.34
Lung	70	5.19	209	6.76
Thyroid	64	4.74	157	5.07
Corpus uteri	49	3.63	136	4.40
Stomach	83	6.15	98	3.17
Leukaemia	63	4.67	117	3.78
Non-Hodgkin's lymphoma	44	3.26	111	3.59
Liver	52	3.85	85	2.75
All sites	1350		3094	

1997. The time trends for cancers of selected sites in males and females are also shown in Figures 2a and 2b. The age-standardised incidence rates for all sites combined rose from 94.7 per 100,000 in 1968 to 154.3 per 100,000 in 1993 to 1997, giving an age-adjusted average annual change of 1.48% in males, while in females the rates increased from 98.0 to 157.3 per 100,000, or 2.08% per year ( $P < 0.01$  for both). In males, cancers of the prostate and other urinary organs registered the most rapid increase. Rates of cancers of colon, rectum, lung, bladder, nasopharynx, leukaemia and non-Hodgkin's lymphoma also increased significantly in males. In females, the rate of increase was steepest for cancers of the breast and colon. Cancers of corpus uteri, ovary, thyroid, rectum, lung and leukaemia also displayed significant increasing trends among females. Significant decreases were observed in rates of stomach cancer in both sexes, the decline being about 1.7% in males and 3.4% in females. For liver, the decrease in rate was about 1% to 2% in both sexes, but only in males was it statistically significant. Over the last 30 years,

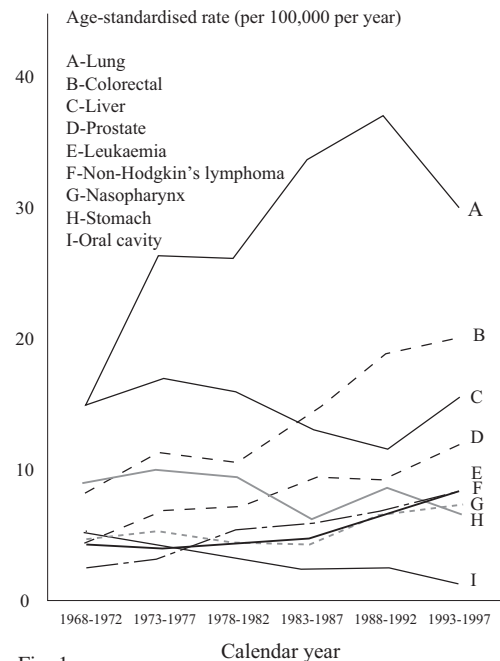


Fig. 1a.

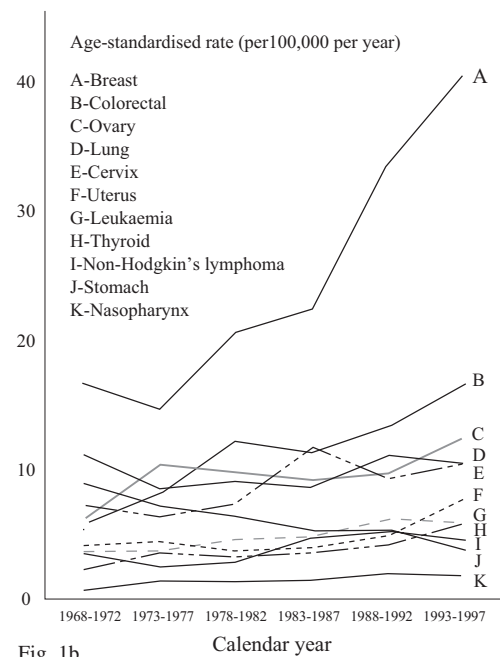


Fig. 1b.

Fig. 1. Trends in age-standardised incidence of selected cancer sites in Malays 1968-1997, males (a) and females (b).

incidence rates have not increased significantly for skin in males, cervix and non-Hodgkin's lymphoma in females. A suggestion of an increase, although not statistically significant, was also seen in nasopharynx among females.

Compared to Chinese, Malays have lower incidence rates for every common site from 1968 to 1997, except for ovary and non-Hodgkin's lymphoma in females and prostate in males. In Malay males, the rates of non-Hodgkin's lymphoma were initially lower than in Chinese males, but this has been increas-

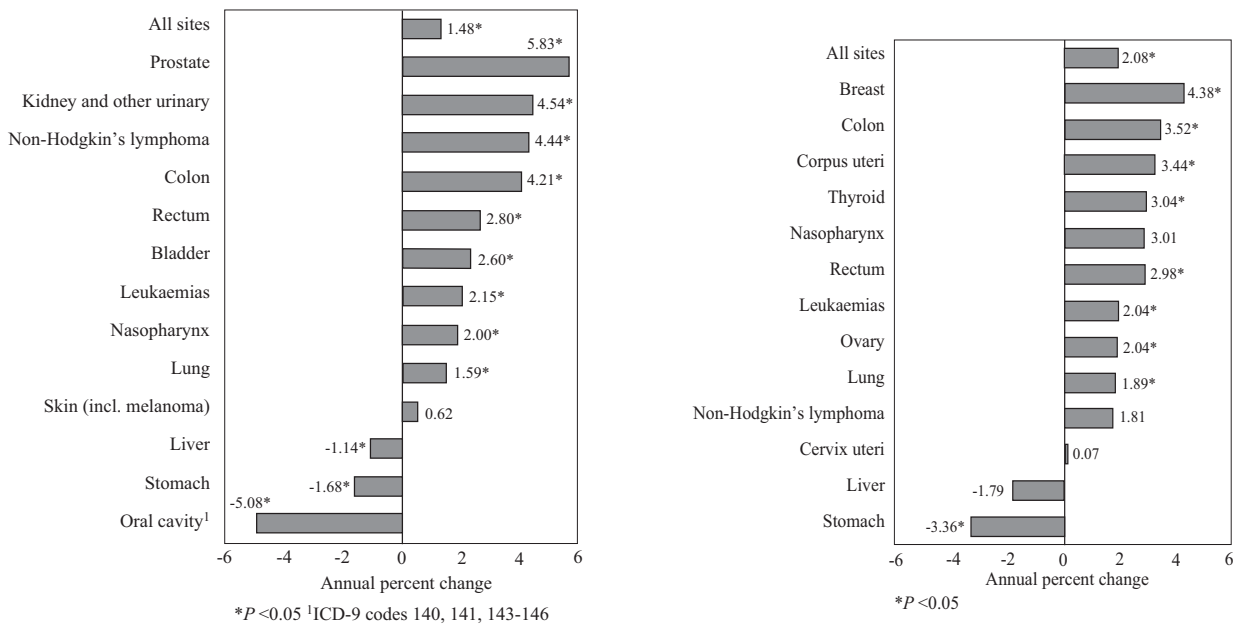


Fig. 2. Age-adjusted average annual percent change in incidence rates of selected cancer sites in Malays 1968-1997, males (a) and females (b).

ing in the last 30 years, giving a sharp increase from 2.4 per 100,000 in 1968 to 1972 to 8.4 per 100,000 in 1993 to 1997. It is interesting to note that the incidence of nasopharyngeal carcinoma increased among Malays, whereas there appears to be no significant changes in the general population.

## Discussion

In interpreting the results, it is necessary to consider the quality of the data with regard to completeness and accuracy. Although notification to the Singapore Cancer Registry is voluntary, a mechanism for checking a wide range of possible sources ensures that the quality of the data is good. Of all cases, 68.3% were notified by medical practitioners and 25.8% on the basis of pathology reports and hospital records. Fewer than 6% of cases were based on death certificates only.<sup>14</sup>

In summary, our analysis shows that Malays generally experienced lower cancer incidence rates compared to Chinese in the period 1968 to 1997. This is in accord with the review of trends in cancer incidence in Singapore from 1968 to 1992.<sup>15</sup> Lower incidence rates among Malays have also been documented in cancers of breast, cervix, colon and rectum in previous studies.<sup>16-18</sup> In comparison with data from the US in 1993 to 1997, the cancer incidence rates for most common sites in Singapore Malays were lower than those in US Whites, except liver cancer. This is particularly noticeable for cancers of prostate, colon, lung and female breast, with age-standardised incidence rates being less than half of those in US Whites. For prostate cancer, the age-standardised incidence rates were approximately one-ninth of that in US Whites.<sup>19</sup> The lower incidence rate among Malays must be viewed in the light of some extraneous factors. This is best illustrated from figures in the 1970s. Malays generally had much lower rates of hospital

utilisation compared with their counterparts in other ethnic groups during that time. In 1972, 31% of deaths among Malays occurred in hospital compared with 61% among Indians and 51% among Chinese.<sup>20</sup> In 1975, deaths owing to ill-defined conditions made up 15.9% of all deaths among Malays, whereas only 8.7% among Chinese.<sup>21</sup> These figures indicate that there might be a smaller proportion seeking medical attention in Malays, which would result in underdiagnosis of cancer among this group in the 1970s. Thus, the cancer incidence among Malays could be higher than that recorded in our data during that time. However, as the proportion of ill-defined conditions in all causes of deaths among Malays were quite similar to that among Chinese (2%) in the 1990s, it is reasonable to assume that currently underdiagnosis is unlikely to be responsible for the lower cancer incidence among Malays.<sup>22</sup>

It is possible that genetic predisposition, as an important aetiological factor, may account for the inherently lower risk of some cancers among Malays. But it is difficult to evaluate the contribution of genetic factors owing to the paucity of similar data from Malays in other countries with which comparisons may be made. Another important group of factors to consider are environmental influences. On the one hand, Malays as well as other ethnic groups have been undergoing changes in lifestyle and environment brought about by the dramatically growing economy during the past four decades. This may have accounted partly for the increase in incidence rates. On the other hand, Malays still remained fairly separate and maintained many unique socio-cultural and dietary habits due to their special religious beliefs. The experiences of Malays are thus more related to traditional practices compared to their Chinese counterparts. This lower adoption of the



“Western” lifestyle by the Malay population may result in their comparatively lower cancer risks for some cancers.

It is worth noting that Malay females had substantially lower risk of cervical cancer, which was only about 60% that of Chinese and Indians. Cervical cancer appears to be more common in the developing world. Among the countries of East Asia, Singapore Malays occupy an intermediate position.<sup>2,19</sup> There has been a suggestion that multiple sex partners could be an important factor in the aetiology of cervical cancer.<sup>23</sup> The low risk experienced by Singapore Malays may have its roots in the social practice of Orthodox Muslim religious beliefs in the community.

Overall, cancer incidence increased significantly in both sexes, which also is partly explained by increased awareness, advances in diagnostic methods and improved reporting. The decline in rates of cancers of stomach and liver, and the increases in rates of cancers of lung, female breast and colorectum, suggest that the patterns of malignancy have moved towards those of the West, as is the pattern in the general Singapore population.

The trends observed for nasopharyngeal carcinoma (NPC) among Malays are interesting. In Malays, the incidence of NPC has been increasing in the last 30 years, especially in males at an average about 2% per annum, while there was no suggestion of any significant changes within the Singapore population. NPC is a rare malignancy in most populations, with the age-standardised incidence rates less than 1 per 100,000 persons per year. It is generally considered as a special cancer in East Asia for the reason that it is highly prevalent in southern Chinese in China, Hong Kong and Singapore, who have incidence rates around 20 per 100,000 or above. Intermediate rates are reported among Malays and other indigenous groups (Thais, Vietnamese, Filipinos, Kadazans and Dayaks).<sup>2</sup> The age-specific rates tend to increase after 20 years of age and reach a plateau at 40 to 59 years, without exhibiting any further rise in the older age groups. Racial differences in NPC incidence do exist between ethnic groups in the Singapore population. The incidence rates are high in Chinese, with the Cantonese sub-group having almost double the rates of Hokkiens and others.<sup>14</sup> In Singapore Malays, the latest age-standardised rates of NPC are 7.1 per 100,000 in males and 1.9 in females, coming between those in Chinese and the low rates observed in Indians. A similar pattern has been noted in Malaysia, where the incidence rates for these 3 major ethnic groups were slightly lower, in both sexes.<sup>24</sup>

It is widely recognised that genetic susceptibility and the interaction of environmental carcinogens have been implicated in the aetiology of NPC.<sup>25</sup> The evidence of a possible genetic element in risk has come from the clustering of the disease in families and the studies of HLA markers.<sup>26</sup> Findings from Malay NPC cases living in Singapore and Malaysia also suggested possible associations with the HLA profile.<sup>27</sup> Among environmental factors, preserved foods have been regarded as prominent in contributing to the high incidence rates. In

particular, increased risks have been reported to be related to consumption of salted fish in the weaning period.<sup>28</sup> Some other non-dietary environmental exposures have also been implicated as risk factors for NPC, including tobacco smoking, occupational exposure to dust, smoke and chemical fumes.<sup>29</sup> In a case-control study of NPC among Singapore Chinese, Lee et al<sup>30</sup> reported significantly increased risk was associated with frequent adult consumption of salted soy beans, canned pickled vegetables, “sze chuan chye”, a salted Chinese tuber, and “kiam chye”, salted mustard greens. Protective effects were suggested for high vitamin E intake. These findings are quite similar to those found in China. Data on the risk factors for Malays are not readily available locally, but a study in Malaysia indicates that exposure to salted fish may also be an important risk factor among Malays. A small case-control study (13 cases, 50 controls) of NPC among Malays in Selangor, Malaysia, found that 5 cases (38%) and 4 controls (8%) had eaten salted fish daily during childhood.<sup>31</sup>

The most common cancer sites in Malays were similar to those reported in Singapore Chinese, except that leukaemia ranked sixth in terms of frequency among Malay males and eighth for Malay females in the period 1983 to 1997. The higher proportion of leukaemia among all cancers in Malays was due to much fewer cancer cases in other cancer sites compared to Chinese, as the age-standardised incidence rates were still slightly lower in Malays compared to those in Chinese. On the international scene, leukaemia in Singapore Malays was found to be lower compared to ‘high incidence’ areas in the United States, Europe and Australia.<sup>2</sup> Frequent exposure to some biological, physical and chemical agents, such as ionizing radiation, benzene and certain drugs, have been associated with an increased risk, but the evidence is inconsistent.<sup>32</sup> With the current limited knowledge of the aetiology of the disease, it is difficult to explain the high proportion of leukaemia among Malays.

In conclusion, the Malay population has experienced relatively lower cancer rates in Singapore in the last three decades. The patterns of cancer incidence in Malays were in keeping with much of the general population, the notable exceptions being NPC and leukaemia. On the other hand, this population is at particular low risk of cervical cancer relative to other ethnic groups, and of prostate, lung, colon and female breast compared to populations in the West. With the baseline incidence rates thus documented among Malays, this study will enable comparisons to be made with other Malay populations in the region. It is hoped that a more detailed analysis of genetic and environmental risk factors in this group will shed light on possible aetiological factors.

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