

Diet, Lifestyle and Health

Impact of Demographic Change

Moira Chan

April 2005

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Preface

“Population projections provide a common basis for the Government in planning public services and facilities. They are constantly rolled forward and updated.”

Census & Statistics Department 5/10/2000

Population projection is an important exercise for all policy-makers because it is based on the periodic projections and adjustments that public infrastructure and public services are planned. Resources have to be set aside or found in order to ensure such needs are going to be met in the future. In other words, population projections determine longer-term policy planning.

Hong Kong's population data points to a declining and aging population. The pressure on public health spending has already become obvious. While the HKSAR Government is preoccupied with how to reform healthcare financing, there is one obvious area of effort which appears to have been neglected – to ensure Hong Kong people are well informed about diet and lifestyle choices since what they eat, whether they smoke and how much exercise they do have a tremendous impact on health. This report shows how critical these aspects are to the good health of Hong Kong people and what policy-makers need to do.

This report is part of a series of studies Civic Exchange is conducting to assess the policy impacts arising from Hong Kong's demographic trends. We are grateful to Dr. Moira Chan for helping us with this report. We are also grateful to Simon Ng for managing the population project as a whole, Carine Lai for layout, and Andrea Li for editing. The population project is funded by the Fan Family Charitable Trust. Without this support we would not have been able to embark on this important area of research. We wish to thank Mr. Henry Fan and Ms. Lily Fan for their personal support of our work.

Christine Loh
Chief Executive Officer

26 April 2005

Author

Dr. Moira Chan-Yeung is an Emeritus Professor of Medicine at the University of British Columbia, Vancouver, Canada and an Honorary Professor of Medicine at the University of Hong Kong. She has headed the Occupational and Environmental Lung Diseases Unit at UBC since 1989. She has also served as the Chairperson of the Assembly of Environmental and Occupational Health for the American Thoracic Society; as a member of the Pulmonary Disease Advisory Committee, National Heart, Lung, and Blood Institute, part of the US National Institutes of Health; and as Chairperson of the Respiratory Diseases Section for the International Union Against Tuberculosis and Lung Disease. Professor Chan-Yeung's research interests include occupational asthma and lung disease, environmental and genetic risk factors in asthma and lung cancer, and the epidemiology and control of tuberculosis.

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Civic Exchange is a non-profit organisation that helps to improve policy and decision-making through research and analysis.

Room 701, Hoseinee House, 69 Wyndham Street, Central, Hong Kong

Tel: (+852) 2893 0213 Fax: (+852) 3105 9713

URL: www.civic-exchange.org

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Summary

In the last two to three decades, there has been a profound shift in the major causes of mortality worldwide with non-communicable chronic diseases such as cancer, coronary heart disease (heart attack), cerebrovascular accidents (stroke), chronic obstructive airway disease (chronic bronchitis and emphysema) and diabetes, accounting for more than two thirds of the deaths and higher for developed countries. Important risk factors for these diseases include overweight, tobacco, alcohol consumption and physical inactivity. All these factors are theoretically preventable. In Hong Kong, cancers accounted for 34% of all deaths in 2002, higher than in other parts of the world. The hospitalization rates for all other chronic diseases have risen by about two to two and a half times in the past two decades. In addition, the prevalence of these diseases such as diabetes and hypertension are growing. The aging population and the increasing prevalence of childhood obesity will place greater demand on the health care system in the next decade. Prevention of these chronic diseases by reducing obesity (avoid fat and free sugar) and lifestyle changes (avoid tobacco and alcohol consumption and increase physical activity) of the local population is an absolute priority for the healthcare authority.

Introduction

In 1997, Murray and Lopez published the results of the Global Burden of Disease Study [1]. They found that in 1990, communicable, maternal, perinatal and nutritional disorders accounted for 17.2 million deaths while non-communicable diseases for 28.1 million deaths and injuries, resulting in 5.1 million deaths worldwide. The 10 leading causes of death in 1990 were ischemic heart disease, cerebrovascular accidents, lower respiratory tract infections, diarrhoeal diseases, perinatal disorders, chronic obstructive lung disease, tuberculosis, measles, traffic accidents and lung cancer. Thus non-communicable diseases are already major public health challenges in all regions.

The investigators further conducted a comprehensive review of published works and other sources to obtain the prevalence of risk factors for all regions of the world and estimated the population attributable fractions (PAF, the proportion of disease caused by the risk factor in the population) of these risk factors [2]. Childhood and malnourished mothers (9.5%), unsafe sex (6.3%), high blood pressure (4.4%), tobacco (4.1%), and alcohol (4.0%) were the leading risk factors of global burden of disease. In both developing and developed regions, alcohol, tobacco, high blood pressure, and high cholesterol were major causes of disease burden.

Table 1 shows the PAF of risk factors of diseases which are the leading causes of death globally [3]. These risk factors, together, are responsible for a large proportion of PAF of diseases. Of note is that these risk factors are potentially preventable. Reduction of these risk factors is likely to be effective in reducing the prevalence of disease, their morbidity and mortality over time.

There is a profound shift in the balance of major causes of death and disease occurring in developed countries, and also in many developing countries in recent decades. Only a few major risk factors account for much of the morbidity and mortality worldwide. For these reasons, the World Health Organization (WHO) produced and endorsed the Global Strategy on Diet, Physical Activity and Health in 2004 [4]. The strategy addresses two of the main risk factors for non-communicable diseases, namely diet and physical activity, while complementing the long-established and ongoing work carried out by WHO on a global and national level in other nutrition-related areas.

Against a backdrop of changing global patterns in mortality, this paper reviews the current status of health in Hong Kong and the morbidity, mortality and prevalence of chronic disease in relation to the dietary intake pattern of Hong Kong Chinese. This paper also recommends possible courses of action for local healthcare authority in the prevention of chronic non-communicable diseases in light of Hong Kong's changing demographic characteristics. For a thorough review on the effects of diet and nutrition on health and disease reported by a joint WHO/Food and Agricultural Organization (FAO) expert consultation [5] and its relevance to Hong Kong, please refer to Appendix A at the end of this paper.

Table 1: Individual and joint contribution of selected risk factors to leading diseases causing deaths

Disease	Contributing risk factors (individual PAF for disease burden) (%)							Combined PAF %
	<i>Smoking</i>	<i>Alcohol</i>	<i>High blood pressure</i>	<i>High cholesterol</i>	<i>High BMI</i>	<i>Low fruit/vegetable</i>	<i>Physical inactivity</i>	
Lung cancer	85*					11		86
Cerebrovascular diseases	22	0	72	27	23	12	9	81-86
Ischemic heart disease	22	0-2	58	63	33	28	22	89-93
Chronic obstructive lung disease	85	0				11		71
Road accidents		38						

* Not appropriate for Hong Kong

Source: Modified from Ezzati et al (Global burden of disease study), see reference 3.

Status of health in Hong Kong

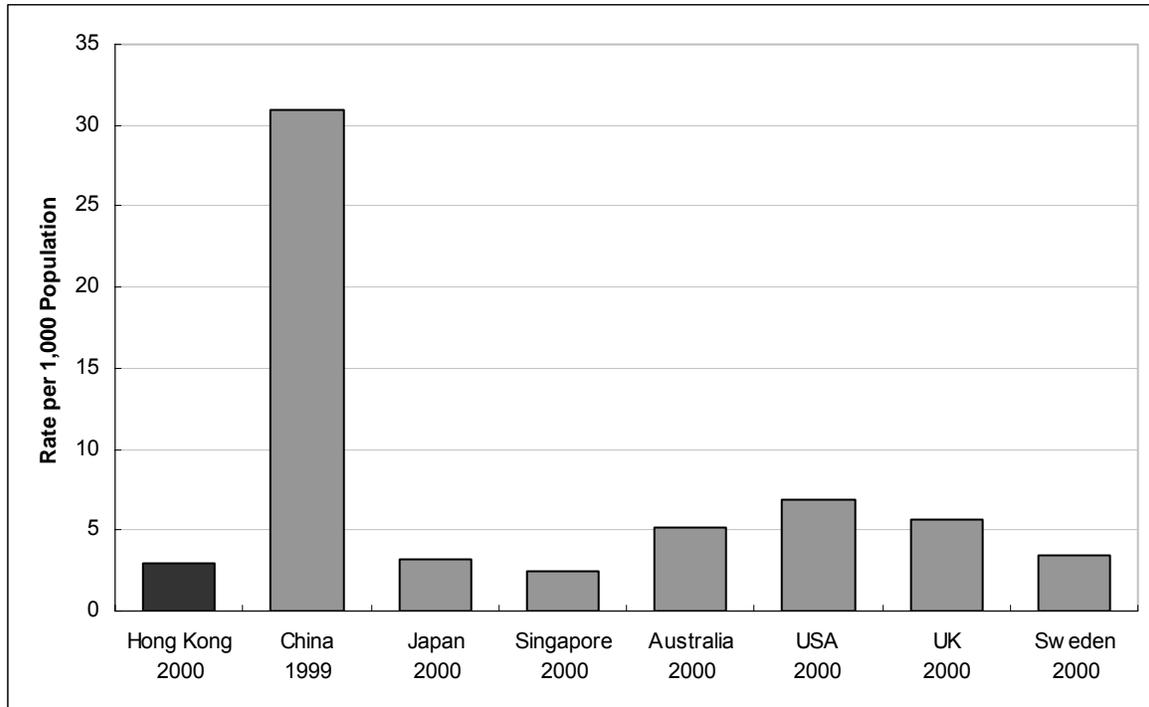
Indicators of health in Hong Kong

Hong Kong currently enjoys excellent indicators of health, better than most of the developed countries. It has a very low infant mortality rate (3/100,000) (Figure 1) and high life expectancy from birth (78 years for men and 83.9 for women) (Figure 2). The age standardized mortality rate showed a consistent decline from 1984 to 2002 (Figure 3) [7].

From the official figures provided, Hong Kong accomplished these impressive indicators with a relatively low budget. In 1999, the health services expenditure was only 5% of the gross domestic product, compared very favourably with the United States (12.9%) and Canada (9.3%). There are 5 hospital beds (Figure 4), 1.5 doctors and 6.06 nurses per 100,000 people [8].

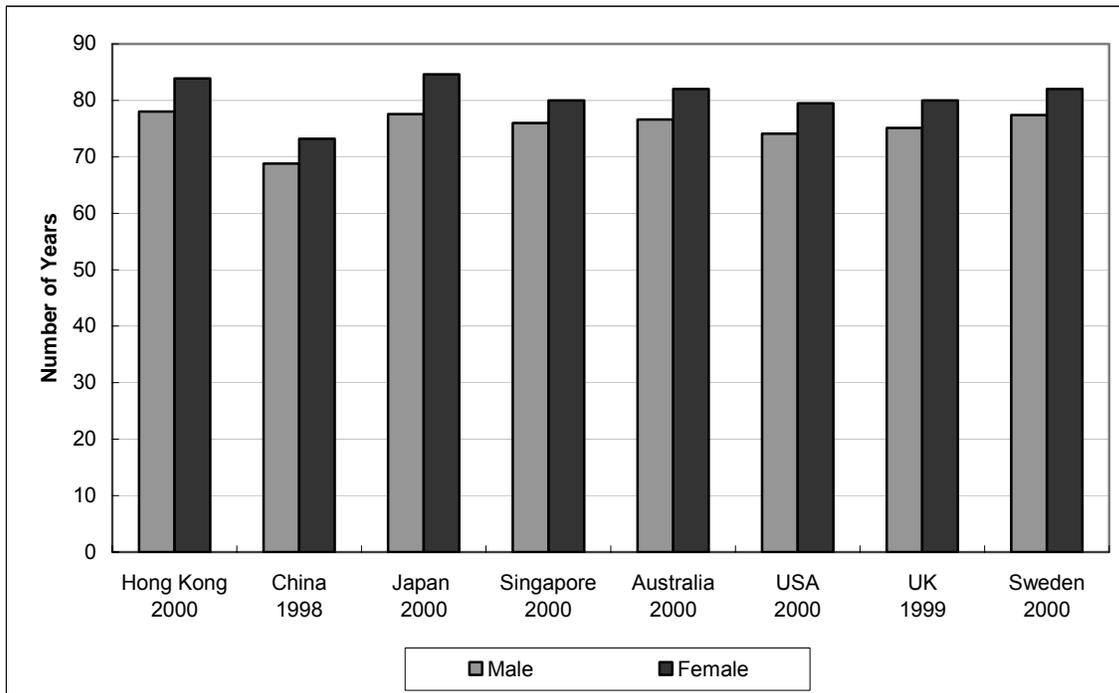
The population structure of Hong Kong is changing over the years. The proportion of those ≥ 65 years of age has increased rapidly in the past 3 decades (Figure 5). With longevity enjoyed by people coupled with a low birth rate, Hong Kong will have a population structure with a high proportion of people over the age of 60 years in the next decade. The question is whether Hong Kong will be able to maintain the excellent indicators of health with the current rate of health care expenditure and the aging population.

Figure 1: Infant mortality in Hong Kong compared with other selected countries



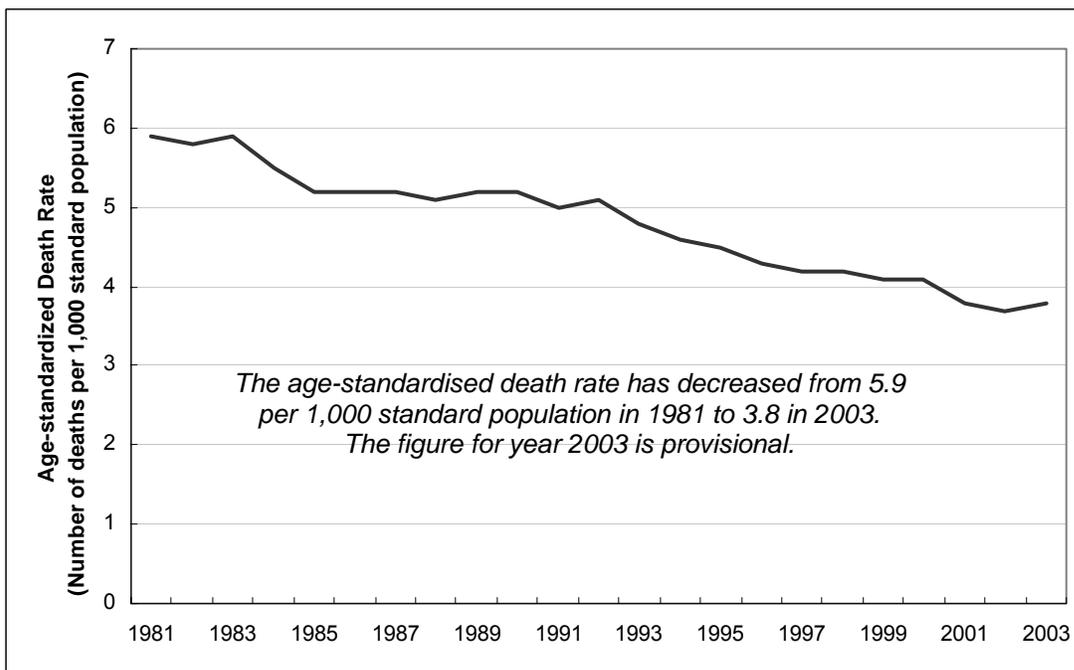
Source: The Hospital Authority, Hong Kong

Figure 2: Life expectancy from birth in Hong Kong compared with other selected countries



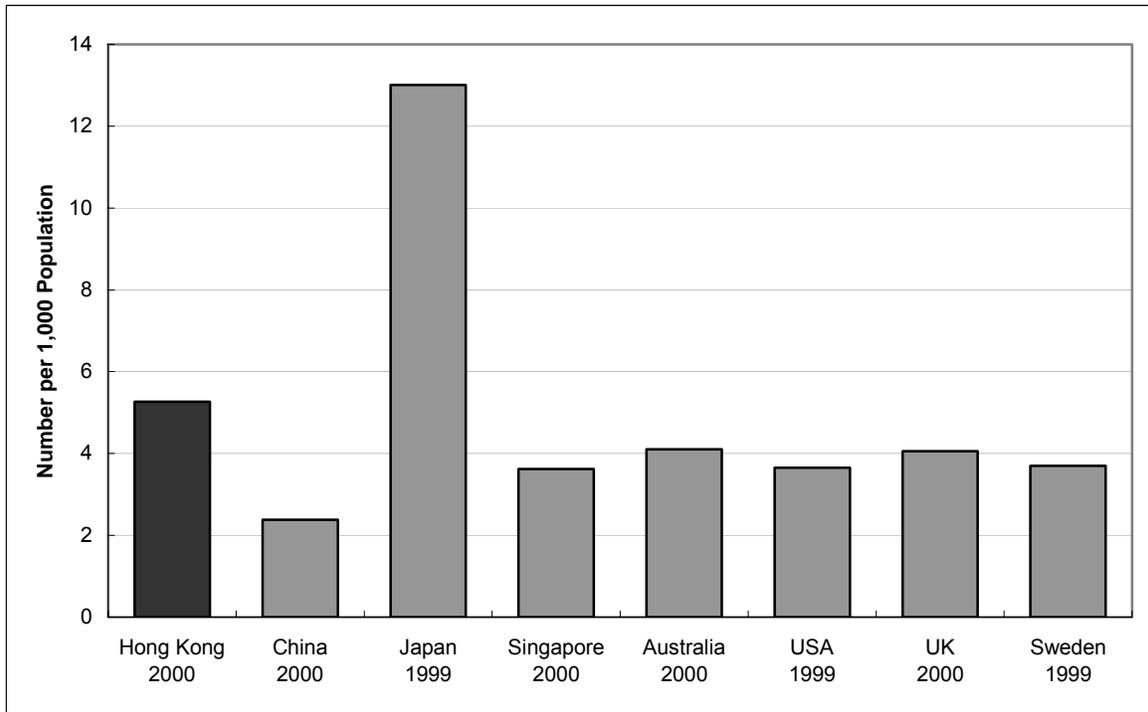
Source: The Hospital Authority, Hong Kong

Figure 3: Age-standardized mortality rate in Hong Kong 1981-2003



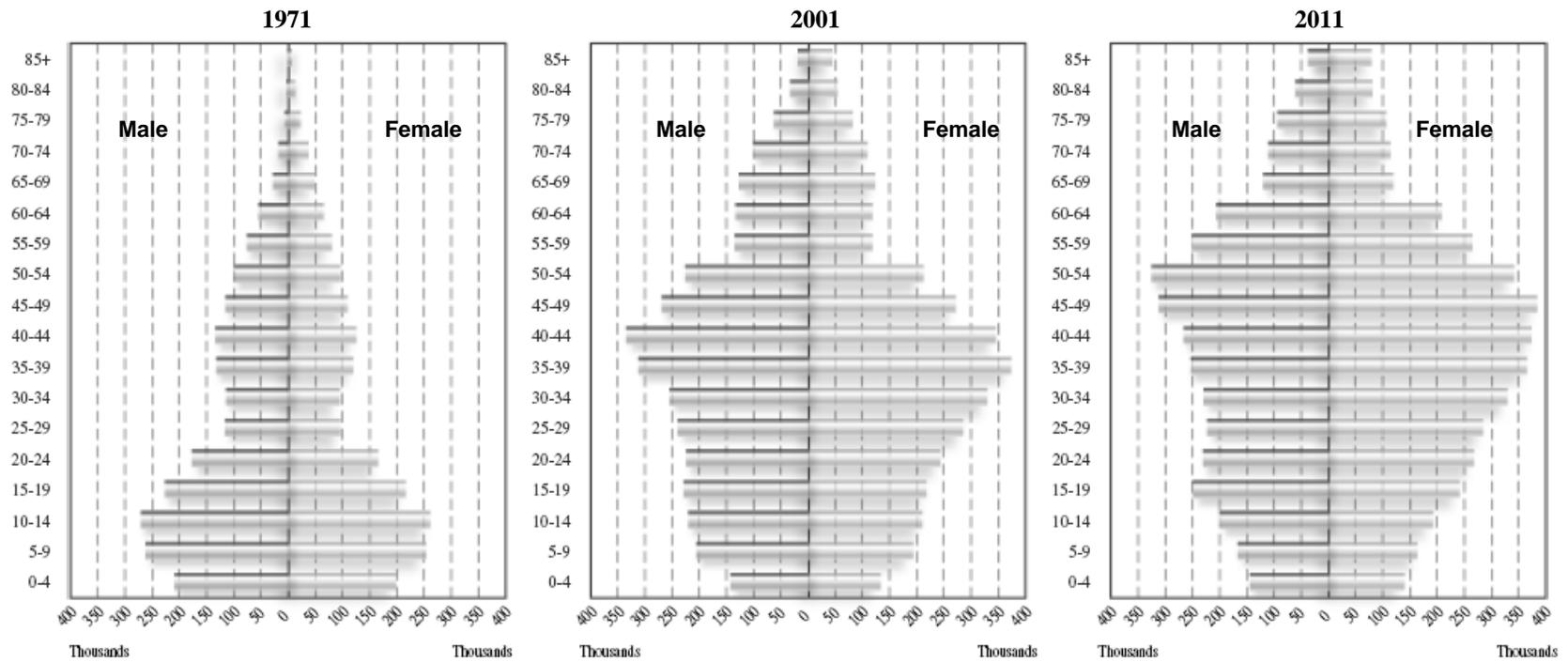
Source: Department of Health, HKSAR Government

Figure 4: Hospital bed per 1,000 population in Hong Kong compared with other selected countries



Source: The Hospital Authority, Hong Kong

Figure 5: Population structure in Hong Kong 1971, 2001 and 2011



Notes: 1971 figures refer to estimated mid-year population (Excludes Vietnamese Migrants).
 Statistics from 1996 onwards are those compiled based on the “resident population” approach.

Source: Adapted from the Hospital Authority Statistical Report 2001/02.

Disease profile in Hong Kong

Table 2 shows the leading causes of deaths in Hong Kong in 2002 compared with the global figures [9] and those of the United States [10]. The striking feature is that malignant neoplasms or cancers were responsible for 34% of all deaths in Hong Kong, much higher than the global figure of 12.5% and those of the United States at 22.8%. 14.5 % of deaths in Hong Kong were due to ischemic heart disease, only slightly higher than the global average but lower than the United States of 28.5%. The percentage of deaths from cerebrovascular accidents or strokes, diabetes and chronic airway disease in Hong Kong were also similar to global averages. Non-communicable diseases (neoplasms, ischaemic heart disease, cerebrovascular accidents, chronic airway disease, kidney disease, diabetes) were responsible for 68.7% of all deaths in Hong Kong. These diseases are major public health challenges for Hong Kong in the coming decades.

Tables 3a and 3b show the rate per 100,000 of discharges and deaths in Hospital Authority (HA) hospitals and all deaths of selected diseases in Hong Kong during the last two decades.

Table 2: Leading causes of deaths (as % of all deaths) in Hong Kong, globally, and in the United States in 2002

	Hong Kong	World	United States
Malignant neoplasms or cancers	34.0	12.5	22.8
Coronary heart disease	14.5	12.6	28.5
Cerebrovascular accidents	9.4	9.6	6.65
Lower respiratory infections	9.3	6.5	2.69
Chronic airway disease	6.0	5.81	5.1
Kidney disease	3.1	1.5	1.67
Diabetes	1.7	1.7	3.0
Perinatal disorders	–	4.3	–
External causes Injuries	6.0	9.1	4.4

Sources: The Hospital Authority, Hong Kong; References 8 and 9.

Table 3a: Number/100,000 of patient discharges and deaths for selected diseases in Hospital Authority Hospitals (1981-2001)

	ICD code	1981	1986	1991	1996	1997	1998	1999	2000	2001
Cancers	140-208	521.5	773.6	886.4	1149.1	1089.5	1085.3	1131.3	1191.3	1251.5
Cerebrovascular accidents (stroke)	430-438	213.4	247.7	270.8	308.9	320.7	356.5	378.1	383.9	367.3
Coronary heart disease	410-414	84.6	113.1	160.3	266.7	268.3	289.5	298.2	316.9	327.7
Chronic lung disease	490-496	434.0	465.0	417.3	580.6	581.3	621.9	686.9	707.8	712.8
Diabetes mellitus	250	115.0	159.3	177.2	217.5	189.2	194.3	213.9	219.3	245.9

Source: Based on Housing Authority data

Table 3b: All deaths per 100,000 for selected diseases in Hong Kong (1981-2001)

	ICD code	1981	1986	1991	1996	1997	1998	1999	2000	2001
Cancers	140-208	127.1	145.8	154.3	157.5	159.8	163.4	166.2	168.4	169.6
Cerebrovascular accidents (stroke)	430-438	62.7	53.9	52.3	48.2	46.6	50.4	52.8	53.3	46.5
Coronary heart disease	410-414	40.6	46.4	52.9	51.3	50.3	50.9	50.0	54.1	47.1
Chronic lung disease	490-496	29.4	37.2	34.2	34.8	31.7	31.8	35.1	33.1	31.4
Diabetes mellitus	250	5.1	4.3	4.7	6.7	5.7	7.96	10.97	12.45	10.0

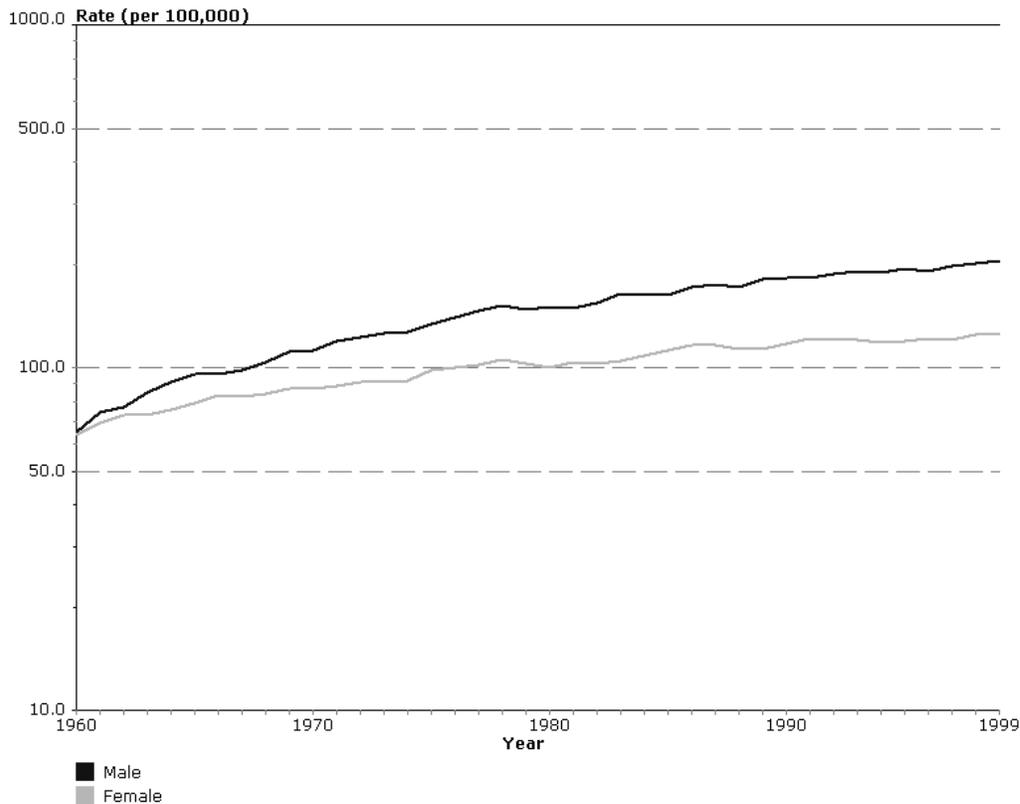
Source: Based on Housing Authority data

Malignant neoplasms or cancers

As malignant neoplasms constitute 34% of all deaths in Hong Kong, much higher than the world average and average figures in developed countries such as the United States, it deserves a more careful analysis [10, 11].

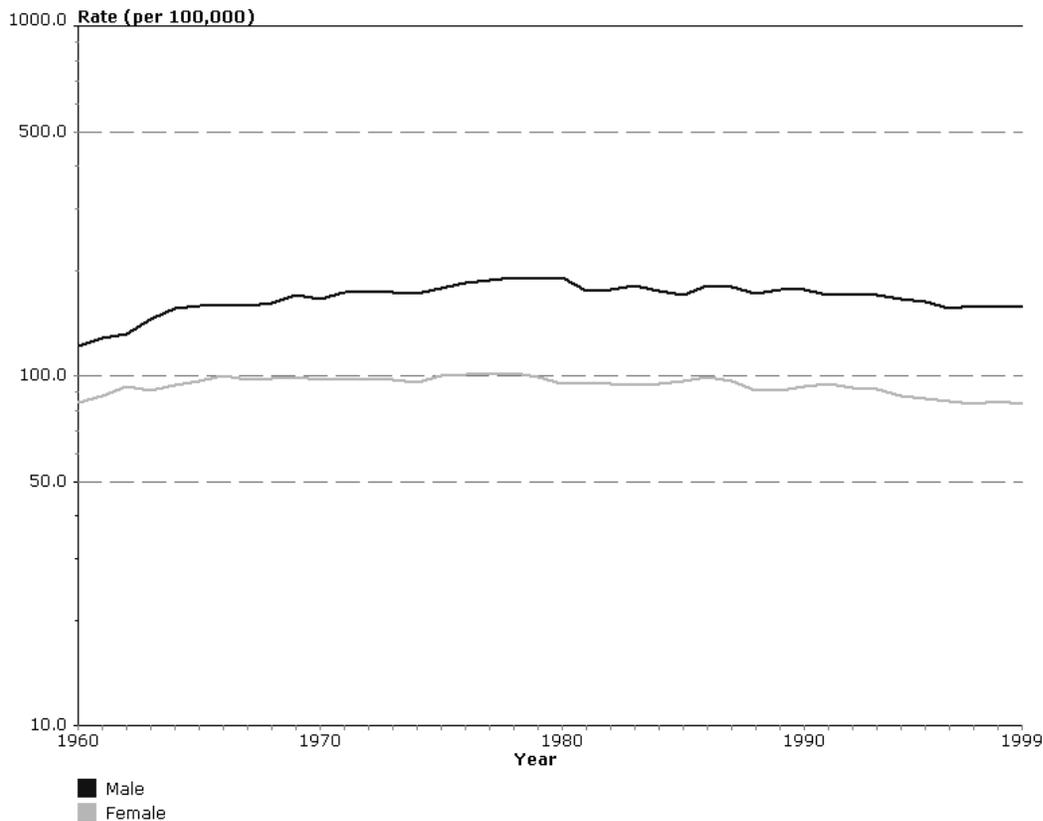
Figure 6 shows the crude mortality rates of cancers in men and women in Hong Kong from 1960 to 1999 [12]. The crude mortality rate for cancers of all types increased progressively from 65/100,000 in 1960 to 206/100,000 in 1999 for men, and from 64/100,000 in 1950 to 126.8/100,000 for women. This increase in the crude mortality rate from cancers could be attributed to the progressive increase of people over the age of 60 years in the past 4 decades rather than representing a real increase in cancer. The age standardized rate (ASR) in Figure 7 shows a gradual rise in cancer mortality from 122/100,000 in 1960 to the highest level of 192/100,000 in 1978; however after 1978, the ASR gradually declined to 157/100,000 for men in 1999. For women, the rate increased from 84/100,000 in 1960 to the highest level of 102.6/100,000 in 1978 with a progressive decline to 83.7/100,000 in 1999 [12]. The real increase in cancer mortality before 1978 could be due to a number of reasons: increase in diagnostic accuracy, better data collection and increase in rate of smoking after World War II, especially amongst men. There is a latency of 15 to 20 years before the smoking exerts its impact.

Figure 6: Crude mortality rate of cancer in Hong Kong 1960-1999



Source: Plotted from the WHO Mortality Database.

Figure 7: Age-standardized rate of cancer in Hong Kong 1960-1999



Source: Plotted from the WHO Mortality Database.

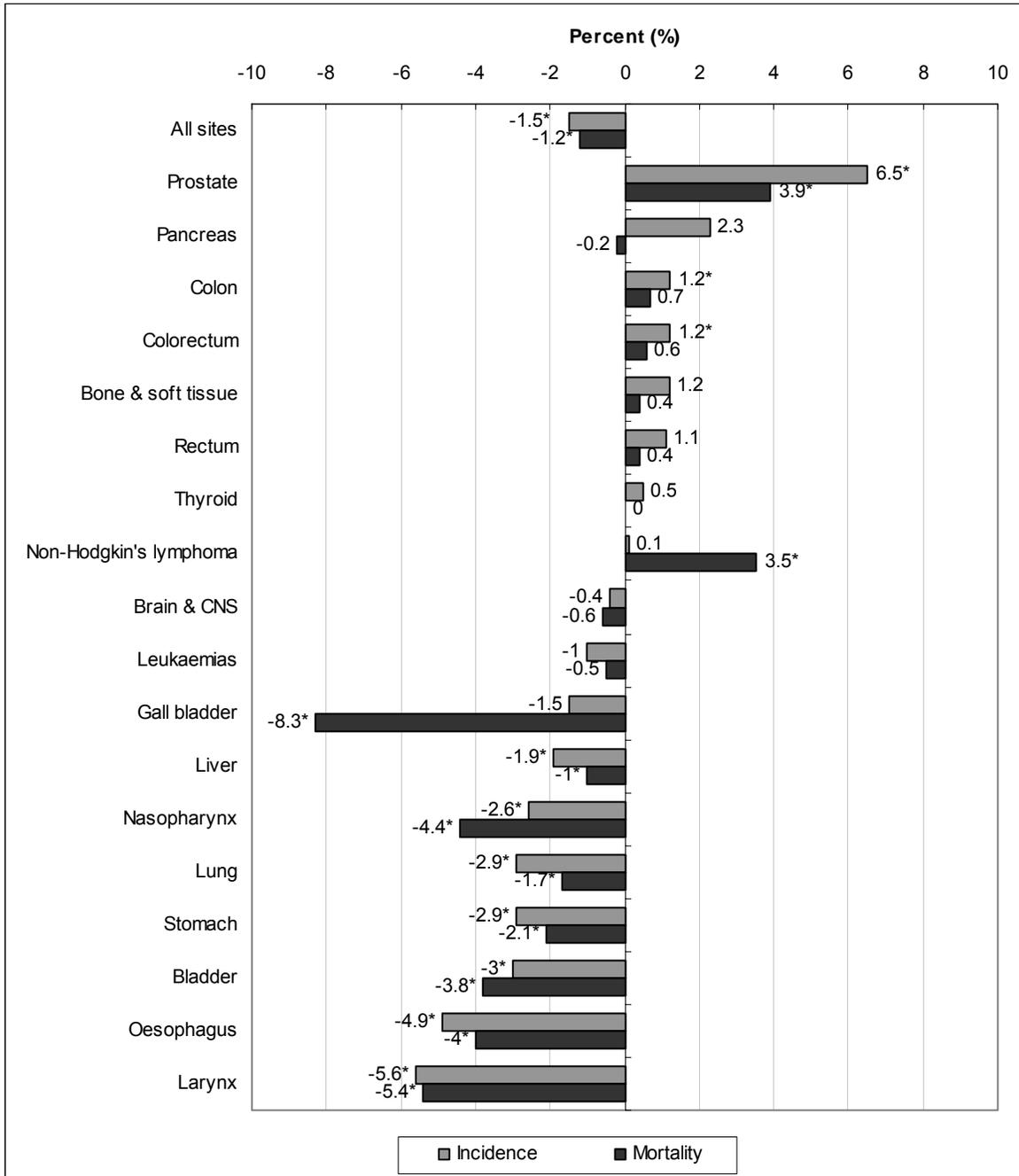
Figure 8 shows the annual change in incidence and mortality rate of selected cancers in men and women from 1990 to 1999 [12]. During that decade, there is an overall reduction in cancer incidence and mortality of 1.2% and 1.5% respectively. In men and women, mortality and incidence of cancers of the larynx, esophagus, bladder, stomach, lung and nasopharynx decreased significantly. The fall is a reflection of the progressive reduction in prevalence of smoking in Hong Kong since the 1980s as smoking is one of the risk factors for these types of cancers. On the other hand, mortality and incidence of cancer of the prostate, pancreas, colon, and rectum increased significantly in men and cancer of the breast in women. Dietary factors such as increased fat consumption and lack of fibre consumption are important risk factors for these types of cancers.

Ischemic or coronary heart disease

The mortality from coronary heart disease in Hong Kong has increased by only 30% in the last two decades but the rate of hospital discharges and deaths has increased by 2.75 times (see Tables 3a and 3b on page 8). The discrepancy of increase in mortality compared to the increase in hospital discharges reflects an improvement in treatment for coronary heart disease.

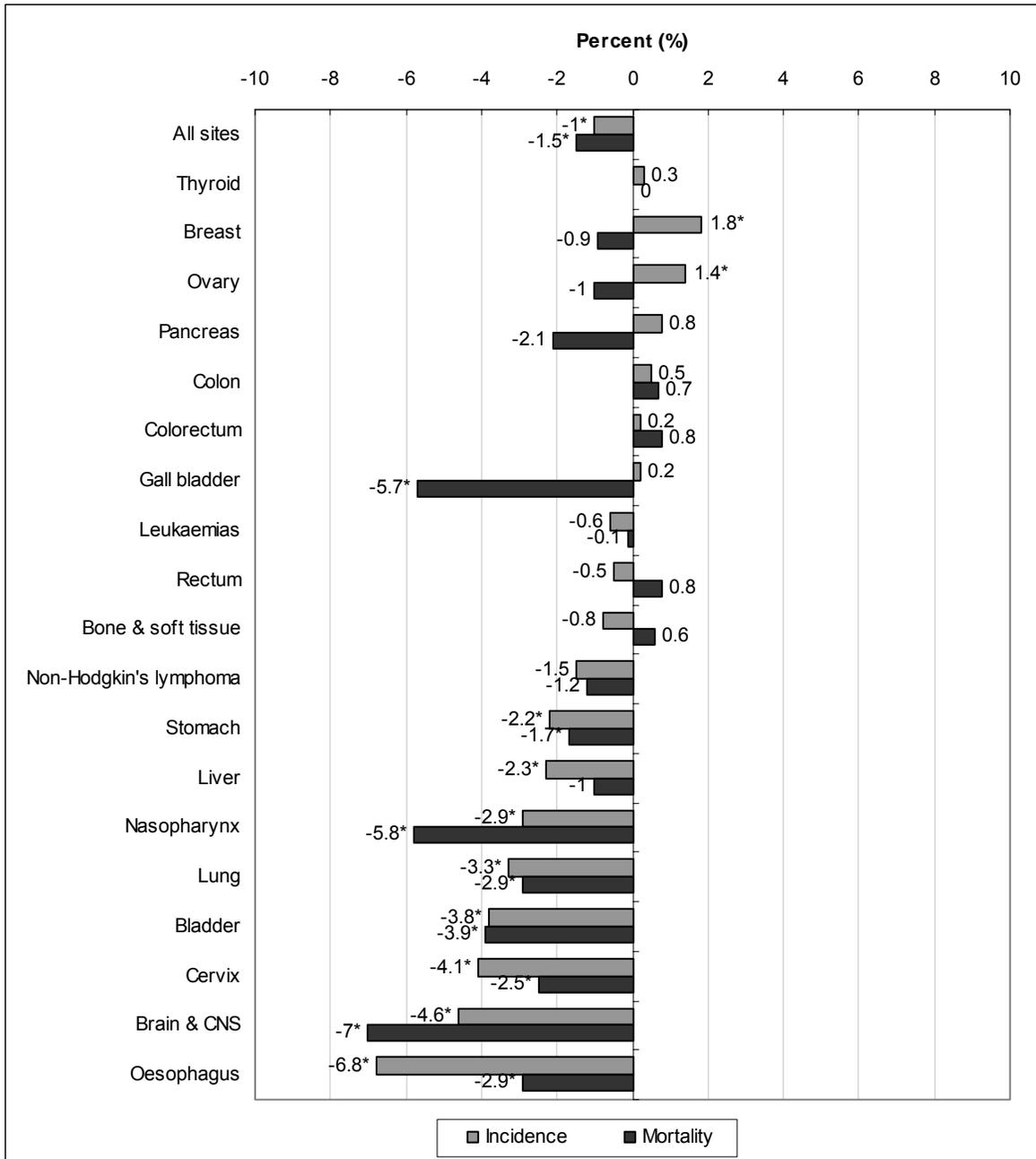
Figure 8: Annual percentage change in rates of different cancers in Hong Kong 1990-1999

Male



Note: * Statistically significant (p < 0.05)

Female



Note: * Statistically significant (p < 0.05)

Source: Reference 12.

Cerebrovascular accident or stroke

Tables 3a and 3b (on page 8) also show a reduction in mortality from cerebrovascular disease or stroke in the last two decades although the rate of hospital discharges showed an increase. Recent studies in Hong Kong have shown a rise in the prevalence of hypertension [13, 14]. In 1995-6, the prevalence was 18% and in 2001-2, it was 26.7% in the same cohort.

After a statistical age adjustment, the prevalence of hypertension has increased by 15%. In 2001-2, the prevalence of hypertension in those over the age of 64 years is 53.8 % in men and 52.3% in women [13]. The increase in the prevalence of hypertension in Hong Kong will ensure the continuous rise in morbidity from cerebrovascular disease or stroke.

Diabetes

Hospital discharge rates from diabetes increased by about two times and death rates from diabetes increased by about two and a half times in Hong Kong (Tables 3a and 3b). The prevalence of undiagnosed diabetes mellitus in Hong Kong was 3.9% and those with glucose intolerance (IGT) 8.9% among those 13-88 years of age in 1997 [15]. For those between 13-66 years, the prevalence of IGT was 7.6% in 1997, much higher than the prevalence of 2.6% in 1990. In fact, the percentage of proportion with undiagnosed diabetes and impaired fasting glucose in 1997 were similar to those in the United States (US NHANES) [16]. The increase in the prevalence of diabetes, undiagnosed diabetes and subjects with impaired fasting glucose in Hong Kong will sustain the high rate of mortality and morbidity of diabetes locally.

Obesity

The prevalence of obesity is rising around the world not only in adults but in children [6]. In the United States, the number of overweight children has doubled and the number of overweight adolescents has trebled since 1980. Obesity prevalence in youths aged 12-17 years has increased dramatically from 5% to 13% in boys and from 5% to 9% in girls between 1966-70 and 1988-91 [6].

In 1993, a survey of 25,000 Hong Kong children showed that 13.4% of boys and 10.5% of girls aged 6-18 years were obese, defined as > 120% median weight-for-height using local reference ranges [17]. Using the same definition, the Student Health Service of the Hong Kong Department of Health reported that 14.1% were obese in 2000/2001 (among primary school children, 17% boys and 12% girls and among secondary school children, 12% boys and 10% girls were obese). This rise in obesity in children is a great concern and an area where strategies for prevention should be directed.

Among adults, about 10% of 846 Hong Kong residents with a mean age of 39 years were found to be obese defined as those with BMI >27.5 [18].

Diet and physical activity of Hong Kong Chinese

Dietary intake in Chinese adults in Hong Kong

A comprehensive study was carried out on daily nutrient intake of 500 Chinese men and 510 Chinese women in Hong Kong [19]. The major relevant findings are summarized as follows:

- Approximately 50% of the studied population had a cholesterol intake of < 300 mg; 60% had a fat intake of < 30% of total energy and 85% had a percentage of energy from saturated fats <=10%; criteria considered desirable for cardiovascular health.
- 78% of the population had sodium intake in the range known to be associated with age-related rise in blood pressure.
- The average intake of calcium was 605 mg in men and 570 mg in women, lower than the recommendations of the WHO/FAO; considerably lower than those of the Australians (1132 and 983 mg respectively for men and women).
- The awareness of the value of whole meal bread and polyunsaturated fat spreads was low.

Hong Kong has one of the lowest age-standardized mortality rates for cardiovascular diseases in men and women over the age of 65 years. The worry about westernization of the diet appears not to be reflected in mortality rates for coronary heart diseases which are declining. However, hospital admissions for coronary heart disease are increasing (Table 4). Other factors may be important such as the rising prevalence of hypertension and diabetes mellitus. An interesting observation is that although diet is “ideal” for prevention of coronary heart disease, the serum lipid profile of people in Hong Kong is similar to those found in some western population [20]. With this lipid profile, coronary heart disease is low suggesting that there might be some “protective factors which may be genetic or other dietary”.

Table 4: Proportion of subjects in Hong Kong meeting recommendations for cardiovascular health

24 hour intake	Men	Women	Total
N	500	510	1010
Fat <=30% of total energy	59%	60%	59%
Saturated fatty acid <=10% of total energy	84%	86%	85%
Cholesterol <=300 mg	33%	64%	49%
Sodium <=2300 mg	21%	23%	22%

Source: Reference 19.

The sodium intake of Hong Kong population is high compared to the Australian data as 78% had salt intake of ≥ 2300 mg per day. This level of intake may partly contribute to the high prevalence of hypertension observed in the older population locally.

The pattern of low intake of calcium together with high intake of sodium of the local population encourages bone density loss. So far, the incidence of fracture of hips is relatively low compared with other populations with a higher calcium intake (see Table A3 in Appendix A on page 24). Genetic predisposition may account for these differences.

Educational status affects dietary intake. A higher education level was found to be associated with a healthier diet (a higher protein intake in men, higher nutrient density of fibre, calcium and other vitamins in both men and women) and a lower prevalence of obesity [21].

Dietary pattern and disease

The associations between food variety and body fatness were determined in 120 adult Hong Kong Chinese aged 18-50 years using a food frequency questionnaire [22]. Differences in dietary pattern between obese and normal weight people were found. Varieties of meat and grain were found to be negatively correlated while a variety of snack was positively correlated with the obesity indices. Most of the snack food has high fat and free sugar content and many are served as dim sum in Chinese restaurants.

The dietary pattern in those with abnormal glucose tolerance was studied in 988 Hong Kong Chinese [23]. The investigators failed to find a specific dietary variety that accounted for body fatness and glucose tolerance.

In hypertensive patients, Cheung et al [24] found that diastolic blood pressure correlated with 24-h sodium excretion ($r=0.41$; $p=0.02$) accounting for 17% of the variance while the systolic BP increases with age. However, the same group of investigators in a later study found that when indices of obesity especially waist circumference were taken into consideration, salt intake was no longer a significant risk factor for hypertension. Instead, the diastolic blood pressure was related to waist circumference (reflecting body fatness), age and fasting blood sugar. Maintaining ideal weight and salt intake are important in the prevention of hypertension [25].

Koo and colleagues [26] studied 88 nonsmoking women with lung cancer and 137 matched controls and found that consumption of leafy green vegetables, carrots, bean curd, fresh fruits and fresh fish was associated with a protective effect on adenocarcinoma. Using the same methodology of data collection, another local study found that a high fat consumption was associated with an increase in lung cancer risk in men [27].

Dietary intake in children

It appears that the problem of over-nutrition is emerging in Hong Kong in early 1990 [28]. A cohort of 125 children recruited in 1984 at birth was examined at 7 years. Dietary intake was assessed by dietary history, 24 hour recall and food frequency. Eight children (5%) were found to be obese, defined as having weight higher than the 97th percentile of Hong Kong reference [28].

The same group of investigators examined the cohort in relation to energy intake and growth and compared with Australian children of the same age group. Compared with Australian children, at 7 years of age, Hong Kong children were lighter and shorter, have a lower total energy intake, a higher proportion of protein and a lower proportion of fat contributing to the total energy intake. The calcium, iron and vitamin C intake all reached 60% or above that of recommended daily allowance (RDA) [29]. However, the fat intake (30% of total energy) of these 7-year olds in Hong Kong was much higher than that of the children in Mainland China [30]. The mean serum cholesterol of Hong Kong children (4.59 nmol/L) at age 7 was significantly higher than Mainland Chinese children (4.16 nmol/L) [30].

In Hong Kong, childhood obesity (weight \geq 92nd percentile for BMI) was significantly associated with parental obesity, birth weight, decreased sleeping time, higher energy consumption and a smoker father [31].

Physical activity

The high prevalence of obesity in children in Hong Kong is partly due to over nutrition and a high intake of sugar and fat and partly from lack of physical exercise. In a study of physical development and lifestyle of 404 students in secondary schools aged 12-18 years, overweight and obesity were closely associated with physical inactivity and inappropriate food selection such as eating snacks or food rich in fat or cholesterol [32].

An alarmingly low level of habitual physical activity was found in a study of a random sample of primary school children aged 8-12 years [33]. When compared with international data of children of comparable ages, only 24% and 4% of Hong Kong children demonstrated single 10-minute periods where the heart rate was continuously above 139 beats/minute and 159 beats/minute respectively on exercise.

Alcohol consumption

The prevalence of alcohol consumption in Hong Kong is low. Only 0.8% of the residents drank \Rightarrow 50 gm/day [18].

Prevention of chronic non-communicable diseases in Hong Kong

The recent Severe Acute Respiratory Syndrome (SARS) epidemic has demonstrated the importance of public health measures in disease control. While acute communicable diseases, such as SARS, are frightening and have high mortality rates, they are not major causes of morbidity and mortality in developed countries and in developing countries. As more than two thirds of the mortality are due to chronic non-communicable diseases in Hong Kong and the prevalence of these diseases are rising with the aging population, it is imperative that immediate efforts be directed at prevention of these diseases. The major risk factors of these chronic diseases are smoking, obesity due to inappropriate diet, inappropriate alcohol consumption and physical inactivity.

Anti-smoking

- The antismoking efforts have been effective in reducing the prevalence of smoking in Hong Kong from 39.7% to 25.2% in men and 5.6% to 4.4% in women over the age of 15 years between 1982 to 2000 [34]. This has paid considerable dividends as there has been a progressive reduction of the prevalence of cancers associated with smoking such as lung cancer, cancer of the larynx and bladder since 1990.
- It is well known that exposure to second hand smoke can cause a number of adverse health effects both in children and adults including lung cancer. This topic has been well reviewed recently [35]. Studies have shown that banning smoking from restaurants and bars did not reduce business. Moreover, they found that employees who smoke are smoking less as a result of the ban and some give up smoking as a result [36, 37]. As many western countries have banned smoking in all workplaces and public places, Hong Kong should also institute such a ban as early as possible. The Government's proposed legislative amendment of Smoking (Public Health) Ordinance to protect the health of our community should be supported.
- Local studies have shown a rise in the prevalence of smoking in young people as in other parts of the world [38]. It is an area that greater preventive efforts need to be directed.

Reduce Obesity

Despite a diet appropriate for cardiovascular health for more than 50%-60% of adult residents in Hong Kong, obesity occurs in around 10% of adults and adolescents [18]. It is important to emphasize the importance of taking a diet according to the recommendation of the WHO/FAO Expert Consultation [5].

- The total caloric intake should be appropriate to the level of a person's physical activity.
- Reinforce the benefits of a diet with fat contributing less than 30% of the total energy with saturated fat less than 10%.

Healthy diet

- Increase fibre intake and intake of fresh fruits and vegetables to increase the level of antioxidants for cancer prevention (lung, colon and colorectal cancers).
- Reduce salt consumption.

- Increase calcium intake in the form of increased leafy green vegetables and soy products.

Physical activity

- The low level of habitual physical activity of primary school children in Hong Kong probably account for the high prevalence of obesity which will have potentially serious implications for the future health of this population unless significant changes are made.

Possible actions for Hong Kong

Local healthcare authority should carefully consider the following WHO recommendations as they are highly relevant to the Hong Kong context:

- The Government should give preventive measures high priority and develop a nutrition and food policy.
- The Ministry of Health (or the Health, Welfare and Food Bureau in Hong Kong) and departments involved in food and trade should form an integrated food and nutrition policy.
- Discussions should be encouraged between the government, the food industry and the consumers to ensure that the development of food products is low in fat, free sugars and salt.
- Mandatory labeling of ingredients and the amounts in manufactured food.
- The Ministry of Health (Health, Welfare and Food Bureau) should ensure experts are available to monitor nutritional and health status of the population.
- Surveillance:
 - (i) Monitor a random sample of adult population for obesity and risk factors for coronary heart disease.
 - (ii) Monitor a random sample of children's weight and height.
 - (iii) Monitor salt intake by collecting and analyzing 24 hour urine specimens from a random sample of subjects.
- The Ministry of Education (Education and Manpower Bureau) should ensure that, as part of nutrition and health education for teachers and children, due attention be given to the prevention of diet-related chronic diseases.
- Major community-based campaigns involving schools, the media, public education and lay organizations to publicize the necessity of changes in diet (more fibres, fruits and vegetables and less fat and free sugars) and importance of physical activity. The use of mass media is important in community-based health education programmes.
- Involve lay organizations in community-based campaign.
- The medical profession that often lags behind public demand for health-promoting measures should take more responsibility to promote changes in dietary behaviour.

Appendix A

Effect of diet and nutrition on chronic diseases

The World Health Organization published a Technical Report on “Diet, nutrition and the prevention of chronic diseases” in 2003. This comprehensive report contains important recommendations from the joint WHO/Food and Agricultural Organization (FAO) expert consultation [5]. In this report, there are also sections on diet and chronic diseases which are relevant to the situation in Hong Kong. They will be summarized in this Appendix A.

Changing dietary pattern and lifestyle in the last two centuries

The industrial revolution in developed countries in the last 200 years has introduced radical changes in methods of food production, processing, storage and distribution. Major changes in the nutritional composition of the diet have occurred in developed countries. The immediate health benefits of this increased and assured food supply has been the elimination of many micronutrient (vitamin) deficiency diseases in the developed countries of the world. The general improvement in nutritional status has led to an increased resistance to infectious diseases and substantial increase in life expectancy in many countries.

The “western” diet of developed countries is characterized by an excess of fat and free sugars and a deficiency of complex carbohydrate foods – the main source of dietary fibres. Table A1 illustrates the changes in various components of diet in the United Kingdom in the last two centuries. The long term adverse health effects of this diet have become evident over the recent decades in developed countries. These include a number of chronic non-communicable diseases such as ischaemic or coronary heart disease (CHD), cerebrovascular diseases, various cancers, diabetes mellitus, gallstones, dental caries, gastrointestinal disorders and various bone and joint diseases. As life expectancy increases in many developing countries, patterns of diseases are occurring similar to those experienced by developed countries. In as early as 1920, cardiovascular diseases emerged as the leading cause of death in the United States; in developing countries, cardiovascular diseases became a significant problem in the 1970s.

Table A1: Estimated per caput consumption in the United Kingdom of various food stuffs 1770, 1870, 1970

	Grams per person per day		
	1770	1870	1970
Fat	25	75	145
Sugar	10	80	150
Potatoes	120	400	240
Wheat flour	500	375	200
Cereal crude fibre	5	1	0.2

Source: Reference 5.

There is usually a sequence in the emergence of chronic disease as the diet in developing countries becomes westernized. Appendicitis and diabetes tend to occur first, followed after several decades by coronary heart disease and gallstones, then cancer of the large bowel, and finally various chronic disorders of the gastrointestinal tract. Such changes have occurred more obviously in countries or population groups undergoing rapid transition between different cultural stages. For example, the Aborigines in Australia traditionally derived most of their diet from roots and vegetables that contained much fibre. During the first half of the 20th century, white flour and sugar became their predominant sources of dietary carbohydrates. This change in dietary pattern together with a sedentary lifestyle, resulted in the emergence of high rates of obesity, hypertension and coronary heart disease.

A major factor that has greatly impacted the dietary pattern is urbanization in developing countries as a household can no longer depend on home grown produce any more. While rural communities depend on staple crops of cereals, tubers, vegetables and fruits, urbanization increases animal fat and sugar consumption. This new diet is perceived as a status symbol and readily accepted by other affluent communities. Within the urban setting, the food industry exerts substantial influence by promoting consumption of soft drinks, meat products, confectionery, snack foods, and other convenience foods rich in free sugars and fats. In general, urbanization is associated with a decrease in physical activity of men, women, adolescents and school children.

As the urban elites in the developing world experience higher rates of cardiovascular disease and cancers, they demand medical therapy of the kind found in affluent societies – high technology, hospital-based medical care, thus escalating the costs of health care.

Association between diet and chronic diseases

Extensive medical research over the last four decades has demonstrated links between diet and chronic disease. The evidence comes from epidemiological investigations and controlled clinical trials, together with laboratory experiments on animals, and in vitro testing. The association between diet and cardiovascular diseases is well established while the association between diet and other diseases is less well established.

Coronary heart diseases (CHD)

CHD became a public health problem early in the last century. By 1950, it had become the single major cause of death in adults.

- Serum cholesterol is strongly related to the incidence of CHD. The intake of saturated fat is strongly correlated with serum total cholesterol. Variations in serum total cholesterol could be largely explained by differences in saturated fat intake. Populations with an average saturated fat intake between 3% and 10% of energy intake are characterized by a serum total cholesterol level of <5.17 nmol/L and by low mortality rates from CHD. Saturated fat intake > 10% of energy intake is associated with a marked and progressive increase in CHD mortality. High density lipoprotein cholesterol does not play an important role in CHD. It is now accepted that low density lipoprotein fraction is atherogenic and responsible for CHD.

- Other dietary components such as dietary fibres have an effect on cholesterol by lowering it. Populations or population subgroups consuming diet rich in plant foods have lower CHD than the general population.
- Alcohol consumption also influences the occurrence of CHD. A slightly lower risk for CHD occurs in slight to moderate drinkers than in abstainers, while moderate to heavy drinkers have higher blood pressures than nondrinkers. But abstinence from alcohol improves blood pressure.

Controlled trials in human beings using diet or drugs to reduce serum cholesterol showed a reduction in the incidence and progression of CHD. Changing from a high to a low intake of saturated fats and replacing the fat with n-6 polysaturated fatty acids reduced serum cholesterol by 15% and led to a reduction of CHD. Dietary cholesterol contributes to CHD risk and a population average intake less than 300 mg/day has been recommended by most international committees. Reducing total intake of fat to provide 30% of the total energy requirement will have a substantial effect on saturated fatty acid intake.

Epidemiological studies carried out on middle aged men provided clear evidence that the risk of CHD in individuals is increased by 3 major factors: high serum total cholesterol, high blood pressure and cigarette smoking. There is also synergism between the different risk factors. The importance of diet in the development of CHD is mediated by its effects on the development of high cholesterol and hypertension. Body weight changes induced by changes in diet and physical activity are strongly related to changes in serum total cholesterol and hypertension, and obesity is also related to diabetes which is another risk factor for CHD.

High blood pressure and cerebrovascular disease

The risk of CHD and of stroke increases progressively throughout the observed range of blood pressure (BP). There is a fivefold difference in the risk of CHD and tenfold difference in the risk of stroke over a range of diastolic pressure of 40 mm Hg from the combined results of nine major studies. Drug trials to lower BP resulted in a marked reduction in the incidence of stroke and CHD. There is no threshold below which a further lowering of BP is without effect. Blood pressure is related to diet in many aspects:

- Sodium intake. Salt intake has a weaker but significant effect on the rise in BP with age. Carefully controlled clinical studies have demonstrated a dose-dependent relationship between dietary salt intake and BP.
- Potassium and magnesium appear to play a role in limiting the rise of BP and they are readily found in the diet.
- Obesity. It is also a major determinant of BP. Abdominal adiposity is more closely related to BP than body weight.
- Alcohol consumption. A modest intake is probably beneficial while a high intake is harmful.

Increased physical activity may reduce BP independent of its effect on weight change. As with obesity and hyperlipidemia, there is evidence of inter-individual variations in

susceptibility to hypertension. Obesity and hypertension can be prevented by a diet low in fat, high in complex carbohydrates and minimal intake of alcohol.

Cancer

The relationships between specific dietary components and cancer are much less well established than those between diet and cardiovascular diseases. For populations in developed countries, where cancer rates are highest and account for one-quarter of all deaths, epidemiologists estimated that 30 to 40% of cancers in men and up to 60% of cancers in women are attributable to diet.

- Cancer of the mouth, pharynx, esophagus and upper part of larynx. In developed countries, epidemiological studies clearly indicate that alcoholic beverages are causally related to these cancers. There is no indication that the effect is related to any specific type of beverage. Smoking also causes cancers of these types.
- Cancer of the esophagus has been found to be associated with: (i) low intake of green vegetables, fresh fruits, animal protein, vitamins A and C, riboflavin, nicotinic acid, magnesium, calcium, zinc, and molybdenum; (ii) consumption of foods and beverages at high temperature; and (iii) high intake of pickles, moldy foods containing nitroso compounds.
- Stomach cancer is associated with diets comprising large amounts of smoked and salt-preserved foods (precursor of nitrosamine) and low levels of fresh fruits and vegetables. In Japan where there is a high rate of stomach cancer, shifting away from this dietary pattern has led to a decline in stomach cancer mortality.
- Colorectal cancer. There is a positive association between the risk of colorectal cancer and dietary fat, saturated fat rather than unsaturated fat. There is also a positive association between meat consumption and colorectal cancer.
- Liver cancer. In developed countries, consumption of alcohol is causally related to liver cancer. In Africa, liver cancers have been correlated with aflatoxin contamination of foodstuffs.
- Lung cancer. Several studies have shown an interactive effect between smoking and a low frequency of intake of green and yellow vegetables rich in carotene. Dietary fats and cholesterol have also been positively associated with lung cancer risk.
- Female breast cancer. Epidemiological studies have shown that breast cancer mortality is associated with intake of energy, fats, and specific sources of dietary fat such as milk, beef.
- Prostate cancer. Obesity or increased weight has been correlated with the risk of prostate cancer.

Table A2 summarizes the associations between dietary components and cancers at various sites.

Table A2: Association between selected components of diet and cancer at different sites

Site	Body weight	Fat	Fibres	Fruits and vegetables	Alcohol	Smoked, salted and pickle good
Lung				–		
Breast	+	+				
Prostate		++				
Bladder				–		
Endometrium	++					
Cervix				–		
Oral cavity				–	+	
Esophagus				–	++	+
Stomach				–		++
Colon		++	–	–		
Rectum		+		–	+	

Notes: + positive association; – negative association

Source: Reference 5.

Type II Diabetes Mellitus

Obesity is a major risk factor for the occurrence of Type II diabetes mellitus, the risk being related to the duration and the degree of obesity. The incidence of diabetes is almost doubled when moderate weight gain is present and can be more than 3 times in the presence of frank obesity. Other risk factors for diabetes include sedentary lifestyles, smoking, stress, urbanization and socioeconomic factors. The most rational and promising approach to preventing Type II diabetes mellitus is to prevent obesity. Physical activity not only improves glucose tolerance by reducing weight gain but also acts independently by having a beneficial effect on insulin metabolism.

Osteoporosis

Fractures occur frequently in the elderly, particularly in older women with fragile bones after a relatively minor fall. Bone density decreases in women after menopause and in men after the age of 55. Table A3 shows the incidence of hip fractures by region and sex. By age 90, one third of women and one sixth of men in the United States will have had hip fractures.

Important determinants of bone density include lack of estrogen, immobility, smoking, alcohol and drug, and calcium intake. High protein and high salt diet are known to increase bone loss. Calcium supplements are helpful in reducing the rate of bone loss in post menopausal women, but at levels of intake that are pharmacological rather than nutritionally relevant.

Table A3: Incidence (per 100,000) of hip fracture by region and sex

	Women	Men	F/M
USA	101.6	50.5	2.01
New Zealand	96.8	35.2	1.79
Sweden	87.2	38.2	2.75
United Kingdom	63.1	29.3	2.15
Yugoslavia	39.2	37.9	1.03
Hong Kong	31.3	27.2	1.15
Singapore	15.3	26.5	0.58
South African Bantu	5.3	5.6	0.94

Source: Reference 5.

Non-cancer conditions of the large bowel

Diverticulitis develops as an inadequate intake of dietary fibres has led to relatively hard, concentrated slow-moving faeces. In developed countries, diverticulitis is common after the age of 40 years, when it affects about 20% of the population. Hemorrhoids are also common in developed countries and are due to increased physical effort necessary for defecation, raising the intra-abdominal pressure, and thereby increasing pressure in the veins. Chronic constipation occurs in 10% of adults and 20% of elderly in societies with low fibre intake.

Gallstones

Gallstones occur much more commonly in developed than developing countries. The occurrence of cholesterol gallstones is the result of the presence of supersaturated bile. Overweight adults excrete an excess of cholesterol with the bile, but fibre intake reduces the saturation of cholesterol in bile, by altering the recycling of the bile acids from the intestine.

Dental caries, sugars and fluoride

The introduction of sugars and refined flour, and the manufacture of confectionery and sweet baked foods increase dental caries dramatically. Diet affects teeth in two ways: while the tooth is forming before eruption and through a local effect after the tooth has erupted; the latter being more important. Fluoride helps to prevent dental caries. In most countries, drinking water supplies 75% of the daily intake of fluoride.

Obesity

Overweight and obesity lead to adverse metabolic effects on blood pressure, triglycerides and insulin resistance which in turn are responsible for cardiovascular diseases and Type II diabetes mellitus. Certain types of cancers, especially hormone related (prostate and breast), large bowel cancers and gall bladder diseases are causally related to obesity. Other debilitating health problems associated with obesity includes respiratory difficulties, chronic musculoskeletal problems, skin problems and infertility. There is a direct relationship between mortality and body mass index (BMI).

BMI is an index of body fatness. In developed countries, a BMI of 20 to 25 is taken as normal for adults. In developing countries, it has been suggested that the lower limit of normal BMI should be 18.5.

$$\text{BMI} = \text{body mass in kg}/(\text{height in meters})^2$$

Obesity is divided into 3 grades: grade 1 carries only moderate health risk but grade 3, being very severe, carries high risks of various diseases as mentioned above. There is increasing evidence that fat deposited abdominally presents a greater hazard so that a waist to hip circumference ratio of more than 0.85 is a particular hazard.

Currently more than 1 billion adults in the world are overweight and at least 300 million of them are clinically obese. Current obesity levels range from below 5% in China and Japan to over 75% in urban Samoa. Childhood obesity is already epidemic in some areas and on the rise in others. An estimated 17.6 million children under 5 are estimated to be overweight worldwide. Obesity accounts for 2 to 6% of total health care cost in several developed countries and some estimates put the figure as high as 7% [6].

Changes in body fat depend on an imbalance between energy intake and energy expenditure. Thus obesity develops when energy intake is in excess of expenditure for a sustained period of time. As societies become more affluent and mechanized, the demand for physical activity declines. The energy intake, if not reduced, will be stored as fat. Dietary fat is particularly conducive to weight gain. Excess dietary fat is more readily stored than dietary carbohydrate. Fibre-rich complex carbohydrates are also much bulkier and tend to limit energy intake.

Recommendations of the WHO/FAO Expert Consultation

Table A4 summarizes the population nutrient goals recommended by the WHO/FAO expert committee. The committee does not consider screening individuals for high serum cholesterol or applying intervention measures as an effective method of controlling coronary heart disease as serum cholesterol is not a good indicator of risk. Moreover, there is no diet-related marker of individual risk for cancer comparable to serum cholesterol. There is no possibility of an individualized high risk approach and only population interventions are feasible. Moreover, if the objective is primary prevention, one must consider the whole population is at risk.

Table A4: Recommended daily intake by World Health Organization / Food and Agricultural Organization

	Minimum	Maximum
Total fat (% total energy)	15	30
<i>Saturated fatty acid (% total energy)</i>	0	10
<i>Polysaturated fatty acid (% total energy)</i>	3	7
<i>Dietary cholesterol (mg/day)</i>	0	300
Total carbohydrates (% total energy)	55	75
<i>Complex carbohydrates (% total energy)</i>	50	70
<i>As dietary fibre (g/day)</i>	27	40
<i>Free sugars (% total energy)</i>	0	10
Protein (% total energy)	10	15
Salt (g/day)	–	6

Source: Reference 5.

The Consultation also provided recommendations related to physical activity because of its intimate relationship with diet:

- A decrease in energy expenditure through reduced physical activity is likely to be one of the major contributing factors to the global overweight epidemic and obesity.
- Physical activity has great influence on body composition – on the amount of fat, muscle and bone tissue. To a large extent, physical activity and nutrients share the same metabolic pathways and can interact in various ways to influence the risk and pathogenesis of several chronic diseases
- Cardiovascular fitness and physical activity has been shown to reduce significantly the effects of overweight and obesity on health.
- Physical activity and food intake are both specific and mutually interacting behavior that are and can be improved by the same measures and policies
- Lack of physical activity is already a global hazard and is a prevalent and rapidly increasing problem in both developed and developing countries particularly among poor people in large cities.

The report articulated a new platform not just of dietary and nutrient targets, but a concept of the human organism's subtle and complex relationship to its environment in relation to chronic diseases. The experts also discussed the macroeconomic implications of public health recommendations on agriculture, and the global supply and demand for fresh and processed foodstuff. It called for a shift in the conceptual framework for developing strategies for action, placing nutrition together with other principal risk factors for chronic disease, such as tobacco use and alcohol consumption at the forefront of public health policies and programmes.

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