

Prevention and Control of Non-Communicable Diseases in Singapore: A Review of National Health Promotion Programmes

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ABSTRACT

The epidemiological transition in Singapore from infectious to chronic, non-communicable diseases created different challenges for our public health system. The population-based strategy is adopted in primary prevention, through the promotion of a healthy lifestyle – smoking cessation, physical activity, eating right and managing stress. Complementing this are measures to detect chronic conditions early through screening and optimal treatment of the disease.

While improvements were seen in the common risk factors of smoking and physical inactivity, prevalence of measurable risk factors like hypertension increased between 1992 and 1998. In 2000, the Ministry of Health initiated a series of national disease management plans for major disease conditions affecting Singaporeans. This approach uses a comprehensive and systematic approach to integrate the various components, with identification of responsible parties to ensure successful implementation of initiatives.

Chronic diseases will remain prevalent as our society rapidly ages. Close monitoring of our initiatives in disease management will provide information on the long-term efficacy of such strategies.

Keywords: chronic diseases, health promotion, disease management, Singapore, public health

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INTRODUCTION

Singapore is a small city-state with a land area of 683 sq km⁽¹⁾ and a resident population of 3.26 million. The three major ethnic groups are Chinese (77%), Malays (14%) and Indians (8%)⁽²⁾. About 7% of the population is 65 years or older, and the median age of the population is 34 years.

Cancers and cardiovascular diseases are the major conditions affecting Singaporeans today, accounting for more than 60% of all deaths⁽³⁾. This is a far cry from the 1950's and 1960's when infectious diseases like tuberculosis and gastroenteritis were among the top five leading causes of death in Singapore (Table I). Major contributory factors to

Table I: Ten Leading causes of death, 1957, 1980 and 2000.

1957	% of Total Deaths	1980	% of Total Deaths	2000	% of Total Deaths
Pneumonia	9.7	Heart diseases	21.4	Cancer	27.0
Heart diseases	7.7	Cancer	20.5	Ischaemic and other heart diseases	25.1
Cancer	7.2	Cerebrovascular disease	11.6	Pneumonia	11.4
Tuberculosis	7.0	Pneumonia	9.0	Cerebrovascular disease	10.4
Gastroenteritis	5.5	Accidents	7.2	Accidents, poisoning and violence	7.2
Accidents	5.5	Diabetes mellitus	2.6	Diabetes mellitus	2.3
Cerebrovascular disease	4.3	Nephritis, nephrotic syndrome and nephrosis	2.4	Nephritis, nephrotic syndrome and nephrosis	1.3
Birth injuries and Postnatal asphyxia	3.0	Tuberculosis	1.9	Diseases of arteries, arterioles and capillaries	0.8
Nephritis, nephrotic syndrome and nephrosis	2.2	Perinatal diseases	1.8	Chronic liver disease and cirrhosis	0.7
Bronchitis, emphysema and asthma	1.7	Congenital anomalies	1.5	Bronchitis, emphysema and asthma	0.7

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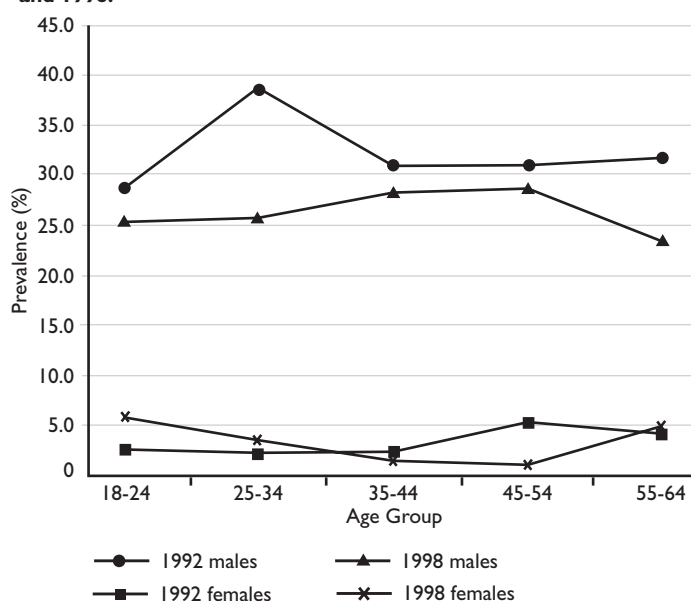
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Table II. Smoking prevalence in Singaporean adults aged 18-64, 1992 and 1998.

the epidemiological transition included improved housing and sanitary conditions, availability of potable water, comprehensive vaccine and disease surveillance programmes and affluent lifestyles, a result from rapid socio-economic development.

With the shift in disease patterns towards chronic lifestyle diseases, the Review Committee on National Health Policies undertook a policy review of the healthcare services in 1991. In their report of October 1991⁽⁴⁾, the Committee endorsed the focus placed on health promotion and disease prevention to reduce morbidity and mortality in Singaporeans and emphasised the role of the individual in being responsible for safeguarding his/her own health. As a result, a coordinated series of health promotion measures was subsequently initiated under the National Healthy Lifestyle Programme which was launched in 1992.

NATIONAL HEALTH SURVEY

Data is necessary when tracking the changes in the health status of the nation. As a result, the first National Health Survey (NHS) was conducted in 1992 to determine the national baseline prevalence of the cardiovascular risk factor conditions of diabetes, hypertension, high blood cholesterol, obesity, physical activity, and smoking before the implementation of healthy lifestyle intervention programmes. The follow-up NHS 1998 was performed to assess the changes in the levels of these risk factors over a six-year period. In view of the multifactorial causes of cardiovascular disease and its risk factors, and the difficulty in designing and conducting good evaluative studies on health promotion programmes,

the NHS data will be considered in this paper, as a proxy indicator for the overall impact of all initiatives under the National Healthy Lifestyle Programme on the prevalence of cardiovascular risk factors in Singapore. Similar definitions for the various conditions are adopted for the data from both NHS. Random samples of about 4,000 Singaporean residents aged 18 - 69 years participated in each of these two surveys.

This nationally driven Healthy Lifestyle Programme focused on four main lifestyle measures - staying smoke free, physical activity, eating right and managing stress - to combat major chronic diseases and their risk factors. This paper reviews this national programme to date, describes recent initiatives in secondary prevention and the overall challenge to control chronic, non-communicable diseases in Singapore.

SMOKING

Singapore has consistently adopted tough anti-smoking policies since the 1970's. A comprehensive mix of strategies was adopted, comprising public education, legislation, tobacco taxation and provision of smoking cessation services⁽⁵⁾. The aim of the strategies was to alert the public of the dangers of smoking, to make it difficult and expensive to smoke, and to free them from the pressure to smoke. Legislative measures such as the prohibition of smoking in public by under-eighteens, mandatory insertions of health warnings on cigarette packets, restriction of smoking in public places and the restrictions on the sale of tobacco products has been effective only with the help of widespread and effective enforcement of the legislation with imposition of penalties on offenders. Together with high profile public education programmes each year, these measures could have contributed to the reduction of the overall smoking rates from 18% in 1992 to 15% in 1998⁽⁶⁾. This rate is much lower than that of United States (estimated 25% in 2000)⁽⁷⁾ and England (27% in 1998)⁽⁸⁾.

At the current low rates of smoking, it will be a challenge for Singapore to further reduce the smoking prevalence. Males comprise 90% of all smokers in Singapore and 46% of all adult female smokers (18 - 64 years) are between 18 - 29 years old (Table II). The national programme will focus on these two groups of smokers: the males, who resist smoking cessation and young children who experiment and become addicted to cigarette smoking.

The Singapore Youth Tobacco Survey 2000⁽⁹⁾ showed that one in four secondary school children reported having ever tried smoking, and about one in ten had smoked at least one day in the last 30 days. To effect any change in their smoking habit, their needs and

fears such as image and peer pressure will have to be fully addressed in detail. More creative interventions need to be developed to counter the innovative methods used by tobacco companies to market their product, such as packaging cigarettes into smaller packs of fewer sticks to make it more affordable for people to smoke, especially young adults.

PHYSICAL ACTIVITY, EATING RIGHT AND OBESITY

The twin problems of physical inactivity and excessive diet are closely linked to obesity. Only 14% of the adult population exercised regularly in 1992, and 5% were obese with a BMI of 30 or more⁽⁶⁾. The strategy was to promote physical activity and eating right, two components of a "healthier lifestyle", through the workplaces and schools where people spend a large amount of their time every day.

School-based programmes

Obesity in students from primary, secondary and pre-university schools showed an almost three-fold increase from 5.4% in 1980 to 15.1% in 1991⁽¹⁰⁾. In response to this trend, the Ministry of Education, closely supported by the Ministry of Health, introduced the Trim and Fit (T.A.F.) programme for students in 1992 to reduce obesity and improve physical fitness among school children in primary schools up to pre-university level. Major strategies employed in the T.A.F. programme include the control of food and drinks sold in school canteens, exercise programmes for overweight and obese students, parental involvement and support, and collaboration with other related agencies.

Over a ten-year period since the programme was launched in 1992, obesity in school children reduced from 14% to 10%⁽¹¹⁾. While the T.A.F. programme played a major role, other concurrent incentives for exercise and sports by the Ministry of Education could have also contributed to this decrease in the obesity prevalence in school children. More can be done to further lower the obesity rate. Intensive efforts during the initial intervention phase to help students lose weight is important⁽¹²⁾. Greater involvement of parents in the TAF programme will be needed, as the home environment contributes largely to the moulding of the child's habits. Intervention at an earlier age has also been shown to be effective locally⁽¹³⁾.

A recent initiative, the C.H.E.R.I.S.H. (Championing Efforts Resulting in Improved Health) Award, recognises schools that have taken a more creative and proactive approach in nurturing physical and mental health of students and staff to help them adopt healthy lifestyles⁽³⁾. As more schools

achieve this award, other schools will be incentivised to work towards reaching similar standards.

Workplace-based programmes

Another means of reaching to the population for healthy lifestyle promotion is through the workplace where adult Singaporeans spend about two-thirds or more of their waking hours. Even today, many companies still resist the idea of having health promotion activities for their staff as it is deemed to be unnecessary expenditure⁽¹⁴⁾. However, studies have shown that comprehensive workplace health promotion programmes are effective in improving the health status and productivity of employees⁽¹⁵⁾.

The National Workplace Health Promotion Programme puts in place a framework to encourage more organisations to conduct and sustain workplace health promotion programmes that achieve desired health outcomes. This framework utilises health facilitators, who are employees of an organisation, as the primary movers within their companies to encourage and facilitate the adoption of healthy lifestyles among the employees. Training courses and education initiatives are conducted to equip facilitators and management staff with knowledge and skills to conduct and promote a healthy lifestyle at their workplaces. The Singapore H.E.A.L.T.H. Award was introduced in 1998 to give national recognition to workplaces with commendable workplace health promotion programmes, which could include health information dissemination, incentive schemes for behavioral changes and environmental support as in provision of water coolers and healthier options at the workplace canteen. In 2000, 135 companies were presented with the H.E.A.L.T.H. Award⁽³⁾.

Several initiatives are underway to further encourage the adoption of workplace health promotion. The Workplace Health Promotion Grant, which works on the principle of co-funding, was instituted to help organisations expand and improve their health promotion programmes. There are plans to incorporate health promotion at the workplace as one of the requirements for national productivity awards to emphasise the importance of employee health to business productivity.

Community-based programmes

Each year, a month-long National Healthy Lifestyle Campaign serves to remind Singaporeans of the importance of a healthy lifestyle. Since the Campaign started in 1992, it has had the support and participation of politicians, with the Prime Minister being the Guest-of-Honour for the annual mass workout campaign launch. The Great Singapore Workout, a

Table III. Results of the 1992 and 1998 National Health Survey, Singapore.

Proportion of Singaporeans aged 18-69 years who:	Age-standardised prevalence	
	1992	1998
Exercise regularly	13.6%	16.9%
Smoke daily	18.4%	15.0%
Are obese (BMI ≥ 30 kg/m ²)	5.1%	5.9%
Have high blood cholesterol (total cholesterol ≥ 6.2 mmol/l)	19.0%	23.5%
Have diabetes*	8.4%	8.1%
Have hypertension (systolic Blood Pressure ≥ 140 mmHg or diastolic Blood Pressure ≥ 90 mmHg)	15.9%	19.6%

* Diabetes is diagnosed when the two-hour plasma glucose concentration ≥ 11.1 mmol/l in the oral glucose tolerance test.

Table IV. Obesity prevalence by race and gender, 1992 and 1998.

Gender	Ethnicity	Age-standardised prevalence	
		1992	1998
Male	Chinese	3.1%	4.5%
	Malay	5.9%	8.7%
	Indian	9.6%	7.2%
Female	Chinese	3.8%	3.0%
	Malay	17.1%	22.0%
	Indian	12.3%	17.5%

Note: Obesity is defined as a Body Mass Index of 30 and above.

Table V. Hypertension prevalence by race and gender, 1992 and 1998.

Gender	Ethnicity	Age-standardised prevalence	
		1992	1998
Male	Chinese	19.6%	23.8%
	Malay	16.5%	22.3%
	Indians	13.8%	20.3%
Female	Chinese	12.1%	14.3%
	Malay	17.6%	25.3%
	Indians	14.2%	14.2%

Note: Hypertension is defined as a systolic blood pressure of ≥ 140 mmHg or a diastolic blood pressure of ≥ 90 mmHg.

Table VI. Prevalence of high blood cholesterol by race and gender, 1992 and 1998.

Gender	Ethnicity	Age-standardised prevalence	
		1992	1998
Male	Chinese	19.1%	23.3%
	Malay	21.7%	38.4%
	Indian	22.3%	26.7%
Female	Chinese	16.9%	20.2%
	Malay	25.3%	29.4%
	Indian	19.6%	19.1%

Note: High blood cholesterol is defined as blood cholesterol of ≥ 6.2 mmol/l.

compilation of easy, low-impact aerobic steps for both young and old, has been used as the exercise workout for the annual National Healthy Lifestyle Campaign since 1993⁽¹⁶⁾. However, its use outside the campaign period was not extensive, and a new workout was introduced in 2001. This new workout, the "Work Fit" was specially designed with the working adult in mind, mimicking moves of common sports for easy recall.

The public education nutrition programme uses many channels to educate the public on healthier food choices, provide a supportive environment for healthier eating, and ensure adequate supply of healthier food. In 1998, Nutrition Labelling was launched to encourage the food industry to display nutritional information panels on energy value and content of seven selected nutrients in one serving portion and 100 grams of the packaged food. The Healthier Choice Symbol on packaged food was devised for easy consumer recognition. Restaurants, food courts and hawker centres have been encouraged to offer customers with more vegetables, less fat and oil through the "ASK for Healthier Food" Programme.

TRENDS IN CARDIOVASCULAR RISK FACTORS

The National Health Survey found an over 20% increase in the proportion of people engaging in regular physical activity between 1992 and 1998 (14% to 17%) (Table III). However, obesity rates have marginally increased, though not significantly, to 6% in 1998, with Malay and Indian women having the highest rates (Table IV).

The prevalence of hypertension and high total cholesterol has also increased despite the national effort to promote a healthy lifestyle since 1992 (Tables V-VI). The increased prevalence of hypertension and high total cholesterol was seen in both sexes and in all races between 18 - 69 years, except for Indian females. For diabetes, the increase in prevalence between 1992 and 1998 occurred in Malay women and Indian men and women. Diabetes prevalence also increased mainly in the older age groups for the same period (Table VII-VIII).

IMPLICATIONS TO THE NATIONAL DISEASE PROGRAMMES

The health promotion efforts of the National Healthy Lifestyle Campaign are likely to have contributed to the increased level of reported exercise activity in the population and reduction in smoking prevalence. However, measurable cardiovascular risk factor indices appear to have deteriorated. There arose a need to review and refine our strategies for combating cardiovascular disease. Current gaps in services should be addressed. Further attention could be given

to high risk groups. A comprehensive framework was needed to realign health services with the changing national needs and priorities.

From 2000 onwards, the Ministry of Health developed a national disease management framework for major chronic disease conditions in Singapore. The aim was to reduce the burden of major disease conditions causing mortality and morbidity, such as cardiovascular diseases. The National Disease Plans use a comprehensive approach incorporating patient responsibility, integration of care by several providers and identification of responsible parties to ensure successful implementation. In this framework, primary preventive activities are targeted at both the general population and high-risk groups. Where primary prevention failed, risk factors have to be detected early and treated (secondary and tertiary prevention), for an overall comprehensive approach to disease prevention and control.

Primary prevention

Traditionally, health education and promotion have provided information to the public on the benefits of a healthier lifestyle. Some measures were also taken to provide an environment conducive for the adoption of healthy habits. As the population becomes more educated, the public will become more aware and better informed on health issues. The next challenge will then be for the government to move beyond pure information dissemination to the next level of reinforcing the benefits of these healthier choices, providing skills and environmental cues for the public to effect the appropriate behaviour changes. Issues like socio-cultural factors will have to be addressed when programmes are directed at specific high-risk target groups.

To provide greater focus on primary prevention, a new statutory board, the Health Promotion Board was set up in April 2001 with an increased budget of about \$100 million for the year 2001⁽¹⁷⁾.

Secondary and tertiary prevention

Diabetes and hypertension confers a person with a higher risk for cardiovascular diseases. Nearly two-thirds (62%) and more than half of Singapore residents with diabetes mellitus and hypertension respectively were not aware of their disease status⁽⁶⁾. To improve early detection of the chronic conditions of diabetes, hypertension and hypercholesterolaemia, the government in 2000 introduced the "Check Your Health" community health screening programme⁽¹⁸⁾. This programme is targeted at the elderly aged 50 years and above. Priced at a highly subsidised fee of \$5, this screening programme is very accessible to

Table VII. Prevalence of diabetes by race and gender.

Gender	Ethnicity	Age-standardised prevalence	
		1992	1998
Male	Chinese	8.3%	7.0%
	Malay	9.1%	8.5%
	Indians	11.8%	14.5%
Female	Chinese	7.2%	7.1%
	Malay	11.1%	12.9%
	Indians	12.6%	14.6%

Note: Diabetes is diagnosed when a two-hour plasma glucose concentration ≥ 11.1 mmol/l in the oral glucose tolerance test.

Table VIII. Diabetes prevalence by age groups, 1992 and 1998.

Age groups (years)	Males (%)		Females (%)	
	1992	1998	1992	1998
18-29	0.9	0.6	1.1	1.0
30-39	5.6	3.7	2.5	2.9
40-49	11.6	9.6	14.3	9.7
50-59	21.0	19.7	16.8	24.0
60-69	28.2	29.4	30.9	35.2

lower and middle income groups and is conducted at neighbourhood venues on weekends, when the children of these elderly are free to accompany their parents. Despite affordability and easy accessibility, only about one in four of the eligible have been screened. More information could be obtained on the reasons for the low participation, such that measures are taken to overcome them. More regular reviews should also be conducted.

In tandem with this, steps were taken to improve the management of diabetes, hypertension and hypercholesterolaemia through a Comprehensive Chronic Care Programme⁽¹⁹⁾. Based at government-subsidised primary healthcare polyclinics, this programme provides a holistic approach to the three conditions, each having a structured regime of care based on evidence-based treatments. With the restructuring of the public sector institutions in 2000 into two clusters of vertically integrated delivery systems offering the range of primary, secondary and tertiary care, polyclinics can now tap on hospital specialists to advise their healthcare teams and review the management of complex cases on a regular basis. One significant advantage for patients is the personalised attention of case managers who track and encourage individual patients to comply with treatment and follow-up.

National Disease Plans are being established for cancer, coronary heart disease, stroke, end-stage renal failure and myopia. Mental health education

programmes have been strengthened to inculcate greater awareness of mental disorders among the general public. Educationists and health professionals will also be trained to detect, diagnose, and manage common mental health disorders.

While it is acknowledged that good evaluative studies are not easy nor cheap to conduct, it will become increasingly essential to have evidence-based information on the effectiveness of implemented programmes. As health care cost increases, cost-effectiveness studies will also become important as a means for comparing between different programmes.

WHERE DO WE GO FROM HERE?

Singapore was cited at the recent 55th World Health Assembly as one of the few countries in the world, together with Finland, Mauritius and Poland, with comprehensive national policy and programmes for non-communicable diseases⁽²⁰⁾. Many health promotion strategies have been successfully implemented under the National Healthy Lifestyle Programme. For example, the National Smoking Control Programme has been able to maintain a low level of smoking prevalence in Singapore. Further refinements of these strategies are needed to address new issues and concerns such as the growing number of young female smokers, to help Singapore work towards a smoke-free society. The roll-out of the chronic disease management plans for the diseases of major importance in Singapore will aim to further reduce the burden of these diseases in the population.

Obesity is gradually acknowledged to be an area of concern globally. In the United States, 34% of adults aged 20 - 74 years old are overweight, while another 27% are obese⁽²¹⁾. Contributory factors include increasing comfort through technological advancements leading to a less physically demanding world. There is also easy access to food and availability of fast-food chains. In addition, obesity norms currently adopted locally are based on Caucasian norms, and may not truly reflect the health risks of our people. Studies have shown that a lower cut-off of the Body Mass Index may be more accurate for Asians, including Singaporeans⁽²²⁾. If a lower cut-off Body Mass Index level is adopted for the definition of obesity in Singaporeans, the prevalence of obesity in adults will be significantly higher. Greater awareness of the health risks associated with, and the necessity for management of obesity will therefore be necessary amongst both the general public and health professionals.

Our society is rapidly ageing. One in five Singaporeans is expected to be elderly by year 2030. Chronic diseases will continue to predominate as

the major disease conditions in Singaporeans in the future. The prevention of chronic, non-communicable diseases is complex and requires long-term actions to prevent or delay the onset of these conditions.

Our focus will remain primarily on health promotion, and where it fails, control of risk factor and disease progression. The challenge in primary health prevention for non-communicable diseases is that there is no instantaneous cure to a condition. Unlike infectious diseases when an antibiotic course provides an effective answer, non-communicable diseases interventions generally require long-term, continuous lifestyle changes. As lifestyle changes impact on the social, emotional, physical and even psychological aspects of our life, a great amount of motivation and determination will be required to make a decision for a change and to implement these changes in our daily lives.

Close monitoring on the outcomes of the present initiatives and research in health promotion programmes will provide valuable data on the long term efficacy and cost-effectiveness of such approaches. This data will help in our continuing efforts to contain the growing public health impact of common non-communicable diseases in Singapore.

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Clinical Trial for Advanced Hepatocellular Carcinoma (Hepatoma)

The National Cancer Centre and the Clinical Trials and Epidemiology Research Unit, NMRC, Singapore, have commenced a multi-national trial on the treatment of advanced Hepatocellular Carcinoma (HCC). This trial will eventually involve about 10 centres in the Asia-Pacific region and is run under the auspices of the Asia-Pacific Hepatocellular Carcinoma Trials Group.

The target population are patients with HCC who are not amenable to surgical resection either because of poor functional status or tumour that is physically inoperable. Treatment in this trial is by daily oral medication. Liver biopsy is not mandatory. The primary end-point of the trial is survival and the secondary end-point is quality of life.

We sincerely welcome referrals of patients who may be eligible for the trial and would assess all patients referred. There are currently two centres in Singapore involved in the trial namely Singapore General Hospital/National Cancer Centre and Changi General Hospital. Patients may be referred to either of these centres and the contact numbers are below:

Singapore General Hospital/ Tel: 9209 1406
National Cancer Centre

Changi General Hospital Tel: 9548 3719

*If you require further clinical information, we would be pleased to help.
 You can also contact us for clinical information at email address: gsupc@singnet.com.sg*