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DEVELOPMENT OF DENTAL EDUCATION
IN SINGAPORE

by

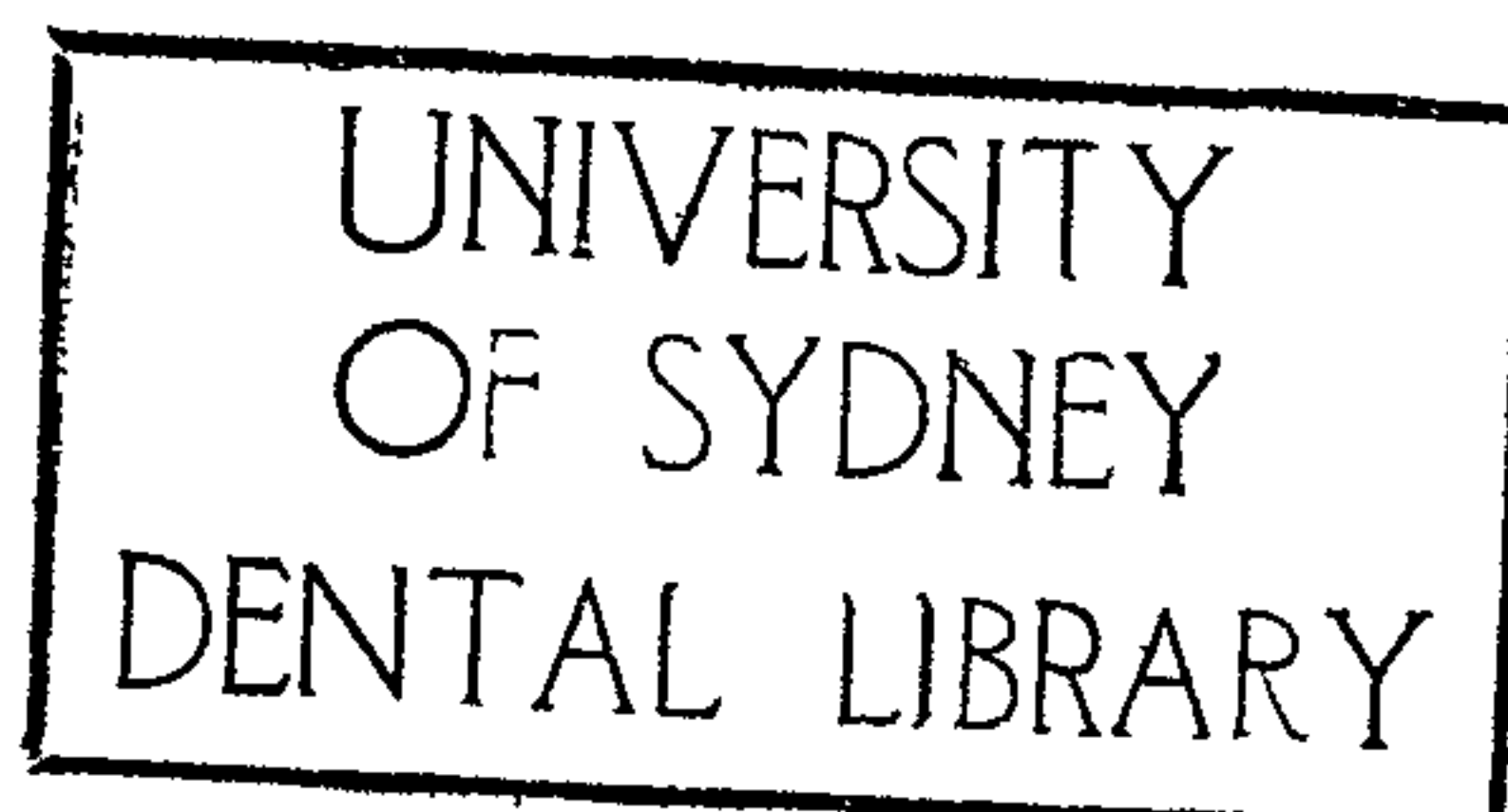
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CHAPTER ONE

INTRODUCTION

Educators of dental students face a great responsibility in these days of rapid social, technological and economic changes. In Singapore, their greatest responsibility is taking a selected number of students into an environment and preparing them in four short years for entrance into a profession and the practice of dentistry. This means that besides gaining knowledge in clinical skills the student should have reached a level of professional maturity whereby he understands his role as a dentist in the community, expresses a concern for oral health of the people and acquires a level of professional judgement. (Hazen, 1976).

This rapid expansion in knowledge and technology requires that dental education be a life-long process which does not end with the acquisition of the degree of Bachelor of Dental Surgery. Hence in developing a curriculum for dental education one must plan such that the end product is an adaptive health care provider who will continue to learn and readjust himself continually to changes in technology, in professional outlook and the needs and demands of society.

Singapore is such a young country which had to go through these rapid changes to become a developed city and in considering changes to the curriculum in dental education, it is imperative that the oral health status and the health delivery systems be understood as this is one of the ways of evaluating effectiveness of the past dental education. (Schoen, 1976).

The practice and philosophy of Dentistry in Singapore are outcomes of the dental education that has developed. Thus, the past development and the present status of dental

education should be assessed before considering changes in the dental curriculum, to produce graduates qualified to:

1. provide comprehensive oral health service,
2. render more complex services than heretofore expected of graduates,
3. possess the skills and ability to administer a dental practice efficiently and
4. improve and develop additional competence through broad experience and continuing education.

(Council on Dental Education, of the American Dental Association, 1977).

Change is not easy especially when long established traditions and procedures for imparting dental knowledge to students exist, as in the dental education of undergraduates in Singapore. However, if dental education is to keep pace with other changes that are taking place in Singapore and the dental student has to become the future practitioner who will face the real world of today and tomorrow, then a review of the education of dental personnel is inevitable.

One also has to look at the future trends in dentistry and postulate on the future roles of the general practitioner in planning for tomorrow. The constitution of W.H.O. and numerous Health Assembly resolutions have reaffirmed that health is a basic human right and a world-wide social goal. On the 12th September 1978, at the international conference on Primary Health Care, sponsored by W.H.O. and UNICEF, the declaration of the Alma-Ata stated that primary health care is the key to attaining the target of health for all by the year 2000, as part of the overall development and in the spirit of social justice. (W.H.O., 1979). This would mean that the dentist should be part of the team that contributes to primary health care.

Through his increased health screening and case-finding function the dentist will be an important referral source and a key contributor to preventive medicine. (Morris, 1976). The benefits of preventive measures like water fluoridation and increased emphasis on dental health education would mean that demand for dental services would not only increase but the nature of the services would change with the general practitioner doing more periodontics, pedodontics, endodontics, orthodontics and oral medicine. (Morris, 1976). This together with the fact that different categories of auxiliaries in dentistry are generally accepted would mean an expanded role for the dentist with more routine work being delegated to the auxiliaries.

An expanded role for the dentists of the future should not mean a lengthening of the Dental Course by the inclusion of the ever-expanding body of knowledge that is required by the dental practitioner, because this may dampen his enthusiasm and motivation for this vocation. Hence the dental curriculum has to be selectively planned to enable students to encompass sufficient knowledge and skills during their four years of training to be competent general practitioners who can cope with their environment and enter into specialist training in any field of dentistry, should they so desire.

A good opportunity exists for introducing relevant changes in the dental curriculum at the National University of Singapore when the Dental Faculty moves to its new premises at Kent Ridge, with its improved facilities. A Dental Curriculum Review Committee has been set up for this purpose.

The main purpose of this thesis then is to contribute to this effort by proposing some guidelines for the development of dental education by relating the dental education requirements to dental needs, demands and

conditions in Singapore. The recommendations for changes in the dental curriculum are general and relate only to the education of dentists, due to lack of sufficient data and time for a well planned research and evaluation, which are required if specific guidelines in the development of dental education are to be proposed.

To be able to suggest optimum changes in dental education it is necessary to:

1. study the relevant demographic, political and socio-economic conditions in the community,
2. assess the present dental needs and treatment demands of Singaporeans,
3. investigate the practice and philosophy of dentistry in Singapore,
4. describe the current state of dental education of dentists in Singapore, and,
5. take the best out of studies on the dental educational systems in the United Kingdom and United States and adapt it to the dental needs, demands and conditions of the fast developing Republic of Singapore.

Views of dentists from the public sector and private practice and those of the members of staff at the Dental Faculty in Singapore, through interviews conducted as part of the research for this thesis have been considered in the evaluation of dental education and the changes suggested. Their practical experience would give more insight to the current demands and suitability of the training in dental education to the practice of dentistry and professional development.

In reviewing dental education in Singapore, it is necessary to bear in mind the following words of Robert J. Nelson in his article "The essence of professional worth". (Nelson, 1977) :

"Hopefully, the current review of dental curriculum will consider the great need to develop a true professional

whose clinical competence will match his highly developed social motivations. Education must build a professional to meet public needs, not to satisfy the whims of curriculum experimentalists."

CHAPTER TWO

SINGAPORE - DESCRIPTION OF THE COMMUNITY

Ideally, the first step in developing a dental curriculum is to consider the needs of the society. However there is more to study about the society than health per se. There should be an identification of various societal trends which can influence health needs and demands. (Durocher, 1970).

Physical factors, demography, educational level, socio-economic characteristics, diet and habits are all important factors affecting the life-style of individuals in a community and their dental needs.

According to Roy T. Durocher, four factors which are likely to influence demand for dental services are:

1. the layman's ability to determine that he has health deficiencies,
2. his awareness of the extent to which it is possible that these deficiencies be met by the health services,
3. his concern over the relationship of his needs to his social environment and
4. the availability, accessibility and acceptability of services provided.

If the Dental Faculty is to produce dental professionals in the true sense of the word 'professional' with motivation in favour of public interest, the curriculum should be planned with the knowledge of the land and people of Singapore.

2.1 LAND AND CLIMATE

The Republic of Singapore is situated approximately 136.8 kilometres north of the equator, in the centre of the Malayan Archipelago between the latitudes of 1° 09'N and 1° 29'N and the longitudes of 103° 38'E and 104° 06'E. (Ministry of Culture, Singapore, 1980).

This location at the focal point of trade routes of the region has contributed greatly to the development of Singapore as an entrepot trade and commercial centre of South East Asia. Recently with emphasis on industrialisation and the advent of modern technology, it also takes on the function of providing services to the region in respect of finance, transport and communication. (Department of Statistics, Singapore, 1980 a).

The total land area of Singapore with its outlying islets has increased from five hundred and seventy-seven square kilometres in 1975 to approximately six hundred and eighteen square kilometres in 1980, due to reclamation of land from the sea so that the island can comfortably support the size of its population in future years.

The island's hot, tropical climate is moderated by the influence of the sea. The average maximum temperature is thirty-one degrees Celsius and the minimum is twenty-four degrees Celsius. Relative humidity exceeds ninety percent in the early hours of the morning. Shortly before sunrise and on dry afternoons it can be sixty-five percent. However the general pattern is that of hot days followed by cool nights. Rain falls the whole year round but tends to be heavy in the first half of the North East Monsoon from November to January. (Ministry of Culture, 1980; Department of Statistics, 1980 a).

2.2 POPULATION

The multiethnic population of Singapore in June 1980 was 2 413 945. The population density is four thousand per square kilometre. Seventy-seven percent of the population are Chinese, fifteen percent Malays, six percent Indians and two percent of persons from other ethnic groups which includes Eurasians, Europeans and Arabs. In Appendix I, the population distribution by ethnic group, sex and five year age group is presented. The population has grown relatively older compared to the population census in 1970; fifty-six percent of the population in the fifteen to fifty-nine year age group and thirty-nine percent in the under fifteen age group in 1970 compared to sixty-six percent and twenty-seven percent respectively in 1980 (Appendix II). (Department of Statistics, Singapore, 1980 b).

Singapore has changed from a migrant society in the earlier decades to a more settled one since the fifties. This is reflected in the number of Singapore born persons from 29.1 percent in 1921 to 78.2 percent in 1980. The sex ratio is one thousand and forty-two males per thousand females. The Malays and the Chinese have a more or less even sex ratio though the Indians have a less balanced ratio of one thousand three hundred and twenty-three males per thousand females due to residual effects of past migration.

There is still a great influx of foreign born persons reflecting the fast growing Singapore economy and the increasing flow of foreign investment, technology and labour in the past decade. From 1971 to 1980 this amounted to 132 705 or 25.2 percent of the total of foreign born persons as seen in Appendix III. (Department of Statistics, Singapore, 1980 c). This amounts to approximately thirty-nine percent of the total increase in population from 1970 to 1980.

2.3 POPULATION GROWTH AND FUTURE PROJECTION

The population growth has decreased from 2.4 percent in 1960 to only 1.2 percent in 1980. This is largely due to the success of the National Family Planning and Population Programme by the Singapore Family Planning and Population Board, which has contributed to the decline in the total fertility rate to 1.8 children per woman in 1978. (Ministry of Culture, 1980; Ministry of Trade and Industry, Singapore, 1980). The expectation of life at birth from 1981 is sixty-six years for males and seventy-seven for females. (Ministry of Health, Singapore, 1977 a). The demographic goal of the programme is to maintain replacement level fertility, with zero population growth in the year 2030 when the population is projected to increase to 3.5 million. (Ministry of Culture, 1980).

Thus as the population ages the number of old dependent population will continue to increase from about 174 000 in 1980 to 200 000 in 1990 and approximately 600 000 in 2030, when they will constitute about twenty percent of the population. (Ministry of Health, 1977 a; Department of Statistics, 1980 b). This pattern of shift in the population age group can be seen in figure 1 which compares population by age group and marital status in 1970 and 1980. (Department of Statistics, 1980 c).

The economically active labour force will continue to increase in the next thirty to forty years but accurate forecasts are difficult to make as age - sex participation rates may vary in future years as a result of various economic and socio-cultural factors. (Ministry of Health, 1977 a).

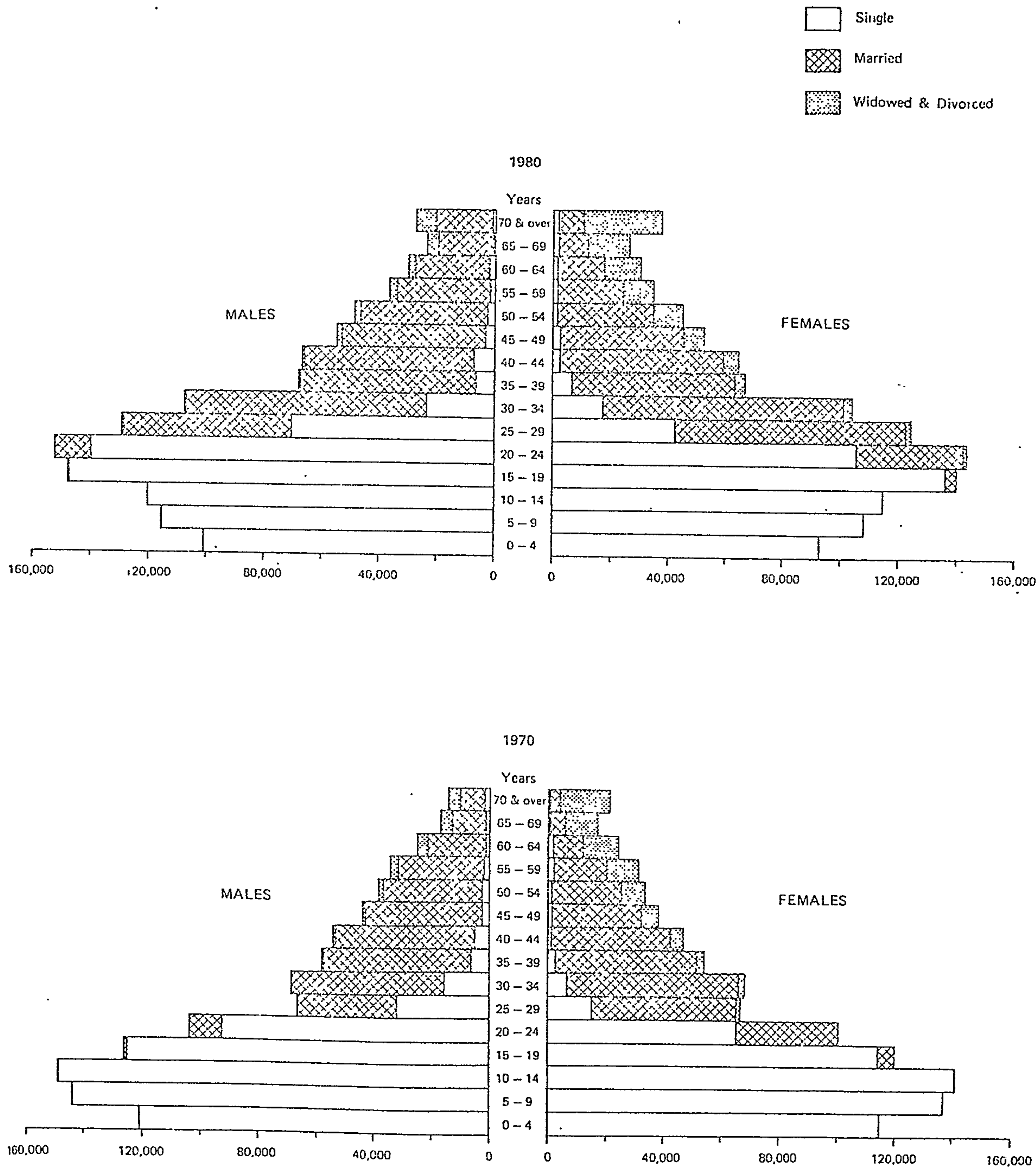


Figure 1: Population by age group and marital status, 1980 and 1970

Source: Department of Statistics, 1980 d.

2.4 EDUCATION

The literacy rate for persons aged ten years and over increased from 72.2 percent in 1970 to 84 percent in 1980 (Appendix II). Figure 2 shows the literacy rate by age group for 1970 and 1980. A larger proportion of the population was literate in more than one of the four official languages in 1980.

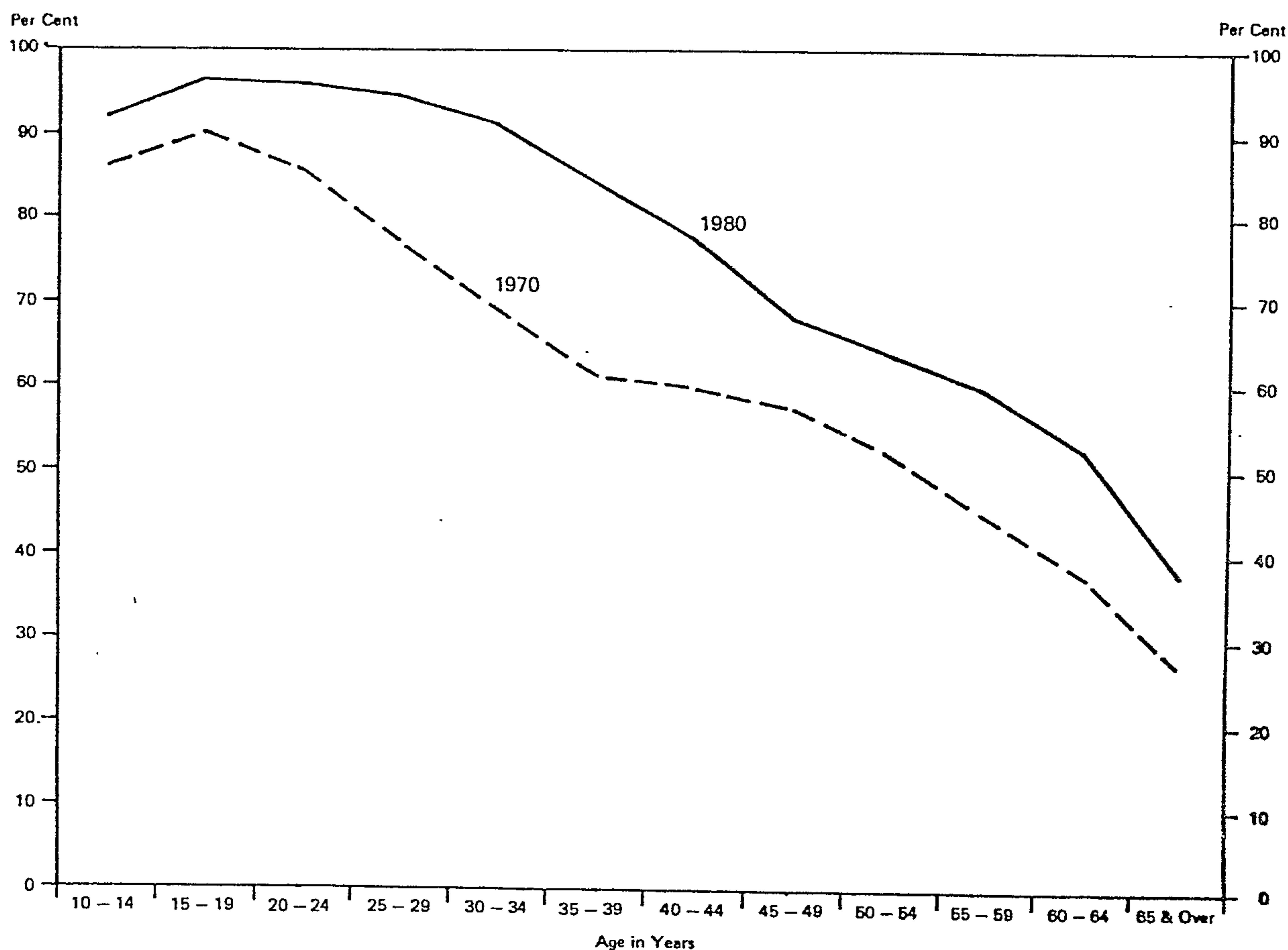


Figure 2: General literacy rates by age group, 1980 and 1970

Source: Department of Statistics, 1980 d..

A total of 559 317 persons aged five years and over were enumerated as full-time students and of these 298 580 were in primary school and 210 397 were attending schools at secondary and higher levels. In 1980, eighty-five percent of those aged between six and seventeen years were attending school compared with seventy-five percent estimated for 1970.

This reflects the increasing importance of education placed by parents and the greater opportunities available in education for every child irrespective of socio-economic status. If this trend continues, then it is likely that differences in qualification attainment between persons of various groups will be progressively narrowed.

Of the 1 649 704 persons aged ten years and over, 34.9 percent were without any qualification, 68 percent had qualifications at primary school level, 19.1 and 8.8 had secondary and upper secondary qualifications respectively and only 4.1 percent had tertiary qualifications. Singapore is still short of trained and qualified manpower. Hence, when this demand could not be met locally, multinational corporations and other foreign companies brought in their own nationals or recruited non-residents from neighbouring countries to fill management and professional positions.

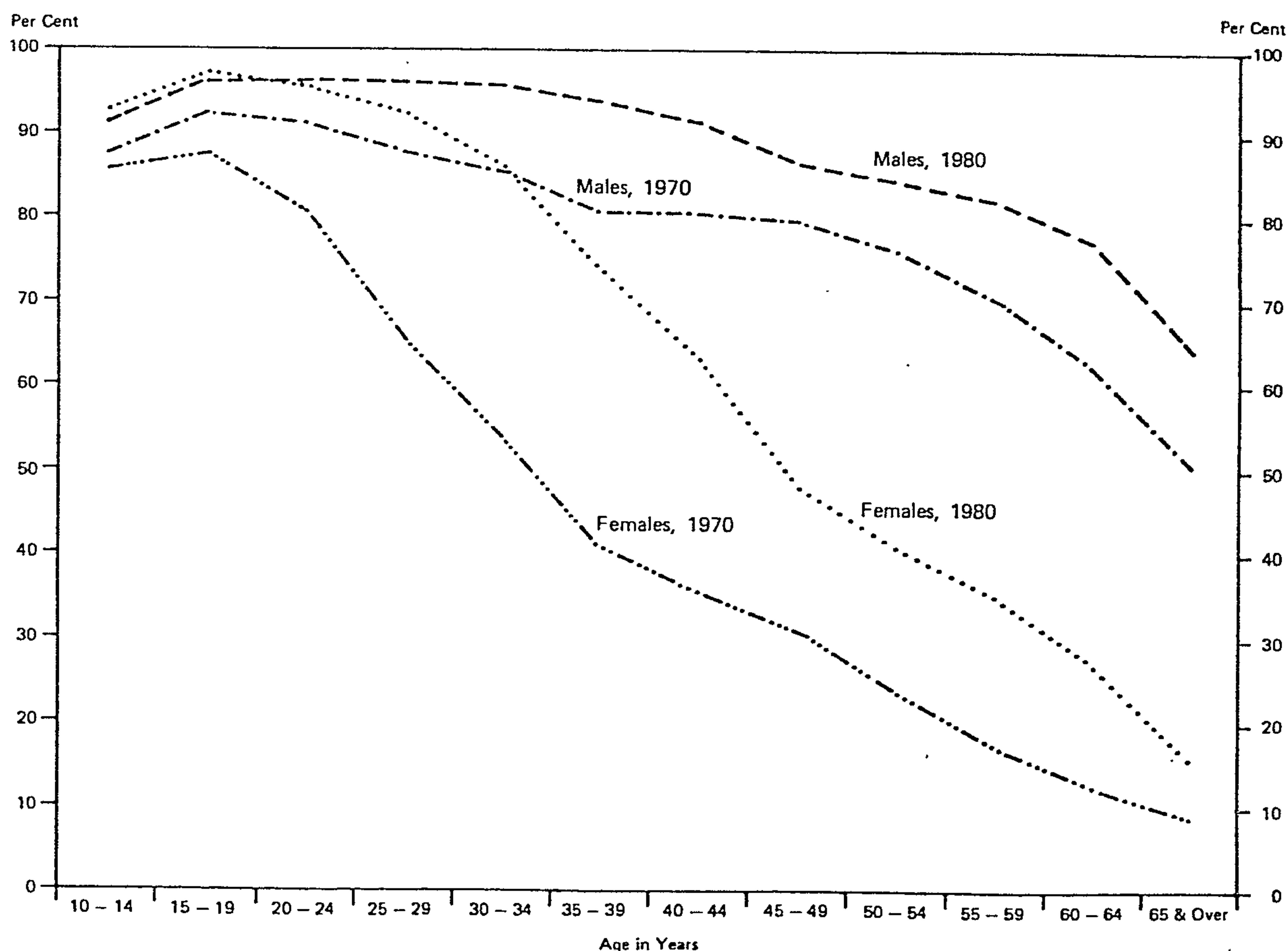


Figure 3: General literacy rates by age group and sex, 1980 and 1970.

Source: Department of Statistics, 1980 d.

There are more males than females with qualifications at each level of qualification and this excess is greater at the higher levels of education. As shown in figure 3, the small disparity in literacy rates between both sexes in the younger age groups becomes wider for the older age groups. (Department of Statistics, Singapore, 1980 d).

The policy of the Ministry of Education is to emphasise the learning of English and the mother tongue; the former as the international language of commerce and industry and the latter to preserve ethnic traditions and culture of the four major ethnic groups. (Ministry of Culture, 1980).

2.5 SOCIO - ECONOMIC TRENDS

Despite a bleak world performance with rising oil prices and recession in the United States, Singapore's economy in 1980 continued to expand. The Gross Domestic Product which measures the output of goods and services grew by 10.2 percent and was valued at \$20.7 billion. Indigenous per capita income rose by nine percent at constant prices faster than eight percent in 1979. The expansion of the economy was achieved with full employment and more efficient use of labour. Unemployment rate was three percent, lower than in 1979, representing persons who were changing jobs and school leavers moving into the labour market.

Being an open economy and solely dependant on imported oil, Singapore was not spared from rising world prices. Consumer prices increased by an average of 8.5 percent per year. Though this is higher than 1979, it is still lower than similar countries like Hong Kong, South Korea and Taiwan. The lower rate of inflation is due to appreciation of the Singapore dollar, improvement in productivity, the free trade policy which allows goods to be imported from the cheapest sources and the availability of low cost public housing. (Ministry of Trade and Industry, Singapore, 1981).

The estimated size of the labour force in June 1980 was 1 102 500 persons, which is sixty-three percent of the population. More people entered the labour market because of ample opportunity and higher wages. Female participation increased to 44.3 percent in 1980. With improved child-care facilities and better paid jobs, female participation is expected to rise in the future. The average weekly earnings of broad categories of workers from 1978 to 1980 is presented in Table I. The public sector however continues with its programme to economise on the use of manpower as well as to mechanise and computerise. (Ministry of Trade and Industry, 1981).

TABLE I
AVERAGE WEEKLY EARNINGS, 1978 - 1980
(As at August)

Occupation	1978	1979	1980	1979	1980
	Dollars			Percentage Change Over Previous Year	
ALL WORKERS	131.3	142.8	161.4	8.8	13.0
Professional, Administrative, Managerial and Related Workers	319.7	341.9	377.9	6.9	10.5
Clerical, Sales, Service and Related Workers	108.5	116.6	130.8	7.5	12.2
Production, Transport and Other Manual Workers	88.2	96.6	110.4	9.5	14.3

Source: Ministry of Labour.

The total consumption expenditure on goods and services in real terms rose faster in 1980 than in 1979. Reflecting the rising affluence, expenditure on all types of major consumer goods and services increased. (Ministry of Trade and Industry, 1981). The private consumption expenditure on different goods and services for 1979 is presented in figure 4. (Department of Statistics, S'pore, 1980 e). Private consumption expenditure increased by nine percent from 1979 to 1980. Expenditure on television sets, clothing, video-tape recorders, photographic equipment, watches, calculators and jewellery also showed substantial increases. (Ministry of Trade and Industry, 1981).

Domestic trade rose by seven percent as a result of increased local consumer expenditure and brisk tourist trade. Tourist arrivals rose by fourteen percent to reach 2.3 million. As an increasingly important convention city, shopping centre and convenient stop-over point for international travellers, Singapore continued to lure more visitors. (Ministry of Trade and Industry, 1981). Hence,

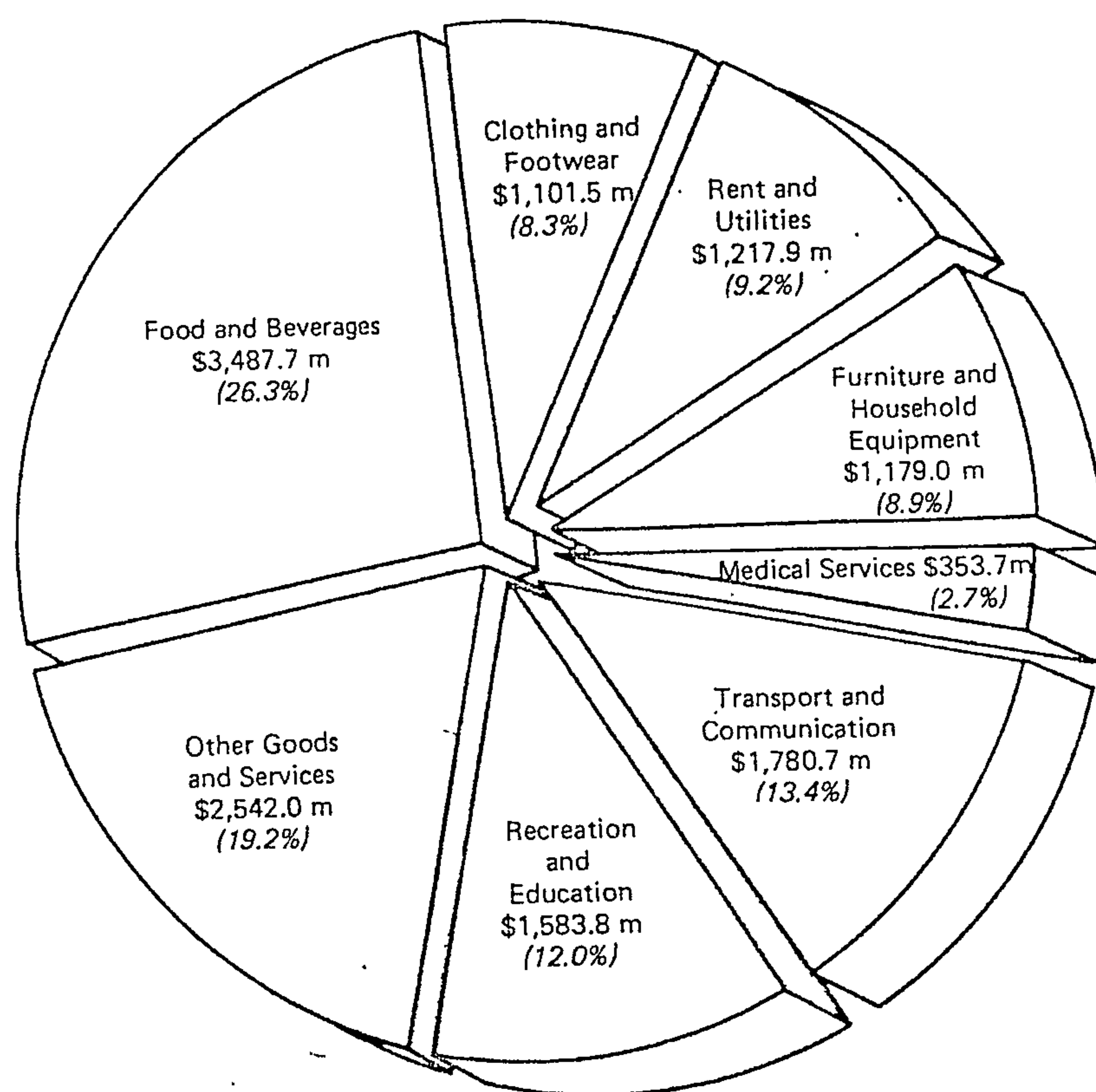


Figure 4: Private Consumption Expenditure, 1979
(at current market prices)

Source - Department of Statistics, 1980e.

it is not Singapore's population alone that generates demands for goods and services.

The ruling party in Singapore has pragmatic and realistic policies and the domestic pre-occupation of the Government is improvement in the quality of life of its citizens and to ensure the continuity of an efficient and effective political leadership and administration into the 1990's. (Ministry of Culture, 1980).

2.6 HOUSING

The scope of Singapore's public housing programme is reflected by the number of people living in the public housing estates provided by the Housing and Development Board. As at 31st December 1978, the number was 1.48 million or sixty-three percent of Singapore's population. By June 1979, sixty-five percent of the population lived in such flats. By the end of this decade more than three-quarters of the population would be housed in these public housing estates. People are encouraged to buy such flats under the home ownership scheme and the percentage of home ownership to rentals is increasing.

The housing units are being built in such a manner as to create new satellite towns in Singapore. Three such towns have been completed. Queenstown (for 150 000 people), Toa Payoh (190 000) and Telok Blangah (70 000). Four other such towns are being developed. Wherever feasible the precinct concept is being introduced into the new housing projects whereby a neighbourhood of four thousand to six thousand dwelling units is divided into precincts of six hundred to one thousand dwelling units, each having its own physical and social identity.

At the community level, residents' committees have been formed and the response by residents to social programmes has been encouraging. The long-term objective is to encourage flat dwellers to organise activities to foster community spirit and to improve the physical environment. The committee also serves as the communication link between residents and the authorities.

The Housing and Development Board has also relaxed certain rules to enable parents and married children to live near one another to preserve the Asian tradition of extended families. (Singapore National Trades Union Congress, Singapore, 1980).

This manner of housing development has influenced the Ministry of Health to provide primary health care services by setting up new polyclinics for general curative treatment, screening, immunisation, family planning and dental services under one roof at these Housing and Development Board new towns. (Ministry of Culture, 1980).

2.7 HEALTH

The general health standard of Singapore's population compares favourably with that of most countries in terms of low crude death rates, low infant mortality and maternal mortality rates. The low crude death rate of 5.2 per thousand in 1978 is partly due to the large proportion of young people. However, mortality rate has decreased from 100 in 1969 to 85.1 in 1978. This indicates true decline independent of age. Infant mortality rate was reduced from 20.5 per thousand live births in 1970 to 12.5 in 1978. Similarly maternal mortality rate remained low at 0.2 per thousand births. Both these indices are one of the lowest in the world and can be attributed to the comprehensive health services available to mothers and children. (Ministry of Culture, 1980). Figure 5 gives an indication of persons per doctor, dentist, nurse and government hospital bed for the period 1969 to 1979.

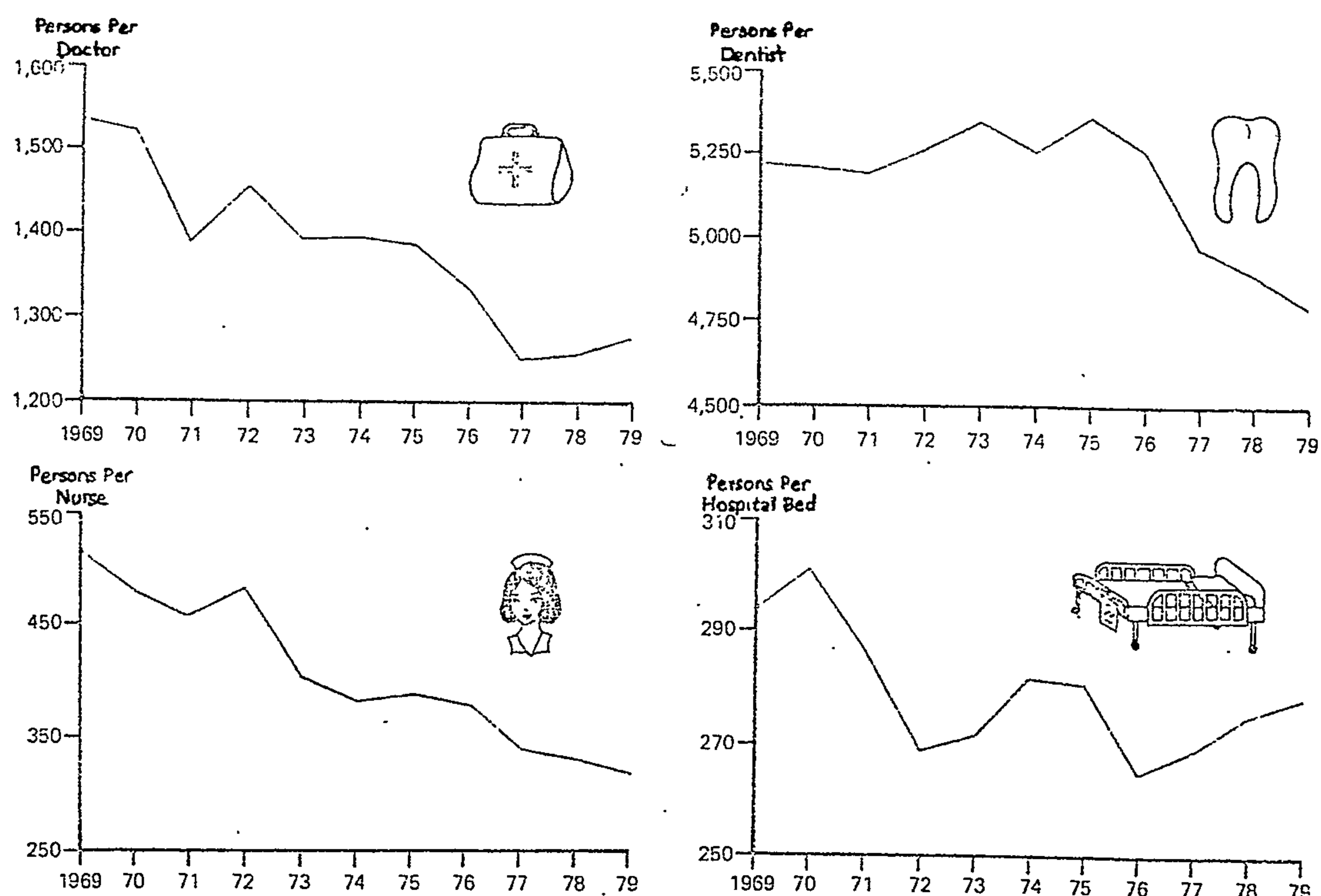


Figure 5: Persons per Doctor, Dentist, Nurse and Government Hospital bed, 1969 - 1979

Source - Department of Statistics, 1980 e

Analysis of the causes of death show that Neoplasms, Ischaemic Heart Diseases, Cerebrovascular Disease and Pneumonia account for nearly half of all the deaths. This pattern of causes of death shows that infective diseases are under control, reflecting a healthy population where death is caused mainly by chronic degenerative diseases and viral infections of the very young and old. (Ministry of Health, 1977 a).

All male citizens of Singapore who attain the age of eighteen are required by law to register for training under the National Service policy of the Ministry of Defence. (Ministry of Culture, 1980). All undergo a medical examination before they can be enlisted. Besides taking care of the defence of the country, this is keeping with the policy of building a rugged healthy society.

2.8 DIET, HABIT AND LIFESTYLE OF SINGAPOREANS

The lack of sufficient research on the diet in multiracial Singapore makes it difficult to make any conclusive statements.

A pilot survey, restricted to one ethnic group, the Chinese with an income level that was characteristic of 90.6 percent of the Chinese households, in 1966, revealed that about half the number of diets in the households surveyed were grossly deficient (less than 50 percent of the recommended values) in calcium and riboflavine. Satisfactory values were recorded for calories, proteins, iron and other vitamins. The deficient diets were in households in the lower income bracket. Households with higher income had satisfactory quantities of calcium though riboflavine was still deficient. This is explained partly by the higher consumption of milk in households that earned more although this food is far from popular in both groups. (Kleevans, 1966).

The Chinese infant too is less often breastfed than either the Malay or Indian baby and the practice then was to feed sweetened condensed milk in dilute form as infant food. This deprived the child of calcium and at the same time provided him with a high sugar diet. (Thomson, 1964). Sweetened condensed milk is still a popular food in Singapore and Malaysia.

With higher per capita income and better education at present, nutrition especially for the children should have improved but there is no evidence to substantiate this. However with more women in the labour force and the increasing availability of fast foods, it is becoming a common thing for Singaporeans to eat out frequently. Whether this sort of diet provides the necessary nutrients is still to be studied.

Sugar and sugar products are consumed more. An indication of this is obtained from tables of exports and imports by commodity division. (Department of Statistics, 1981). The difference between the exports and imports of sugar and sugar products gives the average consumption of sugar in Singapore. This works out to be approximately forty-five kilograms per head for 1981. The amount of sugar consumed is quickly reaching the levels of highly developed countries like America, England and Australia where it is approximately fifty kilograms per head per year. (Burt, 1978; Australian Bureau of Statistics, 1981).

Social habits detrimental to health like smoking and alcohol are prevalent but the severity may not be as marked as in the highly industrialised countries. A survey, reported in June 1979, which was conducted in one of the low cost public housing estates indicated a prevalence of smokers of about twenty to twenty-five percent of all teenagers and adults in Singapore. This is a sizeable problem in view of the increasing mortality due to lung cancer and ischaemic heart disease. Non-smokers were clearly in the majority and fifty percent of them acted on the basis of their health consciousness. (Lee et al, 1979).

The consumption of alcohol can only be estimated from previous survey information. A Straits Times Readership survey in 1969/70, with a sample of 1 991 from Singapore and 3 009 from West Malaysia showed that ten percent of Chinese and Indians above the age of twelve drink compared to fifty percent of the Europeans. However at the estimated rate of increase in drinking, it would take less than ten years before the incidence of drinking reached the fifty percent level. (Khoo and Fernandez, 1971). Hence, at the present state of urbanisation in Singapore, the incidence of alcohol consumption may easily occur in more than fifty percent of the population.

CHAPTER THREE

DENTAL NEEDS AND DEMANDS

Continual survey, especially for a country like Singapore which is experiencing rapid changes in the style of living due to urbanisation is essential, if the dental needs are to be assessed and the demands catered for. Unfortunately, this has not been the case. A nationwide survey on school children was done in 1970 and this represents the dental needs then. An idea of the change in the dental needs in the present period is derived from a comparison of the two surveys done in 1967 and 1979 on eighteen year old males who had registered for National Service.

As no evaluation on the demand for services has been done, this can only be assessed by records of utilisation of Government dental clinics. As for utilisation of dental services provided by private dental clinics, the National Survey of Dentists, 1976 states that the mean number of patients seen by the first division dentists is about twelve per day while for the second division dentists, it is approximately seven per day. Also, fifty-five percent of the total patient attendances of 1.6 million in 1976 was handled by private practitioners. No survey has been undertaken to assess the nature of the services utilised in the private practice.

3.1 DENTAL NEEDS OF SCHOOLCHILDREN IN 1970

A national dental survey on a sample which was 2.51 percent of the school population in 1970, involved 12 801 children. Age groups in the sample covered each age from six years to eleven years in the primary schools and twelve years to eighteen years in the secondary schools. Sex differences were provided for. Ethnic groups included Malays, Chinese, Indians and others. The total was 363 518 and 145 740 respectively. The actual samples are shown in Table II. (Goh et al, 1972).

TABLE II
Sample of Schoolchildren by Ethnic Group,
Sex and Type of School

	Primary Schoolchildren		Secondary School Children	TOTAL
	With Dental Service	Without Dental Service		
All Ethnic Groups	M	689	2605	6068
	F	604	2547	6733
	M & F	1293	5152	12801
Chinese	M	321	1896	4326
	F	302	1729	4761
	M & F	623	3625	9087
Indian	M	81	230	516
	F	94	244	597
	M & F	175	474	1113
Malay	M	235	463	1123
	F	191	562	1250
	M & F	426	1025	2373
Others	M	52	16	103
	F	17	12	125
	M & F	69	28	228

3.1.1 Dental Caries

Results of the survey showed that the average DMF teeth per subject at six years was 0.4 in Chinese, 0.1 in Indians and 0.4 in Malays. At eleven years of age the DMF rates rose to 2.7 in Chinese, 2.2 in Malays and 1.1 in Indians (see Table III). The higher DMF rates of children with access to dental service facilities in school clinics was accounted for by the higher average number of restored teeth. (Goh et al, 1972).

Secondary schoolchildren seek dental treatment on their own initiative and are not provided with school dental clinics. Notable differences are seen in the prevalence of dental caries. The prevalence rate in Chinese was 88.8 per cent, being the highest compared with Malays, 82.2 per cent and Indians 69.2 per cent. At age twelve, Chinese had an average of 3.3 DMF teeth per subject and this increased to 7.7 at eighteen years, with an increment of 1.6 for the D component. The Indians who experienced a DMF rate of 2.2 at age twelve increased to 3.9 but the increment in D was only 0.3 and the Malays experienced an increment of 1.1 in D from a DMF rate of 2.4 to 5.2 (see Table IV and V). (Goh et al, 1972).

TABLE III
Dental Caries of Permanent Dentition in Schoolchildren
6 - 11 years

AGE (YEARS)	ETHNIC GROUPS	WITH DENTAL SERVICE	WITHOUT SERVICE	WITH & WITHOUT DENTAL SERVICE
		Males & Females	Males & Females	Males & Females
Percentage with one or more DMF teeth				
6 - 11	Chinese	74	54	53
	Indians	49	33	37
	Malays	58	50	52
Average DMF teeth per subject				
6	Chinese	0.4	0.4	0.4
	Indians	0.1	0.1	0.1
	Malays	0.3	0.4	0.4
11	Chinese	4.2	2.3	2.7
	Indians	2.3	0.8	1.1
	Malays	2.5	2.1	2.2
6 - 11	Chinese	2.6	1.3	1.5
	Indians	1.1	0.6	0.8
	Malays	1.3	1.0	1.2
Average D teeth per subject				
6	Chinese	0.2	0.4	0.3
	Indians	0.1	0.0	0.1
	Malays	0.3	0.4	0.3
11	Chinese	0.6	1.6	1.4
	Indians	0.6	0.5	0.6
	Malays	0.7	0.9	0.8
6 - 11	Chinese	0.4	0.9	0.8
	Indians	0.2	0.4	0.4
	Malays	0.3	0.6	0.5
Average F teeth per subject				
6	Chinese	0.06	0.04	0.05
	Indians	0	0	0
	Malays	0.07	0	0.03
11	Chinese	3.07	0.48	0.94
	Indians	1.52	0.12	0.45
	Malays	1.55	1.09	1.22
6 - 11	Chinese	2.09	0.26	0.53
	Indians	0.87	0.09	0.30
	Malays	0.92	0.40	0.56

Source: Goh et al, 1972

TABLE IV
Dental Caries of Permanent Dentition in
Schoolchildren 12 - 18 years

AGE (YEARS)	ETHNIC GROUPS	MALES & FEMALES
Percentage with one or more DMF teeth		
12	Chinese	82.3
	Indians	60.6
	Malays	74.1
18	Chinese	95.6
	Indians	80.9
	Malays	87.5
12 - 18	Chinese	88.8
	Indians	69.2
	Malays	82.2
Average DMF teeth per subject		
12	Chinese	3.3
	Indians	2.2
	Malays	2.4
18	Chinese	7.7
	Indians	3.9
	Malays	5.2
12 - 18	Chinese	5.0
	Indians	2.6
	Malays	3.4
Average D teeth per subject		
12	Chinese	1.6
	Indians	1.3
	Malays	1.2
18	Chinese	3.2
	Indians	1.6
	Malays	2.3
12 - 18	Chinese	2.3
	Indians	1.3
	Malays	1.6
Average F teeth per subject		
12	Chinese	1.0
	Indians	0.7
	Malays	1.0
18	Chinese	1.6
	Indians	1.4
	Malays	1.8
12 - 18	Chinese	1.3
	Indians	0.9
	Malays	1.2

Source: Goh et al, 1972

TABLE V
Average DMF Teeth Per Subject of the School Population Examined in Chinese,
Indians & Malays, by Age & Sex

		Sex	YEARS															All Ages
			6	7	8	9	10	11	12	13	14	15	16	17	18			
CHINESE	Number Examined	M	242	352	414	405	394	410	238	256	338	372	452	253	200	4,326		
		F	217	352	369	382	345	366	299	462	595	515	452	218	189	4,761		
		M & F	459	704	783	787	739	776	537	718	933	887	904	471	389	9,087		
	Average DMF Teeth	M	0.48	0.72	0.93	1.63	1.99	2.37	3.11	3.42	4.12	4.87	5.56	6.58	7.50	3.18		
	F	0.40	0.75	1.10	1.45	2.27	3.06	3.46	3.86	4.63	4.91	6.28	6.98	8.01	3.61			
	M & F	0.42	0.73	0.95	1.54	2.12	2.69	3.30	3.70	4.44	4.89	5.92	6.55	7.75	3.41			
INDIANS	Number Examined	M	20	45	63	85	55	43	31	41	38	34	32	15	14	516		
		F	17	75	66	66	59	55	58	58	47	39	29	21	7	597		
		M & F	37	120	129	151	114	98	89	99	85	73	61	36	21	1,113		
	Average DMF Teeth	M	—	0.20	0.55	0.73	1.04	0.67	2.38	2.14	1.55	1.94	3.06	2.13	1.14	1.29		
	F	0.11	0.45	0.95	0.57	1.36	1.52	2.09	1.64	2.68	2.74	4.58	5.19	3.57	1.70			
	M & F	0.05	0.35	0.76	0.66	1.20	1.15	2.18	1.84	2.17	2.37	3.78	3.94	3.95	1.51			
MALAYS	Number Examined	M	86	111	134	131	123	113	98	88	69	72	73	19	6	1,123		
		F	104	139	127	167	116	100	72	100	83	100	105	27	10	1,250		
		M & F	190	250	261	298	239	213	170	188	152	172	178	46	16	2,373		
	Average DMF Teeth	M	0.34	0.62	0.91	1.23	1.43	2.30	2.42	2.72	2.46	2.80	3.45	4.73	6.16	1.81		
	F	0.38	0.76	1.05	1.32	1.50	2.26	2.41	2.98	3.81	4.11	4.60	5.85	4.60	2.24			
	M & F	0.37	0.70	0.98	1.28	1.46	2.28	2.43	2.86	3.19	3.56	4.13	5.39	5.19	2.03			

3.1.2 Oral Hygiene Status and Periodontal Disease

The oral hygiene status for the age group six to eleven was measured by percentage of schoolchildren showing materia alba. They were present in 59.2 per cent of primary schoolchildren without dental clinics and in 48.9 per cent of those with school dental clinics. This difference was found to be significant. (Goh et al, 1973). Forty-three per cent of all secondary schoolchildren between the ages of twelve and eighteen showed materia alba in their mouths. Percentage differences in the racial groups are shown in Table VI. (Ministry of Health, Singapore, 1973). These differences were not found to be significant. (Goh et al, 1973).

TABLE VI
Schoolchildren by Ethnic Group and Materia Alba

Ethnic Group	Total		With Materia Alba		Without Materia Alba	
	No	%	No	%	No	%
Children 6 - 11 years (With Dental Service)						
All Ethnic Groups	1293	100.0	632	48.9	661	51.1
Chinese	623	100.0	282	45.3	341	54.7
Indians	175	100.0	101	57.7	74	42.3
Malays	426	100.0	214	50.2	212	49.8
Others	69	100.0	35	50.7	34	49.3
Children 6 - 11 years (Without Dental Service)						
All Ethnic Groups	5152	100.0	3048	59.2	2104	40.8
Chinese	3625	100.0	2167	59.8	1458	40.2
Indians	474	100.0	280	59.1	194	40.9
Malays	1025	100.0	586	57.2	439	42.8
Others	28	100.0	15	53.6	13	46.4
Children 12 - 18 years and above						
All Ethnic Groups	6356	100.0	2732	43.0	3624	57.0
Chinese	4839	100.0	2101	43.4	2738	56.6
Indians	464	100.0	206	44.4	258	55.6
Malays	922	100.0	372	40.3	550	59.7
Others	131	100.0	53	40.5	78	59.5

Source: Ministry of Health, 1973

Presence of gingival calculus took a turn for the worse in those aged twelve to eighteen as 79.4 per cent of them had calculus. Table VII gives the figures for the different ethnic groups in primary and secondary schoolchildren and the difference for children with school clinics and those without. (Ministry of Health, 1973). This difference was highly significant. (Goh et al, 1973).

TABLE VII
Schoolchildren by Ethnic Group and Calculus

Ethnic Group	Total		With Calculus		Without Calculus	
	No	%	No	%	No	%
Children 6 - 11 years (With Dental Service)						
All Ethnic Groups	1293	100.0	591	45.7	702	54.3
Chinese	623	100.0	281	45.1	342	54.9
Indians	175	100.0	77	44.0	98	56.0
Malays	426	100.0	209	49.1	217	50.9
Others	69	100.0	24	34.8	45	65.2
Children 6 - 11 years (Without Dental Service)						
All Ethnic Groups	5152	100.0	2979	57.8	2173	42.2
Chinese	3625	100.0	2020	55.7	1605	44.3
Indians	474	100.0	301	63.5	173	36.5
Malays	1025	100.0	646	63.0	379	37.0
Others	28	100.0	12	42.9	16	57.1
Children 12 - 18 years and above						
All Ethnic Groups	6356	100.0	5049	79.4	1307	20.6
Chinese	4839	100.0	3836	79.3	1003	20.7
Indians	464	100.0	345	74.4	119	25.6
Malays	922	100.0	782	84.8	140	15.2
Others	131	100.0	86	65.6	45	34.4

Source: Ministry of Health, 1973

Early periodontal disease measured by recording the number of inflamed units was observed in 67.8 per cent of all primary schoolchildren. Again significant differences were present in children with school clinics than those without. (see Table VIII). (Ministry of Health, 1973).

Prevalence rates for secondary schoolchildren showing one or more signs of periodontal disease in the three ethnic groups were high.

TABLE VIII
Schoolchildren by Ethnic Group and
Inflammation of Gingiva

Ethnic Group	Total		With Inflammation of Gingiva		Without Inflammation of Gingiva	
	No	%	No	%	No	%
Children 6 - 11 years (With Dental Service)						
All Ethnic Groups	1293	100.0	728	56.3	565	43.7
Chinese	623	100.0	358	57.5	265	42.5
Indians	175	100.0	95	54.3	80	45.7
Malays	426	100.0	244	57.3	182	42.7
Others	69	100.0	31	44.9	38	55.1
Children 6 - 11 years (Without Dental Service)						
All Ethnic groups	5152	100.0	3642	70.7	1510	29.3
Chinese	3625	100.0	2531	69.8	1094	30.2
Indians	474	100.0	342	72.2	132	27.8
Malays	1025	100.0	752	73.4	273	26.6
Others	28	100.0	17	60.7	11	39.3
Children 12 - 18 years and above						
All Ethnic Groups	6356	100.0	4774	75.1	1582	24.9
Chinese	4839	100.0	3666	75.8	1173	24.2
Indians	464	100.0	313	67.5	151	32.5
Malays	922	100.0	721	78.2	201	21.8
Others	131	100.0	74	56.5	57	43.5

Source: Ministry of Health, 1973

3.1.3 Prostheses and Handicapping Dento-Facial Anomalies

Findings for children aged twelve to eighteen are presented in Table IX. Seven per cent of the sample covering all ethnic groups wore dentures. The Chinese children showed the highest percentage of denture wearers and the highest percentage of children requiring dentures. (Ministry of Health, 1973).

TABLE IX
Schoolchildren 12 - 18 Years and Above by
Ethnic Group and Partial Dentures

Children Wearing Partial Dentures						
Ethnic Groups	Total		Wearing		Not Wearing	
	No.	%	No	%	No	%
All Ethnic Groups	6356	100.0	448	7.0	5908	93.0
Chinese	4839	100.0	431	8.9	4408	91.1
Indians	464	100.0	6	1.3	458	98.7
Malays	922	100.0	9	1.0	913	99.0
Others	131	100.0	2	1.5	129	98.5
Children Requiring Partial Dentures						
Ethnic Group	Total		Requiring		Not Requiring	
	No.	%	No	%	No	%
All Ethnic Groups	6356	100.0	148	2.3	6208	97.7
Chinese	4839	100.0	133	2.7	4706	97.3
Indians	464	100.0	2	0.4	462	99.6
Malays	922	100.0	11	1.2	911	98.8
Others	131	100.0	2	1.5	129	98.5

Source: Ministry of Health, 1973

The percentage distribution of schoolchildren requiring treatment for handicapping dento-facial anomalies is shown in Table X. Crowding is the most frequently found type of anomaly for both primary and secondary schoolchildren. (Ministry of Health, 1973)

TABLE X

Percentage Distribution of Schoolchildren Requiring Treatment for Handicapping
Dentofacial Anomalies by Ethnic Group and Type of Anomalies

Ethnic Group	Type of Handicapping Dentofacial Anomalies									
	Total With Anomaly	Children 6 - 11 years (With Dental Service)								
		Cleft Palate	Cleft Lip	Maxil- lary Overjet	Mandi- bular Overjet	Deep Over- Bite	Open Bite	Crowd- ing Spac- ing Others		
All Ethnic Groups	100.0	..	..	17.0	24.8	4.1	8.7	41.7	4.6	6.4
	100.0	..	..	15.9	28.0	5.6	6.5	39.3	4.7	5.6
	100.0	..	..	32.1	7.1	3.6	10.7	50.0	3.6	3.6
	100.0	..	..	12.3	30.8	3.1	7.7	40.0	6.2	10.8
	100.0	..	..	16.7	11.1	..	22.2	50.0	..	..
All Ethnic Groups	Children 6 - 11 years (Without Dental Service)									
	100.0	0.4	0.1	7.9	12.3	2.1	5.8	63.3	4.1	8.1
	100.0	0.6	..	6.8	13.2	1.2	4.3	64.5	4.0	8.5
	100.0	..	0.8	15.8	4.4	4.4	5.3	65.8	6.1	3.5
	100.0	..	..	7.2	13.6	4.1	11.8	57.5	3.2	8.6
All Ethnic Groups	100.0	..	..	14.3	..	..	..	17.4	14.3	14.3
	Children 12 - 18 years and above									
	100.0	0.1	..	13.5	10.7	2.3	5.5	61.8	7.0	5.1
	100.0	..	..	12.0	11.9	1.9	5.5	62.5	6.4	5.6
	100.0	..	..	27.7	1.9	6.3	6.3	53.5	8.8	2.5
All Ethnic Groups	100.0	0.3	..	13.9	8.4	1.7	4.5	61.5	10.1	4.2
	100.0	..	..	16.7	8.3	6.3	6.3	66.7	2.1	..

Source: Ministry of Health, 1973

3.1.4 Relevance of the 1970 Survey

This brief account of the oral health status of schoolchildren aged six to eighteen years cannot be equated to dental needs, eleven years later in 1981, in schoolchildren. The long term effects of water fluoridation would be more apparent now and the expansion of the dental services with the provision of more school dental clinics in primary schools would have ensured greater initial dental health care. From the foregoing account, however, the dental condition tended to take a turn for the worse, quite drastically, in the twelve to eighteen year old age group when no close supervision by dental personnel was available. Today, though there are more school dental clinics for primary schoolchildren, the secondary schoolchildren are still left to seek dental treatment for themselves. Also, with increased industrialisation and a higher standard of living leading to change of mode of living and diet, caries may be expected to be on the increase. Could it be then possible that these facts act against the effects of water fluoridation and cause little change in the dental needs of the secondary schoolchildren. Certainly surveys at more frequent levels are required to estimate the dental needs, plan future dental services and evaluate treatment and preventive programmes so far provided.

3.2 DENTAL NEEDS OF 18 YEAR OLD NATIONAL SERVICEMEN

Perhaps the closest indication of the possible change in dental needs in the past eleven or twelve years could be gauged from two surveys on a sample of National Servicemen in 1967 and 1979. Both surveys were done on a eight to ten per cent sample of 18 year old youths representing a number of 24 877 and 24 401 in the whole population for 1967 and 1979 respectively. These young men were examined when they presented themselves for the pre-enlistment medical check-up and the two samples had a similar proportion of the various ethnic groups. In 1967 a total of 2 173 subjects comprising 1 736 Chinese, 318 Malays, 87 Indians and 32 of various other races, were examined. 2 200 enlistees comprising 1 793 Chinese, 292 Malays, 94 Indians and 21 persons of other races were examined in 1979. As the earlier survey did not give details of the dental conclusion of the 'Others', only the Chinese, Malays and Indians will be compared. (Goh, 1968, Cheong, 1980).

3.2.1 Dental Caries and Prosthetic Requirements

Table XI(a) and XI(b) compares the prevalence rate of dental caries in 1967 and 1979 as DMF teeth per subject for the three main ethnic groups.

TABLE XI(a)
Dental Caries Prevalence Rates in 18 year-old
National Servicemen in 1967

Ethnic Group	Number Examined in 1967	DMF rates per Subject	S.D & S.E	D/M/F Components
Chinese	1 736	6.52	4.25 0.10	2.4 3.1 0.9
Malays	318	3.87	7.90 0.44	1.5 1.4 0.6
Indians	87	3.48	7.85 0.85	1.5 1.2 0.1

Adapted from: Goh, 1968

TABLE XI(b)
Dental Caries Prevalence Rates in 18 year-old
National Servicemen in 1979

Ethnic Group	Number Examined in 1979	DMF rates per Subject	S.D & S.E	D/M/F Components
Chinese	1793	6.97	5.3 0.11	3.67 1.31 1.99
Malays	292	4.33	3.2 0.28	2.52 0.47 1.34
Indians	94	4.66	3.6 0.5	2.64 0.6 1.41

Adapted from: Cheong, 1980

No explanation is given as to why the sum of the separate D,M,F components given in the text of the report by Goh (1968) does not add up to the total DMF rate given by the Table for the 1967 survey.

The Table XII below shows the comparison of the percentage of subjects in each ethnic group that had no caries experienced in 1967 and 1979.

TABLE XII
Percentage With No Caries in 1967 and 1979

Ethnic Group	Number Examined in 1967	Percentage With No Caries	Number Examined in 1979	Percentage With No Caries
Chinese	1 736	3.86	1 793	6.3
Malays	318	11.94	292	9.9
Indians	87	16.09	94	11.7

Adapted from: Goh, 1968; Cheong, 1980

The prosthetic needs are shown in the following
Tables XIII(a) and XIII(b).

TABLE XIII(a)
Prosthetic Needs (1967)

Ethnic Group	Number Examined in 1967	Number of Denture Wearers	Number Requiring Denture Prostheses	Number of Units of Dentures Required			
				Partial Upper	Partial Lower	Full Upper	Full Lower
Chinese	1736	379 (21.83%)	421 (24.25%)	205	213	3	0
Malays	318	17 (5.34%)	16 (5.03%)	4	12	0	0
Indians	87	5 (5.74%)	7 (8.04%)	4	3	0	0
All Groups	2141	401 (18.73%)	534 (24.94%)	303	228	3	0

Adapted from: Goh, 1968

TABLE XIII(b)
Prosthetic Needs (1979)

Ethnic Group	Number Examined in 1979	Number of Denture Wearers	Number Requiring Denture Prostheses	Number of Units of Dentures Required			
				Partial Upper	Partial Lower	Full Upper	Full Lower
Chinese	1793	169 (9.4%)	254 (14.2%)	166	169	0	0
Malays	292	7 (2.4%)	12 (4.1%)	3	10	0	0
Indians	94	1 (1.1%)	10 (10.6%)	8	6	0	0
All Groups	2200	178 (8.1%)	276 (12.5%)	177	185	0	0

Adapted from: Cheong, 1980

The subjects of the survey in 1967 did not receive the full benefits of water fluoridation which commenced when they were ten years old. The second group of 1979, however should have reaped the full benefits as they have been citizens of Singapore since their birth in 1961.

Comparing the caries experienced and the prosthetic needs of the two samples, it is evident that though less teeth are missing and the prosthetic requirements are approximately halved, the number of carious teeth had increased. Caries experienced (DMFT) is on the increase for all ethnic groups, but more so for the Indians and Malays. These groups being the minority and more conservative of the races are now being increasingly influenced by the Western civilisation together with the concomittent changes in diet and style of living that accompanies it. Apparently the higher level of educational status and perhaps the increased availability of dental services have increased utilisation, resulting in a greater number of teeth restored and saved from extraction.

The fact that the DMF index has increased would lead to the question of whether 0.7 parts per million of fluoride in drinking water is really the optimum level for Singapore. The argument was that the hot, humid weather encouraged people to drink more water and hence this level of fluoride was sufficient. However, increased urbanisation has exposed young children to the varieties of sweetened and carbonated drinks. Do these contain an optimal level of fluoride? Have there been changes of diet causing an increase in dental caries?

The answers to these doubts and questions can only be answered when more surveys on the oral health status of the community and sociological research into the habits and diet of Singaporeans are undertaken. No definite conclusion can be drawn on the basis of the results of these two surveys which represent only the 18 year-old population of Singapore.

3.2.2 Oral Hygiene Status

Oral hygiene status, measured by the presence of oral debris or extrinsic stain, gingival calculus and gingival inflammation for both the 1967 and 1979 groups are presented in Tables XIV(a) and XIV(b).

TABLE XIV(a)
Oral Hygiene and Gingivitis (1967)

Ethnic Group	Total No. of Subjects	Number of Subjects with		
		Oral debris	Calculus	Gingivitis
Chinese	1736	1355 (77.9%)	1461 (78.1%)	1576 (90.8%)
Malays	318	249 (78.3%)	296 (93.1%)	296 (92.9%)
Indians	87	66 (75.9%)	75 (86.2%)	75 (86.2%)
All Groups	2141	1670 (78.0%)	1832 (85.6%)	1947 (90.9%)

Adapted from: Goh, 1968

TABLE XIV(b)
Oral Hygiene and Gingivitis (1979)

Ethnic Group	Total No. of Subjects	Number of Subjects With		
		Oral debris	Calculus	Gingivitis
Chinese	1793	1705 (95.1%)	1546 (86.2%)	1769 (98.7%)
Malays	292	281 (96.2%)	263 (90.1%)	281 (96.2%)
Indians	94	90 (95.7%)	81 (86.2%)	91 (96.8%)
All Groups	2200	2096 (95.3%)	1906 (86.6%)	2159 (98.1%)

Adapted from: Cheong, 1980

Comparison of these figures, again, points to a disappointing neglect of oral hygiene. Though more treatment seems to have been received, the oral health has not improved. Is this due to a deficiency in the provision of our dental services which are treatment orientated? Does it reflect the need for a greater preventive approach to treatment by both private dental clinics and Government dental services? Evaluation of the services and the preventive programmes is without doubt a necessity. Again the observations in this comparison are inadequate for definite conclusions but it does raise doubts and this should lead to further study and evaluation.

3.3 UTILISATION OF GOVERNMENT DENTAL CLINICS

Figures from the annual report of the Ministry of Health, 1979 indicate a total patient attendance of 1 046 167 at all Government dental clinics. This constitutes approximately 45.5 per cent of the population and represents a 15.3 per cent increase over 1978. Details of patient attendances and percentage change between 1975 and 1979 are given in Table XV.

The actual numbers and trend in the number of fillings over the years 1975 to 1979 is shown in Table XVI. There was a sudden downward trend experienced in 1978 but this seemed to pick up in 1979.

The total number of deciduous teeth extracted in 1979 was 162 572, which represents a 15.1 per cent increase over 1978. There is a reversal of a healthy decline in the number of extracted teeth in the previous four years as shown in Table XVII. The total number of permanent teeth extracted in 1979 was 112509, which was an increase of 5.4 per cent over 1978. The break-down figures together with the developing trend over the previous five years is presented in Table XVIII.

The calculated number of permanent fillings per extraction over these years, (Table XIX) indicates the nature of services rendered, the general dental health and the mental attitude of patients who use the Government dental services. The ratio showed a slight improvement from 1.37 fillings per extraction in 1975 to 1.61 in 1977 but had a setback in 1978 and 1979. The ratio in the Dental Health Services showed a similar trend as seen in Table XIX. This is probably due to the introduction of charges, in 1978, for schoolchildren. Some parents would rather wait until extractions became inevitable than pay for regular dental care. (Ministry of Health, S'pore, Annual Report, 1979). This may also explain the slight decrease in patient attendances at the Dental Health Services and the downward trend in

permanent fillings in 1978.

The total number of partial dentures issued in 1979 was five thousand two hundred and seventy-five and exceeded the figure for 1978 by 31.5 per cent. (Ministry of Health, 1979). Substantial increases, seen in Table XX, of dentures issued by the Institute of Dental Health correspond with the inclusion of denture construction in the curriculum of dental therapists and dental nurses. Increased demand for full and partial denture prostheses is very likely, considering the inevitable use in the number of people aged sixty and above in the future years due to the success of the family planning programme. (Ministry of Health, 1977 a).

Orthodontic treatment now assumes greater significance as seen by the volume of work done in Table XXI. (Ministry of Health, 1979). The long waiting list of more than two years indicates a demand for such treatment. However the demand for orthodontic treatment and partial dentures seems related to appearance, more than function.

Utilisation of the dental services, from the trends seen is related to cost, and the decrease in the fillings per extraction ratio to 1.55 in 1979 indicates a demand which is not preventive in nature. Would this be due to the public perceiving the scope of dental services to be as such? Have the community dental health education programmes been effective? Should there be a compulsory insurance scheme for school children at least, to ensure that dental health care is preventively orientated? These are questions which the dental profession must answer through sociological research, surveys and evaluation of the dental public health programmes.

TABLE XV

TOTAL NO. OF PATIENT ATTENDANCES

1975 - 1979

	1975	1976	1977	1978	1979	% Change in 1979 over 1978
Dental Health Services	562,820	587,040	690,747	688,905	782,453	+13.6%
Hospital Dental Service	164,431	174,435	178,014	178,695	198,186	+10.9%
Institute of Dental Health	16,899	25,446	31,366	39,850	65,528	+64.4%
Total - Dental Division	744,150	786,921	900,127	907,450	1,046,167	+15.3%

Percentage Increase in Patient Attendances
using 1975 figures as base

	1975	1976	1977	1978	1979
Dental Health Services	562,820	+4.3%	+22.7%	+22.4%	+39.0%
Hospital Dental Service	164,431	+6.1%	+8.3%	+8.7%	+20.5%
Institute of Dental Health	16,899	+50.6%	+85.6%	+135.8%	+287.8%
Dental Division	744,150	+5.7%	+21.0%	+21.9%	+40.6%

Source: Ministry of Health, 1979

TABLE XVI

TOTAL NO. OF PERMANENT FILLINGS

1975 - 1979

	1975	1976	1977	1978	1979	% Change in 1979 over 1978
Dental Health Services	283,008	309,286	366,817	311,226	330,028	+6.0%
Hospital Dental Service	58,256	58,052	59,694	58,271	60,926	+4.6%
Institute of Dental Health	9,550	10,591	12,501	17,303	36,631	+111.7%
Total - Dental Division	350,814	377,929	439,012	386,800	427,585	+10.5%

Percentage Increase in Permanent Fillings
using 1975 figures as base

	1975	1976	1977	1978	1979
Dental Health Services	283,008	+9.3%	+29.6%	+10.0%	+16.6%
Hospital Dental Service	58,256	-0.4%	+2.5%	0.0%	+4.6%
Institute of Dental Health	9,550	+10.9%	+30.9%	+81.2%	+283.6%
Dental Division	350,814	+7.7%	+25.1%	+10.3%	+21.9%

Source: Ministry of Health, 1979

TABLE XVII

Total No. of Extractions of Deciduous Teeth
1975 - 1979

	1975	1976	1977	1978	1979	% Change in 1979 over 1978
Dental Health Services	150,820	147,133	148,402	124,671	145,432	+16.7%
Hospital Dental Service	20,811	20,619	16,826	15,215	14,982	-1.5%
Institute of Dental Health (1975 - Dental Nurses' Training School only)	1,284	3,055	2,641	1,396	2,158	+54.6%
Total - Dental Division	172,915	170,807	167,869	141,282	162,572	+15.1%

Percentage Change in Total No.
of Deciduous Tooth Extractions
using 1975 figures as base

	1975	1976	1977	1978	1979
Dental Health Services	150,820	-2.4%	-1.6%	-17.3%	-3.6%
Hospital Dental Service	20,811	-0.9%	-19.1%	-26.9%	-28.0%
Institute of Dental Health (1975 - Dental Nurses' Training School only)	1,284	+137.9%	+105.7%	+8.7%	+68.1%
Total - Dental Division	172,915	-1.2%	-2.9%	-18.3%	-6.0%

Source: Ministry of Health, 1979

TABLE XVIII

Total No. of Permanent Tooth Extractions
1975 - 1979

	1975	1976	1977	1978	1979	% Change in 1979 over 1978
Dental Health Services	36,752	37,698	51,084	55,163	57,926	+5.0%
Hospital Dental Service	45,861	50,857	53,299	49,676	50,689	+2.0%
Institute of Dental Health (1975 - Dental Nurses' Training School only)	67	527	1,079	1,897	3,894	+105.3%
Total - Dental Division	82,680	89,082	105,462	106,741	112,509	+5.4%

Percentage Change in Total No.
of Permanent Tooth Extractions
using 1975 figures as base

	1975	1976	1977	1978	1979
Dental Health Services	36,752	+2.6%	+39.0%	+50.1%	+57.6%
Hospital Dental Service	45,861	+10.9%	+16.2%	+8.3%	+10.5%
Institute of Dental Health (1975 - Dental Nurses' Training School only)	67	+686.6%	+1510.4%	+2731.3%	+5711.9%
Total - Dental Division	82,680	+7.7%	+27.6%	+29.1%	+36.1%

Source: Ministry of Health, 1979

TABLE XIX

Comparative Table Showing
the Number of Fillings and Extractions
Done and the Filling to Extraction Ratio
for 1975 - 1979

Year	Particulars	Dental Health Services	Hospital Dental Service	Institute of Dental Health	Dental Division (Total)
1975	Fillings	283,008	58,256	9,550	350,814
	Extractions	187,572	66,672	1,351	255,595
	Fillings Per Extraction	1.51	0.87	7.07	1.37
1976	Fillings	309,286	58,052	10,591	377,929
	Extractions	184,831	71,476	3,582	259,889
	Fillings Per Extraction	1.67	0.81	2.96	1.45
1977	Fillings	366,817	59,694	12,501	439,012
	Extractions	199,486	70,125	3,720	273,331
	Fillings Per Extraction	1.84	0.85	3.36	1.61
1978	Fillings	311,226	58,271	17,303	386,800
	Extractions	179,839	64,891	3,293	248,023
	Fillings Per Extraction	1.73	0.89	5.25	1.56
1979	Fillings	330,028	60,926	36,631	427,585
	Extractions	203,358	65,671	6,052	275,081
	Fillings Per Extraction	1.62	0.93	6.05	1.55

Source: Ministry of Health, 1979

TABLE XX

Total No. of Dentures Issued
(Partial and Full)
1975 - 1979

	1975		1976		1977		1978		1979		Percentage Change in 1979 over 1978	
	Part.	Full	Part.	Full	Part.	Full	Part.	Full	Part.	Full	Part.	Full
Dental Health Services	1,321	540	1,264	437	1,582	909	2,050	1,231	2,658	1,325	+29.7%	+7.6%
Hospital Dental Service	2,868	2,769	3,488	2,805	1,708	3,083	1,602	3,010	2,168	2,801	+35.3%	-6.9%
Institute of Dental Health (1975 - Dental Nurses' Training School only)	2	-	6	1	92	128	360	211	449	226	+24.7%	+7.1%
Total - Dental Division	4,191	3,309	4,758	3,243	3,382	4,120	4,012	4,452	5,275	4,352	+31.5%	-2.2%

Percentage Change in No. of Dentures
Issued (Partial and Full) using
1975 figures as base

	1975		1976		1977		1978		1979	
	Part.	Full	Part.	Full	Part.	Full	Part.	Full	Part.	Full
Dental Health Services	1,321	540	-4.3%	-19.1%	+19.8%	+68.3%	+55.2%	+128.0%	+101.2%	+145.4%
Hospital Dental Service	2,868	2,769	+21.6%	+1.3%	-40.4%	+11.3%	-44.1%	+8.7%	-24.4%	+1.2%
Institute of Dental Health (1975 - Dental Nurses' Training School only)	2	0	+200.0%	∞	+4500.0%	∞	+17900.0%	∞	+22350.0%	∞
Total - Dental Division	4,191	3,309	+13.5%	-2.0%	-19.3%	+24.5%	-4.3%	+34.5%	+25.9%	+31.5%

Source: Ministry of Health, 1979

TABLE XXI

Orthodontic Returns of Dental Division
1979

	Attendances	No. of Removable Appliances Issued	No. of Cases Completed	No. of Orthodontists	No. of Cases Completed Per Orthodontist	Appliances Issued Per Completed Case
Dental Health Services	15,179	1,515	368	4.2	92.4	3.9
Hospital Dental Service	7,255	585	79	1	79	7.4
Institute of Dental Health	3,370	334	105	0.8	131.3	3.2
Total - Dental Division	25,804	2,434	572	6	95.3	4.3

Source: Ministry of Health, 1979

CHAPTER FOUR

PRACTICE AND PHILOSOPHY OF DENTISTRY IN SINGAPORE

4.1 DENTAL MANPOWER AND DENTAL SERVICES

Delivery of dental health care in Singapore is undertaken mainly by the Government dental service, private dental practice, the Dental Branch of the Singapore Armed Forces and the Dental Faculty of the National University of Singapore. The major providers of dental care are the first two categories. The National Survey of dentists conducted in 1976 showed that fifty-five per cent of dental patient attendances were handled by private practitioners. (Ministry of Health, S'pore, 1977 c). The Government provided low cost dental care for approximately forty-five per cent of the population in 1979. (Ministry of Health, 1979).

All dentists in Singapore as from 1950 have to be registered with the Singapore Dental Board. The register presently comprises two divisions:-

1. The first division dentists are those who hold a degree of Bachelor of Dental Surgery from the University of Singapore or any other degree/diploma in dentistry granted by any University or College recognised by the Singapore Dental Board.
2. The second division dentists consists of persons who do not possess any degree/diploma in dentistry but who have been either registered as dentists in Singapore and the States of Malaya before 1950 or who have been residents in Singapore since 1942 and who have been practicing dentistry as their sole means of livelihood for not less than four years before enforcement of the Dentist's Registration Act 1950, and have passed an examination conducted by the Committee of Examiners of the Singapore Dental Board. (Lim, 1979).

The Dentist/Population ratio of the first division dentists as at June 1980 would be estimated at 1:6 765; but if the second division dentists are included, the ratio would be 1:4 812. In 1968 this Dentist/Population ratio was 1:5 500 and in 1978 1:5 000. The projected figure for 1988 when a population of 2.7 million is expected is 1:4 500. Hence a further two hundred and ninety-five dentists are required to reduce the ratio to 1:3 000 which is considered to be acceptable to Singapore at its present stage of development. (Lim, 1979). Though the present Dentist/Population ratio indicates an apparent shortage of dentists, it is offset by employment of approximately three hundred dental nurses and dental therapists mainly to treat school children in the Government Dental Service. (Lim, 1979).

4.1.1 First And Second Division Dentists

4.1.1.1 First Division Dentists

As at June 1980, there were three hundred and thirty-nine first division dentists. Among these, there are three hundred and ten Chinese, seventeen Indians/Pakistanis and twelve from other ethnic groups.

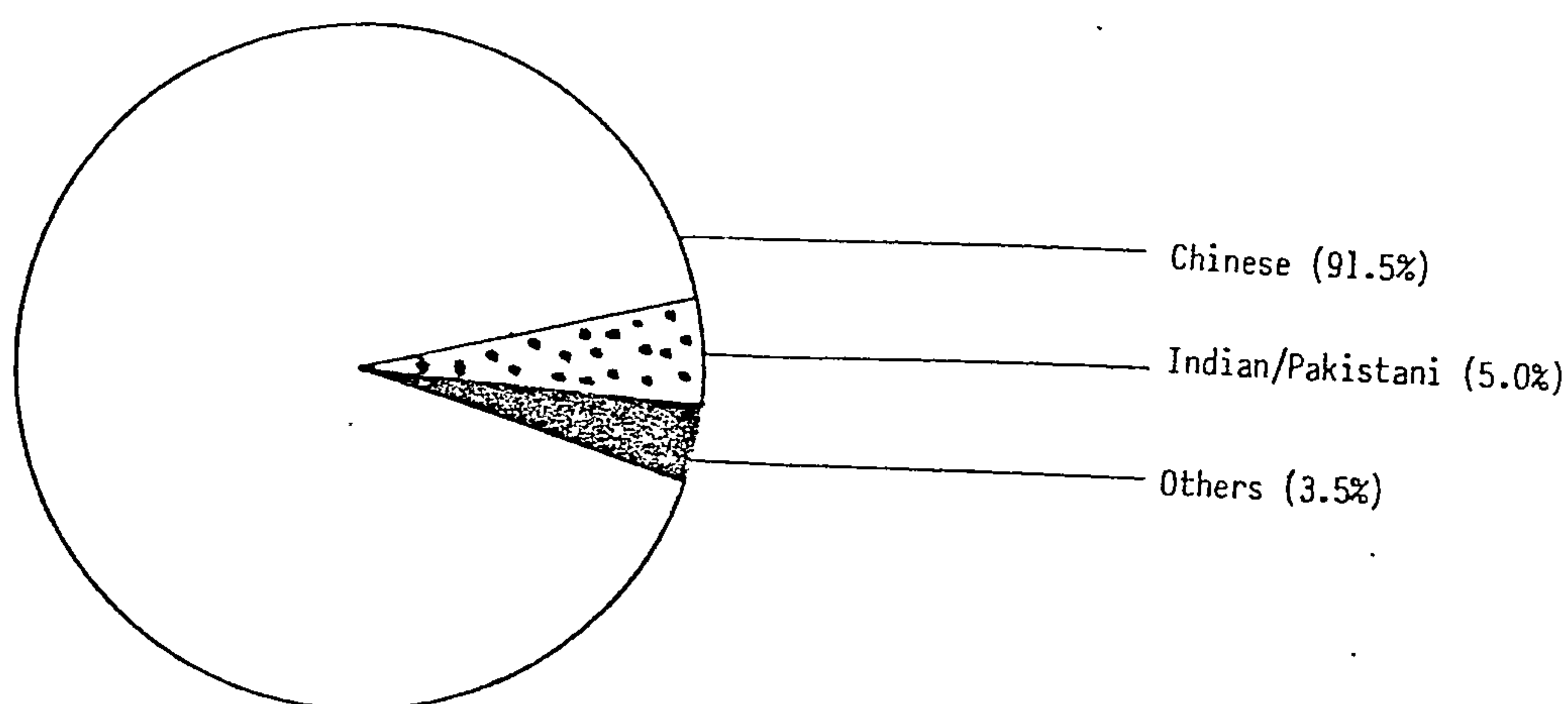


Figure 6: Ethnic group distribution of first division dentists

Source: Singapore Dental Board, 1980

The majority are Singapore citizens. Only sixty-nine are non-citizens out of whom sixty are Malaysians.

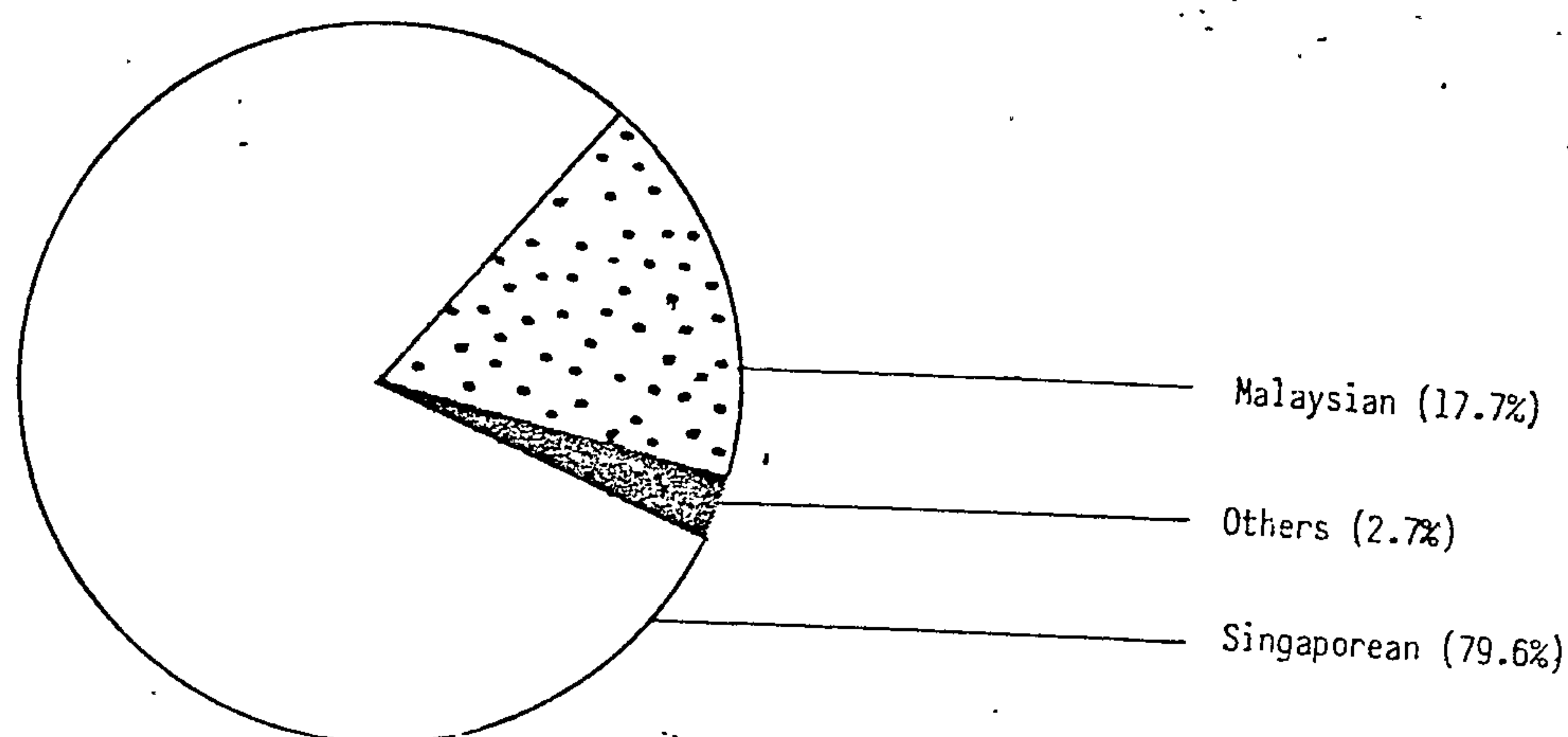


Figure 7: Nationality distribution of first division dentists

Source : Singapore Dental Board, 1980

The mean age is 35.6 years and the median is 33.6 years. Thirty-eight per cent are below the age of thirty years, fifty-eight are between thirty and fifty-nine years and four per cent are sixty years and above. The male female ratio is 2:1.

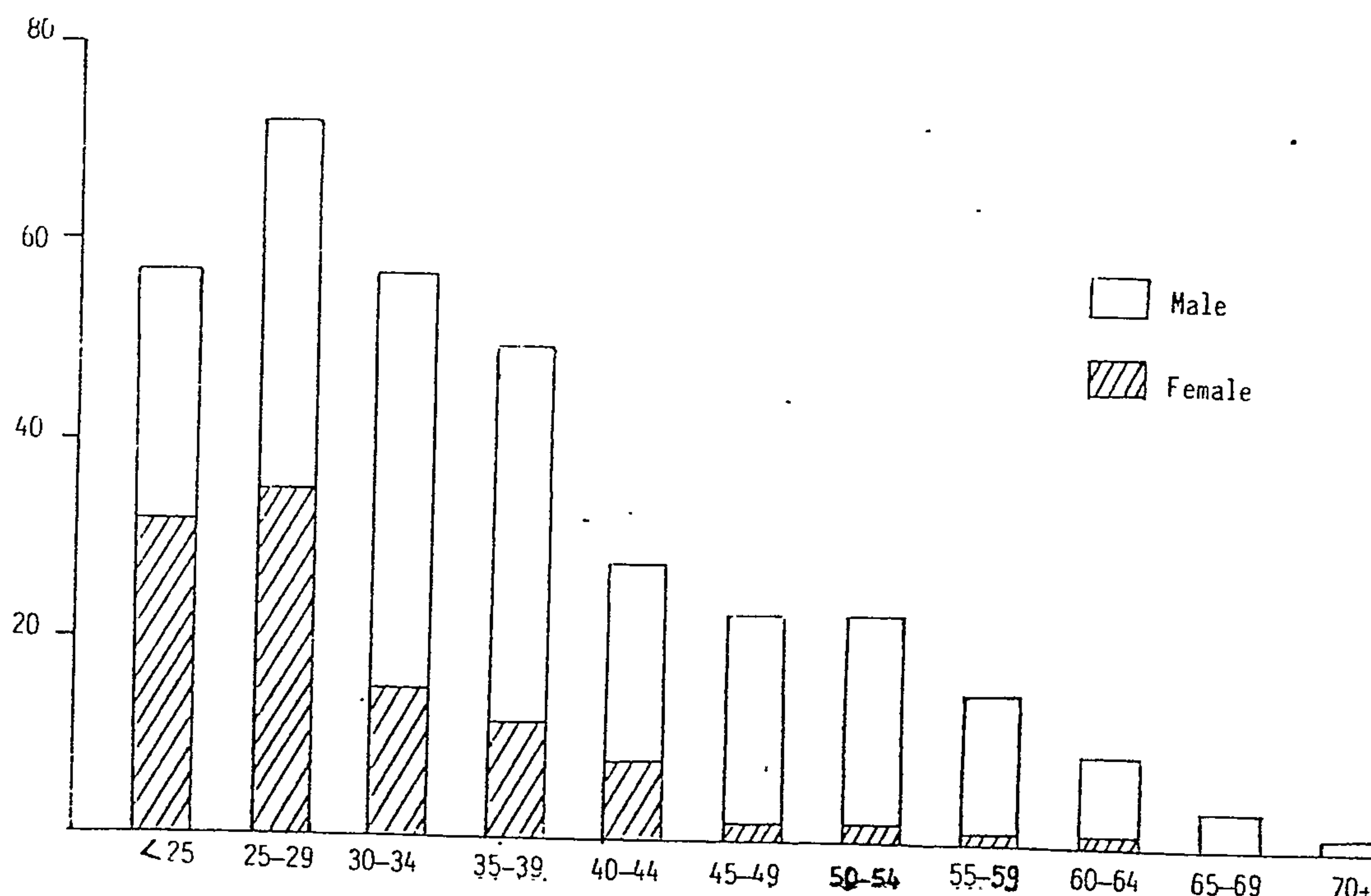


Figure 8: Age and sex distribution of first division dentists

Source : Singapore Dental Board, 1980

Of the three hundred and thirty-nine dentists, three hundred and thirty are currently practising in Singapore. Among the working dentists, one hundred and fifty-eight are in the Government Service, sixteen in the University and one hundred and fifty-six are in private practice.

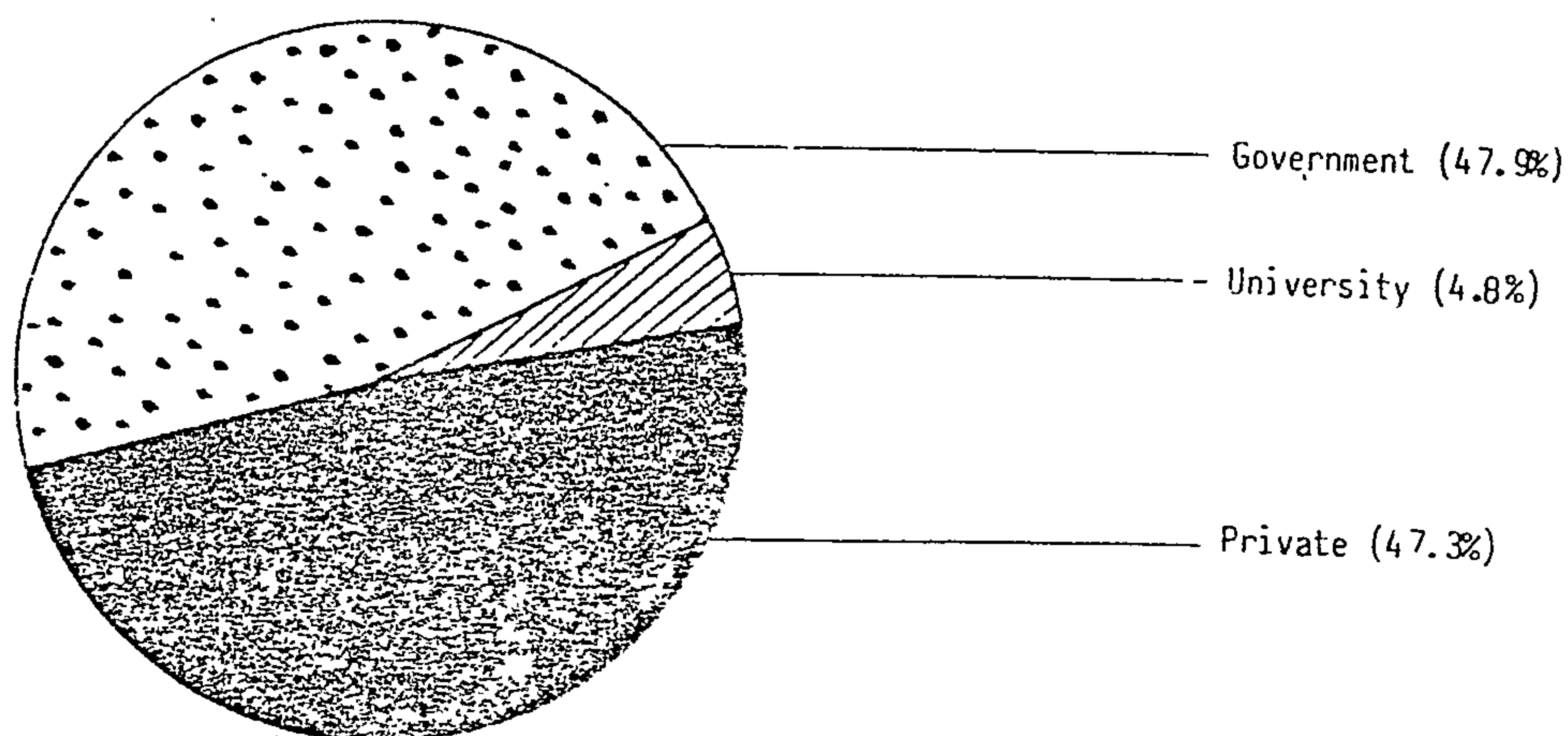


Figure 9: Employment of first division dentists

Source : Singapore Dental Board, 1980

Three hundred and fifteen dentists qualified in Singapore, thirteen in Australia, six in the United Kingdom and the remaining five in New Zealand, Canada and the United States of America.

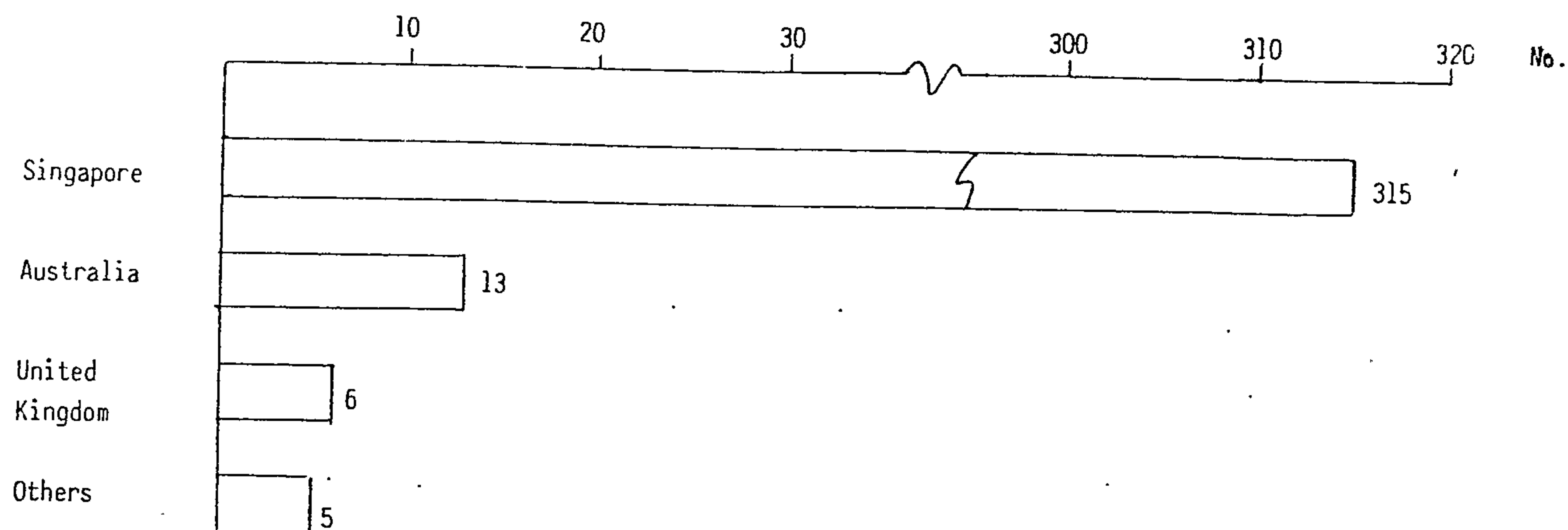


Figure 10: Country of award of basic degree of first division dentists

Source : Singapore Dental Board, 1980

Of the three hundred and thirty-nine dentists, more than half graduated after 1970.

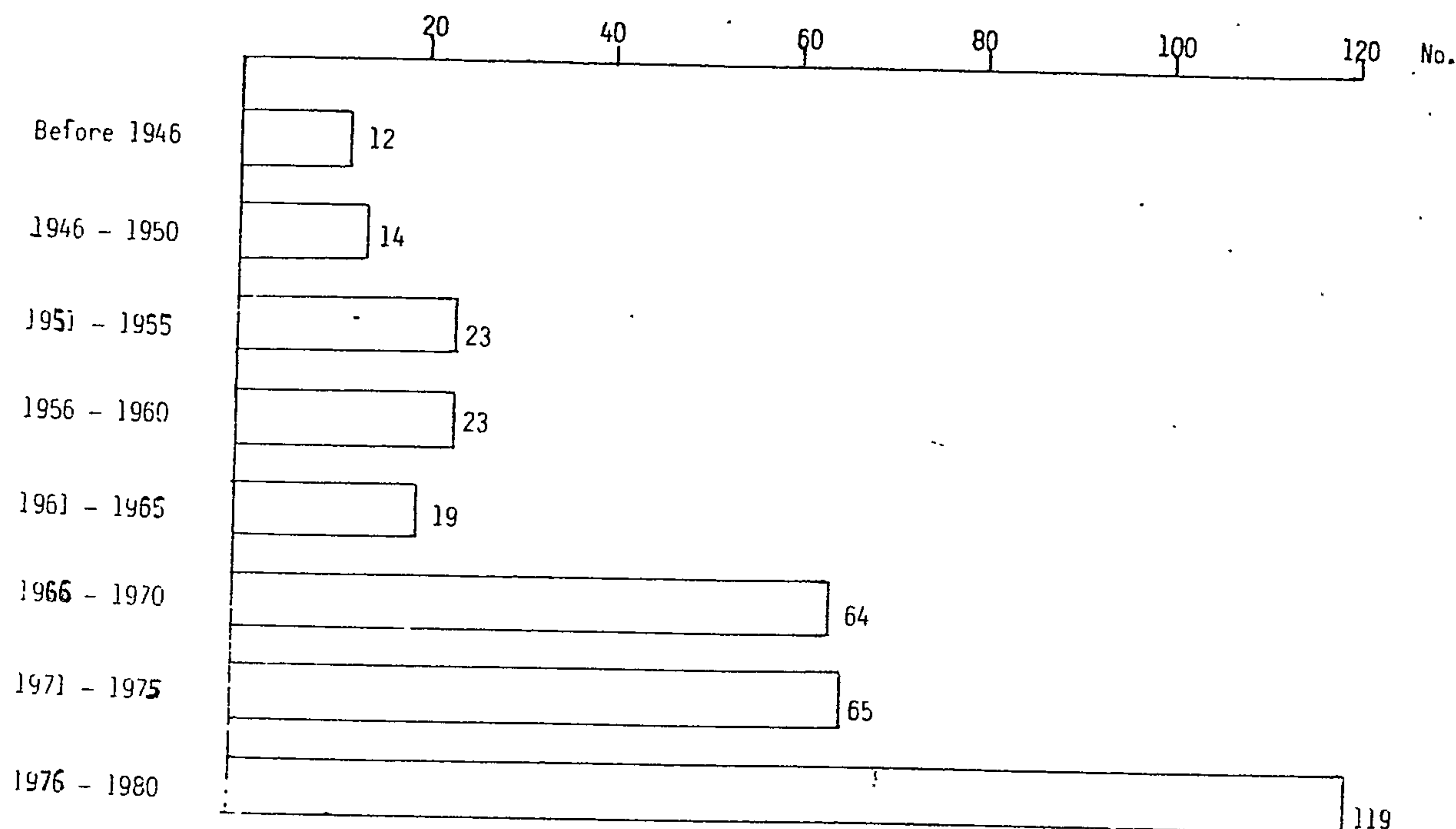


Figure 11: Year of graduation of first division dentists

Source : Singapore Dental Board, 1980

Of the sixty-seven dentists with postgraduate qualifications, twenty-three are in the Government Service, fourteen in the University and thirty in private practice. The specialities are shown in the following table, together with the combinations of postgraduate qualifications which seventeen dentists have.

TABLE XXII

DENTISTS WITH POSTGRADUATE QUALIFICATIONS BY SPECIALITY AND
FIELD OF EMPLOYMENT

Field of Speciality	Govt.	University	Private	Total
Oral Surgery	4	5	9	18
Dental Public Health	7	1	1	9
Orthodontics	4	-	4	8
Prosthetic Dentistry	2	3	2	7
Oral Surgery/Orthodontics	2	-	3	5
Operative Dentistry	1	1	2	4
Oral Surgery/Oral Pathology	2	1	-	3
Pedodontics	-	1	1	2
Oral Surgery/Orthodontics/ Prosthetic Dentistry	1	-	1	2
Periodontics	-	-	1	1
Oral Surgery/Dental Public Health	-	-	1	1
Oral Surgery/Operative Dentistry	-	-	1	1
Orthodontics/Pedodontics	-	-	1	1
Orthodontics/Prosthetic Dentistry	-	-	1	1
Pedodontics/Dental Public Health	-	1	-	1
Periodontics/Operative Dentistry	-	-	1	1
Prosthetic Dentistry/Dental Material	-	1	-	1
Oral Pathology	-	-	1	1
TOTAL	23	14	30	67

Source: Singapore Dental Board, 1980

4.1.1.1.1 First Division Dentists in the Public Sector

Of the one hundred and fifty-eight dentists in the Government Service, one hundred and twenty-nine are attached to the Ministry of Health and twenty-nine are in the Ministry of Defence. There is a larger number of female dentists, eighty-one compared to seventy-seven males. Ninety-two per cent of the total are Chinese. One hundred and twenty-nine are Singapore citizens and twenty-eight are Malaysians. Sixty-seven per cent are below the age of thirty years and the median age is only twenty-eight years. (Singapore Dental Board, Register, 1980).

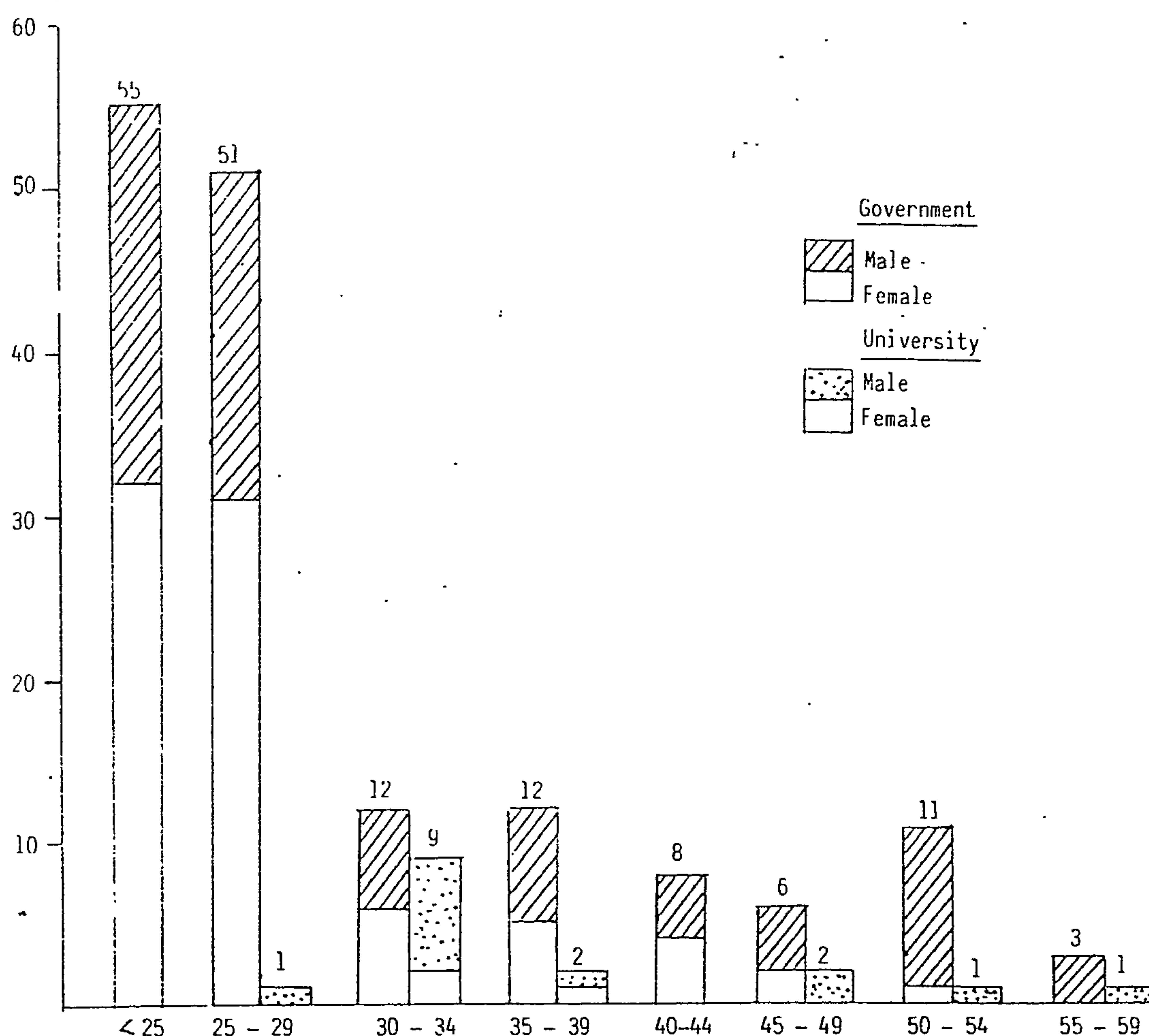


Figure 12: Age group of first division dentists in the public sector

Source : Singapore Dental Board, 1980

This indicates that most of the dentists in the Government services are new graduates.

The principal duty of the Government dentists is clinical work, although, a small percentage perform administrative and teaching duties. (Ministry of Health, 1977 c).

In the University of Singapore, ten Singaporeans, three Malaysians and three from other countries make a total of sixteen staff members. Their median age is thirty-four years. (Singapore Dental Board, 1980). The principal function of the University staff is teaching. (Ministry of Health, 1977 c).

Seventy-five per cent of the dentists in the Government Service and sixty-nine in the University have less than six years of service.

TABLE XXIII
LENGTH OF SERVICE

Length of service (years)	Government	University	Total	
			No.	%
Total	158	16	174	100.0
< 1	35	5	40	23.0
1 - 5	80	6	86	49.4
6 - 10	14	3	17	9.8
11 - 15	8	-	8	4.6
16 - 20	12	-	12	6.9
21 - 25	7	-	7	4.0
> 25	2	2	4	2.3
Mean (years)	5.2	6.2	5.4	

Source: Singapore Dental Board, 1980

4.1.1.1.2 First Division Dentists In The Private Practice

In contrast to the public sector, the sex-ratio of the one hundred and fifty-six first division private practitioners is seven males to one female. They are generally older than the Government dentists with a median age of thirty-eight years.

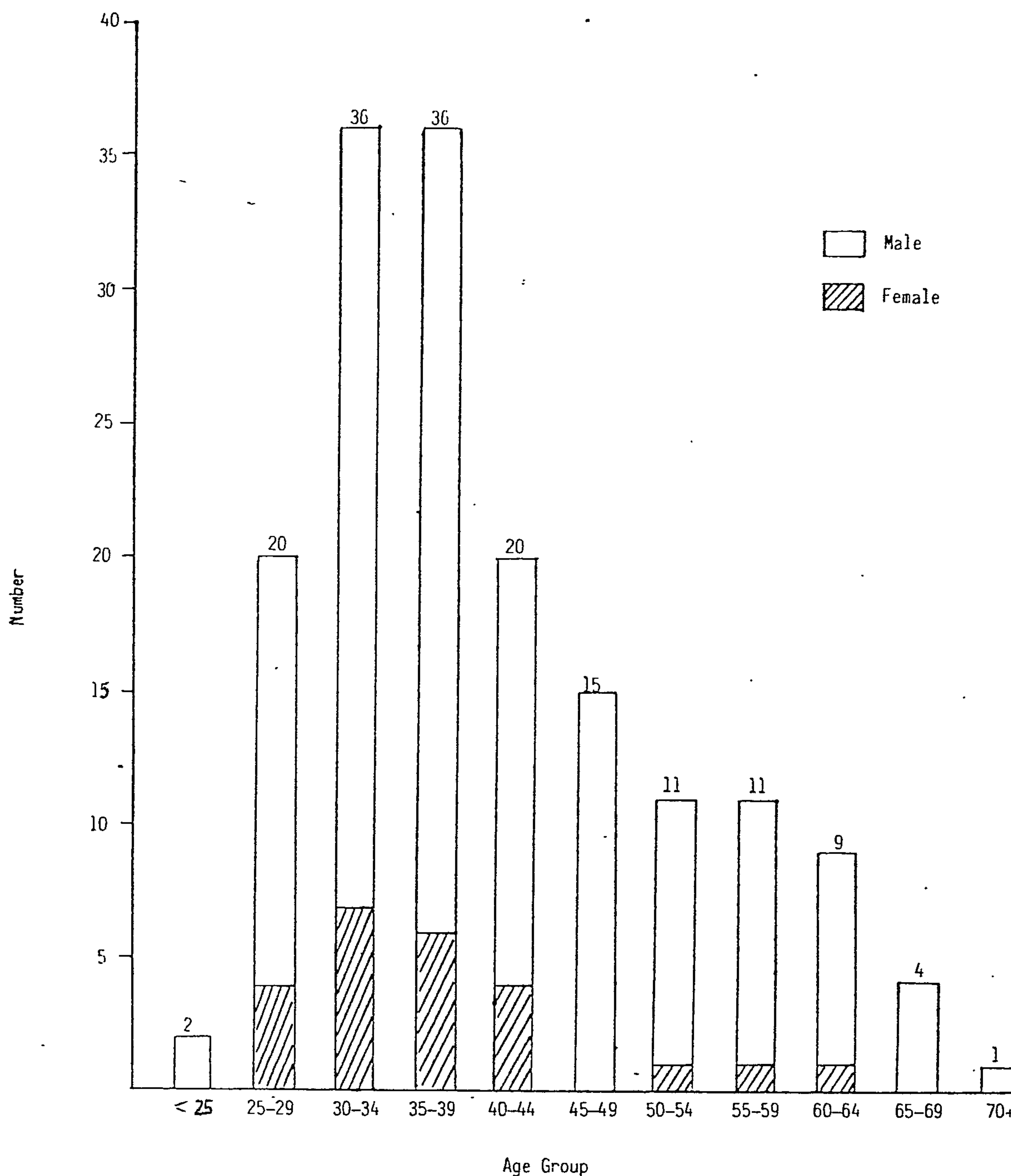


Figure 13: Age and sex of first division dentists in private practice

Source : Singapore Dental Board, 1980

Ninety-three first division dentists are working in the single person practice, eighteen in group practice and four work as locums. Altogether there are one hundred and nineteen first division dental practices and the highest concentration is in the central business district areas of nine (thirty clinics) and one (fourteen clinics).

TABLE XXIV
LOCATION OF FIRST DIVISION PRIVATE DENTAL CLINICS
BY POSTAL DISTRICTS

Postal District	Dental Clinics	
	No.	%
01	14	11.8
02	4	3.4
03	5	4.2
04	2	1.7
05	2	1.7
06	5	4.2
07	8	6.7
08	1	0.8
09	30	25.2
10	5	4.2
11	1	0.8
12	5	4.2
13	3	2.5
14	2	1.7
15	8	6.7
16	2	1.7
19	6	5.0
20	7	5.9
21	4	3.4
22	4	3.4
25	1	0.8
TOTAL	119	100.0

4.1.1.2 Second Division Dentists

As at June 1980 there are one hundred and thirty-nine second division dentists. Other than one registered in 1960, all were registered during the period 1950 - 1953. One hundred and twenty-seven of them are males and twelve are females. All are Singapore citizens except for one Malaysian. There are forty-one in the age group of fifty to fifty-nine, sixty-one in the age group of sixty to sixty-nine and thirty-six above seventy years. The median age is sixty-five years. (Singapore Dental Board, 1980). The age structure of the second division dentists indicates that there soon would be a vacuum in dental manpower created by the retirement of these dentists.

All the second division dentists are Chinese. Three-quarters of them were born in China. 42.8 per cent have primary school education and 51.9 per cent secondary school education. The majority, 90.1 per cent are from the Chinese Language stream. (Ministry of Health, 1977 c). Hence, most of them treat only Chinese speaking patients.

Second division dentists obtained their training through apprenticeship. The period of apprenticeship varied from one to twenty years with a median of 9.3 years. Most received training locally. (Ministry of Health, 1977 c).

A total of one hundred and twenty-two clinics is managed by second division dentists. Certain postal districts like seven and nineteen, followed by three and fourteen seem to be more popular with these dentists as seen in the following table. (Singapore Dental Board, 1980).

LOCATION OF SECOND DIVISION PRIVATE DENTAL CLINICS BY POSTAL DISTRICTS

Postal District	Dental Clinics	
	No.	%
01	8	6.6
02	8	6.6
03	13	10.7
06	2	1.6
07	14	11.5
08	11	9.0
09	1	0.8
10	2	1.6
12	5	4.1
13	3	2.5
14	12	9.8
15	10	8.2
16	3	2.5
19	14	11.5
20	2	1.6
21	5	4.1
22	1	0.8
23	4	3.3
26	1	0.8
27	2	1.6
28	1	0.8
TOTAL	122	100.0

Source: Singapore Dental Board, 1980

4.1.2 Dental Auxillaries

All formal training of dental auxillary personnel is undertaken by the Government at the Institute of Dental Health. Mainly there are two types of operating dental auxillaries, the Dental Nurses and the Dental Therapists and two non-operating auxillaries, the Dental Technicians and the chairside assistants who are known as Dental Assistants in Singapore. Information presented here has been obtained through interviews with the staff at the Auxillary training school and the Ministry of Health.

4.1.2.1 Dental Nurses

The Dental Nurses Training School has been in operation since 1962. It came to be known as the Dental Nurses Department when training of all auxiliaries came under one roof at the Institute of Dental Health in August 1977. (Ministry of Health, Singapore, Annual Report, 1977 b).

The basic training is spread over two years with an extra year of field training before they qualify. The nurses are taught to do simple restorative work on all permanent and deciduous teeth including pulp capping. Extraction of all deciduous teeth is within their realm but extraction of maxillary incisors, cuspids and premolars and mandibular cuspids and incisors only is allowed. The rationale for this being that these teeth only require infiltration anaesthesia for their removal and the nurses are taught to give this. Routine scaling, prophylaxis, topical fluoride application and dental health education is within their scope of work. No prosthetic work was taught to dental nurses but the last two batches learnt to construct simple partial dentures for patients in view of the fact that the Dental Therapist Scheme was in operation and it was possible for these nurses to come back after some years of experience to do the Dental Therapist's Course.

Before 1976 the annual intake of nurses was around twenty-five but was increased in 1976 and 1977 to about fifty. No new class of dental nurses has so far been started, since then, as the development of new school clinics has not kept pace and there are no vacancies for dental nurses in the Government Service. During training there is usually a loss of ten per cent of the student dental nurses. After qualifying, there used to be only an insignificant number resigning but now due to more industrialisation and greater opportunities in the private sector more resignations are seen.

The duties of a qualified dental nurse vary with the type of clinic and the length of time the clinic has been in existence. She may work in a new, school dental clinic where she would have to help the dental officer organise the new clinic and to see to the day to day running of the clinic. She is also responsible for providing systematic and comprehensive dental care to the school's population. Dental nurses may have to assist the dental officer who visits the clinic once or twice a week. The dental nurse could also be a part of a dental health delivery team at one of the outpatient dental clinics situated within a polyclinic. Generally, however, they are able to practice what they are taught.

Basic qualifications necessary for entrance into the course would be the School Certificate at Ordinary Level, obtained after ten years of primary and secondary education in Singapore.

One of the problems associated with the teaching of dental nurses is the preparation of teaching materials associated with their level of understanding. Dental nurses too do not seem to get sufficient practice in extractions. This shows a need for their training programme to evolve with the times as the level of awareness on oral health increases and the public demands more sophisticated treatment. According to the Principal of the Dental Nurses Département, the nurses do not get any training in teamwork until they are working in the field and this is the wrong approach to learning teamwork especially when the new dental graduates working in the Government Service are not exposed to any training in teamwork themselves. Dental nurses can only work in the Government Service and their training is part of an in-service training course. Males were allowed into the course only in 1976.

4.1.2.2 Dental Therapists

The Dental Scheme was started in May 1975. The first batch of twenty students had the Advanced Level School Certificate as the basic requirement for entry into the course, which was spread over three years. The scope of work included all that of a dental nurse in addition to the construction of partial and full acrylic dentures, inlays and composite restorations, and extraction of all permanent and deciduous^u teeth but only with forceps. As they could not use elevators, difficult extractions, extraction of fractured teeth or roots were to be left to dental officers. They could treat any age group of the population and were not expected to help out as chairside assistants.

The second intake of dental therapists was also twenty in number but these were dental nurses who had a good academic record as student dental nurses and who had at least five years experience in the School Dental Services. This time the course spanned only one and a half years. The change was due, again to the fact that there were insufficient chairs or clinics in the Government Service to absorb these new graduates from the Dental Therapists Department and hence dental nurses from the field were upgraded. The loss of dental therapists while in training and after training was about ten per cent. Males and females could join the course.

The third batch of thirty-seven dental therapists presently undergoing training is again different. These are holders of the Ordinary Level School Certificate who have been sponsored by the second division dentists to undergo a four year course. Unlike the previous two batches of dental therapists who underwent an in-service training, these students have to pay for their training and when they qualify they would work for the second division dentists who sponsored them. The scope of work is exactly the same

as that of a Government dental therapist.

This particular course for these dental therapists was introduced to fill the vacuum that was being created by the retirement or deaths of second division dentists. It was the Government's way of keeping costs of dental treatment down for the lower income group. However, it is unlikely that this course will continue as there is strong opposition by the Singapore Dental Association.

Dental therapists from the first two batches can be given provincial registration by the Singapore Dental Board entitling him to practice dentistry under the supervision of a first division dentist, subject to such conditions and restrictions as may be prescribed. Second division registration may also be granted to dental therapists who have not less than ten years practical experience in dentistry, recognised by the Board and who have passed such further examinations as may be prescribed. (Singapore Dental Board, 1979).

4.1.2.3 Dental Technicians

The Dental Technicians School was started in September, 1975 and fifteen students were selected for the first batch by means of a simple manual dexterity test. The course lasting for three years consists of lectures, demonstrations and practical exercises in denture, inlay, crown and bridgework, splints, obturators and maintenance and repair of dental equipment. (Ministry of Health, Singapore, Annual Report, 1975). This is also an inservice course and in the second and third year the students do actual clinical cases.

However this course is not popular and faces stiff competition with other vocational skills in the private sector. Hence the number trained every year is unpredictable, depending on the number of takers for the course. In May 1981, there was a total of eight students but they started at varying times. The turnover figure is high,

about ten to fifteen per cent, especially after training, as many join the private dental companies. During the course there is a loss of ten per cent of potential dental technicians.

After qualifying, dental technicians can specialise by concentrating on work they prefer to do like orthodontics or porcelain work but there is no special post-basic course. On a few occasions, selected dental technicians have been given a trip abroad to observe and learn new techniques practiced in the more advanced countries.

A number of private dental laboratories train their own technicians, employing them first as an apprentice. As a few dental laboratories are family businesses, the apprentices are usually restricted to family members and relatives. Some dentists who have a dental surgery with a laboratory have also trained their own dental technician.

... 4.1.2.4 Dental Assistants

Dental assistants or chairside assistants' training takes two years and except for the first four months when they are given lectures and demonstrations, most of the training is through practical experience, working in the Dental Clinics at the Singapore General Hospital or at the Institute of Dental Health. Though they are taught basic dental health procedures, they are not expected to give chairside counselling. Theory of four-handed dentistry is made known but not taught practically as this is not practised in the Government Dental Clinics.

Formal training of this category of dental personnel commenced in July 1976 with a maximum of twenty-four students. In 1980 the number was increased to thirty-five and in May 1981, thirty students remained in the course. Future numbers of dental assistants would be adjusted according to the posts available for dental officers and dental therapists

in the Government Service.

The majority of chairside assistants working in the private dental surgeries have been trained by their dentists. Most dentists prefer to train someone to suit their individual style. Four-handed dentistry is taught in some of the 'better class' practices and group practices.

4.1.3 Government Dental Services In Singapore

Dental services in Singapore are administered by the Dental Branch of the Ministry of Health under the direction of the Deputy Director of Medical Services (Dental). There are three divisions, namely the Dental Health Services, the Hospital Dental Service and the Institute of Dental Health. (Ministry of Health, Annual Report, 1979). Dental services are also available at the Dental Clinic of the Dental Faculty, National University of Singapore which is a quasi Government body and hence the charges for dental treatment are the same. The Ministry of Defence also provides dental services through its Dental Branch for Armed Forces personnel.

4.1.3.1 Dental Branch - Ministry of Health

The number of clinics that provide dental services under the three divisions total one hundred and thirty-five. Dental treatment was free to patients attending Maternal and Child Health Centres before 18th July, 1975. (Ministry of Health, 1975). Primary schoolchildren who had free dental care had to pay one fifth the charges that adults payed, after 1st April, 1978. The basis for computing charges was also changed for routine treatment from one based on attendance to one based on item of work done. (Ministry of Health, annual Report, 1978). Payment for treatment is subsidised for citizens, permanent residents and people on employment pass. Foreigners seeking treatment at Government dental clinics would have to pay directly for items of work done on a scale which is equivalent to charges by private practitioners.

4.1.3.1.1 Dental Health Services

As from October, 1981, the Dental Health Services comprised of one hundred and ten school dental clinics, three mobile school dental units, one Maternal and Child Health Clinic, ten outpatient dispensary clinics and two large dental centres for both adult and young patients. Before 1979 these dental centres were exclusively for primary and secondary schoolchildren. (Ministry of Health, 1979).

School dental service offers comprehensive systematic treatment to about sixty-three per cent of the primary schoolchildren. This is the only treatment programme which includes preventive services and dental health education. As Singapore's water supply is completely fluoridated at the optimal concentration, topical fluoride application is only encouraged when circumstances warrant it.

The dental clinics are manned by dental nurses, one or two to a clinic depending on the number chairs and they are supervised by dental officers. Due to the high turnover of dental officers in the Dental Health Services section, supervision of the dental nurses is not strict. It was decided from 1980 onwards, for better monitoring of the workload and more meaningful evaluation of the School Dental Service, to monitor the actual number of cases being rendered dentally fit and the number of cases being maintained dentally fit each year. (Ministry of Health, 1979).

At the outpatient dispensaries, Maternal and Child Health Clinic and miscellaneous dental clinics, most of which are situated in the polyclinics with other medical services, treatment is on demand basis. Normal routine dental treatment like amalgam and plastic restorations, scaling and prophylaxis, extraction of deciduous and permanent teeth, and roots is available. The construction of full and partial dentures form a major portion of the work at these clinics.

Chairside counselling and dental health education is left to the individual dental officer or dental therapist working but normally the number of patients attending leaves no time for preventive services. More complicated treatment like endodontics, crown and bridge work, removal of impacted teeth is not encouraged at the smaller dental clinics. Patients may be referred to the two large dental centres, the outpatient clinic at the Institute of Dental Health or the Dental Clinic at Singapore General Hospital for such treatment.

4.1.3.1.2 Hospital Dental Service

There are dental clinics in eight of the thirteen Government hospitals in Singapore including the four main regional hospitals, (Singapore General Hospital, Tan Tock Seng, Toa Payoh and Alexandra Hospital) and two district hospitals. These hospitals provide basic medical services such as internal medicine, general surgery and paediatric services. Certain specialised treatment such as radiotherapy; renal medicine; plastic surgery, ear, nose and throat treatment are centralised in Singapore General Hospital; and tuberculosis, cardiovascular medicine, cardiothoracic surgery, neurosurgery and neurology at Tan Tock Seng Hospital. Trafalgar Hospital, the only leprosarium in Singapore and Woodbridge Hospital which specialises in psychiatry also have a dental clinic each. (Ministry of Culture, 1980). Except for the part-time dental clinics at the Woodbridge and Trafalgar Hospital, hospital dental clinics provide treatment for both in-patients as well as outpatients. Again treatment is on demand basis.

At the Singapore General Hospital, Singapore's largest hospital, specialist treatment in all departments of dentistry is available. There is no periodontist but any specialised work in this field is done by the Oral Surgery specialists. There is close collaboration with the surgical departments of the hospital in the management of patients with maxillo-facial injuries, jaw neoplasia, jaw deformities,

hare-lip and cleft palate. Emergency cases occurring outside office hours can be seen at the Accident and Emergency Department at the Singapore General Hospital. There is normally an equal number of traumatic and non-traumatic dental emergency cases. (Ministry of Health, 1977 b).

In 1979 a specialist oral surgeon was posted to Alexandra Hospital. Since then an increasing number of referrals for specialist attention has been channelled to this hospital. (Ministry of Health, 1979).

4.1.3.1.3 The Institute of Dental Health

Besides running training courses for dental nurses, dental therapists, dental technicians and dental assistants, the Institute houses the Orthodontic Unit manned by four orthodontists. Orthodontic treatment now assumes greater significance in terms of the volume of specialist treatment and the cost in providing such treatment. As such the number of cases receiving treatment, their attendances, the number of cases completed and the nature of work being done for them were more closely monitored since 1979. (Ministry of Health, 1979).

Steps were taken to introduce specialist treatment at the Institute by also posting a periodontist there to begin a Periodontic Unit. (Ministry of Health, 1979). Unfortunately she resigned in 1980. Active steps are also taken to increase activities at the outpatient clinic in the Institute. (Ministry of Health, 1979). More complex dental treatment like endodontics, inlay, crown and bridge work, removal of impacted teeth are available on demand. Patients who would like comprehensive treatment and do not mind being treated by student dental nurses or dental therapists are referred to them from the outpatient clinic. Teaching staff at the Institute also treat cases which are too complicated for students to handle.

The administration of the Dental Health Education Unit

which was part of the Institute of Dental Health was handed over to the Training and Health Education Branch of the Ministry of Health in early 1977. This unit is manned by two dental officers, a nursing officer and thirteen dental nurses who prefer to specialise in Dental Health Education instead of clinical work.

Dental manpower figures in the dental division for 1976 to 1979 are appended (Appendix IV). The distribution of dental manpower for the three divisions and the headquarters in 1977, 1978, and 1979 together with the distribution change in 1979 over 1978 is also presented. Although the overall change was a reduction of 2.1 per cent, it comprised of a 5.1 per cent decrease in the dental assistants and a 8.5 per cent decrease in the dental technicians. The main role of both these auxillary groups are to provide supportive services to the operating dental manpower and loss of these dental personnel creates a significant imbalance in staffing especially as the total operating manpower remains the same as 1978. (Ministry of Health, 1979). At present more manpower in these two categories is very much required.

Appendix IV also shows a significant turnover figure of -5.6 per cent in the number of Dental Officers in the Dental Health Services. This seems to indicate that the young dental graduates who join the public sector find that the routine work of the Dental Health Services does not provide the training and experience they want. According to the National Survey of Dentists, 1976, the main reason for dentists wanting to stay in the public sector was job security (25.4%) and opportunity for training and gaining experience (19.9%), and that for leaving was poor salary (16.7%), poor physical environment (14.3%) and further training (11.9%). (Table XXVI and XXVII). (Ministry of Health, 1977 c)

TABLE XXVI

Reasons Given for Remaining in Public Sector by First Division Dentists

Reasons for Remaining in Service	Government Service		University Service	
	Number of Reasons	Percentage	Number of Reasons	Percentage
Opportunity for training and gaining experience	36	19.9	13	38.2
Opportunity for teaching and research	10	5.5	14	41.2
Job security	46	25.4	1	2.9
Satisfactory salary	18	10.0	1	2.9
Good staff relationship	10	5.5	-	-
Good physical working environment	6	3.3	1	2.9
Recently graduated	26	14.4	1	2.9
No scope in private practice	21	11.6	1	2.9
Others	8	4.4	2	5.9
Total	181	100.0	34	100.0

Source: Ministry of Health, 1977 c

TABLE XXVII

Reasons Given for Wanting to Leave Present Employment in Public Sector by First Division Dentists

Reasons for Wanting to Leave Present Employment	Number of Reasons	Percentage
Poor salary	7	16.7
No opportunity for promotion	7	16.7
Poor physical working environment	6	14.3
Further training	5	11.9
Retirement	4	9.5
Migration	4	9.5
Poor staff relationship	3	7.1
Job is not challenging	3	7.1
Others	2	4.8
Domestic	1	2.4
Total	42	100.0

Source: Ministry of Health, 1977 c

4.1.3.2 University Dental Service

Public can also avail themselves of the dental treatment provided by the third and fourth year dental students and the University staff at the dental clinic which is shared with the Government dental clinic at the Singapore General Hospital. The intake of dental students each year is about thirty-five. Patients are normally referred from the Government dental clinic or are treated on direct request. Normally patients being treated by students agree to full comprehensive dental care but will normally be treated by different students or by one student in different departments so as to complete their dental care. They are also put on a recall system. Specialist treatment by qualified University staff is available.

4.1.3.3 Dental Branch - Ministry of Defence

The Dental Branch of the Singapore Armed Forces provides free dental treatment to personnel in the army, navy, and airforce and was set up in 1968. It serves a population of approximately 65 000 National Servicemen, 20 000 in the National Cadet Corporation, and 85 000 reservists. In addition it helps to provide treatment for 12 000 National Servicemen and reservists who serve in the police force. The families of the regulars are eligible for treatment. The Dental Branch has also been asked to help develop the dental services for the prisons. Except for orthodontics, the full range of treatment, is available.

For Armed Forces personnel, the Dental Branch provides two types of services:-

1. A mandatory screening service to ensure that dental fitness requirements for entry are met and it assumes relevance only if the disease elements it detects are dealt with appropriately.
2. A treatment service based on individually determined demand. The initiative to make the first appointment after enlistment rests with the patient. The dental officer offers to provide

continuing care but the option to accept or decline rests with the patient.

It is realised that the present system is not an efficient one, especially for a military dental service. The proposed policy by the Head, Dental Branch, Singapore Armed Forces seeks to remove the responsibility for dental care from the individual who may be the least qualified to make the proper decision on health matters and to place the responsibility on the Armed Forces Command. (Cheong, 1980).

The permanent dental staff in the Armed Forces comprises of five dental officers. Two are specialists, one in Dental Public Health and the other in Prosthodontics. A third is doing his Master's in Prosthodontics. Two others intend to specialise in Periodontics and Oral Surgery. In addition to the five regular officers the number of National Service dental officers in the Armed Forces vary from twenty-two to thirty-five each year, depending on the number of dental graduates undergoing National Service after graduation.

The Armed Forces trains its own dental assistants (who are also taught to act as dental health educators) and dental technicians. They may be male or female. Chrome cobalt work and complex laboratory work are sent out to private laboratories. In May 1981, the Dental Branch had approximately sixty dental assistants and nine dental technicians. Every Singapore Armed Forces Camp has a dental clinic. There are fifteen dental clinics offering treatment.

Information presented here has been obtained through personal communication with the Head of the Dental Branch, Singapore Armed Forces in May 1981.

4.2 PREVENTIVE MEASURES

Singapore was the first Asian country to institute complete water fluoridation in 1958 after the success of the studies in the United States of America. Up to 1968, this was the only significant preventive measure adopted. Then the Dental Health Education Unit (D.H.E.U) was established by the Ministry of Health to increase awareness of oral health and demand for dental care. Schoolchildren became the target group at which these preventive measures were aimed. Adults are also reached through organised community health education programmes. As the profession feels that the demand for individual preventive services, like topical fluoride and chairside dental health counselling is not present, this is practiced on a limited scale in Government dental clinics and private practices.

4.2.1 Fluoridation of Singapore's water supply

Fluoridation of Singapore's water supply commenced in May 1956. Complete fluoridation of the extensive distribution system was achieved in January 1958. The natural fluorine content of water was 0.2 parts per million. This was brought up to 0.7 parts per million, which was considered as the optimal level for a tropical country with an average temperature of 31° C. (Wong et al, 1970). Sodium silicofluoride is used to maintain the fluoride at this level

In conjunction with this project, annual surveys were carried out on children aged seven to eight and eight to nine for a period of ten years to establish the efficacy of the fluoridation scheme. Sample sizes consisted approximately of one hundred and fifty Chinese and one hundred and fifty Malay schoolchildren, in each age group, randomly selected from a sample frame of twenty English-medium and fourteen Malay-medium schools. Both boys and girls were included in the study. (Wong et al, 1970).

Table XXVIII shows the combined dmf and D.M.F. teeth per child for 1957 (base-line study) and every year after, 1959.. (Wong et al, 1970). The 'def' shown on the table represents decayed, extracted and restored deciduous teeth and hence should be 'dmf'. For Chinese children aged seven years the decay rate dropped from 15.7 per cent in 1957 to 10.3 per cent in 1968, amounting to a 34.4 per cent reduction. The eight-year old Chinese child experienced a 30.8 per cent reduction from 14.3 in 1957 and 9.9 in 1968. The seven-year old Malay child experienced a drop in decay rate from 14.3 to 9.5, a 33.6 per cent reduction while the eight-year old experienced a 23.8 per cent reduction from 12.6 to 9.6. (Wong, 1980). The Chinese children who showed higher prevalence of caries benefitted more.

Wong Mok Qui et al, in their report of the ten year study of water fluoridation in Singapore gave the reduction rate for the combined dmf and DMF from observations in 1966 instead of 1968 because as seen in figures 14, 15 and 16 there seems to be a levelling of the downward trend of caries experience after 1966. He says that various factors such as, more complex groove patterns in tooth morphology with broader contact areas, inability to maintain a steady fluoride level for the first four years and lack of objectivity in the light of current knowledge, in detecting caries could have accounted for this. However these statements are not substantiated by any studies, Singapore being a fast developing country is subject to changes in diet and living styles due to the influence of the western civilisation and rising affluence of its citizens. Hence there is a possibility of increasing caries incidence occurring simultaneously with reduction in caries experience due to water fluoridation. This could explain the levelling of the caries reduction, but again there are no studies to substantiate this possibility. A greater increase in the incidence of caries in Malay children

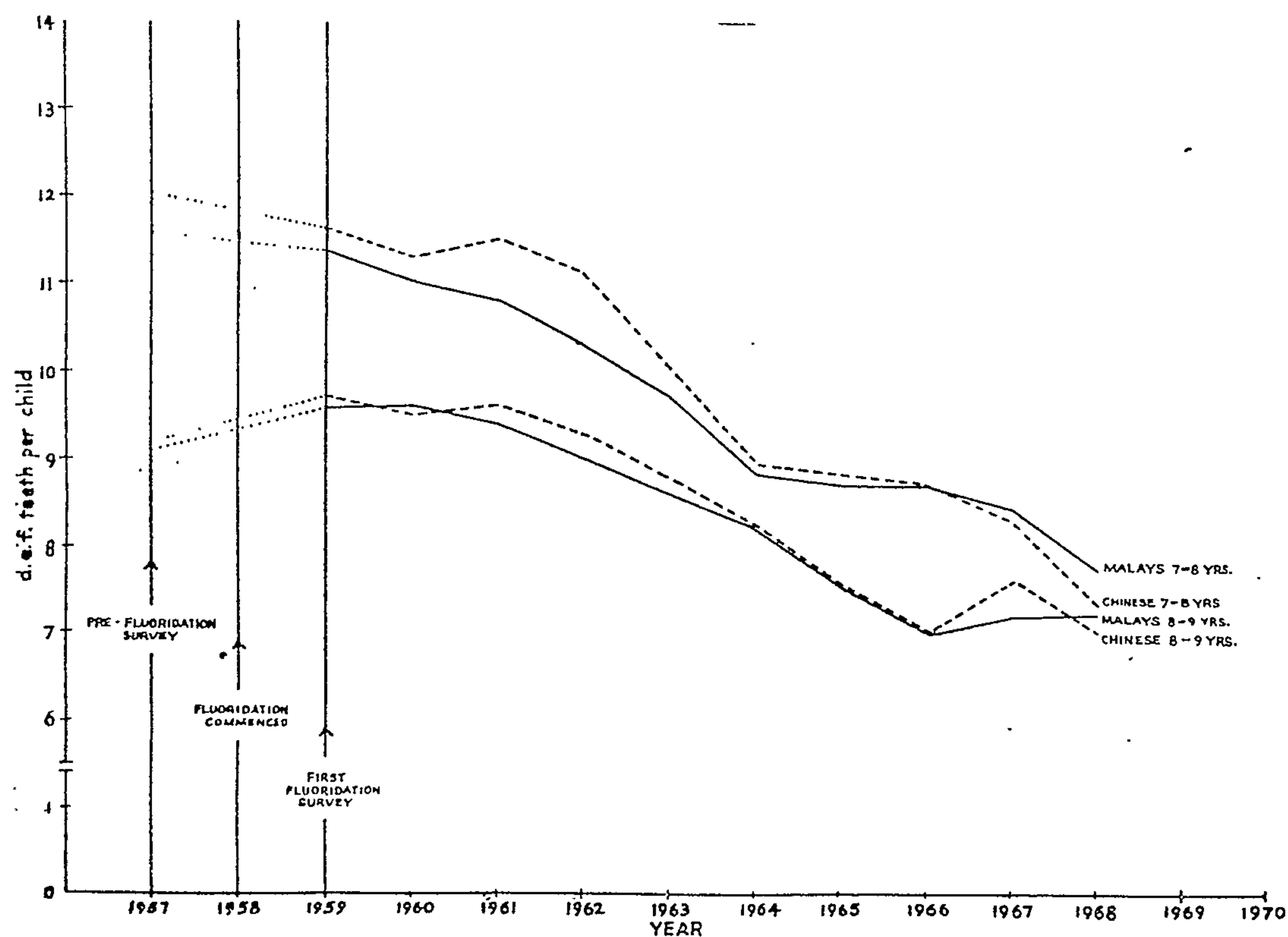
TABLE XXVIII
TEN YEAR FLUORIDATION SURVEY (SINGAPORE)
INCIDENCE OF DECAYED, MISSING AND RESTORED TEETH BY AGE AND RACE

YEAR OF OBSERVATION			1957		1959		1960		1961	
ETHNIC GROUP			Malay	Chinese	Malay	Chinese	Malay	Chinese	Malay	Chinese
MEAN AGE IN YEARS		AGE								
		7-8	7.6	7.5	7.6	7.6	7.5	7.7	7.7	7.6
		8-9	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.4
NUMBER EXAMINED		7-8	305	266	269	303	280	287	260	344
		8-9	178	262	252	395	188	322	208	240
PERMANENT DENTITION	(DMF) Mean No. of missing, decayed & restored teeth per child.	7-8	2.7	3.7	2.8	3.2	2.5	3.2	2.4	3.2
		8-9	3.4	5.2	3.8	4.6	3.1	4.2	3.0	4.2
PERMANENT DENTITION	(DMF) Mean No. of missing, decayed & restored teeth per child.	7-9	2.9	4.4	3.2	4.0	2.7	3.7	2.6	3.0
MIXED DENTITION	Mean d.e.f. & D.M.F. teeth.	7-8	14.3	15.7	14.2	14.9	13.4	14.4	13.2	14.7
		8-9	12.6	14.3	13.4	14.3	12.6	13.7	12.4	13.3
MIXED DENTITION	Mean d.e.f. & D.M.F. teeth.	7-9	13.7	15.0	13.8	14.6	13.1	14.0	12.8	14.3
YEAR OF OBSERVATION			1962		1963		1964		1965	
ETHNIC GROUP			Malay	Chinese	Malay	Chinese	Malay	Chinese	Malay	Chinese
MEAN AGE IN YEARS		AGE								
		7-8	7.6	7.6	7.6	7.6	7.6	7.6	7.7	7.6
		8-9	8.4	8.5	8.5	8.6	8.6	8.6	8.5	8.6
NUMBER EXAMINED		7-8	274	254	213	285	214	349	263	260
		8-9	220	285	248	271	218	296	278	325
PERMANENT DENTITION	(DMF) Mean No. of missing, decayed & restored teeth per child.	7-8	2.6	3.1	2.1	3.0	2.6	2.8	2.6	2.6
		8-9	3.0	3.8	3.1	3.9	3.2	3.7	2.9	3.7
PERMANENT DENTITION	(DMF) Mean No. of missing, decayed & restored teeth per child.	7-9	2.7	3.4	2.6	3.4	2.9	2.1	3.3	3.2
MIXED DENTITION	Mean d.e.f. & D.M.F. teeth.	7-8	12.9	14.2	11.8	13.0	11.4	11.7	11.2	11.4
		8-9	12.0	13.1	11.7	12.7	11.4	11.9	10.4	11.2
MIXED DENTITION	Mean d.e.f. & D.M.F. teeth.	7-9	12.5	13.6	11.7	12.9	11.4	11.7	10.8	11.3

Source: Wong, 1970

TABLE XXVIII Continued

YEAR OF OBSERVATION			1966		1967		1968	
ETHNIC GROUP			Malay	Chinese	Malay	Chinese	Malay	Chinese
MEAN AGE IN YEARS	AGE							
	7-8		7.6	7.6	7.6	7.6	7.6	7.6
	8-9		8.6	8.6	8.6	8.6	8.5	8.5
NUMBER EXAMINED		7-8	226	278	222	278	194	282
		8-9	249	331	263	290	284	322
PERMANENT TEETH	(DMF) Mean No. of missing, decayed & restored teeth per child.	7-8	1.8	2.0	2.0	2.1	1.8	2.5
		8-9	2.2	2.3	2.3	3.0	2.4	2.9
	(DMF) Mean No. of missing, decayed & restored teeth per child.	7-9	2.0	2.1	2.1	2.5	2.1	2.7
MIXED DENTITION	Mean d.e.f. & D.M.F. teeth.	7-8	10.5	10.7	10.4	10.5	9.5	10.3
		8-9	9.2	9.4	9.5	10.6	9.6	9.9
	Mean d.e.f. & D.M.F. teeth.	7-9	9.8	10.0	9.1	10.5	9.5	10.1

Figure 14: Ten year fluoridation survey, incidence of decayed, restored and extracted primary teeth

Source : Wong, 1970

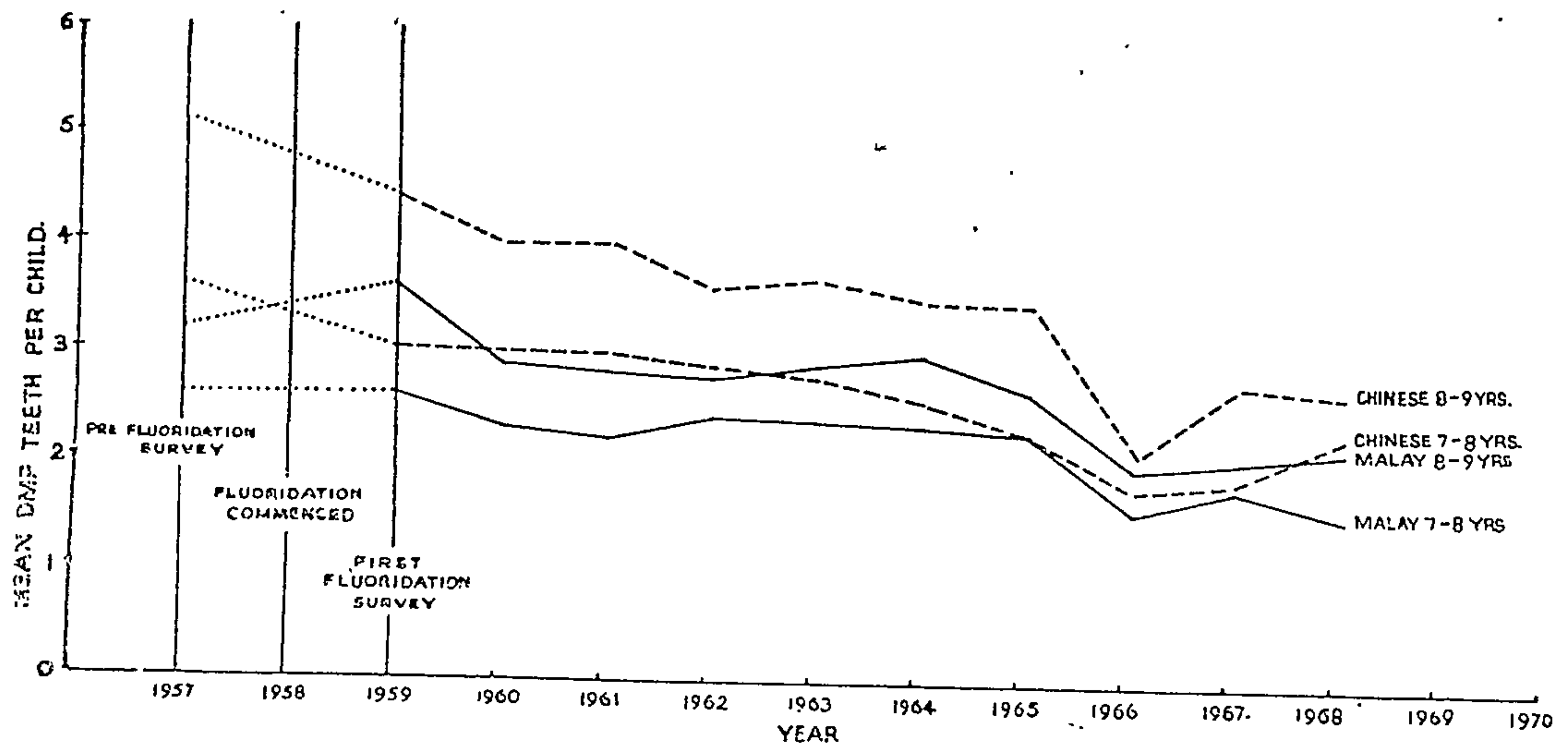


Figure 15: Ten year fluoridation survey, incidence of decayed, missing and restored permanent teeth

Source : Wong, 1970

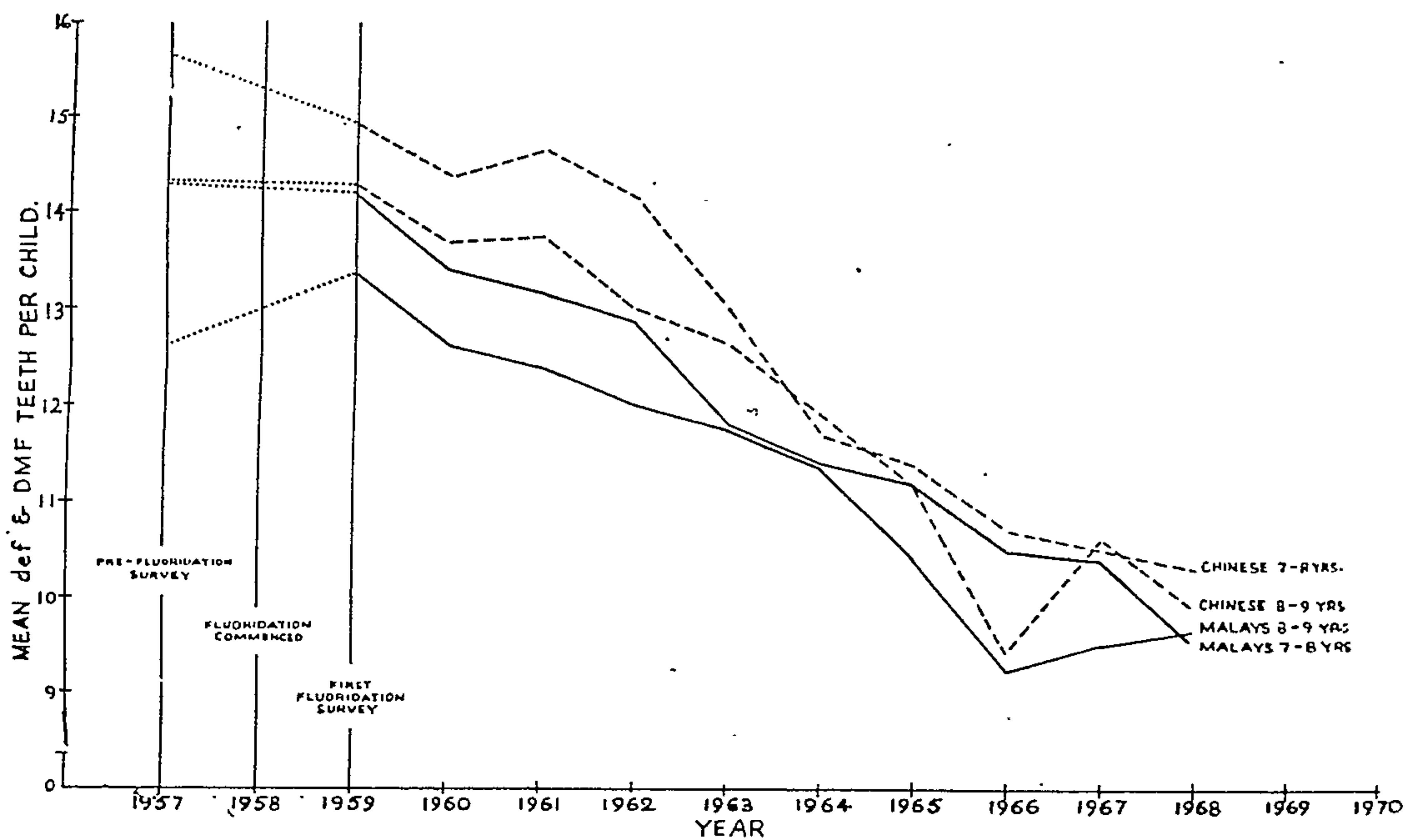


Figure 16: Ten year fluoridation survey, incidence of decayed, missing and restored teeth of mixed dentition

compared to Chinese children who already showed a high prevalence of the disease may also account for the great benefit to the Chinese children.

Though the reduction in caries was less than expected, the benefits of water fluoridation at a cost of approximately ten cents (Singapore) per capita per year (estimated in 1970) was definitely evident (Wong et al, 1970).

4.2.2 Dental Health Education Unit (D.H.E.U.)

The Dental Education Health Unit was set up within the Dental Health Services in 1968. Its main objectives were to:

1. raise the general level of dental health consciousness of the public,
2. educate the public on what they should or should not do to attain and maintain dental health, and,
3. Motivate them into action. (Wong, 1980).

In 1975 this unit became a component of the Institute of Dental Health and in 1977 it became part of the Training and Health Education Branch. (Ministry of Health, Annual Report, 1975, 1977 b). The Branch also includes the Medical Health Education Unit and the Nutrition Unit. There is often a co-ordinated effort of the three units to promote health consciousness.

The Dental Health Education Unit, comprising of a staff of one registrar, one dental officer, one nursing officer and thirteen dental nurses achieves its aim by:

1. planning, directing and co-ordinating the activities in the national dental health programme.
2. training, advising and giving assistance to all those who could be drawn into the programme to act as dental health educators.
3. the development and production of suitable dental health education materials, models and exhibits

4. the collection of data for programme evaluation and improvement.

The Unit is responsible for most of the preventive measures to be described. It offers assistance or advice to any organisation or individual who seeks information on dental health. W.H.O. visitors from developing countries have been attached to the Unit and Dental services for varying periods of time.

4.2.3 Preventive Measures for Pre-school and Schoolchildren

Information obtained through interviewing the Registrar of the Dental Health Education Unit revealed that the Unit reaches out to its target population through the following activities.

4.2.3.1 Daily Toothbrushing Drills in All Primary Schools

This major activity was organised to cultivate the habit of efficient cleansing of the mouth and to ensure that the children brushed their teeth at least once every school day. To achieve this, representative teachers from schools were taught the importance of oral hygiene for oral health and how this could be achieved through conscientious tooth brushing. These teachers in turn taught the techniques and procedures of the drill to other teachers who were also to take charge of the drills in their respective schools.

The D.H.E.U. assisted the teachers in this programme by producing teaching charts and models for their use. An inspection team of three dental nurses visits the schools randomly to see how the drills are progressing and to help with any problems that might occur. Each year the children are provided with three toothbrushes and a water mug, made available through the schools.

An annual toothbrushing competition for teachers is

held and attractive prizes are awarded to teachers whose children brush their teeth most efficiently. This serves to motivate the teachers to make greater efforts at improving the standard of the toothbrushing drills.

4.2.3.2 Prevention Through Dietary Control and Dental Health Education

The sale of sweets in school canteens was banned in early 1981 and this is a step towards reducing sugar consumption which is on the increase in Singapore. Further motivation for dietary control occurs at exhibitions or talks presented to the schoolchildren either as a group or individually when they are treated at the school dental clinic.

Teaching of dental health is incorporated into the primary school curriculum by integrating them with other aspects of healthy living. This is taught when opportunities arise in the classroom or playing field. Special dental health lessons are also taught through the media of songs, games and distribution of useful items like colouring books, blank time-tables and bookmarks with dental health messages. (Wong, 1980).

Public health nurses in Maternal and Child Health Clinics and kindergarten teachers who have been given previous training are responsible for educating the pre-school children and their parents in dental health.

4.2.3.3 Dental Health Competitions

To stimulate and sustain the interest in dental health, competitions based on the oral health status is organised annually for three groups; the primary schoolchildren, secondary schoolchildren and teenagers between the ages of seventeen and twenty-one. Separate prizes are awarded for boys and girls. The criteria for good dental health are the condition of teeth and gums, oral hygiene status and degree of malocclusion. Those less fortunate in dental health

can take part in poster competitions on dental health, held annually for the three age groups.

Prizes are awarded for winners of the competitions during the annual Dental Health Week which is held to highlight the importance of oral health. Fluoride toothpaste (since 1975 - 1976) and dental health kits are given free to all primary schoolchildren during the week.

Another form of 'reward for interest in oral health' has been introduced in the Girl Guide and Boy Scout movement, to instil the idea that dental health is everyone's business. Proficiency badges in dental health can be worked for at the three different levels in the movement. The badges are acquired after D.H.E.U. tests their knowledge of dental health in the form of a poster design, talk or essay on some aspect of oral health, depending on their rank in the movement.

4.2.4 Preventive Measures for the Community

For the adult population, oral hygiene instruction at the chairside which is reinforced and followed is more effective, especially if specific dental health action is desired. (Young and Striffler, 1969). This is carried out only in some private practices and the Government dental clinics depending on whether the individual dental operator believes in its effectiveness and has the time for it. Hence, community dental health education is indirect, through mass communication media such as pamphlets, newspapers, radio, television and regular exhibitions. A minimum of six different oral health posters are issued at regular intermissions to private practitioners and widely displayed at bus stops, community centres, hospitals and dental clinic premises, cinema theatres, departmental stores and other public places. (Wong, 1980).

Each year exhibitions with a different theme, for

example, "Self Care for Dental Health" or "Diet and Dental Health" and "Parent's Role in Dental Care for Children", are held in community centres of areas with high density population or in large shopping complexes. The exhibition is mobile and moves from place to place for a period of five months. Special features of the exhibition include the plaque detection tent and a free oral examination by a dentist, with advice to go for treatment if necessary. A wide range of pamphlets and stickers are given to the public. Those who use the plaque tent are given fluoridated toothpaste, toothbrush and floss. Other gimmicks like awarding prizes for simple contests or quizzes to see what they have learnt from the exhibition serves to increase interest in dental health.

As dental health education has to be a sustained action, a permanent exhibition is set up at the Department of Social Medicine and Public Health, Medical Faculty, for allied public health professionals and patients. A small section on dental health is exhibited at the Singapore Science Centre too. Dental health talks may be given to special groups such as in community centres or multinational companies, on request.

As for communication through the mass media, there are talks on radio, advising parents on the various conditions that may be present in their child's mouth and general preventive aspects. During the annual Dental Health Week, filmlets on oral health is screened on television. The D.H.E.U. is going to introduce cassette training modules for audio and visual use which can be bought by schools, firms and organisations or individuals to promote dental health.

4.2.5 Dental Health Club

On 30th June 1975, the Singapore Dental Health Club was inaugurated and is affiliated to the D.H.E.U. No subscriptions or entrance fees is required. Applicants with perfect,

sound teeth who are accepted as members, have to undergo an annual examination to retain membership. (Ministry of Health - Annual Report, 1975). This year, it was decided to allow people with fillings but no further decay to become associate members. There is no limit on age or sex.

Members get a yearly supply of dental floss, fluoride toothpaste and sometimes soveniors such as T-shirts. Activities of the club, include regular meetings with talks by guest speakers, topic discussions and outings or excursions to toothpaste factories or other relevant places.

D.H.E.U. intends to issue special certificates for members of five years, ten years and fifteen years. This is one way of encouraging people with good oral health to maintain it.

4.2.6 Preventive Measures in the Armed Forces.

The Dental Branch of the Armed Forces provides dental health education to its population of national servicemen and regulars with assistance from D.H.E.U. They have their own Dental Health Week. Dental health exhibitions planned for Armed Forces personnel are mobile from camp to camp. This year it has been decided that all recruits will be exposed to the preventive services, which are to be emphasised. Besides an oral examination and oral hygiene instructions, advice on necessary treatment will be given. Talks on oral health and film shows are to be shown to motivate them to seek treatment and maintain good oral health.

4.2.7 Effect of Preventive Measures

Dental health education and water fluoridation are the two major preventive services in Singapore. No fluoride supplements are given and topical fluoride is not routinely applied.

In 1974, a similar sample of Chinese and Malay

schoolchildren from the same list of schools as taken for the annual surveys immediately following water fluoridation, were surveyed for caries experience.

The mean combined dmf and D.M.F. rate of seven year old Chinese children was reduced by 54.8 per cent from 15.7 in 1957 to 7.1 in 1974. For eight year old Chinese children the mean combined dmf and D.M.F. rate was reduced by 51.0 per cent from 14.3 to 7.0. The rate for seven year old Malay children was reduced by 43.4 per cent from 14.3 in 1957 to 8.1 in 1974 and that for the eight year old Malay children was reduced by 37.3 per cent from 12.6 to 7.9. (Wong, 1980). The Chinese children again showed greater percentage reduction than the Malays.

Results of the 1974 survey show a further reduction in caries experience after sixteen years of water fluoridation when compared to results of the ten year study in 1968. Whether this further reduction is due in part to the national dental health education programme, or due mainly to the stabilisation of fluoridation procedures which have enabled a continued beneficial action on the teeth of children resident continuously in Singapore, or even to the rise in the use of fluoridated toothpaste, is debatable.

Ast and Fitzgerald in their studies of the effect of fifteen years of water fluoridation on children aged twelve to fourteen or thirteen to fourteen in Grand Rapids, Michigan; Newburgh, New York and Brantford, Ontario showed a reduction of 48, 56 and 57 per cent respectively. (Ast et al, 1962). Though the studies in Singapore are not strictly comparable to the above mentioned studies, the percentage reduction in caries experience obtained in 1974 are closer to the results of the studies in North America than those obtained after ten years of fluoridation in 1968.

Thus further studies to evaluate whether the dental

health education programmes are motivating the public are required before any reduction of caries experience can be attributed to the dental health education programme. The programme however is useful in setting a favourable climate for recommended dental health action.

4.3 EVALUATION, PLANNING AND ORGANISATION AND PHILOSOPHY OF DENTAL HEALTH

The philosophy of dental health care and a subjective evaluation of the dental services and the manpower training programme in Singapore, obtained through interviews with members of the profession in the Government service, private practice and the University is presented.

4.3.1 Planning, Organisation and Philosophy of the Ministry of Health

The aim of the Ministry of Health is to provide a basic and comprehensive health service with strong emphasis on primary health care. (Ministry of Culture, 1980). The Dental Branch of the Ministry of Health which plans and co-ordinates the overall Dental Health programme keeps in line with this aim in the provision of school dental clinics but it can be hardly said that the rest of the Government dental clinics emphasise primary dental health care though basic dental health care is provided.

According to the Deputy Director of the Medical Services (Dental), the objectives of the Dental Branch are to see that the dental needs of Singapore are met both by the public and private sector and to provide services that the private sector cannot. They are also responsible for the provision of sufficient dental manpower for the island as a whole. The steady stream of dental graduates from the National University of Singapore would take care of the dentists but production of dental auxillary personnel is the responsibility of the Dental Branch which will train these personnel as and when the need presents itself.

Dental treatment for the public is subsidised by the Government though the trend is to make the public more responsible for their own health. For schoolchildren, there is a ninety per cent subsidy. For the general public, every dollar spent is subsidised by twenty to thirty per cent.

Interaction with other branches of the Ministry of Health does occur especially in polyclinics which provide for general curative treatment, screening, immunisation, family planning and dental services under one roof. (Ministry of Culture, 1980). Such clinics are present at the large Housing and Development Board new towns so that basic health care is provided to people living in these new satellite towns. There is also close interaction between the Dental Branch and the Dental Faculty, National University of Singapore, as the teaching of dental undergraduates is carried out in Singapore General Hospital, which is the main Government Hospital. Professional organisations like the Singapore Dental Association liaise only occasionally with the Dental Branch, Ministry of Health.

The Ministry of Health has its own Research and Evaluation unit. So far evaluation of dental services is based on the quarterly results of service records and any short-comings resulting from this is hoped to be improved. No other active research is going on at the moment. The last National Dental Survey was done and published in 1970. Facilities for research and evaluation are being improved with the introduction of computers. Manpower with the expertise to carry out research and surveys is present. Though in principle it is agreed that continual surveys are useful, the moral support and perhaps finance for such endeavours seems to be lacking.

The allocation of Government funds for health in 1969/70 and 1978/79 is presented in Figure 17 and this percentage of this spent on dental services is presented in figure 18. In line with the Government policy to economise on manpower and computerise, (Ministry of Trade and Industry, 1981), there are no future plans for expansion of dental services. The general philosophy of the Government is to encourage the dental graduate to move into private practice. With no expansion of the dental services, the public sector

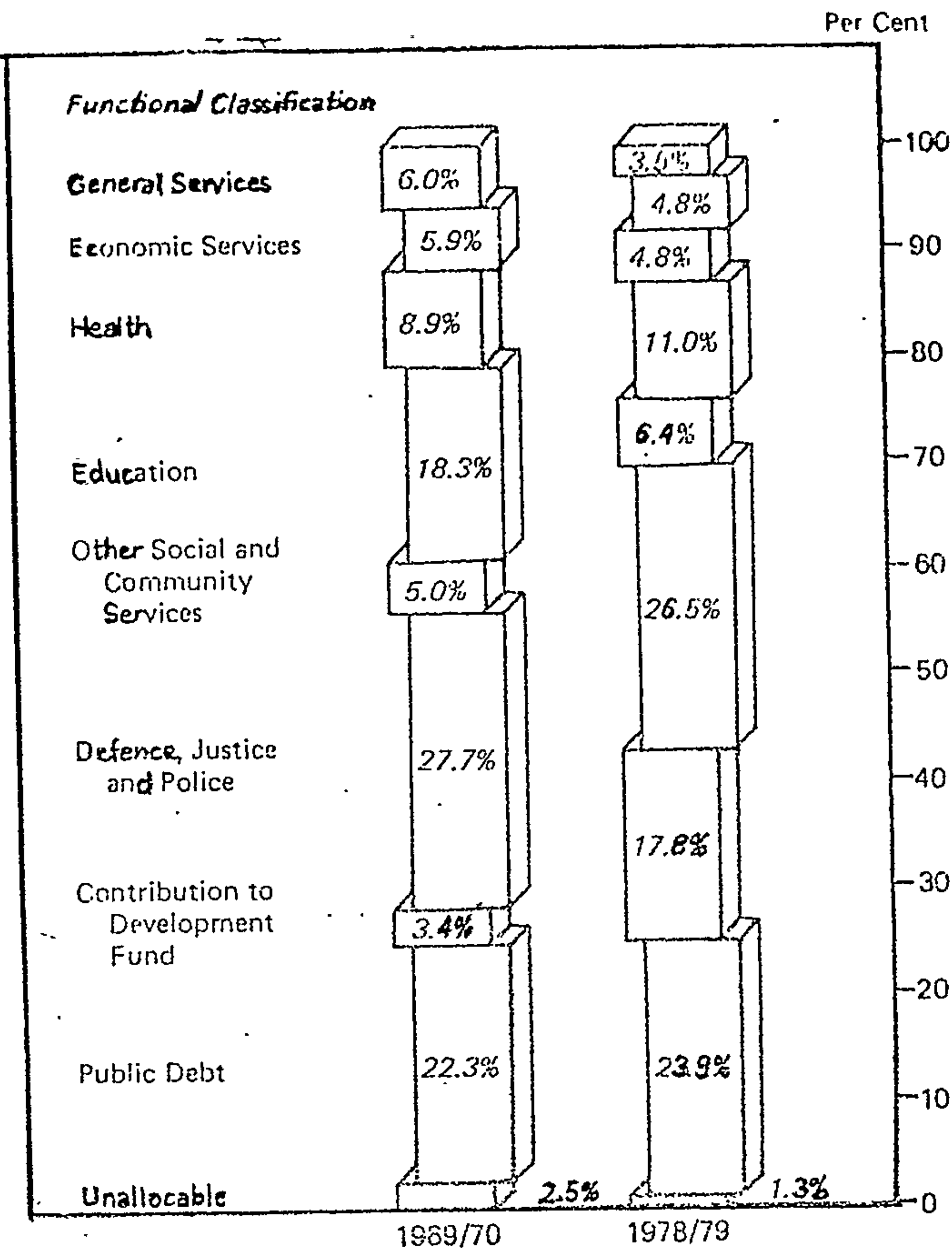


Figure 17: Functional classification of Government expenditure

Source : Department of Statistics, 1980 e

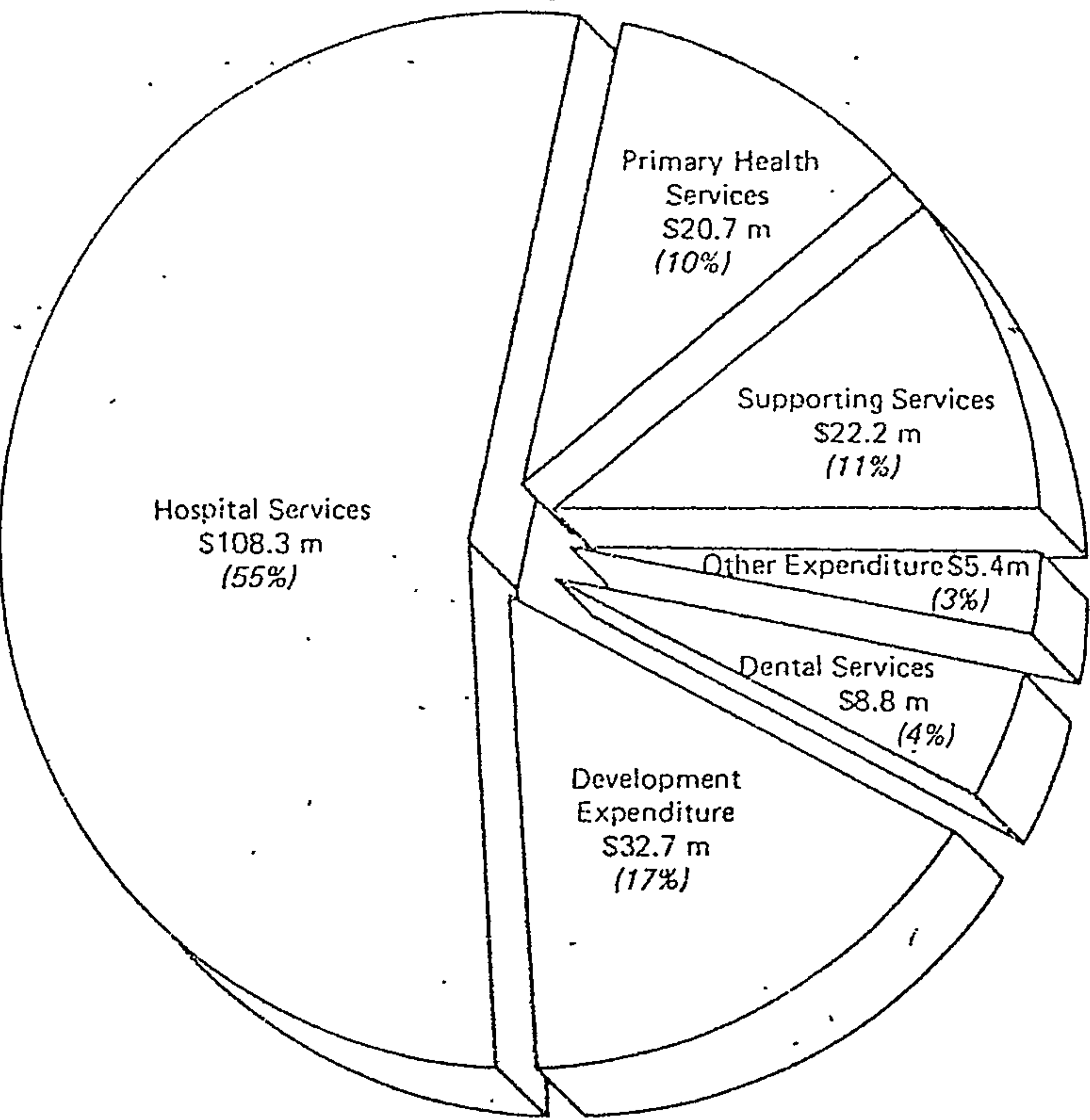


Figure 18: Government expenditure on health

Source : Department of Statistics, 1980 e

will not be able to absorb most of the thirty-five graduates being trained annually. The Government intends to encourage the general public to seek dental treatment at private dental clinics by providing only the minimum basic dental care at most Government dental clinics.

Specialised dental care however will be available in hospitals and with this in mind, the Ministry of Health offers an in-service training attachment to the Postgraduate School of Dentistry, National University of Singapore for specialist training in Oral Surgery, Prosthetics and Conservative Dentistry. Scholarships are offered for overseas training in specialities like Orthodontics and Periodontics which are not available locally. For the next five years at least there will not be any change in the kind of treatment provided though the Dental Branch hopes to see an improvement in the quality of work done.

4.3.2 Philosophy of Dental Care in Private Practice

The President of the Singapore Dental Association (S.D.A) was approached to give his Association's views on dental health care and demand for services in private practice.

The dental profession feels that there is a big gap between needs and demands. This is a subjective assessment as the yardstick of measure is the years of experience as a dentist. Treatment demands however are more sophisticated than the countries around Singapore due to the higher standard of living here. The Singapore Dental Association is willing to fund any research or survey on the dental needs, the behaviour of individuals for their own dental health liabilities and attitudes and opinions about the needs for resources but so far no one has come forward. The Association feels that besides just monetary benefit, some recognition for such services in the form of a prestigious award might induce some dentists to give their time for such work. The general feeling is that more can be done

by the Government and the S.D.A. to increase demand for treatment. Some companies like Colgate - Palmolive of Singapore, through their promotion of fluoride toothpaste have helped to promote dental health care and hence S.D.A. has endorsed their product.

As cost of treatment does affect demand, the profession feels that big organisations and multinational companies should subsidise dental treatment. There are a couple of insurance schemes but these do not seem to be popular. The National Trades Union Congress provides dental health care (Denticare) for its members by employing a dentist and payment is subsidised through the annual union fees.

The scope of services provided in general dental practice would include the whole range of dental treatment, except for orthodontics and major oral surgery. Hence the tendency towards specialising in these fields as seen earlier when dental manpower was described. The profession agrees that services are still treatment orientated. A change towards prevention could come only if S.D.A. and the Government through community efforts can encourage a demand for these preventive services.

On the question of dental auxiliaries, the profession feels that well qualified and properly registered dental technicians are badly needed. Dental nurses are accepted as useful in their role of providing comprehensive dental care for schoolchildren. As long as dental therapists are restricted to working in the public sector, they would be accepted. Private dentists would like to employ dental hygienists but the training of such personnel has not been initiated. The president of the S.D.A. feels that the Association should do this now.

The Association also feels that before politicians can be influenced to be more conscious of dental health

for the public, more members of the profession need to be motivated in community dentistry. In this way more can be done for dentistry as a profession.

4.3.3 Evaluation of Manpower Training (Dentists)

In the absence of an objective collection of data or research this evaluation is very subjective as it is based on opinions.

As far as the Ministry of Health is concerned, the present dental personnel to population ratio of 1:3 000 (including operating dental auxiliaries) is satisfactory, though the ideal would be 1:2 500. The profession would like to reduce the present dentist/population ratio of approximately 1:5 000 to 1:3 000.

All those interviewed agreed that dental graduates were well trained as far as clinical and academic skills were concerned. Another aspect on which all agreed was that dental undergraduates needed training in working with dental auxiliaries, especially chairside assistants and dental technicians. This training is not in the undergraduate curriculum. Most feel that four-handed dentistry should be introduced. This could be feasible if training of the chairside assistants were concomittant with the training of dental students. However they realised that obtaining the finance and auxiliary manpower for the scheme was difficult in the present situation.

Though some University staff and Government officials felt that administrative skills were adequate for Government Service, all agreed that for private practice the management and organisation skills needed to be improved. The Armed Forces ran its own administrative course for all new dental graduates.

Communication skills of the dental graduates were

viewed differently. Some University lecturers and Government officials felt that this was lacking in most graduates and should be taught. Others felt that it was satisfactory though there was always room for improvement. A few felt that this was something inherent in the individual; either you had the flair for communication and motivation or you did not.

As for the presence of a preventive attitude to dental health care, some felt that the Dental School was not doing enough to inculcate this philosophy in the students. Some felt that the students were well versed in preventive concepts. However most felt that the opportunity to practice prevention, either in the Government Service due to constraints of time, or in private practice because of the lack of demand, was not there.

When asked what attributes a future graduate should have, many from the University and Government felt that as dentists, graduates should have more integrity of character, be more socially sensitive and committed to the advancement of the profession. A University lecturer and a senior dental surgeon in charge of dental officers felt that graduates needed more self confidence and the ability to make sound decisions independently. One University lecturer said that dental graduates needed to have a more liberal education and a broader outlook. The S.D.A. felt that dentists should be highly ethical and responsible people as even one unscrupulous dentist could mean a poor image for the profession

CHAPTER FIVE

DENTAL EDUCATION AT THE NATIONAL UNIVERSITY OF SINGAPORE

5.1 HISTORY AND DEVELOPMENT

Practice of dentistry dates back to the time when Singapore was founded by Sir Stamford Raffles in 1819. At that time resident medical officers practiced some form of dentistry. The second decade of the century saw the presence of itinerant dentists mainly from America, France and England who made a circuit of the Far East. Records of several resident dentists with British and American qualifications in private practice, between 1850 and 1920, are present. There were dentists with no qualifications also practising at the same time, as registration of dentists was not required then. (Faculty of Dentistry - University of Singapore, 1979).

In 1924, the Government decided that the public should be protected against the unqualified and incapable dental practitioners and the first Ordinance was passed to provide for registration of dentists and prohibition of practice of dentistry by those not registered. However, this was never fully enforced. (Tay, 1961; Faculty of Dentistry - University of Singapore, 1979).

Because of the need by the population for dental attention from properly trained persons and the appalling standards of dentistry prevailing then, the question of starting a Dental School as part of the King Edward VII College of Medicine was discussed by the Council of the College in 1922. The Dental School first offered its course in June 1926, but there were no applicants.

The course really started in earnest with the appointment of Professor E.K. Tratman as Professor of Dental Surgery in 1929. The course inaugurated was a 5 year course and led to the Diploma of Licentiate in Dental Surgery (L.D.S.). (Tay, 1961; Faculty of Dentistry

- University of Singapore, 1979) The objectives of the Dental School then was to produce graduates of good quality, with sufficient work experience and wide academic knowledge to be able to work on their own. Self confidence and clinical responsibility was to be developed and the primary objective of dental public health to be instilled. (Jansen, 1964)

The large amount of teaching and clinical work that had to be done prevented the commencement of research work in the new Dental School and this has set the pattern through the history of the school. (Faculty of Dentistry - University of Singapore, 1979)

In 1933, the first graduate of the school received his Diploma of Licentiate in Dental Surgery (L.D.S.). At the same time a fresh Ordinance was passed and the 1924 Ordinance repealed. Under the new Ordinance, only those with registerable qualifications could be admitted to the Dental Register. However unqualified dentists who were already in practice prior to the enactment of this Ordinance were allowed to continue in practice under a separate section of the register.

Application to the General Medical Council in the United Kingdom to recognise the L.D.S. was made in 1939. One of the main stumbling blocks to this recognition was removed when the senate of the College of Medicine decided to raise the entrance requirements of dental students to conform to those of medical students in 1941. World War II (1939 - 1945) prevented early recognition of the L.D.S. by the General Medical Council but this was awarded from 1946 onwards.

During the Japanese regime, licence to practice dentistry was issued freely and the result was an increase in the number of unqualified dentists. In 1948, steps were taken to control this when the Government

passed the Registration of Dentists Ordinance 1948, repealing the 1933 Ordinance. The group of unqualified dentists licenced by the Japanese submitted a petition to be included in the Register. Hence, the Government decided in 1950, despite strong protests by the Malayan Dental Association, to divide the Dentist's Register into Division I for professionally qualified dentists and Division II for those dentists without any basic qualifications, but who practised dentistry as their sole means of livelihood. The second division dentists were admitted into the register provided they passed a qualifying examination and 172 of them were registered.

The University of Malaya was founded in 1949 and the King Edward VII College of Medicine became the Faculty of Medicine with Dentistry as a department within the Faculty. The L.D.S. became the Bachelor of Dental Surgery (B.D.S) as from 1950. (Tay, 1961; Faculty of Dentistry - University of Singapore, 1979).

1950 also saw the retirement of Professor Tratman, and Professor R.J.S. Tickle, with Australian, American and English experience took his place. Staffing problems in the early fifties were solved by the employment of part-time staff teachers from the Government Dental Service and recruitment of staff from Europe, America and Australia. The growth of the Dental School in quantity and quality led to an extension of the existing school building, in 1955. The school was then re-organised into 3 main clinical units viz. Conservative Dentistry, Oral Surgery and Prosthetic Dentistry. (Faculty of Dentistry - University of Singapore, 1979). In 1962, Preventive Dentistry was added as a Unit in the Department. (Jansen, 1979).

Concerted efforts were made to obtain Faculty status during 1965 - 1966. This was achieved on 16th September, 1966, seven years after it was proposed to the senate in

1959. The four units of the Department of Dentistry became separate departments in the Faculty of Dentistry.

With the separation of Singapore from Malaysia in 1965, the University of Malaya became the University of Singapore and the southern branch of the Malayan Dental Association became the Singapore Dental Association.

Significant changes occurred to the dental curriculum in 1969 and 1970 with the discontinuation of first year courses of study and the abolition of the Preventive Department respectively. The School of Postgraduate Dental Studies was established in 1970.

The Bachelor of Dental Surgery continued to be recognised by the General Dental Council of England after the report and observations made by representatives of the Council in October, 1976. Currently, the Dental Faculty, set up within the General Hospital, graduates about thirty-five dental surgeons per year and makes a significant contribution to the dental health care in Singapore and South East Asia. (Faculty of Dentistry - University of Singapore, 1979).

5.2 FUTURE DEVELOPMENT AND AIMS

In 1974, plans were made for a new teaching hospital and this would include a New Dental Faculty Building which is expected to be completed by 1985. (Faculty of Dentistry - University of Singapore, 1979). The new Faculty will have facilities for an intake of sixty students and an envisaged strength of thirty-two academic staff. (Tay, 1979). However, due to problems of inadequate staffing and the current training of dental therapists, the Faculty has decided on an intake of forty-five students when the Dental School moves to Kent Ridge.

The academic development of the Faculty will depend on the future dental curriculum. Hence the Faculty of Dentistry has appointed a Curriculum Review Committee to review the present curriculum and design a curriculum for the new school at Kent Ridge. This committee has done the very essential job of formulating objectives of the undergraduate dental education. The objectives adopted by the committee on 11th December 1978 are:

1. A thorough understanding of the biological and physical sciences to enable the integration and correlation of these basic sciences with clinical practice.
2. Competence in diagnosis of oral and dental diseases including an understanding of the relationship between general and oral diseases.
3. Skill to perform well the preventive and treatment services commonly required in general practice.
4. The ability to organise and administer a dental practice efficiently.
5. Ability to critically appraise and apply research findings and motivation towards continuing education.
6. A sense of professional, ethical and social responsibility.

The objectives formulated, considered the objectives of the Ministry of Health which is to encourage more dentists into private practice.

In the Golden Jubilee publication of the Dental School - Dental Education in Singapore - The First Fifty Years, the Dean of the Dental Faculty, Professor Edmund Tay had this to say about the future development of the Faculty of Dentistry:

"In most dental faculties, Conservative Dentistry and Prosthetic Dentistry take a major share of the total number of hours spent in the four years of a dental course. Currently the trend is towards the increased use of auxillary personnel, training in hospital dentistry, practice management and emphasis on preventive dentistry, periodontics and pedodontics. Accordingly, more should be allocated to these areas. Furthermore with the creation of another category of dental auxiliaries in Singapore, namely the dental therapists, we should consider reducing the number of hours spent on that part of the dental curriculum relating to mechanical aspects of dentistry.

If Dentistry is a true function of higher education and if dental educators believe that the development of the intellectual aspects of dental education is as important as the development of skills then the aim of the dental faculty should be the development of biologically orientated, technically capable, socially sensitive dental surgeons, who are keenly aware of the significance of their potential contribution to the total health of their patients. These dental surgeons should not only have the self confidence in their ability to render service but should also be aware of and be dissatisfied with their limitations. They should be prepared to assume major responsibility for their continuing development toward a well-rounded professional man."

5.3 RECRUITMENT AND ADMISSION

The Dental Faculty hopes to recruit about thirty-eight students per year until 1985 when this will be increased to forty-five when the Faculty moves to its new premises. The criteria used to ensure an intake of quality students are:

1. Grades - The total score of points required before a student can be admitted into the undergraduate course in Dentistry is high compared to other courses.
2. Manual Dexterity tests - which give an idea of the students ability to use their hands.
3. Interviews - This is a two-way process where the University ascertains that the student is really interested in Dentistry and not enrolling because it is a professional course, and also to inform the potential undergraduate about the dental career.

No active recruitment takes place. An annual career guidance lecture is given to all Pre-University students who are waiting for their Advanced Level General Certificate of Education results. This lecture informs them about Dentistry, besides other vocations and only interested students attend this talk. The Singapore Dental Association has a career guidance committee which gives talks to some schools on request. According to the Vice-Dean, the Dental Faculty is thinking of giving talks to individual schools in order to attract intelligent and capable students into the course.

A candidate for admission must have passed the prescribed University Entrance Examination or any other examination declared by the senate, at the prescribed level. The Senate Admission Selection Committee should be satisfied with the candidate's proficiency in oral English and standard of health. Additional requirements

in the case of Dentistry would be Advanced Level passes in Chemistry or Physical Science and Biology or Zoology. Physics should be passed at least at Ordinary Level if Chemistry was taken instead of Physical Science. One other subject should be passed at Ordinary Level at least. (National University of Singapore (NUS), 1981). These additional requirements are important as the Dental course which was originally five years was reduced to four years, eliminating the first year courses of study—Chemistry, Physics and Biology.

5.4 CURRICULUM OUTLINE AND REQUIREMENTS

The curriculum outline and requirements are presented from information obtained from interviews with staff members and from Statutes and Regulations (1980 - 1981) of the National University of Singapore. Detailed syllabus of a course is given where there might be a possibility of overlap with the contents of Preventive Dentistry and Dental Public Health courses, as these will help the formulation of guidelines for this aspect of dental education which needs to be emphasised in relation to dental needs and conditions in Singapore.

The course of study for the degree of Bachelor of Dental Surgery at the National University of Singapore is about four years. No candidate is permitted to take more than seven years to complete the prescribed course of study. The students do the pre-clinical subjects in the first two years and the clinical courses in the third and fourth years.

The first Professional Examination after the first year tests them in Anatomy, Physiology, Biochemistry, Dental Anatomy and Histology. In the second Professional Examination, at the end of the second year, the subjects assessed are Dental Materials, Pharmacology, Pathology and Microbiology.

Basic sciences like Anatomy includes Histology, Embryology and Neurology. Fundamental principles of human and oral physiology are taught in Physiology. Biochemistry includes nutrition, general chemical nature of substances of physiological importance, certain physico-chemical aspects, functional aspects (digestion, absorption, elementary metabolism and regulation and excretion) and biochemistry of dental structures.

Dental Anatomy and Histology, the only subject

taught in the first year by dental staff members includes morphology of teeth (especially the ethnic variations seen in Singapore and Malaysia); oral physiology; development; calcification and growth of teeth and jaws before and after birth; theories of mechanism of eruption; shedding of deciduous teeth; radiographic appearance of normal jaws and dental tissues; histology of oral tissues; histophysiology of functional changes in oral tissues; comparative dental anatomy and homologues of human dentition.

The Dental materials course consisting of one lecture and one practical class weekly extends over three terms of the second year. The students are expected to keep adequate records of the practical work done. Pharmacology also extends over three terms and totals approximately sixty hours, consisting of lectures, practical classes and demonstrations. The emphasis here is on the provision of a sound framework of scientific knowledge which the student can use to make his clinical assessment of drugs and to keep abreast of new developments as they occur. In the Microbiology course, students are introduced to infection and immunity and this leads to a systematic study of pathogenic organisms. The course covers the epidemiology, laboratory investigation and prophylaxis of more important communicable diseases. Ninety hours of lectures, tutorials and practical classes in Pathology, bring the students up to date with the principles of pathology, disturbances of nutrition and metabolism and disorders of growth and neoplasia. They are also taught elementary systematic pathology as well.

The third Professional Examination examines the clinical subjects of Medicine, Surgery and Oral Pathology, the first two comprising of a three hour paper, a clinical and oral examination each. Oral Pathology is examined in a three-hour written paper called Oral Surgery Part I.

There is a practical and oral examination as well. The course in Medicine totals one hundred and twenty hours and includes systematic lectures in Internal Medicine and Paediatrics together with clinical examination of patients. The Surgery course totalling ninety hours covers fundamental surgical conditions including trauma, surgical conditions of the head and neck, particularly the oral cavity, surgical conditions of the chest which are of relevance to dental practice and elementary orthopaedic and otolaryngologic conditions. The Oral Pathology course extends over three terms of the year and includes lectures and practical classes which cover developmental anomalies of teeth, jaws and associated parts; affectations of tissues of teeth (for example dental caries and periodontal disease); infection and its sequelae; oral cysts and tumours and bone diseases.

The Final Professional Examination assesses the culmination of a dental undergraduate's academic knowledge and technical skills. There are four papers in this examination; Operative Dentistry I and II, Prosthetic Dentistry and Oral Surgery. II. For Operative Dentistry, besides the written paper, students undergo a practical examination and / or clinical and oral examination as determined by the examiner. Prosthetic and Oral Surgery examinations include clinical examinations and oral examinations as determined by the examiner together with the three-hour written paper.

Operative Dentistry is taught over the second, third and fourth years. The Operative technique course is given during the second year and amounts to approximately four hundred and fifty hours. A certain schedule of work must be completed and students must pass a practical technique examination before proceeding to do clinical work. The course in the third and fourth year in Conservative Dentistry totals approximately one thousand

hours. Clinical requirements must be completed before sitting for the Final Professional Examination. The syllabus includes diagnosis, charting, treatment planning and patient management, psychological and operative procedures in general practice; control of pain; endodontics and advanced dental work.

Prosthetic Dentistry spans the first to the fourth years of the Dental course with technique work being done in the first and second year and amounting to about three hundred hours, and clinical together with laboratory work in the second, third and fourth year totaling about six hundred hours. Together with the Dental Materials course the Prosthetic course does not exceed one thousand hours. Clinical requirements of adequate standard must be completed before a candidate can sit for the Final Professional Examination.

Tutorials, clinical demonstrations and lectures totalling approximately two hundred hours of oral surgery are given during the third and fourth year. Clinical requirements include attendances at the oral surgical outpatient clinic, assisting in the operating theatre, practice of exodontia under local and general anaesthesia and performance of a number of minor oral surgery procedures. Other short courses taught and assessed in Oral Surgery Paper II are Anaesthesia, Radiology and Oral Medicine. Oral Medicine lectures are given in the third year and the clinics in oral diagnosis and treatment planning are held in the fourth year.

The Periodontics course is given during the third and fourth year through lectures, tutorials, demonstrations and clinical practice. The clinical practice extends over six terms and the total course approximates one hundred and fifty hours. The course involves the study of normal and pathological tissues of the periodontium; the etiology and classification of gingival and periodontal diseases;

the application of basic principles of periodontology in the examination, diagnosis, prognosis and treatment planning of periodontal patients; oral physiotherapy; treatment of soft tissue lesions and osseous defects and deformities; muco-gingival surgery; trauma from occlusion and occlusal equilibration and periodontal splinting. Students are expected to provide periodontal treatment if required to all patients assigned to them in the clinic. Questions on periodontics will be set in Operative Dentistry Paper II.

Pedodontics and Orthodontics also total one hundred and fifty hours each, of lectures, laboratory techniques and clinical demonstrations. Treatment of child patients is done in the fourth year for pedodontics. Clinical requirements of adequate standard must be completed for both subjects before the final examination. Questions on Orthodontics will be set in the Prosthetic Paper while Pedodontics is assessed in Operative Dentistry II.

The Orthodontic syllabus includes the study of growth and development of cranial, facial and oral structures; physiology of the stomatognathic system; physiology of tooth movement; classification, aetiology and diagnosis of malocclusion; case analysis; general principles of orthodontic therapy and the use of removable appliances with particular reference to general practice.

Child behaviour and management, occlusion and space maintenance, cavity preparations for primary and young permanent teeth, pulp management, preventive measures related to pedodontics, patient-parent health education, diseases and development syndromes related to pedodontics form the course content for pedodontics.

Preventive Dentistry and Dental Public Health both occupy approximately fifty-five hours of the course in the third and fourth year together. About twenty

preventive lectures are given in the third year and another twenty lectures in Dental Public Health in the fourth year. Tutorials for both subjects are held in the fourth year. During the vacation, field trips are arranged to the water fluoridation plant, child health centre and dental auxillary training school.

The Preventive Dentistry syllabus covers application of basic sciences in maintaining the health of oral tissues; principles and control of dental diseases; the aetiology and prevention of dental caries; Dental health education as a preventive dental service; the metabolic and dental aspects of fluorides in the control of caries and incorporation of preventive dentistry into office practice. Clinical aspects are stressed and carried out in the treatment of children and adults.

The Dental Public Health course covers Dental public health principles, basic elements of administration of dental services including planning, operation, evaluation and quality controls; distribution and quantity of services, personnel and cost of services. Epidemiology of dental caries, periodontal diseases and other dental conditions together with statistics are done, briefly. Questions on these subjects are set in Operative Paper II.

Part of the topics of Dental public health is covered in Ethics, Jurisprudence and Practice of Dentistry which is run as a series of twenty lectures in the final year. The history of dentistry; Ordinances covering dental practice in Singapore and Malaysia; legal responsibilities of dentists to the public; the ethics of dental practice towards the public and conferees; private enterprise; locums, assistantships, partnerships and group practice; payment for services; principles of record and book-keeping; accounting; organisational problems in private enterprise; dental auxiliaries and their functions in dental practice make up the syllabus for the course.

Questions are set in Oral Surgery II.

Psychology is given as a series of seven lectures by a psychiatrist in the final year but the student's knowledge in this field is not evaluated.

The present curriculum and course requirements in Dentistry are very much treatment orientated and had been planned to produce graduates with good technical skill and adequate academic knowledge to meet the backlog of needs which prevailed earlier in Singapore. The following table gives the approximate time allotted to clinical subjects in the third and fourth year and clearly shows the emphasis given to operative and prosthetic work.

TABLE XXIX

Clinical subjects in the third and fourth year.	Hours
Prosthetics	413
Operative Dentistry	1000
Oral Surgery	200
Anaesthesia	
Radiology	65
Oral Pathology	
Oral Medicine	
Medicine	120
Surgery	90
Periodontics	150
Pedodontics	150
Orthodontics	150
Preventive and D.P.H.	55
Ethics, Jurisprudence and Practice of Dentistry	30
Psychology	7
Total	2430

Time allotted for clinical subjects - third and fourth years

A total of two thousand four hundred and thirty hours is approximately equivalent to two calendar years.

Due to the lack of a Preventive Department, subjects which should be assessed together as preventive subjects are assessed in different papers; such as Orthodontics in the Prosthetic paper, Ethics, Jurisprudence and the practice of Dentistry in Oral Surgery II and Pedodontics, Periodontics and Preventive together with Dental public health in Operative Paper II.

5.5 POSTGRADUATE AND CONTINUING EDUCATION

Postgraduate education began in 1949 when the University of Malaya was founded and the Dental School became a department within the Faculty of Medicine. The degree of Master of Dental Surgery was then introduced together with the change of Licentiates of Dental Surgery to Bachelor of Dental Surgery.

However during this period, the attainment of this higher qualification did not necessarily reflect the attainment of a specialised professional skill and the degree of Fellowship in Dental Surgery from one of the Royal Colleges of Surgeons in the United Kingdom was preferred. Hence the only graduates attempting the M.D.S. were academic staff of the Dental School. As the F.D.R.C.S. required travel abroad and financial commitment, very few graduates had postgraduate qualifications. From 1949 - 1970, seven local dental surgeons were conferred with the degree of M.D.S. and twelve local dental surgeons acquired the F.D.R.C.S. (Faculty of Dentistry - University of Singapore, 1979).

In 1970, the School of Postgraduate Dental Studies was formally established. The objectives of the School are:

1. to provide specialist training in dentistry and courses leading to postgraduate qualifications in dentistry,
2. to provide continuing dental education and
3. to develop research in dentistry.

The higher professional qualifications of Master of Dental Surgery, Doctor of Dental Surgery (D.D.S.) and Doctor of Philosophy (Phd.) are awarded by the Dental School and are open to dentists who possess recognised dental qualifications and fulfil the entrance requirements laid down by a Board of Postgraduate Dental Studies.

The Board of the Postgraduate Dental Studies determines the policies of the School and the School's programmes and is responsible to the University Senate. It comprises of representatives from the University, Singapore Dental Association and Ministry of Health. Committees appointed by the Board organise courses leading to postgraduate qualifications. (N.U.S., 1981).

The School's predominant role is to provide training programmes and courses to prepare candidates for the M.D.S. examination. These continue to be organised and conducted by staff of the three undergraduate departments in close liaison with para-clinical and basic sciences staff within the Medical Faculty, as well as experienced specialist practitioners from the private sector. The M.D.S. is offered in the three specialised disciplines viz. Operative Dentistry, Oral Surgery and Prosthetic Dentistry.

Present constraints of limited manpower resources and facilities prevent the School from offering training and certification for Orthodontics, Pedodontics, Periodontics and Public Health Dentistry.

The School has also granted clinical attachment to dentists from surrounding countries who seek further professional expertise and knowledge in clinical and laboratory dentistry. To foster links with international dentistry and provide fresh insights into a wide range of topics and the practice of dentistry in other countries, public lectures by distinguished personalities in Dentistry from overseas are held whenever opportunities permit.

Continuing education is provided through the organisation of short refresher courses for general practitioners in the various disciplines in dentistry. A brief survey of course attendances in 1975 indicated a preference for courses which facilitate quicker methods

in clinical practice. Courses which merely promoted the updating of knowledge for its own sake appeared to have less appeal.

There is a need at the School for carefully planned research programmes. Staff at the Dental School are aware of the dual responsibility of training and research, but lack of appropriate facilities, properly trained personnel in scientific methodology and continuing loss of staff are some of the factors that contribute to this relative lack of development of research in Dentistry, in Singapore, today.

Students emerging from clinically-orientated curriculum tend to possess a narrow outlook on research, having had little opportunity and encouragement to participate in research projects themselves. (Chan, 1979). The few who contemplate research are disadvantaged by going through a training process which is very mechanical and does not teach them to be critical enough of accepted theories or to analyse the knowledge gained.

Hence, the Director of School of Postgraduate Dental Studies in 1979, Associate Professor Chew Yew Ai adds in her report of Postgraduate Dental Education in Singapore:

"Efforts should be made to develop the research-oriented teacher who can generate enthusiasm for research activity, and impart to the dental curriculum not just clinical training and transmission of knowledge but also the necessary stimuli to inspire his students towards a positive role in research. Students who benefit by this more 'optimum' dental education will graduate with the necessary knowledge and ability for dental practice yet at the same time be curious enough to continue their thirst for knowledge they have assimilated, and zealous enough to strongly desire to participate actively for the advancement

of knowledge in dentistry.

Unless and until the research aspect of dentistry is strongly developed, a healthy graduate school cannot become truly established."

CHAPTER SIX

DISCUSSION ON DENTAL EDUCATION REQUIREMENTS RELATED TO DENTAL NEEDS AND CONDITIONS IN SINGAPORE

The presentation of different facets of dentistry and dental education in Singapore gives an indication of the Government, professional and community attitudes to dental health care. One feature that stands out is the lack of commitment and interest in organised dentistry. The need for increasing dental awareness is recognised by the profession but an inertia exists in reviewing and improving the situation. There is general agreement that existing dental care is treatment orientated and that the dental graduate is considered competent as far as clinical skills are concerned, but surely the practice of dentistry means much more than this.

Dentistry is a segment of our society and unless it reorientates its position, it will not achieve the fulfillment of its potential as a profession. This is not to discount the vocational aspect of the dentist's work, which forms a significant portion of the dental education. But vocationalism, pragmatism and empiricism are too limiting for a profession which wishes to call itself learned. The learned man must possess an insight into the problems of the world around him, an insight into human relationships and an appreciation of humane problems and feelings. He needs not only to know skills but how to use them and when. Dental education being an integral aspect of the dental profession must therefore reflect the objectives of that profession. (Durocher, 1970).

As Floyd F. Dewhirst of the American Dental Association states, Dental education's basic responsibility seems to be three-fold: to educate dentists and auxiliaries to meet the dental care needs of the public, to provide new knowledge through research and to offer services to both the

profession and the public. Dental education is accountable for the educational process and the product. Thus decisions made within the realm of dental education are critical in determining how well the dental profession satisfies public demand. (Dewhirst, 1977).

Dr. Dewhirst also mentions two challenges faced by dental educators which we think are relevant to Singapore:

1. Education must assure that they provide future dentists with an education that is comprehensive and incorporates the latest advances in basic health sciences and clinical dentistry.
2. They must assure that the practitioners and the profession at large are prepared to deal with societal demands for dental care. (Dewhirst, 1977).

The Council on Dental Education of the American Dental Association in its report of the Dental Schools Curriculum Survey in the United States in 1976, concluded that no 'typical' curriculum can be applied to dental education. However to meet the 'challenges' of dental education and to improve the quality of dental care in Singapore, certain dental education requirements are suggested and discussed.

6.1 COMPREHENSIVE PATIENT CARE

The aims of the Dental School in Singapore and the philosophy of the Ministry of Health point to the development of competent general dental practitioners. By increasing the supply of dentists in private practice and the training of dental auxiliaries, the Government hopes to reduce the cost of dental care. Slowly the Government also hopes to make the people responsible for their own health. If the aim of the Ministry of Health is to provide a comprehensive health service with strong emphasis on primary health care (Ministry of Culture, 1980), it logically follows that in dentistry too, primary dental care should assume importance.

After two workshops, held in 1975 and 1976, to project future roles for dentistry in primary health care delivery in America, the definition of primary dental care was given as "a continuing management and co-ordination of health services provided by a dental care provider system of first contact for the maintenance of health, prevention of disease and injury and the restoration of health. It includes appropriate assessment of general and oral health status; provision of oral, diagnostic, preventive, educational and therapeutic services, and the referral and co-ordination of episodic speciality care." Primary dental care is comprehensive general dental care but the scope has been extended to contribute to the general health of dental patients. (Loupe, 1978).

This expansion of the scope and role of the dentist is required because:

1. Dental training programs should be geared to fulfilling public need. (Nuffield Foundation, 1980; Rovin, 1977). At a period where means are available to prevent development of dental caries, when most of the adult population has some form of periodontal disease that can be prevented (or

detected early enough to matter), when only a small percentage of the population has access to orthodontic treatment and a large number of people annually develop oral cancer, which is largely preventable and thousands more have a variety of undiagnosed systemic problems that can be easily detected by the dentist, the end result of most training programmes is still a person who concentrates on the repetitive procedures of restoring diseased teeth. (Rovin, 1977)

2. The different operating auxillaries at present in Singapore not only cost the Government less to educate and train, but also take over most of the routine work which the dentist spends a great deal of time on. The paradox of dental care being largely manual when its practitioners have been selected for their intellectual attributes, needs resolution by concentrating on the intellectual element and delegating much of the manual component to the auxillaries. The Dean of the Dental Faculty in his report on the future development of dentistry in Singapore has also stressed that there should be a reduction in the training of the mechanical aspects of dentistry, in consideration of the dental auxillaries being trained.
3. Faults of the delivery system, namely the fragmentation of care is responsible for both the inaccessibility and the escalation of costs to the consumer. Expanding the limits of capability of the general practitioner into what is currently the realm of the specialist will give a greater chance for the patient to receive comprehensive care at the first stop - the primary care practitioner. (Rovin, 1977).

If emphasis is to be on management and co-ordination of dental care the primary area of expansion is diagnosis. (Loupe, 1970; Rovin, 1977). During the past ten to

fifteen years, in the United States, a need has been defined for increased emphasis on both in-depth knowledge and clinical application of pathology for the practitioner dentist. As the concept of total care developed, it became apparent that the oral cavity was another body structure suffering from the same diseases as other structures. The dentist is the logical person to diagnose and treat disease in this location. In very recent years, sections in certifying examinations dealing with oral pathology and diagnosis have been increased in scope and depth to ensure that the dentist going into practice is truly qualified. At the same time, dental schools have recognised a responsibility in this area and responded accordingly. (Council on Dental Education, 1977).

The second largest cause of dental malpractice suits today is the "failure to diagnose" a pathologic situation. This involves not only serious diseases like oral cancer but also less serious problems such as periodontal disease. Consequently it is essential that the practitioner be prepared. (Council on Dental Education, 1977). Diagnosis can be separated into two parts: the interpretation of data, and, judgement. Interpretation of data, gathered through history-taking, physical examinations and laboratory tests can be taught, but learning to make judgements can happen only in an environment or curriculum whose experience with many and varied patients can be obtained. (Rovin, 1977).

The dental curriculum in Singapore should provide students with the opportunity of providing comprehensive patient care not only to all population age groups but also to the handicapped and medically compromised. It is assumed that dental practitioners, who as students had experience in caring for such patients will be prepared emotionally, technically and professionally to manage special patients and to interact with other health disciplines (medicine, psychiatry, nursing) in caring for such patients in a setting and manner appropriate to the patient's disabling

condition. Preliminary evaluation of the practices of recent graduates in the United States, suggest that students who have had these special experiences do tend to care for the handicapped and the disabled better than other graduates who were not provided with these experiences. (Council on Dental Education, 1977).

The primary care practitioner of the future in Singapore will be concerned with technical skills but should graduate with an increased capability in endodontics, periodontics, pedodontics and orthodontics. The efforts made by the Training and Health Education Unit of the Ministry of Health to raise the health consciousness of the people, and the rising socio-economic standards with better education levels would result in more sophisticated treatment demands. Thus, the above mentioned skills would assume greater importance.

Preventive measures like fluoridation of water, school dental programs and use of fluoridated toothpaste have slowly increased the resistance of teeth to decay. This is shown by the substantial reduction in caries experience after sixteen years, as seen in the earlier account on the effects of preventive measures. However, the prevalence of periodontal problems are still high as indicated by the National Dental Survey on Schoolchildren in 1970 and the two surveys on National servicemen in 1967 and 1979. A curricular change that must be high-lighted in the development of a primary care practitioner is the emphasis on periodontics, with particular accent on diagnosis and prevention.

Though essential, a topic like growth and development of jaws is taught in Dental Anatomy and Histology, and again in Pedodontics and Orthodontics. To eliminate this duplication, an amalgamation of Pedodontics and Orthodontics into Pediatric Dentistry is suggested. Pediatric Dentistry,

a new concept in America, emphasises the development of the human organism from conception to adulthood and includes growth and development, interceptive orthodontics and pediatric oral medicine. The concept also entails a de-emphasis on restorative dentistry for children but still includes patient management as a fundamental. (Rovin, 1977).

Time saved by reducing this duplication could be used to increase the skill of management of young patients and the scope of dealing with orthodontic problems.

If the main function of the Oral Health Service is to provide comprehensive dental care through diagnosis, proper sequence of treatment and appropriate instruction in preventive dentistry (Winer, 1976), prevention must assume an eminent position in the curriculum throughout the development of the primary care practitioner. But to be learnt and later practiced efficiently, the subject matter of prevention must transcend the individual departments and be woven into the fabric of the entire curriculum. (Rovin, 1977; Diefenbach, 1973). Also it must be valued by the faculty. The failure of prevention to take hold in practice can be traced to the cursory manner in which it has been taught and its relative unimportance to the faculty. (Rovin, 1977). At the Dental Faculty in Singapore, students are introduced to clinics first in the department of Prosthetic Dentistry, which deals with the utmost in destructive dentistry - replacement of missing teeth.

The philosophy and practice of dentistry would take deeper root in dental graduates if instead they were exposed to the practical aspects of prevention at an early stage and the opportunity taken to stimulate dental students by projects concerning prevention. (Nuffield Foundation, 1980; Moore, 1976). A survey of prevention in the fifty-nine American schools in 1976 shows that of the curriculum time

given to Preventive Dentistry, a significant majority occurs early in the dental students career. On the average, the proportion of the total Preventive Dentistry instruction is divided among the four years as follows: first year 51 per cent, second year 23 per cent, third year 15.5 per cent and fourth year 10.3 per cent. (Ayers, 1979).

One sees a close relationship between public response to preventive measures and maintenance of oral health, and the educational background and professional philosophy of the practicing dentist. (Applewhite, 1969). Hence, dentists in Singapore should practice this philosophy of prevention and increase the awareness of dental health in the public through their own efforts instead of giving this as a reason for not practising preventive dentistry. As related in the account on preventive services in Singapore, a number of preventive measures have been instituted, but utilisation of the Government dental clinics seems to indicate that these measures have failed to instil a preventive attitude in the demand for dental care by the community. The individual dentist can do more in this respect by his approach to treatment and a sincere involvement in the organised community efforts to promote dental health. It is the responsibility of the dental faculty to inculcate this attitude into the students.

The age shift in the population with an increasing number of elderly people will mean a more observant and responsive care of the elderly. The problems of providing the first full dentures for the aged are formidable and will require detailed study by the practitioner. Also for some time to come there will be a continuing requirement for renewal of full dentures already in use. (Nuffield Foundation, 1980).

Students should also be exposed to more instruction in Oral Surgery procedures (Nuffield Foundation, 1980; Council on Dental Education, 1977), if they are to deal

with minor oral surgical problems in their future practices. Comprehensive care for the patient would also require dental students to be sufficiently aware of the seriousness of the implications for dentistry of the widespread practice of prescribing medicines and of self medication with the consequent risks of drug interactions and drug allergies. To meet their responsibilities dentists must be encouraged and enabled to keep up to date. (Nuffield Foundation, 1980; Council on Dental Education, 1977).

"A more complete and widely accepted commitment by general dental practitioners towards patient care, follow-up and overall evaluation is necessary. Whilst many no doubt currently feel a moral responsibility for continuing care of patients, there is no contractual requirement at present for a dentist to do any more than complete the course of treatment upon which he has embarked. This does not encourage the development of attitudes and standards to which it is believed the profession aspires and that the public has a right to expect." (Nuffield Foundation, 1980). The dental curriculum at present does include recall of patients and evaluation of work done. This practice is good and should be carried on but if we are to emphasise comprehensive care, the curricular design must stress patient needs and health goals as the overriding concern of the oral health care professional and not departmental requirements.

Graduation from dental school depends predominantly on satisfying departmental requirements. The doctrine has been largely responsible for students learning tooth care rather than patient care. (Rovin, 1977). It is quite common to see patients shuffling from one department to another and from one student to another for clinical requirements to be completed. Such patient care produces fragmentation of care and students learn to place greater emphasis on procedures rather than on caring for people.

In the report to the Nuffield Foundation, this

recommendation was made: "whole patient care should be one of the guiding principles of any clinical dental course. . We were impressed with the arrangements made at some schools to simulate general practice in a realistic manner and would wish to see this extended to all schools. Students should be required to spend long enough in such units to get the feel of whole patient care. We are in favour of experimenting with various techniques and arrangements for teaching schools to explore their own means of providing experience of total patient care."

Most schools (46 out of 59) in the United States offer this sort of comprehensive care through an individual practice format. (Council on Dental Education, 1977). An example is Tufts University where in a three year curriculum one thousand and three hundred hours are spent in general clinic. An additional seven hundred hours is spent in speciality clinics with about four hundred hours in extramural programs. The students education and clinical training are geared towards the concept of comprehensive care with an emphasis on preventive dentistry and the promotion of sound oral health. (Winer, 1976).

A few schools (21 out of 59) in the United States are experimenting with providing their students with experience in the team concept or simulated group practice. (Council on Dental Education, 1977). This group practice system involves groups of students caring for groups of patients in contrast to training programs where one student cares for one patient. This involves assigning a faculty member to supervise this group of students (one from each year) who are responsible for the total care of a given patient. The fourth year or senior student is the team teacher and is responsible conjointly with the faculty supervisor for the conduct of the team. (Rovin, 1977).

In Dental Schools, like Singapore's, with limited

staff, this sort of student experience is difficult to implement but there are advantages and it would be beneficial to monitor the progress of these experiments in the United States so that if resources are available, this form of clinical experience could be adapted for use in Singapore.

The advantages of this practice are that the first year students are exposed early to the trials and tribulations of patient management and care even if they are not directly responsible. As the teams meet at least weekly to discuss the progress of the patients assigned to their teams, problems are aired and this offers opportunities for peer-review experiences and allows students to examine the results of patient care, whether their own or someone else's, over a long period of time. This sort of experience also allows for the learning of communicative and interactive skills which are important for group practice and interdisciplinary health care. More patients are seen by the given student too. With the team approach, the orthodontic faculty can consider a substantive orthodontic curriculum as at least some of the members of the team could follow a given patient for three or four years, more than what graduates do now. (Rovin, 1977).

Dental students can also be exposed to community dental clinics under the guidance of dental school teachers or specially recruited teaching associates in the dental practices, health centres and school clinics. (Duckworth, 1974). Under the present system, the final year students visit a private practice for a day, with no opportunity to practice at this extra-mural site and experience real community problems and rigours that go beyond all that protects him in the dental school environment. A period of working at these extra-mural sites followed by discussions of their experiences would not only serve to increase the motivation of the students but will also broaden their perspectives, increase their sensitivity to the needs of

society, develop interpersonal relationships with both auxillary personnel and patients, and increase their confidence in dealing with patients both on an emergency and on a continuing care basis. (Rosenstien et al, 1976).

The Government outpatient clinics and school clinics are good extra-mural experiences for the Singapore dental undergraduates. Private practice experience too will be possible with close cooperation between the Singapore Dental Association and the Dental Faculty. Time may be an important consideration for the provision of these experiences but this can and must be created in the dental curriculum with efficient planning which avoids repetition of instruction and promotes good co-ordination between the various subject teachers. These experiences are essential for the development of a confident 'professional' who can provide optimal comprehensive care to the public.

Besides providing patient care settings that simulate primary care practice settings and a curriculum that includes experiences which emphasise comprehensive care, the criteria for evaluation of a student's capability in delivering comprehensive patient care is important in inculcating this concept in the student. The report by the Nuffield Committee recommends that although various methods of judging students performance cannot obviate the need for a critical appraisal of practical work, emphasis should be on methods designed to assess the varying attributes that together are required for the practice of dentistry. They feel that it is better to test the integration of knowledge and skills by emphasising history-taking, clinical examination, diagnosis, treatment planning and whole patient care. They also attach great importance to the ability to express oneself logically and clearly. (Nuffield Foundation, 1980).

Data from the 1976 Study of Curriculums of the United States dental schools indicated that a number of factors were

important components of the performance standards in comprehensive patient care. These were sequencing of the treatment plan, the recognition of a logical alternative treatment plan, the timely submission of a treatment plan, the timely initial contact with the patient, and the newly assigned patient. Many schools (35 out of 59) also reported some attempt to evaluate the subjective elements (examples: attitudes, values, demeanour and motivation) associated with the delivery of comprehensive patient care. These evaluations present a promising first step towards establishing criteria which members of the National Dental Curriculum Conference defined as both desirable and necessary. (Council on Dental Education, 1977).

Comparison of the oral health status of eighteen year old National Servicemen in 1967 and 1979 seemed to indicate that though more treatment had been received, resulting in less missing teeth, oral health had not improved. The success of any treatment will depend on the cooperation and preventive behaviour of the patient and as this is influenced to a large extent by the dental operator, it is essential in Singapore, to devise some methods to assess these subjective qualities of the dental student. Before we do so the student must be made aware of the close relationship between patient and practitioner. An essential component of our dental education should be a course on Behavioural Sciences or Applied Psychology.

6.2 ESTABLISHING A DEPARTMENT OF COMMUNITY DENTISTRY

If the general dental practitioner is going to be the future lynch-pin in the provision of most dental care in Singapore, he would spend a great deal of time supervising other health care workers as well as managing patients.

"As leader of a team of health care personnel, the dentist will be called upon to use managerial skills and interpersonal skills to maintain a smoothly operating team which can provide a broad spectrum of care. As manager of patients the dentist must be equipped with the basic skills of communication and facilitation and must be able to translate a variety of cues and words into an understanding of patient needs and fears. The ability to manage patients and be responsible for their care should assume primacy in any hierarchy of educational values." (Rovin, 1977).

Leadership and management skills are not acquired automatically upon graduation and cultivation of these attributes should begin in the undergraduate years. (Nuffield Foundation, 1980).

Recent experience in the teaching of Behavioural Science in North America suggests that exposure of dental students to this course is not necessarily a rewarding exercise unless the teaching is closely applied to problems in dentistry. This indicates the need to make teaching programmes of this type in Singapore a conjoint effort between dentists who will present the dental problem and those in other disciplines, especially social scientists and psychologists who will bring their special skills to bear upon it. (Duckworth, 1974).

The dental curriculum in Singapore does include psychology as a short series of lectures, in the fourth year, by a psychiatrist. This is not useful to students for two reasons:-

1. The course is taught at a time when students have

covered a major portion of their clinical training (when most patient interaction has taken place).

2. There is no correlation between Dental Faculty staff and the psychiatrist. Hence material presented is not applied to dental problems and there is no way of evaluating what the students learn in a span of a few lectures.

Ethics, Jurisprudence and Practice Management is also taught in the final year. Most students are concentrating on the clinical requirements during the period when this is taught and as they do not have any experience of private practice, these lectures do not have much significance for them. Also this subject matter is assessed in the Oral Surgery paper instead of the Dental Public Health or Community Dentistry paper. Consequently this topic is hardly assessed. It is not surprising then that the views of all dentists interviewed was that Management and Organisation skills for dental graduates needs to be improved. Many of the professionals, too, wanted to see more integrity of character, more social sensitivity, a sense of pride in the profession and a spirit of inquiry in the dental graduates.

Singapore's dental education closely follows the pattern of dental education in England where most schools "showed a tendency to value highly the teaching of a prescribed body of knowledge and technical skills rather than the inculcation of professional attitudes based on a broad liberal education. Students are taught a mechanistic and quantitative approach to dentistry and it is not surprising that many adopt a materialistic attitude to practice." (Nuffield Foundation, 1980).

Therefore to remedy this situation and stress the professional aspect of dental training, the setting up of a department of Community Dentistry which will be able to co-ordinate and participate in the teaching of

Behavioural and Social Sciences, Dental Practice Management, Preventive Dentistry and Dental public Health, should be considered seriously by the Curriculum Review Committee.

"Community dental health is that branch of dentistry which is practised in relation to populations and groups, which derives from epidemiology an awareness of the services required and which includes the development of the techniques necessary to organise application of these services for the benefit of the population. Its concerns include the health and sickness behaviour of individuals seeking care, their reactions to that care and the evaluation of the effectiveness of the care provided.

In order that practitioners may play their roles effectively, they should understand the structure of the system in which they are working and the direct role that they can play in helping to reduce avoidable dental suffering for all by:

1. maintaining a good standard of therapeutic care;
2. using effective preventive measures;
3. running an efficient practice and working closely with all groups concerned with health and social services;
4. making their practices accessible, available and acceptable to all members who demand care, giving priority to groups such as the elderly and people with disabilities." (Sheiham, 1981).

To instil such values all dental students should be exposed at an early stage to the problems of community dental health. They should have early contact with selected groups of subjects from all age groups, socio-economic backgrounds and ethnic origins so that they can learn about dental disease in the context of general health and life styles of different groups. (Nuffield Foundation, 1980). Besides experiencing this through the treatment of

patients in the sheltered environment of the University, the extramural experiences cited in the previous section, as necessary, will help to develop these qualities and should be arranged by the Department of Community Dentistry.

In Singapore one of the deterrents to patients seeking professional care to adopt habits and practices which help preserve oral health, is the cost of dental treatment. Dentists also don't practice preventive dentistry because it is not financially rewarding and are waiting for the Government to increase public awareness and demand for preventive treatment. This constitutes a problem in community dental health which the profession could seek to remedy if it paid more attention to the question of the effect of patient charges and investigated alternatives of financing which would encourage the practice of preventive dentistry. Students must be trained to think of the problems of dental health care delivery, not just the technical aspects and a Department of Community Dentistry would be needed to give impetus to a dental curriculum that motivates the student in this direction.

This process of cultivating awareness of the world outside the dental school could be encouraged by having a community laboratory, which should consist of a well-defined community close to the dental school. In co-operation with the community, field trials of new preventive and therapeutic measures can be conducted. Students can participate in:

1. the development of the community profile,
2. social and dental surveys,
3. education for dental health,
4. treatment services for priority groups and
5. evaluation of the effectiveness of dental services.

In the community laboratory, the dental school can take responsibility for dental care of the population besides their current practice of care for the individual. (Sheiham, 1981). These projects and treatments should be conducted

during term but could be conducted during student vacations in a compact four-year course.

This will serve not only to stimulate interest in Dental Public Health as a subject but would also sow the seeds of interest in research and evaluation which are so badly needed in Singapore, judging from the lack of data on dental needs and other characteristics of the population pertaining to dentistry.

In the Dental Curriculum Survey, all fifty-nine Dental Schools of the United States include Behavioural and Social Sciences (which includes Dental Public Health and Practice Administration) in their curriculum. Generally, the average curriculum is reasonably balanced between the basic, clinical and behavioural and social sciences. Though the teaching of behavioural and social sciences is spread throughout the curriculum, the recommendation is a more effective integration of these sciences into the clinical setting and for existing clinical staff to serve as transmitters and evaluators of behavioural and social science curriculum content. (Council on Dental Education, 1977).

With all this call for closer integration of preventive, behavioural and social sciences in the curriculum, it may be argued that there is no need for a separate Department of Community Dental Health. A department of community dental specialists is necessary if these subjects are to be integrated into the curriculum with the proper emphasis. Also this integration and avoidance of duplication needs co-ordination which must be overseen by the department.

6.3 INTEGRATION OF CLINICAL AND PRE-CLINICAL SCIENCES

In the dental curriculum at present, some topics like Development and Growth of Jaws, Microbiology, Applied Physiology and Anatomy are duplicated at a later stage in different courses because the basic health sciences are taught separately in the first and second years. Students normally have memorised this by rote learning because they do not see the relevance of the subjects to dentistry and thus have to be reminded of what they learnt and how to apply them in the clinical years.

Lack of time in the compact four year curriculum was mentioned as a factor which prevented the introduction of new courses like Behavioural Sciences during the interviews. But with better integration of clinical and basic sciences and good co-ordination of the subject matter taught in different courses, a great deal of repetition could be avoided and the time used more efficiently for teaching more relevant courses.

It is only in the third year that preventive dentistry lectures are introduced in the dental curriculum. It covers the application of basic sciences in maintaining the health of oral tissues, principles and control of dental diseases and aetiology and prevention of dental caries. A more efficient teaching of preventive dentistry would be to introduce the subject in the first and the second years when the basic health sciences are being taught. The application of these sciences would then be more relevant to the students with the introduction of the practical aspects of prevention. The didactic instruction in prevention could avoid duplication of the basic sciences topics.

To bridge the gap between basic and clinical sciences, departments of Oral Biology were started in some dental schools in the United States. But the workshop of the National Dental Curriculum Conference which deliberated

over the needs and functions of a Department of Oral Biology, concluded that because of the all-pervasive character of an oral biological concept of dental practice, such a separate department is a transitory phase necessary in schools until sufficiently trained faculty can routinely make basic sciences correlation an integral part of the teaching in all clinical departments. (Council on Dental Education, 1977). It would be more relevant to have dentally qualified basic science teachers and it is equally important to develop clinical sciences faculty with basic sciences orientation. (Nuffield Foundation, 1980; Council on Dental Education, 1977).

The early exposure of students to clinical dentistry and patients would help to sustain student motivation and enthusiasm, encourage the acquisition of practical and caring skills and allow timely initial assessment to be made of each student's suitability for dentistry. (Nuffield Foundation, 1980; Council on Dental Education, 1977; Duckworth, 1974).

As a result of the Dental Curriculum Survey in the United States, some specific recommendations were made which could help in the correlation of pre-clinical and clinical sciences during all four years of the curriculum. Some of these recommendations relevant to Singapore are:

1. Review the sequencing of instruction and make whatever changes necessary to optimise the dental educational environment and produce the best possible graduates.
2. Conduct bioclinical conferences involving students and faculties of both the clinical and basic sciences. These should be problem orientated.
3. Utilise examinations, evaluations and planning for the care of patients as opportunities to correlate basic sciences with clinical experience.

4. Organise preventive dentistry courses and clinical experiences that emphasise the basic sciences concept underlying the clinical experience.

These recommendations are essential to the dental education requirements in Singapore where the changing character of the role of dental practice in response to the changes taking place in the community requires that a strong basic sciences background be reaffirmed as an essential element of dental education so that dental graduates have the maximum ability to adapt to new conditions and demands.

6.4 DENTAL AUXILLARY UTILISATION PROGRAMME

One area which the dental graduate of Singapore was found to be inadequately trained by all members of the profession who were interviewed was their ability to work with auxillaries. The dental practice of the future will be based on team approach, where available resources will be organised to provide an acceptable level of dental care efficiently and effectively. Diagnosis, prescription and quality control of the team itself must be the responsibility of the dentist. (Nuffield Foundation, 1980). For the dental student to be a confident leader he should receive the support of chairside assistants and dental technicians during this training. In this way the whole team learns to communicate and work together. They will not experience the problems of adjustment which arise out of being trained in isolation with limited communication. Over recent years legislation governing the rights of employers and duties of employers have become increasingly complex and the dentist needs to be well versed in matters such as these and the relationship of employers to trade unions. (Nuffield Foundation, 1980).

Implementation of dental auxillary utilisation programmes in Singapore faces two problems:-

1. Obtaining funds to finance the programme.
2. Shortage of auxillary manpower.

The present scarcity of auxillary manpower, especially technicians and chairside assistants needs to be remedied by improving the training, the status and prospects and financial emoluments. The dental profession must accept its full share of the responsibility to maintain recruitment, standards of training and provision of adequate resources.

Though Singapore has a Dental Auxillary Training School for different categories of dental auxillaries there seems to be little communication between the training of dental students, dental auxillaries and the requirements of the

dental practitioners, in terms of dental personnel they would like to work with. The President of the Singapore Dental Association expressed a need for dental hygienists in Singapore but the Ministry of Health had started the training of dental therapists much to the dismay of the profession.

If the team concept is to prevail and the dental practitioners trained to deliver effective and efficient comprehensive care then the Dental Faculty must take steps for close liason and cooperation with the Dental Auxillary Training School. Initially this would include the chairside assistants and dental technicians and slowly expand to dental nurses and therapists. If, as expected, dental health improves, there will be an increasing demand for routine scaling, polishing and reinforcement of the dental health message; tasks which the private practitioner would prefer to leave to the dental auxillary. The dental hygienist who is trained for these specific tasks will be a welcome introduction to the school of dental auxillaries and should be included in the team which the dental student works with during the Dental Auxillary Utilisation Programme (D.A.U.) if this is implemented in the dental school.

In the United States, the D.A.U. programme, which is considered to be a fundamental curriculum component for the future of the modern dental practice, is included in fifty-four of the fifty-nine dental schools surveyed. This programme is now twenty years old. D.A.U. programs use both didactic and clinical instruction and simulation. The primary focus of the programme is clinical productivity which is what most practitioners desire to know. Other concepts taught are operator efficiency, basic principles of D.A.U. and four-handed dentistry.

TEAM programs which evolved out of D.A.U. programmes are designed to teach dental students to organise and manage

a multiple auxillary dental team, utilising expanded function auxillaries and the concept of four handed dentistry. The TEAM personnel includes expanded-duty auxillaries, dental assistants, receptionists, hygienists, business managers and laboratory technicians. The primary focus of the programme is interpersonal skills. These programmes are administered by the Departments of Community Dentistry or Operative Dentistry. Didactic instruction on teamwork and efficient utilisation of dental auxillaries should be carried out, by the Department of Community Dentistry if established in Singapore, in the Behavioural Sciences and Practice Management lectures. The practical aspects can be overseen by the department planning and administering comprehensive care, as the two programmes should be integrated. (Council on Dental Education, 1977).

The dental curriculum in Singapore does not include any experiences of working with auxillaries and should as a start adapt the D.A.U. programmes for implementation. Dental technicians could be employed to perform laboratory work previously performed by students. This would not only simulate the world of dental practice but also help in teaching students to communicate effectively, to write accurate and descriptive laboratory prescriptions and to judge accurately the quality of the services performed. (Council on Dental Education, 1977). This should lead to improved understanding of each other's problems and mutual respect for each other's skill. (Nuffield Foundation, 1980). Another added advantage is the increased time available for patient contact. Students must reach a level of proficiency in performing prosthodontic laboratory procedures themselves before working with technicians.

Contrary to the view that the introduction of these programs would cause further cramming of the already packed curriculum, D.A.U. programmes can actually save some time

to broaden the base of knowledge of the new graduates with relevant courses. Data obtained from student clinics in the London Hospital Dental Institute as part of the work of the Experimental Care Project showed that:

1. Undergraduates of the same seniority require only one third the time spent when operating alone if they operate with the close support of a fully trained dental surgery assistant.
2. Inexperienced junior students working with the close support of the dental surgery assistant require only seventy-eight per cent of the time that their very much more experienced colleagues, (two years their senior) need when they work without such help.

It is suggested that such figures indicate a potential economy in time within the undergraduate course in the region of one and a half years. (Allred, 1978). The time saved seems tremendous but it must be remembered that the chairside assistants are fully trained. With student chairside assistants less time would be saved but still there is a benefit and a reduction in undergraduate, patient and faculty time because of the ability of the students in a controlled way to delegate aspects of patient care in which they have acquired adequate knowledge. It also allows a reduction in stress to operators, of providing patient care in the training situation. (Allred, 1978).

The dental auxillary utilisation programme could be implemented together with the comprehensive care programme where, for a certain period of his training, the student undertakes total patient care in a simulated general practice setting, utilising auxillaries. In order not to cram the undergraduate course, this comprehensive care and D.A.U. programme could also be the basis for assessing clinical competence in preventive dentistry, periodontics and oral diagnosis. Clinical requirements for speciality clinics like Prosthetics and Conservative dentistry could be

reduced as part of that work would be done in the general practice clinic. The benefits of such a programme are:

1. the ability to more easily and effectively teach the whole care of patients to undergraduates,
2. the ability of the undergraduates to accept the responsibility for patient care at levels appropriate to their own development,
3. lowering of barriers between dentists and auxillary personnel through their training together and learning to understand and respect each other's roles, and,
4. an improvement in the management skills learnt by undergraduates. (Allred, 1978).

6.5 INTERNSHIP AND VOCATIONAL TRAINING

6.5.1 Internship

To ensure a smooth harmonious transition from the sheltered environment of the Dental School to the naked reality of dental practice, a period of obligatory, pre-registration year of internship or residency following graduation, with supervised clinical training in all fields of dentistry has been proposed. (Söremark, 1978; Nuffield Foundation, 1980). This is preferred to the lengthening of the undergraduate course to accomodate the increasing scientific, technical and sociological knowledge relevant to dentistry. By introducing this compulsory one year pre-licencing period much of the repetitious practical work and minute details which currently is a necessary component of the course could be delayed allowing for basic principles and techniques with a limited range of clinical work to be covered prior to graduation.

The opportunity then exists for more freedom in the undergraduate course to construct a curricula that "will provide the student with an improved education in scientific and medical subjects of relevance to dentistry, a more considered approach to the philosophical and attitudinal aspects of dental care, time for more reflective approach to study and scholarship, and the encouragement to develop the art and skill of communication and interpersonal relationships." (Nuffield Foundation, 1980).

Singapore did have this compulsory internship in the Government service until about seven years ago when it was scrapped as dental graduates were considered clinically competent upon graduation. Considering the present packed course in dentistry and the necessity to introduce some relevant new programmes into the dental curriculum, it would benefit the society and the profession if newly qualified dentists worked under University-approved appointments in the Government service or the Armed Forces under the

guidance of more experienced supervisors. A rotation to different dental services (school dental services, hospital dental services, outpatient dispensaries) would provide the new graduates with a change in environment and different types of experiences.

Most graduates in the Government service now, are new graduates and the median age of dentists employed is only twenty-eight years. (Singapore Dental Board, 1980). Many hope to gain further training and experience before leaving for private practice. The main reason given by dentists for staying on in the public sector was this opportunity for training and experience. (Ministry of Health, 1976). Compulsory internship would be a needed change which requires cooperation between the University and the Ministry of Health and ensures that the new graduates get the necessary guidance through supervision by experienced practitioners and consultants.

As newly qualified dentists undergoing supervised training prior to registration would be paid less than a licensed dentist, introducing this compulsory internship also provides a means of providing low cost dental care to those who cannot afford private practice charges. Of course it means an initial expenditure by the Government and University to provide for such positions by creating the facilities for such training. In the long term, this would be of advantage to the Government who is presently trying to economise in the use of manpower due to the rising costs of highly skilled labour.

6.5.2 Vocational Training After Internship

Another suggestion by the Nuffield Committee is a two-year vocational period of training in a general dental practice (Government or private), in addition to the pre-registration internship before a dental graduate is allowed to become a principal dental practitioner. (Nuffield Foundation, 1980).

Two such schemes of vocational training have been established in Guildford and Canterbury in England on a voluntary basis. The schemes consist of two parts; the training practice and the day release course. The graduates, called trainees, worked in training practices as associates and an experienced dental surgeon in each practice was appointed as trainer by the British Postgraduate Medical Federation. The day release course consisted of series of lectures, discussions and demonstrations. In addition, visits were made to dental practices, hospitals and other places of dental interest. The trainees attend the course for thirty days in a year; three terms, ten days each term. (Erridge, 1981; Horobin, 1981).

A profile on recent graduates undertaking the course indicates that one of the major reasons for joining the scheme was the opportunity to learn about practice management and finance both from the day release course and through involvement with their trainer. It also gives an opportunity for dealing with problems of speed which are encountered due to the large increase in the amount of clinical work as compared to their student days. They also learn and discuss with the trainer, variations in techniques, use of new materials and ethical standards. (Erridge, 1981).

Most dental graduates of Singapore express dissatisfaction and inadequacy in this aspect of their training. The Dental Practice Management Course in the final year is of limited value to them because non-clinical subjects like practice and personal finance, and business management exercises are best understood against a general practice background. Many graduates acquire this training by working for a more senior dentist or taking up a partnership with him. But with such a scheme, arrangements are formalised so that the trainee does not feel any embarrassment when he seeks

advice or help. The trainer can also provide a degree of positive training on clinical matters and practice management. His role is not to act as presiding supervisor but to be on hand when advice is needed. (Horobin, 1981).

An overall view is gained of general dental practice, the community dental practice, the community dental service and industrial dentistry. The contact and exchange of ideas between trainees from the community and general practice is a unique and valuable one which adds considerably to the scope and benefit of the course to the participants and stimulates an interest in continuing education. (Horobin, 1981).

If implemented in Singapore, this scheme could be reduced to one year after internship instead of two, provided the other changes, which are geared to the development of the primary care practitioner can be included in the dental curriculum. This vocational training can be done after the compulsory pre-registration period by dentists working in either private dental practices or in the Government service (Armed Forces, school dental service, outpatient clinics and hospital dental service) as administration and personnel management skills are also required of those in the Government service. This training scheme should be made a pre-requisite for becoming a principal in a dental practice or for promotion in the Government service. If this is done it is likely that more graduates would join the scheme, protecting the public and the profession from the errors, and sometimes the excuses, of inexperienced dental graduates. Should the scheme be accepted, then some aspects of the detailed course on Dental Practice Management which occupies about thirty hours in the present curriculum can be omitted from the undergraduate course, providing more time which will be much needed for changes suggested.

The Postgraduate School of Dental Studies in collaboration with the Ministry of Health and the Singapore

Dental Association, supported by general practitioners, faculty staff and course organisers, should be responsible for this scheme. It will be necessary to recruit and train teachers and to negotiate acceptable remuneration for their tasks.

For the trainee, this approach provides a less traumatic and more pleasant route into practice than before and is highly recommended by the trainees in England. As far as the profession is concerned, vocational training should produce a new generation of general practitioners attuned to postgraduate education and continual 'updating' of their skills and knowledge. (Horobin, 1981).

Effective vocational training with an emphasis on practice management should produce efficient general dental practitioners and will also influence the quality of dental care.

6.6 RESEARCH AND CONTINUING EDUCATION

Though some effort has been made to promote postgraduate and continuing education, the area of research and evaluation has been sadly neglected. For any curriculum to be well planned, data about health needs and attitudes of the population, Government and professionals are vital. "Clearly we need better data on what dentists do and more especially why they do what they do. There are pressing needs to investigate the benefits of preventive procedures and determine the effects of involving patients more actively in maintaining their own oral health. Answers to these and other questions will lead ultimately to difficult decisions regarding changes in dental school enrolment, different teaching styles, changes in curricula emphasis for the various dental disciplines, altering the length of educational experience, the role of dental specialities and the position of continuing education in dental education." (Hershey, 1981). Thus a spirit of enquiry, of dedication to the advancement of the profession must be cultivated for obviously it is lacking in the profession in Singapore.

The acute shortage of staff at the Dental Faculty has caused the dominance of teaching and clinical commitment over research. In addition, the treatment orientated approach in dental education has failed to stimulate interest in research.

In the United States, some dental schools allow for programme flexibility so that the exceptional student can graduate in less than the amount of time typically required. This is possible because the level of pre-professional education significantly exceeds minimum entrance requirements. Most recruits possess a baccalaureate degree and are more mature. (Council on Dental Education, 1977). Although the exceptional student in Singapore may not be allowed to graduate earlier, the curriculum should make provisions to channel this talent by letting him engage in research

which might earn him an honours degree.

Future private practitioners need a good grounding in research methods and statistics during their undergraduate education to be able to assess claims of others in reports, articles and advertising. (Nuffield Foundation, 1980). Besides just encouraging students and practitioners to read and understand journals, statistics and research methods if understood well, would be a good basis for trying their hand at research and evaluation.

The proper time for the basic training would be just before the student is exposed to clinical dentistry so that he will have no problem understanding dental literature and not in the final year (as it is now done in the Dental Public Health Course) when students are facing academic survival problems. The vocational training period if introduced could be used to reinforce the understanding of the concepts and rationale of analytical procedures.

Students should also be taught the use of computers in solving problems in dentistry. The interaction with the computer will not only be an experience of value in the graduate's future professional life, (Nuffield Foundation, 1980; Lu, 1976) but will be a valuable aid if research is undertaken.

Closely allied with this interest in research is the quest for continual knowledge and keeping 'up to date' with advances made in the field of dentistry. Even if the graduates do not engage in research, it is imperative that they do not allow themselves to stagnate with the knowledge gained in their undergraduate dental education, if they are to be effective oral health professionals.

The dental education received should imbue newly qualified dentists with the idea of making continual dental education a way of their professional life. They should

realise that their undergraduate education is only a basic fundament of knowledge skill and competence essential to begin practice. From then on it is their duty and responsibility to:

1. keep abreast with current developments,
2. expand the scope of treatment by acquisition of additional knowledge, and,
3. develop appropriate attitudes towards dentistry and the public.

All this must be harmoniously related to the changing patterns of society in the context of total health needs. (Söremark, 1978).

Dental practitioners in Singapore seemed to be only concerned with the technical aspects of advances in dentistry as revealed by the survey done by the Postgraduate School of Dental Studies which indicated that continuing education courses for the sake of knowledge appealed less than those that increased clinical productivity. (Chan Yew Ai, 1979).

Obligatory regular participation in continuing educational programmes tied to a periodic re-licencing system (Söremark, 1978) and the acquisition of a certain number of 'credits' for attendances at approved continuing educational activities every five years for registration not to lapse automatically (Nuffield Foundation, 1980), has been suggested as methods to encourage continuing education. But these methods may reduce enthusiasm for learning. Rather vocational training schemes suggested earlier could serve to instil these values of the essentiality of continuing education.

6.7 BEHAVIOURAL OBJECTIVES AND EVALUATION

To be able to produce dental graduates to provide optimal dental care for the population, we must be able to evaluate the training they receive to see if it is suited to the needs of society. In a rapidly developing society like Singapore, where the dental care delivery system serves not only its own people but also the vast number of tourists, this evaluation must be continual and at great frequency so that social changes are mirrored in the professional education. However, no evaluation can take place unless the objectives or goals of dental education are stated explicitly. The dentist is assessed, by the knowledge, skills and attitudes he possesses, that is by the behavioural objectives of the teaching and learning process. (Mast et al, 1976).

The first step in curriculum development is defining the educational goals using behavioural objectives and this the Curriculum Review Committee has done. These goals must be communicated to all levels of the educational process if the concept of instructional objectives is to be effective. This vital communication between faculty and administration, faculty and other faculty and faculty and students appears to be infrequent and inefficient. (Council on Dental Education, 1977).

It is recommended that overall objectives of the institution serve as guidelines for more specific objectives developed for individual instructional areas by the faculty associated with those areas. Instructional objectives should be disseminated by the faculty in written form to students and all other faculties regardless of the teaching responsibility of those faculties. (Council on Dental Education, 1977). Students must know the behavioural objectives expected of them as their learning will be guided by it.

Behavioural objectives can be said to have been achieved only if the coursework and, by extension, the curriculum is evaluated and found adequate. The objectives themselves should be monitored against the changing needs and demands of the society and when necessary updated. Hence this calls for the combined efforts of cooperation and co-ordination between departmental clusters, departmental heads and the curriculum review committee to ensure an optimal dental education which provides the manpower to provide optimal dental care.

SUMMARY

The relevant demographic status of the quite densely populated island of Singapore indicates a population which is growing progressively older due to the success of the family planning programme and an increase in life expectancy.

Literacy rates have increased from twelve per cent in 1970 to eighty-four per cent in 1980 and the socio-economic trends indicate a rising standard of living which is close to that of other well developed cities. The technological advances, increased participation of women in the labour force, rising affluence and the increase in the number of international travellers have all contributed to the large influence of western civilisation on the lifestyle and diet of Singaporeans.

The housing programme has tried to divide the population into organised community groups with easier communication links between residents and authorities; and the provision of health services is made easier. Efforts made to raise the health consciousness of the people seem to be taking effect judging from the relatively favourable standard of general health.

Due to the lack of recent published data on the dental health needs and demands in Singapore, it was necessary to use the National Survey of schoolchildren in 1970 and the comparative surveys of eighteen year old National Servicemen in 1967 and 1979 to get an idea of the oral health status at least of children and teenagers in Singapore. Results indicate that more surveys and evaluations need to be undertaken before conclusive statements about the oral health status could be made. Generally, oral health had not improved but with more treatment available more teeth were saved. The utilisation of Government dental clinics indicates an increase in patient attendances. However

treatment demands appear to be related to cost as evidenced by the reversal in the healthy decline of extracted teeth when charges for treatment were raised.

Orthodontic services are very much in demand with the waiting list stretching for more than two years. There is also a substantial increase in the demand for partial dentures and in the Singapore General Hospital which offers specialist treatment, the waiting list for crowns and bridges also exceeds two years. These demands seem more related to appearance rather than function.

The population of Singapore is served by two categories of dentists, the professionally qualified dentists and those who learnt the trade through an apprenticeship system. The second category of dentists is slowly disappearing. To prevent a vacuum in the dental manpower, the Government created a class of dental therapists to take their place much against the wishes of the profession. The Government also hopes to lower the cost of dental care by producing a separate category of dental therapists and nurses to work in the public sector. Two types of dental auxiliaries who are really needed for the practice of dentistry, but are scarce because they are difficult to recruit or are lost to the private sector, are the chairside assistants and the dental technicians.

At present about half the number of professionally qualified dentists are in the Government service and the other half are in the private practice, with less than five per cent in the University. However, seventy-five per cent of the dentists in the Government service and sixty-nine per cent in the University have less than six years of service and the median age of dentists employed in the Government service is only twenty-eight years. The main reason for dentists to stay in the public sector is to gain experience and confidence and to undergo further training before starting their own practice.

Dental services are offered by the Government in the school dental clinics, the outpatient dental clinics (which are normally situated in polyclinics with the other interdisciplinary health services), and in the hospitals. Besides the private dental practices, the public can also obtain dental care at the Dental Faculty by dental students and staff. The Singapore Armed Forces has its own salaried dentists to provide dental services for military personnel. The school clinics are run by dental nurses and supervised by dental officers. In some outpatient clinics dental nurses and dental therapists form a dental health delivery team together with the dental officer. Learning to work together as a team occurs only in the service, with its concomitant adjustment problems, as no training of this kind occurs either in the dental auxillary training school or at the Faculty of Dentistry.

A number of preventive measures have been instituted in Singapore, including fluoridation of the water supply in 1958 and efforts at a dental health education programme by the Dental Health Education Unit (DHEU) which is part of Training and Health Education Branch of the Ministry of Health. Fluoridation of water seems to be mainly the cause of the reduction of caries experienced by approximately more than fifty per cent in the seven and eight year old Chinese children in 1974 compared to the base-line study in 1957. Use of fluoride toothpaste and the dental health education programme could have contributed to this but no studies have been done to evaluate this. Though the preventive measures undertaken by the D.H.E.U. have served to make the public more aware of dental services available judging by the utilisation at the clinics, the manner of utilisation does not indicate that the concept of prevention has been absorbed by the public. This may relate to the philosophy of the dental profession which feels that preventive dentistry cannot be practiced successfully because the demand is not there. They are waiting for the Government and the Singapore Dental Association to create this demand by making the people

aware of the importance of oral health. The profession also recognises the need for more of its members to be motivated in community dentistry and sees a need for dental hygienists instead of dental therapists.

As far as the Government is concerned, it is responsible for the provision of dental manpower to see to the dental needs of the population but it is trying to economise on the cost of this manpower by the provision of operating auxiliaries. The Government also hopes to make the people responsible for their own health and hence is encouraging more dentists to go into private practice. By flooding the market with private practitioners, they hope to reduce the cost of dental care.

The history and development of dental education and the current curriculum outline and requirements point to a treatment orientated education of the dentist. This might have been required previously to provide for the accumulated backlog of treatment needs. The present situation needs a review of the whole education of the dentist with more emphasis on prevention, the development of the professional and the importance of research and continuing education.

With this in mind, a review of recent studies of dental education systems in the United States and the United Kingdom was undertaken. An analysis of these and other studies as they pertain to the conditions in Singapore has produced a set of recommendations for the development of undergraduate education for Singapore's future dental professionals. These guidelines are outlined in the final chapter that follows.

CONCLUSION

RECOMMENDATIONS FOR CURRICULUM DEVELOPMENT

The following recommendations, as guidelines for curriculum development, have arisen from the discussion on dental education requirements related to dental needs, demands and conditions in Singapore:-

1. The development of a dental curriculum for the training of a primary care practitioner who will be able to provide comprehensive dental care.

This could be done by:

- a. placing more emphasis on the training and learning of diagnosis;
- b. exposing the students not only to all population age groups but also to the handicapped and the medically compromised patients;
- c. giving prevention an eminent position in the dental curriculum by teaching the concepts of prevention in all the four years of the dental education and co-ordinating its infusion in all departments of instruction;
- d. stressing improved capability of students in periodontics, pedodontics, orthodontics, endodontics, minor oral surgery, prosthodontics and clinical pharmacology;
- e. encouraging the commitment by students to patient care, follow-up and overall evaluation;
- f. orientating the graduation requirements towards total patient care; (This could be done by allowing students to work in general practice settings where the education and clinical training are geared towards comprehensive care with

- emphasis on prevention and promotion of sound oral health);
- g. increasing the management and co-ordination skills by letting students work under supervision in extramural sites with auxillaries;
 - h. establishing criteria for evaluating subjective elements (attitudes, values, demeanour and motivation) that are associated with the delivery of comprehensive care;
 - i. introducing a behavioral science course in the dental curriculum to help students understand patients better and work with other dental personnel through more effective communication and interpersonal skills.
2. Establishment of a department of Community Dentistry to see to the following:
- a. the co-ordination and integration of subjects like Behavioral sciences, Preventive dentistry, Dental Public Health and Dental Practice management in the dental curriculum;
 - b. that the proper emphasis is placed on cultivating the values needed in a professional and an awareness of the world outside the dental school.
3. Efficient integration of pre-clinical and clinical sciences so as to optimise the educational environment to sustain students' motivation and to improve correlation between basic and clinical sciences.
4. Introduction of a dental auxillary utilisation program with didactic instruction and practical training which could be incorporated with the comprehensive patient care program.

5. A period of obligatory, pre-registration year of internship, following graduation, with supervised clinical training in all fields of dentistry.
6. An additional year of vocational training following internship as associate in a private dental practice or employee in the Government service. This scheme involves a course of lectures, discussions and demonstrations with an emphasis on practice management and should be made a pre-requisite for becoming a principal in a dental practice or for promotion in the Government service.
7. Promotion of research and continuing education through:
 - a. an educational system that stresses the needs for continual updating of skills and knowledge and allows for the exceptional students to engage in research and
 - b. a better grounding in research methods and statistics in dental students.
8. Effective communication of behavioural objectives in written form to the faculty who will be teaching the subjects and to the students who will be guided by it.
9. Continual evaluation of the dental curriculum and instructional objectives in relation to changing needs and demands of the society.

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APPENDIX I

POPULATION BY AGE GROUP, ETHNIC GROUP AND SEX

AGE GROUP (Years)	TOTAL			CHINESE			MALAYS			INDIANS			OTHERS		
	Persons	Males	Females	Persons	Males	Females	Persons	Males	Females	Persons	Males	Females	Persons	Males	Females
TOTAL	2,413,945	1,231,760	1,182,185	1,856,237	935,078	921,159	351,508	181,883	169,625	154,632	88,066	66,566	51,568	26,733	24,835
0 - 4	193,684	100,847	92,837	148,411	77,379	71,032	30,429	15,805	14,624	10,280	5,272	5,008	4,564	2,391	2,173
5 - 9	223,883	115,770	108,113	171,805	88,990	82,815	34,660	17,820	16,840	12,424	6,389	6,035	4,994	2,571	2,423
10 - 14	235,556	120,857	114,699	175,002	90,235	84,769	40,686	20,491	20,195	15,630	7,991	7,639	4,238	2,142	2,096
15 - 19	287,420	148,236	139,184	212,663	109,305	103,358	51,679	27,161	24,518	19,303	10,034	9,269	3,775	1,736	2,039
20 - 24	296,192	152,832	143,360	225,513	115,334	110,179	46,688	24,749	21,939	19,645	10,833	8,812	4,346	1,916	2,430
25 - 29	253,531	129,407	124,124	198,027	100,764	97,263	35,072	18,073	16,999	15,339	8,279	7,060	5,093	2,291	2,802
30 - 34	211,040	107,368	103,672	166,513	84,479	82,034	25,791	13,100	12,691	12,132	6,385	5,747	6,604	3,404	3,200
35 - 39	135,767	68,882	66,885	107,091	54,001	53,090	15,353	7,362	7,991	8,154	4,535	3,619	5,169	2,984	2,185
40 - 44	131,475	66,497	64,978	102,580	51,826	50,754	16,824	8,145	8,679	8,317	4,355	3,962	3,754	2,171	1,583
45 - 49	107,245	54,756	52,489	81,482	40,663	40,819	14,439	6,942	7,497	8,577	5,503	3,074	2,747	1,648	1,099
50 - 54	93,136	48,322	44,814	68,685	33,385	35,300	13,453	7,267	6,186	8,826	6,381	2,445	2,172	1,289	883
55 - 59	71,384	36,989	34,395	52,605	24,785	27,820	10,359	6,038	4,321	6,814	5,198	1,616	1,606	968	638
60 - 64	59,708	29,795	29,913	47,186	21,730	25,456	7,084	4,076	3,008	4,451	3,444	1,007	987	545	442
65 - 69	49,310	23,737	25,573	41,914	19,254	22,660	4,241	2,310	1,931	2,538	1,882	656	617	291	326
70 - 74	33,344	15,429	17,915	28,998	12,847	16,151	2,659	1,423	1,236	1,284	957	327	403	202	201
75 - 79	18,616	7,857	10,759	16,472	6,620	9,852	1,286	728	558	581	400	181	277	109	168
80 & OVER	12,654	4,179	8,475	11,290	3,483	7,807	805	393	412	337	228	109	222	75	147

Source: Department of Statistics, 1980 b

APPENDIX II

POPULATION BY SELECTED CHARACTERISTICS, 1980 AND 1970

	1980		1970	
	Number	%	Number	%
Age				
Total	2,413,945	100.0	2,074,507	100.0
Less than 15 years	653,123	27.1	804,836	38.8
15 to 59 years	1,587,190	65.7	1,151,384	55.5
60 years and over	173,632	7.2	118,287	5.7
Ethnic Group				
Chinese	1,856,237	76.9	1,579,866	76.2
Malays	351,508	14.6	311,379	15.0
Indians	154,632	6.4	145,169	7.0
Others	51,568	2.1	38,093	1.8
Marital Status				
Single	1,379,633	57.2	1,301,675	62.7
Married	918,330	38.0	679,924	32.8
Widowed	99,318	4.1	85,941	4.2
Divorced	16,664	0.7	6,967	0.3
Residential Status				
Singapore Residents	2,282,125	94.5	2,013,563	97.1
Citizens	2,194,280	90.9	1,874,778	90.4
Non-citizens	87,845	3.6	138,785	6.7
Non-residents	131,820	5.5	60,944	2.9
Literacy				
Total Aged 10 years and over	1,996,378	100.0	1,558,518	100.0
Literate	1,676,408	84.0	1,125,524	72.2
In one official language only	1,039,344	52.1	904,422	58.0
In two or more official languages	628,789	31.5	214,751	13.8
Not Literate	319,970	16.0	432,994	27.8

Source: Department of Statistics, 1980 b

APPENDIX III

POPULATION BY SELECTED CHARACTERISTICS, 1980 AND 1970

	1980		1970	
	Number	%	Number	%
Sex				
Total	2,413,945	100.0	2,074,507	100.0
Male	1,231,760	51.0	1,062,127	51.2
Female	1,182,185	49.0	1,012,380	48.8
Citizenship				
Singapore	2,194,280	90.9	1,874,778	90.4
Malaysia	120,104	5.0	92,292	4.4
Others	99,561	4.1	107,437	5.2
Country of Birth				
Singapore	1,886,793	78.2	1,543,624	74.4
Outside Singapore	527,152	21.8	530,883	25.6
Malaysia	233,162	9.7	187,192	9.0
China, Hong Kong and Taiwan	189,262	7.8	243,682	11.7
India, Pakistan, Bangladesh and Sri Lanka	42,379	1.7	50,876	2.5
Other Countries	62,349	2.6	49,133	2.4
Persons Born In Singapore				
Total	1,886,793	100.0	1,543,624	100.0
Less than 15 years	623,367	33.0	764,278	49.5
15 — 59 years	1,219,875	64.7	759,398	49.2
60 years and over	43,551	2.3	19,948	1.3
Persons Born Outside Singapore				
Total	527,152	100.0	530,883	100.0
Less than 15 years	29,756	5.6	40,558	7.7
15 — 59 years	367,315	69.7	391,986	73.8
60 years and over	130,081	24.7	98,339	18.5
Year of First Arrival of Persons Born Outside Singapore				
Before 1931	59,002	11.2	102,919	19.4
1931 — 1940	83,067	15.8	110,290	20.8
1941 — 1950	86,069	16.3	99,175	18.7
1951 — 1960	105,395	20.0	126,795	23.9
1961 — 1970	60,914	11.5	91,704	17.2
1971 — 1980	132,705	25.2	—	—

Source: Department of Statistics, 1980 c

INDEX IV

COMPARATIVE TABLE ON
DENTAL MANPOWER IN DENTAL DIVISION
1976 TO 1979

TYPE	1976	1977	1978	1979	Percentage Change in 1979 over 1978
All Categories of Dental Officers	100	101	111*	113*	+2.7%
All Categories of Dental Therapists	19	18	37	36**	-2.7%
All Categories of Dental Nurses	269	289	258	256	-0.8%
All Categories of Dental Assistants	118	117	114	108	-5.3%
All Categories of Dental Technicians	54	60	59	54	-8.5%
Total Dental Manpower	560	585	579	567	-2.1%

* This figure includes 1 Dental Officer who was on loan to Training and Health Education Department.
** This figure includes 3 Nursing Officers undergoing Dental Therapist Course.

COMPARATIVE TABLE SHOWING DISTRIBUTION OF DENTAL MANPOWER
OVER THE THREE MAIN DIVISIONS AND HEADQUARTERS IN 1977, 1978 AND 1979

Types of Dental Manpower	Headquarters				Hospital Dental Service				Dental Health Services				Institute of Dental Health			
	1977	1978	1979	% Change in 1979 over 1978	1977	1978	1979	% Change in 1979 over 1978	1977	1978	1979	% Change in 1979 over 1978	1977	1978	1979	% Change in 1979 over 1978
Dental Officers (All categories)	2	2	2	0.0%	35	37	39	+5.4%	48	54	51	-5.6%	16	17	20	+17.6%
Dental Therapists (All categories)	0	0	0	0.0%	0	0	0	0.0%	0	15	17	+13.3%	18	22	19	-13.6%
Dental Nurses (All categories)	0	0	0	0.0%	0	0	0	0.0%	191	168	192	+14.3%	98	90	64	-28.9%
Dental Assistants (All categories)	0	0	0	0.0%	46	43	39	-9.3%	45	57	55	-3.5%	26	14	14	0.0%
Dental Technicians (All categories)	0	0	0	0.0%	19	22	25	+13.6%	8	16	10	-37.5%	33	21	19	-9.5%

Source: Ministry of Health, 1979