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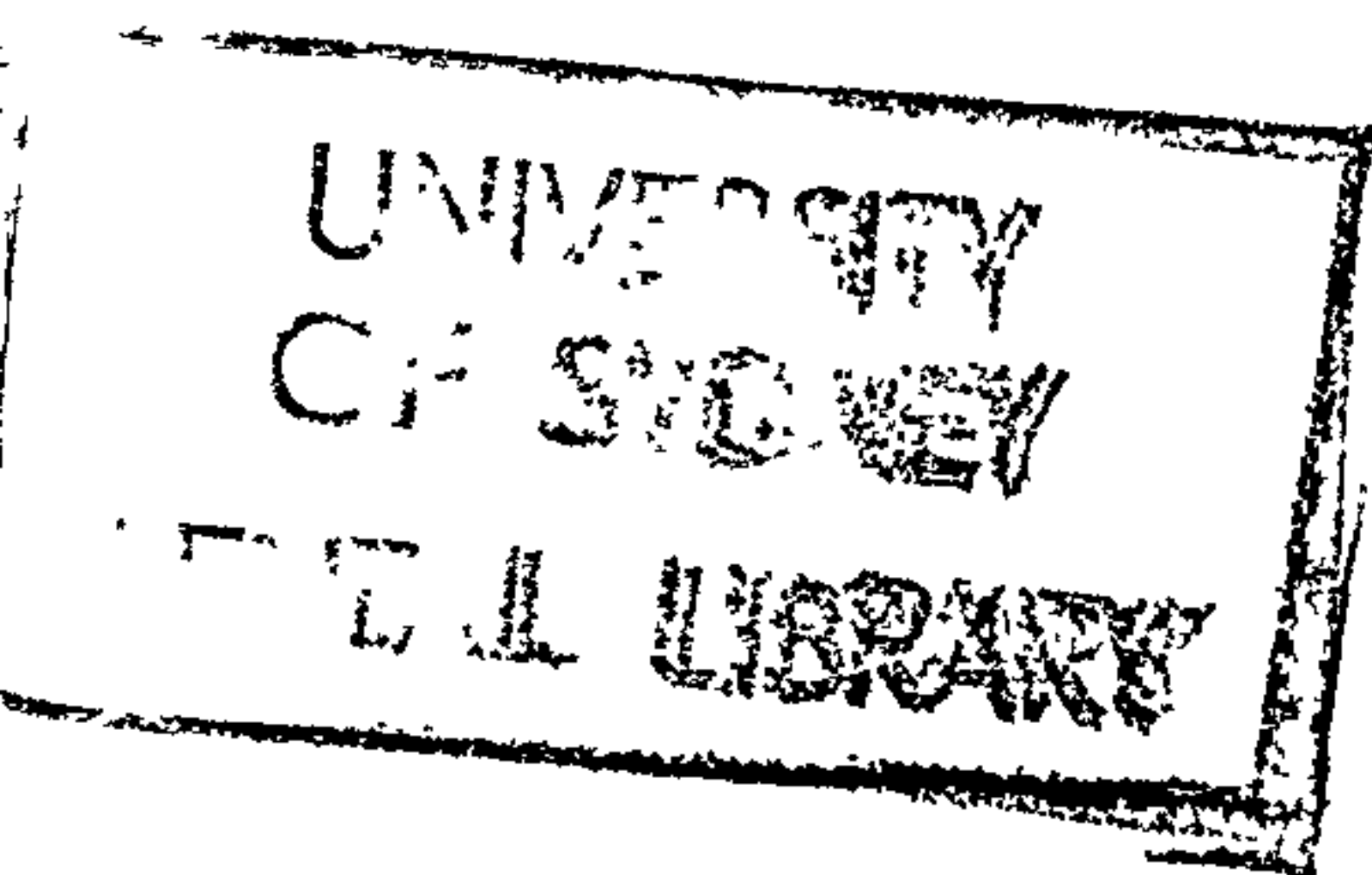
CURRENT EFFORTS
IN
THE PREVENTION AND CONTROL OF DENTAL DISEASE

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for the
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I. INTRODUCTION

The dental profession is justly proud of the scientific and technical advances it has made in recent years. Yet despite undoubted technical competence of the profession to provide the people with sound dental health, the state of dental health almost everywhere in the world today is lamentably poor.

Bleak as the outlook may first appear when viewed from perspective of mounting need, continued neglect and often unenlightened attitude towards the receipt of care, changes are taking place which hold a promise of a significantly better future. These changes are in the form of methods of attacking dental disease; primarily, the increase in the utilization of those measures which prevent the onset of disease and secondarily, the expansion of programmes which control or limit the ravages of the diseases that cannot be prevented.

On the preventive front two measures are gaining significance; fluoridation of water supplies and public education in dental health.

FLUORIDATION

The use of fluoride in drinking water supplies has given the dental profession an effective way of reducing the incidence of one of the major dental diseases - dental caries. Its superiority over previous available preventive measures lies largely in the fact that it reaches all the people in the community without effort on their part and without demand upon efforts of professionally trained dental

personnel. It has two major defects : it is not a cure-all and its effect is not instantaneous. However, a two-third reduction is definitely significant and the increasing rate it has been receiving acceptance of late, more and more children are building up a degree of immunity against dental caries, with the logical result of a promise of a great reduction in the need once the present children population grows into adulthood.

DENTAL PUBLIC HEALTH

There is an ever increasing effort of educating the population, including governments, to the value of dental health. Through education the public is made increasingly aware of maintaining its teeth and the necessity for regular dental examination and treatment.

Through education the public is motivated to utilize more widely the available preventive measures such as topical application of fluoride by dental personnel, addition of fluoride to public water supplies, proper tooth brushing, use of fluoride toothpastes, proper diet, the interference with oral habits and the prevention of accidents to teeth.

There is also a change in concept of teaching in dental schools. The trend now is to give more time and emphasis to preventive and public health dentistry than ever before. There is a transition of dentistry from a mechanical and restorative vocation to a health profession marked by a steadily increasing emphasis on the prevention of disease and promotion of the total health of the individual.

PUBLIC DENTAL CARE

In recent years concepts of public responsibility for ensuring the security of the individual citizen was undergone great changes.

Oral health was of relative little concern in the period when the population was decimated by typhoid fever, diphtheria, cholera and smallpox. Today, with the major killers of the past under control, the health professions and the public can devote their efforts to the control of chronic diseases, the rehabilitation of the handicapped, and the attainment of the maximum potential for productive living for every individual. As the nature of health service has changed, complete oral health care - in contrast with mere relief of pain - has, in the minds of many, evolved from a luxury to a basic component of complete health service. As a result, there has been increasing public interest in obtaining more comprehensive service for themselves.

A number of countries have established public dental care programmes. Some benefiting certain segments of the community, some covering the entire public. In countries where dental care is obtained largely from dentists in private practice, two significant developments have taken place : mechanism by which dental care can be more easily purchased, and provision of dental service to remote areas where private practice is economically not attractive.

With the three-prong attack on dental disease; reduction of need by fluorides, health education of the public to bring home the importance of oral health and the provisions of making dental treatment conveniently available there is every reason to believe that the future holds a promise of better dental health.

This thesis reviews these major efforts in practice today, namely, fluoridation, dental health education of the public and the control of dental disease by the provision of dental care.

II. FLUORIDATION

WATER SUPPLY

a) BACKGROUND

As in the case of any disease, the ideal solution of the problem of dental diseases is prevention. A number of procedures will partially prevent dental disease. These methods include reducing the consumption of sticky, fermentable carbohydrates, brushing the teeth at regular intervals or immediately after meals, mouth rinsing, using therapeutic dentifrices, applying topical fluoride, and dietary supplements such as vitamins and minerals.⁷⁶ In practice, however, these methods usually have not been utilized by enough individuals in the population to bring about a measurable reduction in the overall incidence of the disease. The only procedure which has shown significant effectiveness in large population groups is water fluoridation.

The controlled fluoridation of community drinking water supplies was started in 1945 at Grand Rapids, Mich., U.S.A.⁽⁷⁾ and shortly afterwards at Newburgh, N.Y., U.S.A.⁽⁹⁾ and Brantford, Ontario, Canada^(22,51). In each case fluoride was added to the water to bring the concentration up to 1.0 - 1.2 ppm. and for each fluoridation city a controlled area was selected. These studies were planned to extend over a period of 10 years, so that the deciduous dentition and most of the permanent dentition would be subjected to fluoride during the whole period of development and calcification, and would be exposed for some years to

caries-attack. In addition, these studies were designed to study, by actual performance, the feasibility of adding fluorides to water, the reliability and accuracy of the machinery, and the per capita cost. The studies were carefully planned and controlled and the effect in general health was watched. One study (Newburgh) included an extensive research programme.

Detailed dental examinations were carried on in children between 4 - 15 years of age before fluoridation started and were repeated each year. Dental caries experience in the fluoridation areas was compared with that in the controlled areas, and also caries experience among similar groups of children in Aurora, Ill., a natural fluoride area with 1.2 ppm. fluoride in the water. This was done to determine whether the added fluoride was as effective in reducing dental caries as fluoride which occurs naturally.

These field trials were only exploratory and not expected to show definitive results which would warrant wide-scale application for ten to fifteen years. But within five years, so impressive were the results and so insistent were the demands for a statement of approval, particularly from the State Dental Society of Wisconsin, where 50 communities had begun or approved fluoridation by the end of 1949, that the Public Health Service decided to announce a new policy.⁽⁶¹⁾ Late in 1950 it strongly encouraged communities which desired to fluoridate their communal water supplies to do so. In quick order, public

endorsements were made by other professional organizations : the American Dental Association, the American Association of Public Health Dentists, the National Research Council, the American Medical Association and others.

After ten years, reports of the result of controlled fluoridation in the three trials showed a remarkable uniformity. The prevalence of caries in the permanent teeth of continuously resident children who had used the fluoridated drinking water throughout life was decreased by 60%, comparison being made either with findings among counterparts prior to fluoridation, or with findings among children in the control cities selected for the separate studies. Dental caries prevalence in the deciduous dentition was similarly reduced; the reduction ranged from 50% to 60%.

The results obtained in the three studies confirmed the hypothesis that the use of drinking water with 1 ppm. fluoride produces similar dental and general effects whether the fluoride occurs naturally or by mechanical means.

b) MODE OF ACTION

The exact mechanism through which fluoride exerts its beneficial effect in the teeth is not clear. A reasonable hypothesis may be constructed from the following facts.

1. Fluorides reduce the solubility of tooth mineral by their replacement of hydroxyl in the hydroxyapatite, the calcium phosphate in the crystal lattice.
2. Fluorides in sufficient concentration inhibit bacterial metabolism. (19)
3. Relatively high concentrations of fluoride may be found in the most external layer of the enamel, thus providing conditions for decreased solubility of the surface enamel and possibly an increased fluoride ion concentration locally in the immediate surface fluid layer. (57)

c) PHYSIOLOGY

Soluble fluorides are rapidly absorbed from the gastrointestinal tract. (68) Ingestion of fluorides together with solid food in milk and especially with large quantities of calcium may decrease absorption markedly, presumably because sparingly soluble calcium salts are formed. In any case, absorption is rarely complete; 10 - 15% of the ingested fluoride usually is excreted in the faeces.

Concentrations of fluoride in the blood is estimated to be in the range of 0.01 - 0.2 ppm. whether drinking water contains essentially no fluoride or as much as 1 ppm. the average concentrations in the blood remain in this narrow range of extremely low values. After the ingestion of a large or even a toxic dose of fluorides, the concentrations

reach peak values in one half to one hour and thereafter decrease promptly reducing the normal range in 24 hours or less. The increment of blood fluoride from drinking fluoridated water is consequently slight or of very short duration.

A large fraction of the absorbed fluoride is promptly excreted in the urine; the renal clearance is considerably greater for the fluoride ion than for chloride or sodium ions. (68) Of the retained fraction, almost all is taken up by the mineral crystal of the skeletal tissues. The uptake in the bone and teeth is most rapid in young developing individuals. A gradual saturation of the skeleton takes place, which, on constant fluoride intake, is reflected in an increase in urinary excretion. The soft tissues take up very small quantities of fluoride, comparable but less than the concentration in the blood. No storage occurs in soft tissues. (43)

Fluoride effects on cells and bacteria :

No evidence of enzyme inhibition is known in persons ingesting fluoridated water with concentrations optimal for dental health. (69)

The inhibiting concentration in vitro range from 10^{-2} to 5×10^{-6} M.

Fluoride effects on metabolism of calcium, phosphorus and magnesium :

No adverse effects have been detected in mineral metabolism when drinking water containing 1 ppm. fluoride. Blood serum contains

normal concentration of these elements even when fluoride intake is considerably elevated.

Fluoride effects on development and growth :

Normal development and growth have been demonstrated in areas in which drinking water contains ^{an} optimal amount of fluoride. (67)

Fluoride effect on kidneys :

No evidence has been forthcoming that fluoridated water effects the kidneys or worsens concurrent kidney disease.

In animals given large doses of fluorides for short periods, histological studies show that the kidney is more susceptible to structural injury than any other organ. Well defined microscopical changes requires diets containing 200 ppm. (76)

Thyroid gland :

Prolonged ingestion of fluorides at 3.45 ppm. has no effect on gland size or function in human subjects. No significant difference in serum protein bound iodine level was found between groups ingesting water with 3.48 ppm. and 0.09 ppm. fluoride. Nor was there displacement of iodine by fluoride. (56)

Hard tissues :

The skeleton is the sole storage site of fluoride. Large quantities of fluoride can be stored in this way without any detectable structural changes. However, three clinical conditions may be

defined when very large daily doses are ingested for extended periods. (76)

Crippling fluorosis :

This condition is characterised by severe osteosclerosis, fresh areas of osteoporosis, exostosis and calcification of certain ligaments of the spine and the pelvis. Motion of the joints is so restricted that simple daily duties can no longer be performed. (76)

Its appearance requires a fluoride intake of 20 to 80 mg. or more per day for periods up to 10 to 20 years.

This happens in rare instances of excessive industrial exposures to fluoride or where natural waters contain very high fluoride concentration particularly when consumed by under-nourished or mal-nourished groups.

Asymptomatic osteosclerosis :

In this condition there is an increase in the x-ray opacity of certain bones first seen in the sacral vertebrae and later involving other bones. No functional abnormalities accompany these radiographic changes. (76)

A drinking water content of at least 8 ppm. fluoride is required to produce mild osteofluorosis.

Mottled enamel :

Moderately severe mottling is characterised by unsightly discolouration and severe mottling by pitting and irregularities of the enamel surface.

Mottled enamel or chronic dental fluorosis appear when drinking water supplies contain 2 ppm. or more and when these waters are ingested during the first eight years of life.⁽⁷⁶⁾ Usually only permanent teeth are affected, but mottling of deciduous teeth is found in areas of exceptionally high water concentrations of fluorides. Teeth cannot become mottled after eruption. Severe chemical trauma from very high fluoride doses disturbing normal development may effect both enamel and dentine.

Mottling does not occur at fluoride concentrations of 1 ppm. However, based on findings that people drink more water in warm climate than cool one, it has been suggested that fluoride concentration be reduced slightly in warmer regions. The U.S. Public Health Service recommendation of fluoride levels for cool and warm climates is given in Table I.⁽⁷⁹⁾

Table IFluoride levels recommended for cool and warm climate

Annual average of maximum daily air temperatures °F.	Recommended control limits		
	<u>F concentrations in parts per million</u>		
	Lower	Optimum	Upper
50.0 - 53.7	0.9	1.2	1.7
53.8 - 58.3	0.8	1.1	1.5
58.4 - 63.8	0.8	1.0	1.3
63.9 - 70.6	0.7	0.9	1.2
70.7 - 79.2	0.7	0.8	1.0
79.3 - 90.5	0.6	0.7	0.8

Source : U.S. Public Health Service

(In Young, W.O., and Striffler, D.F. - The dentist
his practice and his community. Philadelphia &
London, Saunders Co., 1964. 318 P., P.110)

OBJECTION TO WATER SUPPLY FLUORIDATION (72)

Fluoridation has probably been subject to more intensive investigations than any other public health measure. Despite this controlled fluoridation still continues to be the subject of attack in communities in which its introduction is proposed.

Some of the opposition may arise from a sincere but over-cautious attitude on the toxicity question but the majority is motivated by political, emotional and religious reasons. Valid judgement against these backgrounds are not readily effected by factual arguments.

The arguments levelled against it fall mainly into three categories; its benefits are uncertain, it may have injurious consequences, it violates human rights.

The first argument seems to be least effective. Its persuasive force steadily diminishes as favourable results of fluoridation are reported from one community to another. Nevertheless, the evidence is more meaningful to the statisticians than to the laymen who are relatively insensitive to quantitative documentation. Moreover, neither the magnitude of the caries problem nor the prospect of reducing it make much impression on a public which does not regard tooth decay very seriously.

The second argument, the possibility of poisoning is more persuasive because it appeals to the emotion and invokes anxieties. Further-
more refutation of the poison argument rests on negative rather than positive evidence. A claim that fluoridation causes kidney and bone damage, for instance, is denied on the grounds that such effects have not been detected in spite of search, but this does not exclude the possibility that damage may yet be discovered in the future.

The third argument, perhaps the most potent one used by the opposition, is the charge that fluoridating the public water supply infringes the rights of the individual, who are not free under this form of 'compulsory medication' whether or not to consume extra quantities of fluorides. The argument rests on a value assumption and thus falls beyond the realm of proof or disproof.

SITUATION TODAY

Twenty-two years have now elapsed since fluoride was first introduced into water supply. Increased resistance to caries is the most obvious benefit of drinking water containing the optimal levels of fluoride for the particular geographical area. Measured in terms of the number of decayed, missing, or filled permanent teeth, the incidence of dental caries has been found to be from 40 to 70 percent less among groups of 12 - 14 year old children in various communities using fluoridated water from birth than among children of the same ages on fluoride deficient water. Of even greater significance is the decrease

in the number of missing teeth, the decrease ranging from 65 to 89 percent among children of the same age group on fluoridated versus nonfluoridated water. These benefits are known to be carried over well into adult life. (23) (8)

It is now apparent that water fluoridation has significance beyond the protection against tooth decay. For example data now available that fluoride improves the crystalline structure of bone as well as teeth. Persons living in areas served by fluoridated water are less apt to develop osteoporosis in later years. These people are less likely to experience bone fractures. (18) Furthermore, some physicians are now prescribing relatively large doses of fluoride for some of their elderly osteoporotic patients. (14) (30) No longer can fluoride be regarded as chiefly to benefit children. Indeed, it is possible that fluoride's effect on bone and teeth may ultimately be shown to be of greater benefit in the later years than in the younger years.

In the meanwhile investigations have shown that there is no difference in health between persons living in fluoride and nonfluoride areas. In the United States it was shown that mortality rates were about the same for cancer, heart disease, intracranial lesions, nephritis and cirrhosis of the liver. Research teams in England concluded that fluoride at levels encountered in British waters did not affect mortality rates, did not cause osteochondrosis of the spine (crippling

fluorosis), did not relate to mongol births, peptic ulcer or absenteeism from school and had no association with thyroid enlargement.

d) EXTENT OF FLUORIDATION

U.S.A. : In the United States, homeground for controlled fluoridation, 65 million people are enjoying the benefit of water fluoridation by the end of 1965. One significant single gain was the fluoridation of water supply in New York in September, 1965 for its 8 million residents. (3)

One of the major obstacles to the more rapid spread of fluoridation in the United States has been the resort by the opposition to ^{the} use of referendum. (65)

In the course of a referendum the opposition plays on the fears and emotions of the uninformed public persuading it that it is better to maintain the status quo than to try something new which has an element of danger.

The outlook for the future, however, appears brighter than ever before. (16) With the efficacy and safety of water fluoridation firmly established, there is an increasing and widespread professional and public support. Communities which had been over-cautious and hesitant are now considering their views. There is a decline in

the number of communities that discontinued fluoridation after it had already been in operation and an increase in those reinstating fluoridation after discontinuance. During the three-year period 1954 to 1956, sixty-one communities discontinued fluoridation, only nine reinstated it and whereas in the 1961-1963 triennium, only sixteen communities stopped fluoridating and fifteen started fluoridating again after previously discontinuing the procedure.

CANADA : Over 5 million Canadians, living in nearly 300 communities, are now benefiting from fluoridation.⁽¹⁵⁾ Major centres now using controlled fluoridation include Toronto, Winnipeg, Laval, Halifax and Saskatoon and Edmonton.

All Canadian provincial governments are in favour of this public health measure.⁽¹²⁾ In April 1966, Alberta amended its Public Health Act and lowered the requirement of approval of fluoridation from two-thirds to a simple majority. Another amendment permits free distribution of fluoride tablets by any health unit or municipal health department to any resident who requests them, or whose physician or dentist prescribes them. An offer by the Nova Scotian Provincial Government to pay for half of installation costs to fluoridate water supply is expected to encourage communities to take action.

ENGLAND : In England, the Ministry of Health fully supports fluoridation even to the extent of offering to indemnify any local health authority for costs of any legal proceedings taken against the measure. (54) The matter is therefore now decided and the extent to which it will be applied rests with the local governments.

Furthermore, in order to counteract the delaying tactics of some local councillors, the Minister has announced that he was not prepared, under Section 28 of the National Health Service Act, to make available fluoride tablets as part of the arrangement to prevent illness. (20) He pointed out that the cost of administration and health education by physicians, dentists and health visitors, which would be necessary to convince parents of the need of continuous co-operation in providing fluoride tablets to children might well, in the long-run, be considered more expensive and almost certainly less effective than fluoridation.

IRELAND : Ireland's Health Act in 1960, which requires fluoridation, was upheld as constitutional in a lengthy and comprehensive battle in 1963 - 1964. The measure has since been extended to 860,000 persons, beginning with Dublin. (16)

EUROPE (6) : Most of the major cities in the Netherlands are already fluoridating their water supplies, although most other continental countries are still in the test project stage. The main reason for the slow progress has been the preference for alternative ways of using fluoride for individual prophylaxis so as to avoid encroachment on human rights to decision and the popular belief that the American investigations were based on habits and ways of American life and so need not completely apply to European habits.

The largest European cities now fluoridating their water supplies are Karl-Marx-Stadt, East Germany (284,000 population), Basel, Switzerland (220,000), and Brno, Czechoslovakia (100,000). It was reported that Denmark, Norway and Hungary were looking with increasing favour to fluoridation. News from the U.S.S.R. indicates that fluoridation is already instituted or planned for several cities. Some areas, including Moscow, have natural fluoridation.

AUSTRALIA AND NEW ZEALAND : In Australia and New Zealand fluoridation has the highest support of the health agencies and is gaining steadily.

In Australia, fluoridation began in 1953 in Beaconsfield, Tasmania, followed by Yass, New South Wales in 1956. By 1966 the fluoridation situation was as follows : (25)

A population 457,300 persons in 23 communities had fluoridated water supplies; 2,881,933 persons in 22 communities, including Sydney (population 2,700,000) were awaiting fluoridation, 134,890 persons in 17 communities were in favour of it and 39 communities with population of 665,553 had, for one reason or another, rejected it. It was estimated that by 1968 almost thirty percent of the Australian population (3,339,233) would be in fluoridated areas.

The latest position in New Zealand for the whole population is that 43 per cent receive fluoridated public supplies, 2.4 per cent await implementation of approved schemes, 26.6 per cent are as yet denied, and 2.8 per cent have no access to reticulated public supplies. (13) These percentages probably place New Zealand near the top of the world fluoridation ladder.

Wellington, New Zealand's capital, has 200,000 people, and its water fluoridated. Fluoridation of public water supply of Dunedin city commenced in May 1967.

OTHER COUNTRIES (55) :

In other countries, fluoridation, as a rule, has gone no further than test projects. This is largely due to lack of piped water supplies. This is particularly evident in Asia, Eastern Mediterranean and Latin American regions. Economic problems and other more pressing needs are other reasons which make water fluoridation well down the list of priorities. However, the entire population of Hong Kong and Puerto Rico serviced by public water supplies have fluoridated water.

e) EFFECT OF FLUORIDATION :

Fluoridation where practised, is having pronounced effects on dental health.

Children who have consumed only fluoridated water throughout their lives have fewer carious lesions, less malocclusions, rare loss of permanent first molars, and better dental health generally than children from similar economic backgrounds who live in a fluoride-deficient area. (33)

Measured in terms of time and cost of providing dental care, the Newburg/Kingston fluoridation study showed the following figures : (11)

The mean cost for initial dental care per child, 5-6 years old, in 1962 was \$14.16 in Newburg (fluoridated water), and \$32.38 in Kingston (non-fluoridated). The mean cost for incremental care per child in 1963 was \$5.90 in Newburg, \$11.00 in Kingston. The mean chair time per child in 1962 was 76.9 minutes in Newburg, and 117.3 minutes in Kingston.

In New Zealand it has had a great effect on the dental public health programme. (29) It has increased the number of children that one school dental nurse could be responsible for, and reduced the number of school dental nurses needed. The cost of operating the General Dental Benefits programme has been reduced. Dentists have more time to devote to treating the population over sixteen years of age.

In Hastings, which began to fluoridate its water in 1954, one dental nurse can treat 690 children, whereas in most fluoridated cities one nurse can treat only 475 children.

In Hastings, 1,000 children required 1,257 fillings in the year ended March 31, 1965. In a non-fluoridated community 762 children required 4,089 fillings. The mean number of fillings in the two groups were 1.257 in Hastings and 5.366 in the control group.

The mean cost of dental care for postprimary school children in Hastings in the same year for examinations, radiographs and fillings was £3/14/10 compared with a mean cost per child on £5/14/5 in non-fluoridated communities.

These benefits are in addition to the advantages to the children who are spared unnecessary pain and discomfort, require fewer fillings and extractions, lose less school time taken up by treatment, and who pass into adulthood with more tooth tissue and fewer restorations.

A review of the literature listing the benefits derived from fluoridation also reveals some of the effects being felt by the dental profession as a result of the change in the pattern of dental disease. (33)

1. The drastic decline in tooth ^{morbidity} ~~morbidity~~ through fluoridation has been accompanied by an equally important rise in restorative dentistry. The reduction in caries causes the available dental manpower to be more nearly adequate. In endemic fluoride areas, there is less demand for dental services, especially from younger patients, than in fluoride deficient areas.

2. With caries being brought under a large measure of control, it is possible that dentistry may undergo a gradual transition from a practice preoccupied with an unending demand for dental repair, to the more satisfactory practice of a comprehensive oral health service.

3. In fluoride areas, less dental treatment time is required per child than in non-fluoride areas. More attention can be given to periodontal therapy and interceptive orthodontics.

4. With fluoridation, the backlog of needed dental care can be more nearly met. One dentist can care for many more children.

5. Comparisons of sets of towns with and without fluoridation indicate that there is apparently not a lesser need for dentists in those cities with fluoridation.

No large-scale study has yet been done in which private dental practices in cities with and without fluoridation have been compared. Such a study is needed before many of the observations mentioned can be substantiated.

2. DIETARY SUPPLEMENT

With the present technical development, fluoridation of drinking water is limited to regions served by waterworks where adequate control of the fluoride level is technically and economically possible. This means that large population groups cannot obtain prophylactic doses through the drinking water.

Various methods have been proposed for systemic administration of fluoride in regions where water fluoridation cannot be applied.

Four methods of administration are in use :

- a) fluoride alone, or in tablets or drops
- b) fluoride in vitamin preparations
- c) fluoride in milk
- d) fluoride in table salt.

a) FLUORIDE TABLETS AND DROPS :

Fluoride can be administered in the form of a solution of fluoride or in the form of tablets.

Fluoride Supplement Levels

It is essential, before prescribing dietary supplemental fluorides, to know the fluorine content of the water supply.⁽³⁸⁾ Since there have been no investigations on dietary supplemental fluorides that have established proper dosages, the data for arriving at a suitable dosage of supplemental fluorides were obtained from estimated daily intake of water containing 1 ppm. of fluorine. (Table 2)

Table 2Estimated Daily Intake of Water and Fluoride IonWhen Water contains 1 ppm. of Fluoride

Age Years	Body Weight		Water Intake	Fluoride Intake
	Kg.	(lb.)	Litres	Mg. Fluoride
1-3	8-16	(18-36)	0.390 - 0.560	0.39 - 0.56
4-6	13-24	(29-53)	0.520 - 0.740	0.52 - 0.74
7-9	16-35	(36-77)	0.650 - 0.930	0.65 - 0.93
10-12	24-54	(55-119)	0.810 - 1.160	0.81 - 1.16

Source: McClure, F.J. - Ingestion of Fluoride and
 Dental Caries. Amer.J.Dis.Child.,
 66: 368, 1943.

The Council on Dental Therapeutics of the American Dental Association has established the dosage schedule of dietary fluoride supplements based upon water supplies devoid of fluorine or water supplies containing suboptimal levels. (Table 3)

Since practically all the drinking water of infants might be provided in the home, it appeared possible to simulate conditions existing in a community where the water supply is fluoridated. The suggested prescription for infants specifies the quantity of sodium fluoride, which added to the required volume of water will provide water containing fluorine at 1 ppm. level.

For older children who would be consuming a substantial amount of drinking water away from home, the necessary amount should be consumed at one time.

Table 3Tablet Dosage of Supplemental Fluoride When DrinkingWater is Substantially Devoid of Fluorine

Age Years	Dosage	How Often	Method of Administration
0-2	One fluoride tablet (1 mg.) to each quart of water	As needed	Preparing formulas or other food
2-3	One fluoride tablet (1 mg.)	Every other day	Fruit juice or drinking water; consumed at one time
over 3	One fluoride tablet (1 mg.)	Each day	Fruit juice or drinking water; consumed at one time

Source : Prescribing supplement of dietary fluorides.
J.A.D.A., 56: 590, 1958.

For communities with water supplies containing fluorides below 0.7 ppm. the supplemental fluoride dosage should be cut proportional to the fluorine level in the water supply. Table 4 gives the prescription for administering supplemental fluoride by the teaspoonful. Table 5 gives prescription for administration by drops.

Table 4

Teaspoonful prescription for areas where the drinking water contains fluoride levels from 0.0 to 0.6 ppm.

Rx : Sodium Fluoride (equal 60 supplemental doses)
 Distilled water, to make 240 ml.

Label : One teaspoonful per day

Caution : Store out of reach of children

Natural Fluoride content of water ppm.	Grams of Sodium Fluoride to use in Above Prescription	Equivalent Milligrams of Fluoride ions per teaspoonful
0.0	0.132	1.0
0.1	0.119	0.9
0.2	0.106	0.8
0.3	0.092	0.7
0.4	0.079	0.6
0.5	0.066	0.5
0.6	0.053	0.4

Table 5

Drop Prescription for areas where drinking water
contains fluoride levels from 0.0 to 0.6 ppm.

Rx : Sodium Fluoride (equal to 100 supplemental doses)
 Distilled water, to make 60.0 ml.

Label : 0.6 ml. (or 10 drops) per day

Caution : Store out of reach of children

Natural Fluoride content of water ppm.	Grams of Sodium Fluoride to use in Above Prescription	Equivalent milligrams of Fluoride ions per 0.6 ml.
0.0	0.220	1.0
0.1	0.198	0.9
0.2	0.176	0.8
0.3	0.154	0.7
0.4	0.132	0.6
0.5	0.110	0.5
0.6	0.088	0.4

Source : Gellin, M.E. - Utilization of Systemic
 Fluorides. Dent.Cl.N.Amer., 511:(July)1965.

Administration of fluoride in the form of tablets and solutions have shown positive results which are said to be comparable to those in children drinking fluoridated water. There is no reason, on theoretical grounds, that this should not be so. In order to simulate the effect of drinking fluoridated water, the fluoride should be in a solution so that the surface of erupted teeth may absorb the fluoride thus receiving the benefits of both primary and tertiary fluoride.

Supplementation of dietary fluoride by means of tablets is in relatively widespread use in Australia; two provinces in Canada and Yugoslavia, and to a lesser extent in Cyprus, Denmark, France, Germany, Great Britain, the Lebanon, Luxemburg, Norway, South Rhodesia, Sweden and the U.S.A. (55)

Besides cost, the main disadvantage is the need for continuous ingestion for the period of tooth formation at least to twelve years of age. Fluoride tablets have been available in Switzerland since 1953. Initially they were distributed to schools of 400 communities. However, only 100 communities continued the distribution of the tablets. Similarly, a project carried out in Hawaii from 1957 to 1961 to gain satisfactory utilization of free fluoride tablets proved a failure despite extensive publicity. At the beginning of the project, 90 per cent of the parents were using the tablets provided, but after four years about only 4 per cent continued to give the tablets to their children. (55) It is there-

fore concluded that fluoridation on an individual basis, although perhaps effective in properly motivated families, is a failure from the public health standpoint.

b) FLUORIDE-VITAMIN COMBINATIONS (66)

The administration of fluoride-vitamin combinations to children is not justified by any scientific rationale.

The use of inflexible combinations of nutrients makes it all but impossible to adjust the fluoride intake to the needs of the individual in relation to the fluoride level in the community water supply.

The increased expense of fluoride supplementation when linked with vitamins and other nutrients further increases the difficulty in fluoride use in poorly motivated families.

In other families with presumably stronger educational backgrounds, multiple vitamins are rarely needed because the family diet would tend to be adequate in the first instance.

c) FLUORIDE IN MILK (66)

At the concentrations in which it is added, fluoride is probably absorbed from milk almost as well as from water. Here again, apart from the problem of additional cost, the administrative

difficulties all but preclude serious consideration of this medium for fluoride.

Control would be needed of the many dairies supplying milk, and some mechanism would have to be found for supplying various levels of fluoride, since a particular dairy may serve households with different water supplies.

In addition, the consumption of milk is far more variable than that of water.

d) FLUORIDATION OF TABLE SALT (59)

Fluoridated salt is widely used in Switzerland in order to increase the fluoride intake of large populations as there are no community water supplies in many villages and towns. Ninety mg. of fluorine as sodium fluoride is added to each kilogram of sodium chloride which is used for preparation of food in the kitchen and for individual seasoning of food at the table.

Data concerning table salt consumption are still scanty, but an estimate in Switzerland stated the range of salt consumption to be from 0.9 to 5.0 g. of table salt per person per day. Infants and children consume less salt than adults.

Based on the above figures, the amount of fluoride ingested daily through the use of fluoridated milk is between one third to one half that of water fluoridation. Advocates of this media of supplementary fluoride have suggested the present concentration be doubled but due to extremely large intakes by some individuals this is thought to be ill advised.

While dietary supplementation of fluoride is of some value, it is no substitute for water fluoridation because of the following selective characteristics.

1. Water fluoridation makes fluoride available to all children residing in the area served by the water supply.
2. It requires no conscious and sustained effort on the part of the individual.
3. It automatically restricts the fluoride intake to levels which have been proved to be safe for everyone.

However, such measures are worth careful consideration when a fluoridated community water supply is not possible.

3. TOPICAL FLUORIDE THERAPY

a) Topical application

Epidemiological findings in areas where fluoride occurs naturally in the water indicate that not only is fluoride necessary during the pre-eruptive phase of tooth formation, but also during the post-eruptive phase, if maximum inhibition of dental caries is to be obtained. Dean et al. showed that in Bauxite, U.S.A., children who were exposed to pre-eruptive effect of fluoride had less caries, even though they had no post-eruptive fluoride; but the degree of inhibition was not as great as comparable children who were continuously exposed to fluoride. (32)

The results of the various studies in fluoridation, e.g. Newburg, N.Y. (9) and Brantford, Ontario (21), show that children 12 - 14 years old whose teeth had erupted at the time the fluoridation programme commenced, had less caries due to the post-eruptive effects of fluoride.

In 1942, Bibby (19) showed that the use of three applications of 0.1 per cent solution of sodium fluoride spaced four months apart resulted in a 46 per cent reduction in the incidence of dental caries. Since then, many investigators have used a great variety of fluoride solutions, with variation as well in the age of patients, duration of study, number of treatments per year, spacing of treatments, concentration of solutions and pH of solution.

Two major techniques have been advocated and in both cases the treatment is preceded by a thorough prophylaxis. The Knutson technique requires four applications in a period of a few weeks following a single prophylaxis, the treatment being performed at ages three, seven, ten and thirteen years, to coincide with the eruption of important groups of teeth. (52) The technique recommended by Bibby uses a single application repeated every six or twelve months, thus it could be used in conjunction with the periodic recall system of private practice. (19)

Most of the earlier investigators were using 2% aqueous sodium fluoride. Other fluoride compounds have been claimed to give superior results. Stannous fluoride has been reported to give caries reduction ranging from 50% (19) to as high as 90% (50). Reduction produced by sodium and other fluorides ranges between 40 and 50%. (52). (30)

Clinical studies with stannous fluoride have suggested that topical stannous fluoride treatments are effective in children whose teeth have developed in the presence of fluorides and in limited studies a reduction in adult caries has been reported.

As a public health measure, topical application does not rank very high as yet. The main difficulties are :

1. It requires the services of trained personnel, who are already in short supply.

2. It is costly in terms of extra dental fees
3. Public attitude towards dental health is not strong enough for the preventive method to be utilized by large population groups.

However, topical fluoride therapy is being used increasingly.

Leatherman reported that it is used to a larger or lesser extent in Australia, Brazil, Bulgaria, Canada, Taiwan, Columbia, Czechoslovakia, Denmark, Egypt, Finland, Hungary, Italy, Japan, Korea, New Zealand, Norway, Sarawak, Sweden and the U.S.A.

b) PROPHYLACTIC PASTES

Studies conducted using stannous fluoride in a prophylactic paste have been consistently positive with a caries reduction mostly between 30 and 40%. (71) These studies indicated a comparable degree of effectiveness in both children and adults and in the presence or absence of communal water fluoridation. The use of fluoride containing prophylactic pastes seems to warrant consideration of providing fluoride therapy in caries-preventing programmes.

c) FLUORIDE IN DENTIFRICES

For some time stannous fluoride containing dentifrices have been available to the public. Calcium pyrophosphate is used as the polishing agent since both the conventional polishing agents, calcium phosphate and calcium carbonate, have been shown to render the stannous fluoride ineffective. (15)

An examination of the caries reduction per cent based on D.M.F. surfaces shows that with the use of stannous fluoride-pyrophosphate dentifrices, reductions in the range of 12 to 71% were obtained. Neglecting the six months trials as of doubtful significance, a 25 to 30% reduction is probably the most realistic figure. The clinical studies also show that the maximum effectiveness is obtained in children and adults and in fluoridated and in non-fluoridated areas, when stannous fluoride dentifrice is used in conjunction with topical application of fluoride and the use of fluoride prophylactic paste.

Recently, a fluoride dentifrice containing sodium monofluorophosphate has been placed on the market in Australia following successful clinical trials in school children.

Reservations on the value of stannous fluoride dentifrice for general use may be made on the grounds that in view of the lack of stability of the stannous fluoride and probable limited shelf-life, it cannot be guaranteed that the commercially distributed samples would be as effective as the fresh products used in the trials. (24) Also, as long as the stannous fluoride is in active stannous form, it will carry with it the same possibility of staining enamel imperfections and silicate fillings as does the topical application of stannous fluoride solution. Finally, because the dentifrice is highly acid and contains an abrasive, the possibility of causing tooth brush abrasion will be greater than if neutral dentifrices are used.

To overcome all these undesirable effects, Brudevold and Chilton have suggested the use of dentifrice containing sodium fluoride and acid orthophosphate in a calcium-free base.⁽²⁴⁾ This combination of fluoride is recommended because -

1. Sodium fluoride acidulated with orthophosphoric acid has been shown to have pronounced caries inhibition.
2. It does not discolour teeth as is frequently found with stannous fluoride.
3. Laboratory studies have shown that the uptake of fluoride by enamel is considerably greater from acid phosphate - sodium fluoride than from stannous fluoride.
4. The presence of phosphate in the solution counteracts dissolution of the enamel and favours deposition of fluoride as fluoroapatite.
5. A calcium-free abrasive - insoluble sodium metaphosphate - is incorporated in the paste because several studies have shown that fluoride is unstable even in dentifrices that employ calcium pyrophosphate and the abrasive partly react with the fluoride present in the dentifrice.

Results after two years' study using this combination in unsupervised, permissive toothbrushing at home, showed a reduction similar to figures obtained for stannous fluoride dentifrices. The preliminary report of a similar clinical trial conducted in Australia substantiated these findings.⁽³⁵⁾

4. MULTIPLE FLUORIDE THERAPY (17)

On theoretical grounds, the use of more than one fluoride therapy should produce additive benefit resulting in greater reduction in caries incidence. However, studies so far have not shown a very marked effect. Bixler and Muhler using stannous fluoride in prophylactic paste, topical solution and dentifrice for home use, noted an 80 to 90% reduction in dental caries in children in a non-fluoridated area after six months treatment. After one and two years, these reductions decreased to about 60 and 70%. Similar results were obtained by Gish and Muhler employing the same series of treatments in children born and raised in an optimal fluoride area.

III. HEALTH EDUCATION

1. PREAMBLE

Adequate education of the public is a necessary adjunct to programmes aimed at a high standard of health in the community. Those responsible for the dental health education of the community face a particularly difficult task in arousing and maintaining public interest since the effects of the disease are not generally spectacular, and dental health procedures may require some continuing sacrifices by the public in the form of time, labour and inconvenience. In dental health, continued and sustained co-operation of the individual is essential. Elimination of caries by the filling of decayed teeth in itself does not ensure freedom from future attacks : caries may form in a different tooth or even on another surface of the same tooth. When a filling is placed in a tooth, the effect of dental caries is treated, not the cause of the disease. Unless the patient practices regular and adequate home care, periodontal disease will recur even after a highly sophisticated and expensive treatment involving gingivectomy and bone grafts. Similarly, unless the patient makes special effort in oral hygiene, dental appliances such as partial dentures, bridges and orthodontic appliances, will cause tremendous damage to dental and oral tissues.

Another aspect of dental health education is to raise the present low level of public interest in dental health. Dental health education will stimulate public awareness of the dental health problem. This will in turn create a demand in dental care from the individual more in keeping with the prevalence of the disease. When the demand becomes more widespread there will be a demand for an adequate dental health programme from the people, the allied health professions and the government.

Who should be educated ?

Dental health education is concerned with people, with changing their knowledge, feelings, habits and attitudes in order to develop those dental health practices which will bring about the best possible state of well-being. To be effective, dental health education should cover the following groups :

1. The dental profession

Members of the profession are highly trained authorities in matters of dental health. In the past, dentists have been generally reluctant to proffer advice unless advice was particularly sought or when it was an essential adjunct for the success of treatment currently in progress. Present trends are towards a change for the better. Recent graduates are more public health minded than their older colleagues. This is partly due to a change in the curricula in many dental schools, and partly due to increasing activities of professional organisations in this field.

2. Allied professions and other organizations

The participation of health and welfare personnel and school teachers is an important part of dental health education. These people serve as a bridge between the profession and the public. Of particular importance is to attain a favourable disposition to dental health of the opinion leaders in the community.

3. The public

In its second seminar on dental health, held in Adelaide, South Australia in 1959, the World Health Organisation listed the following objectives of dental health education of the public⁽⁷⁶⁾ :-

- (a) In a community or nation, an awareness of it's dental need should be aroused.
- (b) A community should be informed of the seriousness of dental disease.
- (c) The fears and prejudices concerning dentists and dental treatment should be removed.
- (d) People should be motivated through
 - (i) fear of consequence
 - (ii) aesthetics
 - (iii) dental experience, and
 - (iv) prestige in order to promote positive action towards dental health.

Motivation should be more effective if dental health is related to health matters of higher levels of public interest such as maternal and child health, heart and circulatory diseases and obesity.

2. NEED FOR DENTAL HEALTH EDUCATION

The biggest barrier against the attainment of good dental health has been, and still is, the general indifference of the public towards dental health.

It is a feature of modern society that technical changes take place at so rapid a rate that public attitudes and opinions tend to lag behind, with the consequence that there is often a serious gulf between what is technically possible and what is socially acceptable. (58)

It is becoming increasingly clear that this time-lag presents a very serious problem to many of the professions, and that unless some steps are taken to remedy this, the value of technical advances is strictly restricted. It is, for example, of little practical value to develop new preventive measures or wider provision of public dental services unless the climate of public opinion is such that these measures and practices are accepted by the community.

The impediments in the way of good dental health have always been assumed to be financial ones. Except amongst the indigent, income level is not as much a barrier to seeking treatment as it is a reflection of a standard of living and a pattern of personal values which determine the attitude of an individual towards dental health. (45)

An analysis of the utilization of patterns of the public indicates that motivating the public to seek adequate dental care is no simple problem. Utilization of dental services is far too low even among

the upper income groups. It is obvious that the attitude and values of the individual and his knowledge about dental health partly determines whether he purchases dental care for himself or his family in preference to the goods and other services which compete for his attention and money. (82)

The impediments, therefore, are largely social and psychological. The most serious problem confronting the profession at the present time is that of discovering ways and means by which the existing technical competence of the profession may be effectively employed in society and accepted by the public.

The recognition of the deep-seated nature of these problems has led in recent years to more strenuous efforts on the part of the profession to bring about change. The dental profession has, in recent years, sought the services of social and behavioural scientists to assist it in the task of furthering dental health education. In 1964, for example, the Dental Health Education and Research Foundation of the University of Sydney made a grant to enable the School of Applied Psychology of the University of New South Wales to make an exploratory investigation of the dentist/patient relationship. The report and recommendations of this study were published earlier this year. Information of this type should make possible a more intelligent approach to the development of programmes to improve the dental health of the public.

3. SOME BASIC PRINCIPLES OF HEALTH EDUCATION

Behavioural scientists have established that all human behaviours are motivated.⁽⁶³⁾ This widely accepted formula, however, is

not sufficient to account for specific acts in health behaviour.

Among the factors that determine the individual's action about health are four initial and highly subjective beliefs.

1. that one is susceptible to a particular disease
2. that the disease would be severe if it should occur
3. that there is a course of action available which would be effective in reducing one's susceptibility to the disease or severity of the disease should it occur, and
4. that the available course of action should not be unpleasant, exacting or compete with other stronger motives.

The emphasis is on the individual's belief not on what is objectively true, People vary in their objective reality. Moreover,

the term 'severity' of illness as used here includes more than clinical or medical severity of the illness. It may, and often does, include beliefs upon consequences in areas such as family relationships, finances, occupation and social standing.

For a person to be motivated to take any given action towards positive health he must be convinced on all four factors. Most individuals believe that they are susceptible to dental caries, but because of widespread ignorance about periodontal diseases, very few recognise their susceptibility to the attack of these conditions.

Dental disease is rarely regarded as being clinically severe. Still it may be serious to the individual because he may suffer social disapproval because of bad breath or unsightly teeth or his income and chance of promotion may suffer from unsightly anterior teeth.

While the first two factors seem favourable, the remaining two are mainly responsible for general neglect in obtaining optimum dental health.

Ignorance about dentistry is widespread.⁽⁴⁶⁾ Most people know that sticky carbohydrates are harmful to the teeth. But that is as far as the knowledge goes. There is agreement among investigators that calcium cannot be withdrawn from the teeth once it has been formed. Yet sixty-three per cent of the individuals surveyed by the Americal Dental Association believe that the unborn child absorbs calcium from the teeth of the mother. The idea that eating food with adequate vitamins will prevent tooth decay was held by almost seven out of ten people. One fourth of the individuals felt that a toothache need not necessarily require the attention of a dentist "since it will often disappear by itself."

Whether or not an individual will act to preserve his dental health will depend on his judgement on the course of action available to him. Restriction of sticky, fermentable carbohydrates and regular tooth brushing after each meal is often perceived to be inconvenient or too exacting. Visits to the dentist are associated with pain and discomfort and, at times, prolonged waiting.

People with obvious symptoms of disease ordinarily will act to regain their health if they feel the action they will take is effective. This type of action may be considered to result from high motivation, and little persuasion or education from the outside is necessary.

For those who are apparently well, a more sophisticated knowledge and considerable persuasion are required if action is to be taken to prevent illness. The contrast between these two levels of effort is illustrated by those patients who will seek advice from a dentist only when they have a toothache and who are willing to return regularly for periodic examinations and treatment.

The problem of dental health education of the public is, therefore, to say the least, enormous. It presents the greatest challenge to the profession and a challenge that must be met if progress is to be made. In recent years great efforts have been made to bring changes and there is every reason to believe that progress is being made in that direction.

If dentists and dental health educators can find more than one reason for their patients to carry out a certain health action, the chances are obviously increased that the patient will do it. Dentists and dental health educators who merely appeal to the health motives are failing to tap the richness and variety of human motivation and longing. Dental health practices may be taught more effectively if they are related to a variety of factors and not just 'health'. More effective learning takes place in learning one's culture through the process of socialisation. The child who takes a step closer to civilisation, for example, by brushing his teeth regularly is rewarded with love and affection not only by his parents but also by members of his family, other adults and playmates. Pressures to conform stem from all these sources.

4. CHANNELS FOR PUBLIC EDUCATION

Broadly speaking there are three channels for public health education. (53)

1. Personal instruction of the individual by the dentist, dental health educator, or professional person who comes into direct contact with the public and is in a position to give personal advice on health matters.
2. Small group contacts through churches, clubs, parent-teacher and other similar associations.
3. General propaganda by such means as printed matter, public meetings, films, radio and

television, exhibits and pageants.

a) PERSONAL INSTRUCTION

In private practice

Personal instruction as a method of dental health education is without doubt the best and most effective one. Personal problems and peculiarities can be discussed and solved and the dentist has the individual attention of his listener. However, this method is limited only to that section of the community which is already in the habit of seeking regular care.

In the United States, the National Opinion Research Centre study on private dental practice indicated that most dentists in practice recognise the importance of the education of the individual patients in the dental office, said that they provided such instruction almost routinely in their offices and they recognised the obligation of the dental profession to educate the general public regarding oral health and preventive dentistry. (48)

In schools

A great deal of health teaching including dental health, is taking place in the schools. The first priority for any dental health education programme in schools should be assigned to enhancing the knowledge of the teacher and providing aids which will improve his effectiveness in the classroom. (48) (42)

The American Dental Association, Bureau of Dental Health Education has produced a film entitled 'Set the Stage for Dental Health' which is designed for in-service training of teachers and other adult groups. (42)

The 28-minute colour film covers the basic facts of dental health, utilizing a wide variety of audiovisual materials and speaking techniques. In addition, the Bureau has a lecture illustrated with 57 slides, based on the film, so that a speaker after he has seen the film and ^{having} learned the technique, can take the slides and make a similar effective presentation. Parents should also be included in school dental health talks so that they can enforce in the home what is taught in the school. (1)

In countries where there is a school dental service in operation, (e.g. Australia, New Zealand, Scandinavian countries, United Kingdom) dental health education is a feature of the service.

b) TALKS TO SMALL GROUPS

Voluntary health agencies and civic groups provide an opportunity to reach a certain segment of the population with a relatively effective person-to-person teaching. This venue for health education is not used to any significant extent. To encourage its members to take part in such activities many dental societies in the United States have established "Speaker's Bureaux" to recruit and train dentists to be effective speakers. The Bureau also provides films, slides, leaflets and other audiovisual aids to make speeches even more effective.

c) MASS MEDIA (53) (27)

This includes the daily and weekly newspapers, and magazines, radio and television, which can contribute in at least three ways to health education.

1. They create a general awareness of the content materials.
2. They provide opinion leaders with the specific information which they subsequently pass on to others.
3. They reinforce those who are somewhat tentative or diffident about introducing the new recommendations. The printed word or the public utterance over the radio or television, for some people, seems to carry the imprimatur of authenticity.

Dental health education of the public is carried out by many professional organisations in many countries to different extents. In the United States mass media are used to quite a considerable extent and will be described briefly.

Newspapers and magazines (41)

In 1965, fifty-two dental societies had qualified public relation counsels in the staff to 'tell the profession's story in a straightforward, simple, lay language but in a dramatic manner that will capture the interest of the public.' Arrangements vary from the part-time employment of a newspaperman to the full-time staff public

relation people or agency. The newspaperman's job is primarily to report on the society's activities, write news releases and see to their distribution; an agency offers a full range of its production services - such as writing, art, purchasing of printing and typographical advice and communications, business and community contacts that it has built over many years, plus complete coverage, press, radio and television.

In addition, a number of dental societies have organised dental columns in major local newspapers. They usually appear in the Science Magazine pages and are written by the dentists themselves.

Radio and television (40)

The American Dental Association Bureau of Audio-visual Service, Dental Health Education and Public Information, present brief health education messages on television throughout the nation. This programme was started in 1962. Each month a new one-minute cartoon film was sent to the stations. In 1965, 260 television stations were transmitting the message and it was estimated that on the average each film was used twelve times per month. This indicated that each film was shown nationally about 3,000 times a month. The subject matter ranged from mouth protectors to the relationship of dental health to general health; and from the importance of deciduous teeth to the danger of periodontal disease. There were several films on fluoridation.

Similarly the bureaux maintain a variety of 30-second and 60-second radio spots on such subjects as dental neglect, teenage dental habits and adult dental health.

In addition, several local dental societies distribute health education spots on radio and television stations in their states. During Dental Health Week 'open mike' type of radio shows were used by a few dental societies. In these programmes, listeners called or sent in written questions to a panel and these were answered on the air.

Feature programmes (40)

The A.D.A. Bureau of Audio-visual Service had a variety of films made from television programmes that were produced by State and local societies. The following selection of five indicates the scope and variety.

1. Artificial Replacements (Better Health through Dentistry, No.7)
16mm., sound, black and white, 28 minutes, 1959.
Presented by the Denver State Dental Association in co-operation with Rocky Mountain Dental Products.
2. Injuries to the Teeth (Better Health through Dentistry, No.8)
16mm., sound, black and white, 29 minutes, 1959.
Presented by the Denver State Dental Association in co-operation with Rocky Mountain Dental Products.
3. Romper Room Dental Programmes, 16mm., sound, black and white,
51 minutes, 1959.
Presented by Romper Room Inc., Baltimore.

4. Inside Story - Immediate Denture, 16mm., sound, black and white, 29 minutes, 1960.

Presented by the Greater Milwaukee Dental Society.

5. A Smile is to Keep. 16mm., sound, black and white, 29 minutes, 1962.

Presented by the Chicago Dental Society.

In addition, the Association maintains a large group of films that are cleared for television stations and may be used by themselves or as part of a longer programme. The films vary in length from $4\frac{1}{2}$ to 51 minutes.

The Association also makes these films available directly to television stations through a commercial distribution agency. In 1965 ten films were distributed in this manner. One such film, 'Pattern of a Profession' has been distributed since 1960. In five years it had been shown on television more than 800 times to a total estimated audience of 20 million persons. The film which discusses dentistry as a career, was placed in distribution in 1962, and in three years has been televised about 500 times to an estimated audience of almost 14 million persons.

IV. PUBLIC DENTAL CARE

1. PREAMBLE

This section will review some of the mechanisms now available to make dental care within easy reach of everyone.

In the socialised countries, e.g. Europe, Scandinavia and New Zealand, the responsibility of the health of the people has been largely taken over by the State. In these countries there is some form of public dental service available. The type and extent of the service varies in different countries depending on the political attitude, financial status, and availability of manpower.

In countries where health responsibility lies with the individual, dental care is largely purchased from private dental practitioners on a person-to-person basis. Here, the amount of dental care people receive depends to a large extent on the family income and the people's attitude towards dental health. Public health services are limited only to certain sections of the population. This comprises those under the responsibility of the State such as members of the armed forces, those confined to institutions, and the indigent. On the grounds of greatest need, expectant and nursing mothers are offered public facilities.

The health of the child population is given more attention in recent years. In the United States and Canada a mechanism has been devised to encourage parents to seek dental care for their school-going children. This is done in the form of referral programmes whereby the children are referred by the schools to private practitioners for examinations and the parents are notified of their dental conditions. In Australia, in addition to referral programmes, the public health departments provide school dental services, but unlike Norway and New Zealand, dental care is limited to certain groups.

Socio-economic developments in these countries have resulted in a change in spending patterns. Time-payment has enabled the people to afford many things which are otherwise beyond their means. This has included the purchase of dental care. Another important development in financing dental care is the growth of third-party payment by organisations such as labour unions and industry.

This section will review some of the above facilities of obtaining dental care which may be of interest. It is proposed to describe the following :

1. Public dental care in Great Britain and Germany
2. Public dental service in Oslo, Norway and New Zealand
3. School dental service in Australia
4. Referral programme in the United States of America
5. Purchase of dental care in the United States of America.

2. PUBLIC DENTAL SERVICE IN GREAT BRITAIN

This section deals with the Public Dental Services for England and Wales, but broadly speaking it is applicable to Scotland and Ireland. The Public Dental Service is part of the National Health Service introduced in 1948.

The National Health Service is not an insurance scheme and everyone in the country is eligible to receive treatment without regard to his or her income and without being called upon to make any direct payment.⁽⁷⁵⁾ Theoretically, every form of dental treatment is included in the service but patients may be required to pay part of the cost of such things as metal dentures and gold inlays if they desire these, and they are not certified as being clinically necessary. On the other hand, if these are certified as being necessary, the whole cost is borne by the service. Amendments of the National Health Service Acts in 1951 and again in 1952, have somewhat changed the situation as regards absence of direct payments.⁽⁷²⁾ At present charges at the start of each course of treatment are made to all but persons under 21 years of age and nursing and expectant mothers. Charges are made also toward the cost of dentures supplied.⁽³⁶⁾

General Financial Provision

The Service is financed from three sources⁽³⁹⁾.

1. The National Insurance Fund to which weekly contributions are compulsory under the National Health Service Act, from practically the entire population except children, housewives and elderly people.
2. Direct grants by the Treasury out of general taxation levied by the central government.
3. Rates from local authorities and Ministry of Education by government grants to cover the considerable cost of the service these bodies are called upon to provide.

The major part of the cost; however, falls on the taxpayer.

Dental Services (75)

Dental services are provided in two ways :

1. In health centres or clinics where the treatment is carried out by salaried dental officers who may be either full or part-time.
2. By private dental practitioners working in their own surgeries and remunerated on a scale of fees for each item of treatment provided.

The Priority Service (75)

Dental services for priority groups have been in operation long before the introduction of the National Health Service. These included :

1. Dental service for preschool children
2. Dental service for expectant and nursing mothers.

3. School Dental Service

Dental treatment is given in the health centres and clinics by salaried dental officers.

With the advent of the N.H.S. this system has been retained. The N.H.S. Act places upon local health authorities a responsibility to provide dental treatment for nursing and expectant mothers and young children under school age, and a similar responsibility is placed upon local education authorities in respect of children of school age, i.e. from five years to sixteen years of age. The idea behind this priority arrangement was that, owing to the overall shortage of dentists in relation to the population, it would be impossible for the Government to guarantee to provide full service for everyone, but every endeavour should be made by the local authorities to provide a complete service for the special classes for whom they were made responsible. Unfortunately this theory has not worked out in practice. The heavy demands made on the profession under the General Dental Service has led to a very substantial increase in the income of general dental practitioners which has been reflected in a runaway inflation of the salaries offered to their assistants. Moreover, so great has been the demand for dental service that it has been relatively easy for a newcomer to a district to establish himself in a profitable practice in a matter of months. These two factors, together with the reluctance of local authorities to raise the low salaries of their dental officers to a reasonable

level have led a number of those officers to resign from the service in order to take up private practice. The result is that instead of the priority services being expanded, there has been a catastrophic reduction in the facilities available for them. There is, moreover, little reason to suppose that children hitherto treated by the school dental service are seeking treatment in the general dental service as some dentists are unwilling to undertake the treatment of children on a comprehensive basis.

The General Dental Service

By far the largest component of the Public Dental Service is the General Dental Service - designed to provide all the treatment necessary to secure 'dental fitness' for the mass of the population. Under Regulation S.I. 1948, No.505, 'dental fitness' is defined as "such a reasonable standard of dental efficiency and oral health as is necessary to safe-guard general health." (72)

Administration (64)

The Executive Council : The Executive Council is a statutory body charged with the duty to make arrangements with dental practitioners in its area for the provision of General Dental Service. Generally speaking, there is an Executive Council for every administrative county or county borough and each keeps a list of dentists in its area participating in the Service.

The Dental Estimates Board is the body responsible for approving and sanctioning payment for estimates submitted by practitioners in the General Dental Service and consists of nine members, all appointed by the Minister of Health, of whom seven must be dental practitioners.

The patient

Under the scheme a patient :

1. may seek treatment from any dental practitioner in the list of the Executive Council
2. is free to change his dentist as he likes even before the completion of a course of treatment
3. may accept as much or as little of dental treatment needed to make him dentally fit as he wishes.

The dentist

Under his term and condition of service the dentist among other provisos :

1. is free to refuse any person as a patient
2. must complete for any patient he accepts as much of the treatment necessary for dental fitness
3. cease to act as that person's dentist before the completion of the treatment only with the consent of the executive council of his area.

DISPUTES (72)

There are three disciplinary bodies, the tribunal, the dental service committee of the executive councils, and the local dental committees dealing with disputes depending on their seriousness.

The Tribunal

This is a quasi-legal body consisting of three members :

- (a) a chairman who is a barrister or solicitor of standing appointed by the Lord Chancellor
- (b) one member appointed by the Minister of Health after consultation with Executive Council's Association, and
- (c) another member appointed after consultation with the British Dental Association.

Duty : To investigate the more serious complaints against practitioners in the N.H.S. made by an executive council or any other person. It has the power to erase the name of a practitioner from the lists of one or more executive councils.

Proceedings are held in camera unless the dentist involved applies for a public hearing. Evidence is heard on oath and both parties allowed legal representation.

Appeal against tribunal decision can be made to the Minister of Health. Only respondent dentists may appeal. Appeals are heard by a person appointed by the Minister.

The Dental Services Committees of the Executive Councils

Each executive council has a statutory duty to establish a dental service committee to which it must refer for any disputes.

It consists of one lay chairman, three lay members from executive council and three dental members appointed by local dental committees.

Duty : Investigation of all complaints received from N.H.S. dentist practitioners on their list in which a breach of the terms of service is alleged.

Only those concerned with the case are admitted. Paid advocates are not allowed and witnesses may be used, examined and cross-examined.

Powers : The committee reports its finding to the executive council and suggests the line of action to take.

The Executive Council may

- (a) impose penalty as recommended by the committee
- (b) recommend to the Minister of Health that the respondent dentist be fined
- (c) request tribunal to remove dentist from council's list of practitioners.

Appeal : Appeals may be made to the Minister of Health against these decisions. (Except (c) above.)

Both complainant and respondent may appeal.

Appeals are heard by person or persons on the Minister's behalf (one of whom is usually a dentist from the B.D.A. panel).

Local Dental Committee

Its function is purely investigatory. Findings are reported either to executive council or Minister.

Members of the committee are elected by dental practitioners of the area and recognised by the Minister of Health as representative of dental practitioners of the area.

Duties :

- (a) to investigate claims of payment in excess of what is necessary to render a patient dentally fit.
Complaint may be made by dental estimates board or investigation may be on matters against another
- (b) It investigates complaints of one general practitioner against another
- (c) It investigates reports by dental service officers that a practitioner is not keeping adequate records.

In all cases the Minister's decision is final.

In cases where the question before the Minister is a breach of terms of service or professional ethics, the Minister must refer the case to a local Dental Advisory Committee consisting of

- (a) The Principal Dental Officer
- (b) Two dental officers from the Ministry of Health,
and
- (c) Three general practitioners from the B.D.A. panel.

Dental treatment is given by private practitioners working in their own surgeries and remunerated on a scale of fees for each item of treatment provided. Dentists who wish to take part in the service are required to register with the executive council of the area. All dentists registrable in the United Kingdom are eligible to register in the N.H.S. In 1965 there were 12,000 dentists registered in the various executive councils serving a population of 53 million people.⁽⁷²⁾

When a dentist undertakes to provide treatment for a patient, he may be able to carry out the treatment without obtaining approval, but in certain cases the prior approval of the Dental Estimates Board must be obtained. For example, fillings, root treatment and extraction for the relief of pain may be given without prior approval, but in most instances, the provision of dentures or replacement of dentures need prior approval.

In the first four years of the service, the public demand was weighted towards the provision of dentures. This reflected the public need at the time, but was exaggerated by the apparently free nature of the service. This demand was reduced in 1951 by the introduction of charges against the patient in receipt of dentures.

In 1952 further changes in the Act provided for direct contribution by patients other than certain priority classes (namely, people under the age of 21 years, expectant and nursing mothers) towards the cost of conservative treatment. The provision of children's dentistry was encouraged by an improved scale of fees for conservation of deciduous teeth.

Charges for Dental Treatment (36)

There is a charge for dental treatment up to a maximum of £1. There is no charge for examination, the arrest of bleeding or a house visit. No charge is made to persons who are children of young persons under the age of 21 years, expectant mothers and mothers who have had a child during the preceeding 12 months.

There is a charge for dentures (including bridges) of £2.5s.0d. for one, two or three teeth; of £2.10s.0d. for four to eight teeth and £2.15s.0d. for eight or more teeth. No charge is made for repairs to dentures or other dental appliances.

The total cost of the General Dental Services for 1963 was £61,000,000. Of this, £10,250,000 was contributed by patients paying statutory charges for treatment received.

The vast proportion of dental service was in the form of restoration and repair; very little inducement or demand was made for preventive measures. (73) This can be shown by an analysis of the costs of the

principal items of treatment derived from a sample of estimates from the Dental Estimates Board (England and Wales 1961 - 1962)

Conservation of teeth	50%
Prosthetic appliance	26%
Diagnosis and treatment planning	8%
Periodontal treatment	6%
Extraction of teeth	6%
Orthodontic and other treatment	4%

3. PUBLIC DENTAL SERVICE IN GERMANY (60)

The dental care of the population is entrusted by state legislation to sickness insurance companies. Sickness insurance is divided into groups of local, works, guild and rural insurance companies and their obligations have to conform to legally fixed regulations.

These 'obligatory service' cover the fields of conservative dentistry and dental surgery as well as disease of the mouth and jaws. The insured cannot demand services which are "uneconomical and unnecessary to cure and alleviate" nor can the dentist in question effect or prescribe them.

The insured person does not pay for dental treatment as long as it is within the obligatory service. Prosthetic, orthodontic and root treatments are not obligatory but so called 'optional services', which may be subsidised by different companies in their regulations. There is, however, some freedom as regards the additional 'optional service'

which may lead to certain amounts of competition between the different groups of insurance. About 80 per cent of the population is covered by sickness insurance scheme.

Not all dentists who wish to work under contract actually take part in the treatment of the insured population. A dentist must be admitted : admission being decided on the principle of parity by a procedure prescribed by the law. Strenuous efforts to restore the free choice of dentists, i.e. to admit all dentists who wish to enter into contract, so far have failed. In 1955 there were 24,000 dentists working under contract out of a total of 32,312.

Treatment is given in private practice by dentists who are under contract with the insurance companies. Until 1933 panel dentists were engaged individually by different companies. Nowadays the Federation of Panel Dentists is responsible to the public for treatment of all insured persons.

The insured is free to choose his dentists only from those admitted to give treatment.

The panel dentist decides on the amount of treatment required at his own discretion but within the framework of the legal regulation prescribed. Itemised treatments are entered into a form which at the time serves as the final account.

The accounts of the panel dentists are checked by the Dental Clearing Office - a sub-office of the area professional organisation.

Payment to the dentist is made by the dental clearing office which is then reimbursed by the insurance company. The dentist, therefore, have no direct dealing with the insurance companies but only with his own organisation.

There is a basic scale of charges for obligatory services which is decided between the different group of insurance companies and the Federation of Panel Dentists. As a rule, the insurance companies do not usually pay the full amount fixed by official schedule of fees, but pay a capitation fee which, in practice, leads to payment of a percentage only. Competition among the insurance companies had led to offers of additional benefits; some companies have for decades paid fees for individual treatment instead of lump sums in the form of capitation fees, others have included many optional services in obligatory services.

Disputes

Differences arising from contracts between individual dentists and the sickness insurance companies or between insured person and the companies can be brought before the so-called social courts. These courts deal with the whole field covered by social insurances and were established in order to ease the burden of the law courts.

Administration

The Federal Board of Dentists and Sickness Insurance established in 1955 is the highest authority in the joint self-government between the federal organisation of dentists and the corresponding organisation of sickness insurances.

The Board lays down the principles to protect the panel dentists. It determines the meaning of adequate suitable and economical care of the patients.

4. PUBLIC DENTAL SERVICE IN THE MUNICIPALITY OF OSLO, NORWAY (37) (43)

The public dental service in Oslo is without doubt the best service in operation anywhere in the world. Here, since 1910, there has been an excellent school dental service in operation; a service, which in the period from 1910 to 1930 expanded to such an extent as to attain almost 100 per cent effective care of the young. Here too, there is a care for infants from three to six years of age and also after-care is provided for young persons from fourteen to eighteen years old. After this age the risk of dental disease can be insured against with a social insurance company for a very low premium.

Dental surgeries are, as a rule, installed within the school buildings. They operate six days per week. Two daily shifts of personnel occupy these surgeries : 8 a.m. to 2.30 p.m. and 2.30 p.m. to 9 p.m. There is no afternoon shift on Saturdays.

Dentists employed by the municipality are on a salary basis. The salary ranges from a minimum of 27,000 kroner to 32,000 kroner. (Approximately 7 krone to the US\$1 - 1957.)

School Dental Service

This comprises the major part of the public dental service in Oslo. Treatment is systematic and free, expense being borne by the municipality. Small payments are charged for dentures and restorations using gold. The children are treated during school hours.

Norwegian children have compulsory primary education between the ages of seven to fourteen, during which time they attend the same type of schools. Dental treatment is started as soon as the child starts school otherwise ^{he is} ~~his~~ is taken only if dentally fit.

If appointment is broken or the patient shows any lack of co-operation in matters of oral hygiene, he loses his right for the service. He may be re-admitted provided he brings his dental condition up to date at his own expense.

Treatment comprises of the following :

- (a) Prophylaxis
- (b) Restoration with amalgam and cement
- (c) Root treatment
- (d) Orthodontic treatment
- (e) Extraction
- (f) Other surgical dental treatments.

All treatments are given without charge.

X-rays are free.

For orthodontic work the following fees are charged :

Fixed appliance	25 kroner
Removable appliance	30 kroner

Pre-school children

All children aged three to seven years are eligible for dental treatment provided they commence treatment during the year in which they complete their third year. i.e. before the fourth birthday. If older, the child must show evidence on admission that his dental condition is already satisfactory.

Broken appointments may result in loss of right to the service. Appointments may be broken only when sufficiently early notice is given to the dentist - at least four hours before the appointment time.

Treatment is given at school clinics when these are not in use by school children.

A fee of 5 kroners per child at the beginning of treatment and 5 kroners at the commencement of each succeeding year is payable.

Dental Service for Young People

Dental service for young people is provided between fourteen to eighteen years of age and resident in Oslo, provided that his treatment is up-to-date. They are treated in the school dental clinics outside school hours, normally between 8 a.m. and 9 a.m. and 2 p.m. to 8.30 p.m.

A contribution of 10 kroners is requested at the time of registration and later at every first appointment in each treatment year.

National Health Insurance

Apart from this school service, the public dental treatment scheme includes National Health Insurance, which partly covers the expenses incurred by insured persons and members of their family for surgical operations and for the treatment of acute infections of the gums. The National Insurance scheme also contributes to radiographic charges. In addition, the Oslo Insurance Bureau defrays part of the cost of dental treatment for persons between eighteen and twenty-three years of age, thus extending the obligations assumed by the municipality for persons up to eighteen years old.

5. PUBLIC DENTAL SERVICE IN NEW ZEALAND (31)(65)(74)

The major public dental service in New Zealand is the National Dental Service, and is divided into two services :

1. The school dental service
2. The adolescent dental service

The service is controlled and administered by the division of dental hygiene of the New Zealand Department of Health. In 1964 it employed approximately 100 dentists, 990 school dental nurses as well as a number of auxiliary workers.

The School Dental Service

The unique feature of this service is its dental nurse personnel.

The idea of using female nurses to care for children's teeth, as a solution to the problem of the vast amount of work that needed to be done and the shortage of manpower to do it, was formed in 1921.

The nurses are trained to carry out a very clearly defined and limited range of dental operations on pre-school and primary school children. Their aim is to prevent dental disease by early and regular inspection, by dental health education - both of children and their parents and including support for fluoridation - and by systematic and comprehensive treatment of carious lesions.

The great majority of their one-surgery or two-surgery clinics are built and placed in the school grounds. The dental nurse and her surgery are an integral part of the school. Each girl is responsible for the dental health of about 500 children. Throughout their primary school life ~~of the~~ this is the responsibility and every primary school is staffed and equipped at this ratio. A large urban school with 1,000 children has a two-chair clinic while a village school even with as few as 100 children has its one-chair surgery with one part-time dental nurse. Remote schools are visited by a dental nurse with a mobile clinic.

The vast majority of the children attend state schools and there is approximately a 98% acceptance rate. Every child is made dentally fit on entering school at five years of age and is given such treatment as is necessary every six months thereafter. Every endeavour is made to enrol children of pre-school age but acceptance is still poor.

In mid-1965 the number of children enrolled in the school dental service was 635,000 which represents 93% of the school children under the age of sixteen and 53% of pre-school children.

Treatment by the school dental nurse is standardised as far as is possible and consists of prophylaxis, topical application of fluoride, fillings in permanent and deciduous teeth and extractions using local anaesthesia. Root canal treatment is not performed, but capping of clean traumatic exposures is routine treatment. Treatment beyond her scope is referred to a dentist.

Supervision and control are exercised through the principal dental officers of the six dental districts into which the Dominion is divided for administrative purposes. No provision is made for immediate and continuous supervision of the school dental nurse but frequent visits are paid by inspecting officers.

In addition to the school dental service, the State provides an adolescent dental service for children from thirteen and a half to sixteen years. This is carried out by private practitioners under a Social

Security 'fee-for-service' scheme. In 1963-64, 185,000 children received treatment from private practitioners who were paid £1,167,000 or roughly US\$10 per patient in fees for this service.

After the age of sixteen, dental benefits cease. This has posed some serious problems because a good percentage of adolescents also cease to seek regular care. However, with increasing fluoridation of water supplies in New Zealand and the almost certain extension in due course of the dental benefit to the age of nineteen years, the problem could be reduced considerably.

6. SCHOOL DENTAL SERVICE IN AUSTRALIA (49)

In Australia each state has a School Dental Service operating within the Department of Public Health of the State. The extent of service varies slightly in the different states but in general the School Dental Service provides for a measure of professional supervision over the dental health of a section of the school population during the period of attendance at primary school. The School Dental Service also trains children in the care of the teeth and to teach them the principles of dental health. Dentists are employed by the Department on a salary basis.

New South Wales

In New South Wales the School Dental Service operates an examination service in which parents are advised of dental defects by marked charts. A free dental service is provided to restricted age groups :

6 - 8 years in the metropolitan area

6 - 9 years in the country areas

All age groups in remote areas where there is no private practitioner.

An emergency service is available to children of all ages suffering pain.

In the examination service school dental officers move from school to school. Children are entitled to seek free treatment within the prescribed age groups at well-equipped fixed clinics in Sydney, Newcastle, Wollongong and Tamworth. In country areas mobile dental clinics offer free treatment in school grounds. The units are fully equipped and only electric power is required to enable the dental officer to provide modern treatment services. To date there are fifteen fixed clinics and a fleet of sixteen mobile clinics. New Zealand trained schoold dental nurses are being used as well as dental officers.

Dental service is also provided for children attending day nurseries in metropolitan Sydney. The nurseries have well-equipped dental clinics manned by two dentists from the United Dental Hospital of Sydney on a roster basis.

Victoria

In Victoria officers of the School Dental Services provide dental treatment at dental clinics at the metropolitan area and in mobile units which visit schools in certain country districts. They also visit child institutions, homes, and orphanages in the metropolitan area and three large country towns - Geelong, Balarat and Bendigo.

Staff are rostered on the basis of school terms to duty in the several aspects of the work of the service. They spend at least half of each year in mobile units engaged in country work.

There are two types of mobile units : single-surgery dental vans for rural schools that have enrolments of fifteen to seventy-five children, and two-surgery semi-trailer units that visit group and consolidated schools and other large schools in country towns having 200 to 400 children.

For the metropolitan area, dental service is provided in three dental centres. Each of these centres has a district allotted and children are brought from their schools by contract bus, under the control of an escort teacher provided by the Department of Education.

In 1963 the service employed a staff of 40 dentists who treated about 50,000 children out of the 80,000 to whom dental care was made available, comprising 30,000 attending metropolitan schools, 45,000 attending country schools and 5,000 in homes, orphanages and organised centres for physically and mentally handicapped children.

In addition, the Department provides a subsidy to any municipal council willing to provide facilities for pre-school dental service.

Queensland

In Queensland the School Dental Service provides treatments to all children in primary school. The basis on which treatment is undertaken is :

- a) In places where there are private dental practices, treatment is restricted to children where parent's income does not exceed a stipulated limit.
- b) In areas without resident dental practitioners, free treatment is available regardless of income of the parents.

Dental treatment is given in fixed clinics, in the 'dental room' in specified country schools in the State and for the remote areas, in 'dental trains'.

Fixed dental clinics are situated in the metropolis and larger towns in the State.

In country areas without fixed dental clinics, treatment is given in the school building by travelling dental officers using portable units. For some years now it has been accepted as official policy that where new schools are built or additions are made to existing buildings, the building plan shall include a dental room for the specified use and convenience of the dental officer. Fourteen portable dental units are in use in the secondary country schools throughout the state.

Dental trains are combination mobile units staffed and controlled by School Dental Service personnel with arrangements with the railway authorities, in towns possessing railway facilities. Four such trains are at present in use.

South Australia

The Royal Adelaide Dental Hospital provides dental services to children in the six welfare institutions including an orphanage and a spastic centre. The hospital also provides treatment for indigent and other low income groups. During the school holidays these institutions are visited by the mobile dental clinics of the School Dental Service.

In country areas where there is no private dental practice, the Department of Public Health operates a service for school children. Only primary school children are treated. Treatment is given either in mobile surgeries of the caravan type or in school rooms using portable equipment. There are eight mobile surgeries and two portable units.

Australian Capital Territory

There is no separate department for school dental health in the A.C.T. Department of Health. The A.C.T. Dental Service provides dental treatment to primary, infant and pre-school children as well as expectant and nursing mothers and low income adults.

Dental surgeries have been established in various schools in Canberra providing annual examination and treatment comprising mainly conservative work and exodontia. Orthodontic and prosthetic appliances are not constructed and restoration involving gold is not carried out.

Northern Territory

The Northern Territory Dental Service is administered from A.C.T. and provides dental treatment for all school children as well as adults. Treatment is given in fixed clinics and mobile units including an aerial mobile.

Western Australia

In the capital and other large towns treatment is given to children in certain age groups in fixed dental clinics.

In places without private dental practitioners, mobile surgeries of the caravan type provide treatment to all children. During the school vacations, the mobile units attend to the needs of children in the orphanages and aboriginal missions.

Tasmania

All children are treated up to the school-leaving age. The School Dental Service is organised into about fifteen dental districts each containing an average of 3,000 school children. For areas where it is difficult for children to get to a district clinic, the Service

maintains a series of mobile surgeries of the caravan type. School Dental Nurses at present being trained in Hobart under similar conditions to New Zealand will be used to supplement the dental manpower.

7. REFERRAL PROGRAMME IN THE U.S.A.

In the United States of America, the responsibility of health lies largely on the individual, a different system to promote the dental care of school children has been devised. The intent is to bring the attention of the children, and parents, to the dental conditions of these children and induce them to seek treatment.

Mass Inspection of School Children

In this method, school children are given complete inspection of their dental condition and the parents are notified of the findings. (80)

In 1960 well over half of the school administrators responding to a questionnaire indicated that oral examinations were provided for the students. (47)

Of those schools that do provide this service, about 90 per cent reported that the examinations were conducted within the schools. Seven per cent of the schools indicated that the examinations were done in the offices of private practitioners.

In some schools children are referred to private practitioners without prior mass examination in the schools or elsewhere. (80) Referral cards are given to the schools and parents are asked to take the children to the family dentist for examination. The dentist indicates whether

or not dental treatment is required, present status of dental treatment if treatment is in progress, and the cards returned to the schools.

The system has the following advantages :

- a) it stimulates parents to seek professional service of the family dentist
- b) annual inspection in schools motivates the child towards better health and habits.

Among its shortcomings are :

- a) at least 90 per cent of all school children need dental care routinely. The inspectors are looking for cavities they already know are there - cavities which they looked at last year, only this year they are bigger.
- b) the inspectors are cursory at best, and tend to lend a false sense of security to parents if nothing is found
- c) the dental manpower spent on inspection could be better used in treatment.

In order to ensure dental treatment is actually sought after referral, a follow-up mechanism is necessary. This is the intent for keeping dental records of children in the schools as used in the second system in which the referral cards are returned to the schools.

The danger in the second system is that in some instances children are almost compelled in order to achieve a 100 per cent record for their classroom, for the school and finally the school system. Such a high degree of emphasis is not compatible with good health practices.

Some children from low income families are pressured to see their dentists when most do not even have a dentist.

To be effective referral systems should have

- (a) concurrent dental health education
- (b) sufficient private dentists or community dental clinics
- (c) some form of assistance for financially disadvantaged children.

Latest Development (2)

On November 16, 1966 the American Dental Association's House of Delegates adopted a proposal for a Dental Health Programme for children, designed to counteract the enormous oral health problem affecting the nation's children.

This programme, based on a blend of public and private resources, calls for the establishment of pilot projects to obtain information in such areas as manpower, administration and the role of prepayment programmes. It is expected such pilot projects will be established in a number of communities possibly during 1967.

The aim is to make the benefits of an organised programme of dental health education, preventive dentistry and dental care available to all children, and in particular the underprivileged and the needy.

Government funds would be used for the support of dental services only for the indigent.

Financial responsibility for dental care for non-indigent children must continue to be with the individual families and private or voluntary agencies. Coverage of prepayment plans should be extended to children. Those that can afford to pay the premium could do so and those families that cannot would be aided by the federal government or sponsored privately.

Incentives, such as income-tax deductions, would be made available to parents to purchase dental care for their children. Other incentive measures would be established to stimulate prepayment agencies to develop new methods for providing coverage for children.

The proposal calls on all dental societies and appropriate governmental health agencies to co-operate in developing the programme. When this project is fully implemented it would make comprehensive dental care available to 100 million youngsters.

8. PURCHASE OF DENTAL CARE IN THE U.S.A. (34)

In the United States where health tends to be regarded as the responsibility of the individual, dental care is obtained through individual purchase directly from the private practitioner. The difference between need and demand has been shown partly due to financial reasons

as shown by differing utilisation of the dentist by people of different income levels.

In recent years, payment methods have been developed to ease the payment burden so that dental care may reach that segment of the population that is normally unable to pay for private dental care.

Three methods are in use :

1. Health insurance
2. Postpayment
3. Prepayment

Health Insurance

Over the past two decades the American public has made exceptional progress in providing itself with financial protection against the costs of medical and hospital care. This progress is directly related to the public's growing appreciation of the value of health care and the necessity of finding a mechanism to finance this care. In 1962, more than three quarters of the population, 141 million people, had hospital expenses protection.

Insurance operates with greatest ease where there is catastrophic risk involved, unpredictable to the individual but predictable to the underwriter in large groups of cases. Such risk in the dental field are predominantly those where oral surgery is involved, or restoration of teeth following an accident.

Health insurance plans provide benefits usually in the form of cash payments (indemnities), direct service or a combination of both.

Cash indemnity plans allow subscribers specified sums of money not necessarily to reimburse them for the entire cost of correcting an injury but to pay a fixed sum which is usually based upon the minimum cost of correction under ideal conditions. The types of service offered by the plans are usually specified carefully and limits are often established on the amount of service that may be received within a given period of time. The policy-holder to a certain extent becomes a co-insurer, carrying part of the risk himself.

Dental coverage in health insurance is therefore limited only to injuries received in accidents and does not include routine dental care for which the risk is high and not unpredictable to the individual.

Postpayment Plans

Postpayment plans involve nothing more than the spreading over a period of time the settlement of a debt. Dentists have frequently arranged to allow payments for dental care to be made by instalments but in doing so they lose interest on the credit they have extended and they take the risk of default in payment as well.

On an organised basis, postpayment plans were originally designed by banks on personal loan basis as a personal loan service. Recently they have been brought within the supervision and management of dental societies.

Under a postpayment plan, the dentist writes a note to the bank for the sum the patient wishes to be placed on the plan. The bank pays the full sum of the note to the dentist immediately, less a deduction of up to 5% towards the accumulation of reserved fund to cover delinquent accounts. The maximum deduction would occur at the beginning of the plan and would be reduced later when the reserve fund reaches sufficient size.

The bank would then proceed to collect the note in instalments from the patient, charging such interest as is appropriate in the field of personal loans. To provide security, life insurance of the patient to the sum of the note may be included often without extra charge.

The dentist may pay an entrance fee of the magnitude of \$10 in order to become a participant in the plan, or participation may be automatic with dental society membership. Under present patterns of operation postpayment plans are a convenience to the public to help the payment of restorations of accumulated defects by eliminating the necessity for a large immediate expenditure such as prosthetic treatment. They are also helpful to the dentist for reducing collection problems.

In 1967 sixty-six dental societies were sponsoring postpayment. The Los Angeles County programme in the first $6\frac{1}{2}$ years of its existence purchased \$20,865,846 worth of notes from dentists covering 78,838 cases. (34)

The California State programme in San Francisco during a similar period financed \$15,612,835 in loans for dental care for 65,416 patients.

A postpayment plan could easily help to clear away the barrier for initial care for a group of patients who would then be good material for a prepaid maintenance care plan.

Prepayment Plans

A prepayment plan is an arrangement by which periodic specified payments are made in advance and used to pay for health services when the need arises. The plan usually includes insurance coverage of health catastrophies.

The scope of benefits provided in prepayment plans varies widely, but the trend is towards more comprehensive coverage. These plans can be divided into three categories.

1. 'Minimal' plans, which included diagnostic, surgical and emergency care benefits, but do not include restorations.
2. 'Basic' plans which offer more complete dental care including restorations but excluding dentures.
3. 'Comprehensive' plans, which offer benefits included in the first two categories, dentures and, in many instances, other specialised services.

In 1930, 40% of the plans provided only minimal benefits, 20% included basic services and only 40% had comprehensive benefits.⁽⁸¹⁾ By 1965 programmes confined to minimal benefits had dropped to 18% and comprehensive plans had risen to 73%. Apparently no plans started since 1960 has offered less than basic care as benefit.⁽⁶²⁾

It is the essence of all prepayment plans that an estimate be made in advance of the annual dental needs of the population to be served and the premium is charged to the individual being the full cost of meeting these expected needs.

Basic and comprehensive plans may protect themselves from an overload of extreme individual cases by not including initial dental care in the programme. Accumulation of dental neglect requires a volume of dental treatment and such care has been estimated to produce costs of the magnitude of five times that of annual maintenance.

Heavy as the financial load for initial care has proved to be, a prepayment programme can hardly afford the transfer of this burden to the individual subscriber operates as a deterrent to membership. Many plans have devised ways to overcome this hurdle :

1. Spreading the load of initial care over succeeding years
2. New members paying only half the initial care
3. Increasing the initial fees slightly
4. Excluding the first \$150 of the cost of initial care.

Sponsorship

Plans also differ as to their sponsorship both for the source of funds and methods of administering the plans. Funds for service must come either from the individual patient or from some outside party.

Payments may be from payroll deductions or may be paid as a fringe benefit from a company in lieu of a wage increase.

The net effect of these two methods of payment is the same as if an outside party assumes the cost of care, since they remove the payment of dental service from the area of immediate personal choice.

One of the most significant developments recently has been the active role of labour unions in fostering dental care plans. On December 31 1964 the number of beneficiaries receiving dental care through union-employer arrangements was almost $1\frac{1}{2}$ million people, and sponsored as follows⁽⁶²⁾ :

<u>Sponsorship</u>	<u>Percentage</u>
Union-employer	55
Employee-employer	15
Employer	20
Unions/Co-operatives	1
Miscellaneous	9

Programmes which provide service benefits to union members have proved particularly attractive because they provide 'new dental money' since these benefits are not taxable.

Organisation of dental care plans

Most beneficiaries receive care in the office of private practitioners.

Among plans using this method are programmes for indigents sponsored by the Department of Health and Welfare, the Medicare plans financed by

the Department of Defence for servicemen's dependents and plans administered by dental service corporations, Blue Cross or insurance companies.

Service under a dental care plan may be provided either through 'open' or 'closed' panels.

'Open' panel

An open panel is characterised by three features :

1. any licensed dentist may elect to participate
2. the beneficiary has his choice among all licensed dentists participating
3. dentists may accept or refuse any beneficiary.

'Closed' panel

In a closed panel, beneficiaries may go only to those dentists who have agreed to provide service under the prepayment plans. Dentists must accept any beneficiary as a patient.

Some prepayment plan beneficiaries receive service from clinics sponsored by organisations such as consumer co-operatives, industries, labour unions and health departments. Such clinics utilise the services of salaried dentists. A dental clinic service almost always represents a 'closed' panel since service is limited to specific groups and these individuals have limited choice of dentists.

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The American Dental Association advocates the use of the open panel system because there is a free choice of dentists and it reduces the possibility of a third party exercising restrictive control over the ethics and professional standards of the practitioners involved.

Recently, many dental societies have formed a dental service corporation to provide a medium for responsible agreement between consumer groups and groups of dentists. This includes fixation of fees, supervision over the quality of work, and arbitration of complaints.

Interest in 'closed' panel systems usually springs from the desire of a consumer group to make a long-term agreement with a small group of professional people whose competence they know. The reasons in favour of such an agreement usually centre upon the desire on the part of the sponsoring group to make sure the money spent on the programme buys service adequate in quality and quantity.

Regardless of the variations, it seems apparent that prepayment plans have resulted in substantial increases in demand for dental care.

It has been estimated that the number of individuals visiting a dentist annually will increase 20% with the institution of a prepaid dental care plan. Since the average amount of care received will also rise, the overall demand for service may be increased by as much as 100%.

The long-range impact of group payment plans on utilisation may be expected to be even greater. Namely,

1. The increased number of children receiving routine care under the programmes should raise the level of dental consciousness of the next generation of parents.
2. The removal of financial impediment will make educational efforts to remove the other blocks to seeking care more effective.
3. Dental manpower needed for the population will need to increase.

9. DISCUSSION

Some of the efforts in tackling the problem of providing dental care for the population have been reviewed.

In Great Britain, it would appear that the question is not so much one of a system for securing dental fitness of the population, but more of one by which incidental and non-systemic dental treatment can be given to anyone who asks for it. Dental treatment for all who ask for it means trying to comply with a demand which is not real as the patient is not able to decide when he needs assistance. The patient is neither able to determine the right moment at which he requires treatment, nor the degree of help.

Too many patients seeking care from too few dentists have resulted in serious consequences :

1. the great disparity between the salaries of the dental officers in the health centres has ruined the good intentions of providing service to priority classes.
2. The present condition enables the dentist to pick and choose and even if the fees are attractive, he is less likely to attend to young children.

The inflexible, comprehensive itemised scale of fees has many drawbacks, e.g. it discourages the dentist from excelling in providing standards of treatment, service or amenities above the bare minimum, and preventive procedures are at present financially unrewarding.

The injection of the Dental Estimates Board between the dentists and the patient not only tends to destroy the dentist-patient relationship but also tempts the dentist to determine what treatment shall be provided in terms of its acceptability to the Estimates Board to avoid time-wasting correspondence.

Although the service has many shortcomings, it has enabled a large number of persons to obtain dental treatment which previously they have been unable or unwilling to afford. Changes are being made to reduce any shortcomings and in 1966 a Royal Commission was set up to investigate the service.

Germany

The public dental service practised in Germany is short of being adequate in many aspects, but those in other countries in Europe are even worse. The service in Germany was formed in 1883 and little change has taken place since then. Professional advice has not carried much influence in changing political attitudes. However, competition among the insurance companies has resulted in wider scope of obligatory services and some companies even provide fees for individual treatment instead of the traditional capitation fee.

Norway

In Norway, particularly in the municipality of Oslo, dental service has been in operation since 1910. Here there has been an excellent

school dental service which, since 1930, has been expanded to provide care for infants from three to six years of age and after-care for young persons up to eighteen years old. After this, dental service can be obtained through health insurance for low premiums. If it were possible to attain permanent dental health of the population by therapeutic means only, then the effective application of the Norwegian system would make this possible.

New Zealand

It is probably impossible to increase the number of dentists at a much quicker pace than that being done at the present moment. The subsidising of learning is not unknown, and other methods can be evolved. Neither the number of universities nor the number of teachers can possibly be increased to such an extent at short notice. Thus, within the period required, the number of dentists will not be increased to cope with the demand for treatment. This fact and concern over the dental health of her child population induced New Zealand in 1921 to resort to utilising the dental nurse to supplement the dental manpower. This departure from the traditions of the profession has quite naturally brought unpleasant remarks. However, as the country now has a dental service almost equivalent to that in Norway, this system is slowly being accepted, and there is increasing use of this form of auxiliary personnel in many countries.

Australia

The Department of Public Health in the states of Australia provide dental care for those people who cannot care for themselves as well as for children attending schools including day nurseries. The school dental services give comprehensive care to selected groups only in the metropolitan areas and in the larger towns. But in places where there is no resident private practitioner dental care is provided for all age groups including adults.

Comprehensive dental care for limited groups is thought to be a better objective than scattered, incomplete care for a larger group. To treat only part of the mouth is to invite the undermining of one's work through the ravages of caries elsewhere in the mouth, and it also fails to demonstrate the advantages of comprehensive care to the child. The children thus selected will be sent off to a good start both therapeutically and educationally. They will be better patients for the private dentists to whom it is hoped they will later go, and if they can see the advantages of comprehensive dental care, they are all the more likely to seek dental care later.

United States of America

There is every reason to believe that private plans for the purchase of dental care are entering their period of greatest growth. It may

be anticipated that the number of plans will increase, the number of beneficiaries will grow, and more comprehensive services will be available. Such developments are consistent with the general trend towards budget-payment for a wide variety of goods and services. Similarly, payroll deductions to cover premiums for group purchases and premiums paid as fringe benefits by a company in lieu of wage increase have removed payment for dental service from the area of immediate choice. On the basis of experience in the past few years, it is estimated that coverage under private dental care plans will rise from 1.14 million in 1963 to 15 million in 1970 and perhaps as high as 30 million by 1975.

The Dental Health Programme for Children adopted in November 1966 includes coverage of prepayment plans for children. Those families that cannot afford the premium would be aided by the federal government or sponsored privately.

V. SUMMARY

Three major efforts is the prevention and control of dental disease have been reviewed.

The best preventive method now available is the use of fluoride in the communal water supply. This procedure is safe, effective and practical. Its superiority over previous preventive measures lies in the fact that it does not require conscious effort of the individual nor efforts on the part of trained personnel. Early opposition to its use has abated to a large extent and it can be said that fluoridation is now in the implementation stage. Many communities throughout the world are now enjoying the benefits of water fluoridation. Many more have accepted the procedure and are now awaiting its implementation. In communities where this method is not possible due to lack of piped water supplies or other reasons, alternative methods of fluoridation with tablets and drops are widely used to give the necessary amount of fluoride to children. In some countries fluoride has been added to milk, salt and vitamin preparations. Beneficial effects can also be obtained by the application of fluoride directly to the tooth surfaces. Topical fluoride therapy is gaining acceptance rapidly in many dental practices. Fluoride in dentifrices is another way fluoride can be widely utilised by the population. Combination of ingestion of fluoride and topical therapy would give greater protection.

Fluoridation reduces caries up to about 60% and the protection lasts to adult life. As more and more children are now building a considerable degree of immunity towards dental caries, it can be expected that the need for dental care will be reduced considerably when the present child population grows into adulthood. With decreasing need, the present dentist/population ratio will be more nearly adequate to meet the demands of the future. The alteration in the demand will result in a change in the pattern of dental practice from an endless process of treatment to a more satisfying care of dental and oral health.

Fluoridation, unfortunately, affords only partial protection against dental caries and not effective against other dental diseases. Improvements on this situation may occur. However, until a complete preventive measure is found, the best hope lies in a combined attack using water fluoridation, dietary improvements, oral hygiene, early correction of dental defects, use of fluoride in topical application in the dental office and home use of fluoride dentifrice. All these methods other than fluoridation, require action on the part of the individual.

Because of the low level of public interest in the dental health problem this is not easy to achieve. Dental health education can do much to alter this problem especially if dental problems can be linked to other health problems with a higher level of public and personal interest.

Many efforts have been made in the past to inform the public of the importance of dental health but never as concerted and intense as in recent years. Most professional associations have enlisted the

services of psychologists, social scientists and health educators to help them in the campaign. The experience of these experts in the general health field is being applied to the present specific conditions in dentistry, such as the attitude of the public towards dental health, and the planning for improving dental health conditions.

Governments, too, have had a change of attitude in recent years. In the past, provision of service was preferred because it gives immediate results and therefore appealed more to the electorate. However, experience has shown provision of dental service alone does not give lasting benefits and that preventive measures are needed.

With fluoridation reducing the need to about one third, and dental health education removing many of the blocks to the attainment of dental health, the remaining effort is to make dental service within the reach of everyone. In many countries, the government at a national or state level have assumed responsibility for providing dental care of the population. The degree of care depends on the political attitude and economy of the country as well as availability of personnel. In some countries, especially in the United States, there is a growing tendency for the public to belong to group insurance schemes or prepayment plans. These are proving satisfactory for both the patient, who obtains treatment from a dentist of his own choice, and the dentist who is properly remunerated. A further advantage in this arrangement is that the majority of these plans are

sponsored by the management as a fringe benefit of employment and thereby removing direct out-of-pocket purchase from the individual patients. An ambitious programme to cover the cost of dental treatment for the school-child population through the prepayment plan is now being tested by the American Dental Association. When this programme is fully implemented it is expected to provide comprehensive dental care for 100 million youngsters.

VI. CONCLUSIONS

Recent progress in the prevention and control of dental disease seems to indicate a better future. For the first time there is a good chance to reduce need and to equate it with demand and available resources. Although complete prevention of dental disease seems impossible, scientific advances may produce more effective preventive measures which are compatible with modern cultures. Health education may secure a universal utilisation of these measures as well as regular attendance for dental treatment. It seems logical to speculate that in the foreseeable future dental health can be obtained by preventing dental disease in part, and by controlling it in part.

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