REPORT ON THE
FIRST REGIONAL WORKSHOP ON DENTAL HEALTH SERVICES
SINGAPORE, 9-16 MAY 1972
FIRST REGIONAL WORKSHOP ON DENTAL HEALTH SERVICES

Sponsored by the

WORLD HEALTH ORGANIZATION REGIONAL OFFICE FOR THE WESTERN PACIFIC

Lecture Hall, Faculty of Medicine
University of Singapore
9 - 16 May 1972

FINAL REPORT

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CONTENTS

1. INTRODUCTION ............................................... 1
2. OBJECTIVES OF THE WORKSHOP ................................. 1
3. ORGANIZATION AND ADMINISTRATION ........................... 2
4. WORKSHOP COMMITTEES ......................................... 2
5. PLAN OF WORK .................................................. 2
6. COUNTRY QUESTIONNAIRE ....................................... 3
7. SUMMARY OF DISCUSSIONS AND CONCLUSIONS .................. 4
   Topic No. 1 - Dental health programme ....................... 4
   Topic No. 2 - National dental epidemiological data and their significance ................................. 5
   Topic No. 3 - Dental health services and manpower ........... 7
   Topic No. 4 - Dental auxiliaries ............................... 9
   Topic No. 5 - Undergraduate and post-graduate dental education .................................................. 12
   Topic No. 6 - Dental health education of the public .......... 15
   Topic No. 7 - Symposium on fluorides .......................... 16
   Topic No. 8 - Symposium on international and bilateral aid and assistance ................................. 18
8. FINAL GENERAL CONCLUSIONS ................................... 20

ANNEXES:
   1 - LIST OF PARTICIPANTS, OBSERVERS AND RESOURCE PERSONS ..................................................... 23
   2 - WORKING GROUPS ............................................. 29
   3 - PROGRAMME DETAILS ......................................... 31
   4 - EVALUATION .................................................. 33
   5 - QUESTIONNAIRE ............................................. 39
   6 - SUMMARY OF RESULTS OF QUESTIONNAIRE .................. 49
   7 - WORKING PAPERS FOR TOPICS 1 to 7 ..................... 85
Contents (continued)

ANNEXES:

7 - WORKING PAPERS FOR TOPICS 1 TO 7 (continued)

THE WESTERN PACIFIC REGIONAL DENTAL HEALTH PROGRAMME -

Part I: The Inter-country Dental Health Programme ......................... 85
Part II: WHO and UNICEF Assistance in the Past, Present and Future in the
Western Pacific Region .................................................. 92

EPIDEMIOLOGY OF ORAL DISORDERS ...................................... 97

PLANNING AND PROGRAMMING FOR DENTAL HEALTH SERVICES ................................................. 111

DENTAL HEALTH SERVICES AND MANPOWER .................................. 121

DENTAL AUXILIARIES .......................................................... 131

UNDERGRADUATE AND POST-GRADUATE DENTAL EDUCATION .......................... 167

DENTAL HEALTH EDUCATION ................................................ 177

WATER FLUORIDATION - ENGINEERING ASPECTS .................. 191

TOPICAL AND OTHER FLUORIDE APPLICATIONS ....................... 197
1. INTRODUCTION

The history of dental epidemiological activities aided by WHO in the Western Pacific Region were described by Brigadier J. Ferris Fuller (see Annex 7).

To meet the needs of the Asian segment of the Region, it was decided to hold a workshop instead of a seminar or conference. At a workshop, participants themselves set the task, determine the goal, select the problems and work together, study and seek solutions to the problems selected. It is a problem-solving process by co-operative efforts to achieve a common goal. The summary of discussions and the conclusions are, therefore, those of the participants.

Singapore generously offered its services and facilities as host country for the workshop, an offer which was actively supported and implemented by the Ministry of Health and the University of Singapore.

Participants from ten countries attended the workshop along with four consultants and two temporary advisers, a secretariat drawn from the World Health Organization, and a widely representative group of observers (see Annex 1).

The Singapore workshop was officially opened by the Minister of Health of the Government of Singapore, Mr Chua Sian Chin, at the New Lecture Theatre, Faculty of Medicine, University of Singapore, on Tuesday, 9 May at 9:00 a.m.

The WHO Representative for Malaysia, Singapore and Brunei, Dr D.R. Huggins, welcomed participants and others on behalf of the Regional Director; Professor Edmund Tay, Dean of the Dental Faculty of the University of Singapore extended a welcome on behalf of the Chancellor of the University; and the ceremony concluded with an address by the Workshop Director, Brigadier J. Ferris Fuller.

An informal closing ceremony was held on Tuesday, 16 May, at 3:00 p.m., the concluding address being given by Dr Ho Guan Lim, Director of Medical Services, Ministry of Health, Singapore.

2. OBJECTIVES OF THE WORKSHOP

2.1 To review the dental epidemiological data collected under the inter-country dental health advisory services project;

2.2 To formulate, on the basis of the findings, guidelines for regional and national dental health services and staffing, and also for the necessary dental education and training activities to provide these services;

2.3 To draw conclusions on the role of the basic health services and school health services in relation to dental health, especially dental health education.
3. ORGANIZATION AND ADMINISTRATION

3.1 Work groups

The participants were divided into three work groups, each of six participants. Two consultants/temporary advisers were assigned to each work group as resource persons. The observers were distributed fairly evenly among the work groups (Annex 2).

3.2 Workshop appointments

3.2.1 Each work group at its first working session elected its own Chairman and a Rapporteur as follows:

<table>
<thead>
<tr>
<th>Group</th>
<th>Chairman</th>
<th>Rapporteur</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Dr Yap Jin Hwee</td>
<td>Dr B.J. Moreira</td>
</tr>
<tr>
<td>II</td>
<td>Dr E.C. Castillo</td>
<td>Dr L.P. Alfiler</td>
</tr>
<tr>
<td>III</td>
<td>Dr Tan Yok Lin</td>
<td>Dr Goh Soo Wan</td>
</tr>
</tbody>
</table>

3.2.2 At the opening plenary session, the participants elected a Chief Rapporteur, Dr Yim Khai Sun, and their Social Representative to join the local Organizing Committee, Dr Heun-Taik Jhee.

4. WORKSHOP COMMITTEES

4.1 A Steering Committee was established whose function was to ensure the smooth running of the workshop and to adjust the programme from day-to-day considering the needs and interests of the participants. The Steering Committee comprised the three work group chairmen and the Workshop Director (or his representative from the secretariat).

4.2 An Editorial Committee was established whose functions were the preparation of a daily bulletin of activities and the preparation and presentation of summary reports and conclusions on each topic discussion. The Editorial Committee comprised the Chief Rapporteur and the three work group rapporteurs assisted by resource persons as directed by the Workshop Director.

5. PLAN OF WORK

5.1 After a description by the Director of the mechanics of the workshop, the overall theme and the objectives, individual countries were invited to make short oral statements on the dental situation in
their respective countries, the purpose being to state the current situation, identify the problems requiring solution and introduce the participants. From that point onwards each topic was dealt with in turn as a separate item. The programme was followed as outlined in Annex 3.

5.2 At the plenary sessions chaired by the Director, each topic was introduced and explained for fifteen to thirty minutes by the consultant responsible for the working paper concerned. Each consultant drew attention to the main issues in his topic, posed principal questions to be decided and suggested conclusions that might be drawn. The workshop then split into the three work groups to discuss the topic. Generally, two hours was allowed for this. The workshop reassembled in plenary session approximately three quarters of an hour before the end of the session. Each work group rapporteur then presented an oral report on the observations and conclusion of his group. The three reports were then discussed and a consensus reached where possible. The chairmanship of these concluding plenary sessions was shared between the Director and the work group chairmen.

5.3 To co-ordinate the programme and provide a checklist of matters to be discussed, the consultants prepared a series of guidelines for themselves and for the work group chairmen.

5.4 At the end of each day the Editorial Committee met to prepare a summary report of each topic with the assistance of the consultant assigned to that particular topic. Topic summary reports were distributed the following day but were not discussed until the last two days of the workshop when they were all reviewed and discussed in detail under the chairmanship of the Director.

5.5 The consultants and the secretariat met with the Director at the end of each day to plan the next day's proceedings. The Steering Committee met each morning at 8:00 a.m. with the Director or his representative from the secretariat, to study the previous day's evaluation report (Annex 4) and to take note of views and needs of participants.

6. COUNTRY QUESTIONNAIRE

Before coming to Singapore, each country completed a comprehensive questionnaire which had been distributed beforehand (Annex 5). The Regional Office compiled a series of consolidated tables from the replies received. These were handed to the participants. During the course of the workshop, Professor P.D. Barnard filled in the gaps after discussing details with individual country participants and produced a final series of tables that give a comprehensive picture of the problems confronting dental public health in the Region (Annex 6).
It became evident that the questionnaire provides basic information that each country should have about its own dental and socio-economic situation, and information also that should be ascertained by a consultant or adviser investigating the overall dental problems in a country for the first time.

7. SUMMARY OF DISCUSSIONS AND CONCLUSIONS

Topic No. 1 - Dental health programme

Discussion centred on the identification of major problems which affect the delivery of dental services. It was recognized that in most countries, neither systematic school dental services nor public dental services could be provided for the entire population.

1.1 Problems

The problems identified as common to most countries were:

(a) dental manpower shortage (except for New Zealand and Macao);
(b) inadequate training facilities;
(c) scarcity of dental personnel in rural areas;
(d) attitudes of public and governments towards dental care;
(e) gaps in knowledge of oral disease patterns;
(f) inadequate budgetary support;
(g) inadequate coverage of water fluoridation (except Hong Kong and Singapore);
(h) population growth;
(i) social, political and economic conditions, and wartime disturbances affecting several countries.

Even in countries with adequate dental manpower, special provisions need to be considered for:

(a) dental care for those who cannot afford to pay, late adolescents, intellectually handicapped, and physically handicapped;
(b) orthodontic services;
(c) industrial dental health services.
1.2 Remedial proposals

(a) vigorous implementation of preventive programmes, including water fluoridation and the prevention and control of periodontal disease;

(b) training of more dental manpower, both dentists and auxiliaries;

(c) legislation and incentives to improve rural dental services;

(d) national dental health surveys of children and adults to determine the nature and extent of problems, and to enable programmes to be planned and evaluated more effectively;

(e) intensified dental health education programmes;

(f) control of population growth;

(g) overall socio-economic development and peace.

Topic No. 2 - National dental epidemiological data and their significance

1. Introduction

Any system for the classification of the prevalence of dental diseases into high or low must not be viewed in isolation but against the background of:

(a) population size;

(b) distribution of the population between urban and rural areas;

(c) ethnic groups;

(d) availability of dental manpower.

For example, even a relatively low prevalence of caries in a large population constitutes a significant public health problem.

Major problems identified from the epidemiological data presented by the countries represented were:

(a) dental caries;

(b) periodontal disease

(c) handicapping dento-facial anomalies.
2. **Pattern of dental caries**

2.1 In countries with a predominantly urban population, the prevalence of dental caries is generally higher than in less urbanized countries.

2.2 Within some countries, which were able to supply data, the prevalence of caries is higher in urban areas.

2.3 Data from Malaysia and Singapore indicated that in those countries the prevalence of caries is higher among Chinese than in other main ethnic groups.

2.4 In all countries, except New Zealand, relatively few decayed teeth are filled.

2.5 The prevalence of dental caries tends to be higher in deciduous than in permanent teeth.

2.6 A system of classification of the prevalence of dental caries into low, moderate and high categories was discussed and noted by the participants.

3. **Pattern of periodontal disease**

3.1 Data on the prevalence of periodontal disease are less adequate than the data for dental caries.

3.2 Nevertheless, the results from survey data showed that gingivitis affects up to eighty per cent. of children.

3.3 Where data were available, the prevalence of destructive periodontal disease was found to be high (up to fifty per cent. of subjects) and a major cause of tooth loss in adults.

3.4 Direct evidence of a correlation between the prevalence of materia alba and gingivitis in children was presented by Malaysia.

4. **Pattern of other diseases and conditions**

4.1 It was evident that the interpretation of the criteria for the assessment of handicapping dento-facial anomalies was quite variable.

4.2 Data suggesting that the prevalence of cleft-palate was relatively high in Chinese children were presented for West Malaysia.

5. **Proposals**

5.1 The importance of information about tooth mortality was stressed since it was agreed that the objective in designing dental health programmes should be the preservation and maintenance of the permanent dentition - the lifetime teeth. This requires that a greater priority must be given to permanent teeth and their supporting tissues.
5.2 Institution of intensified programmes for the prevention of dental caries (to reduce \( df^1 \) and \( DMF^2 \)).

5.3 Adequate provision of dental health services to fill more teeth (to raise the value of the \( f \) and \( F \) components of \( df \) and \( DMF \); and to lower the \( M \) component of \( DMF \)).

5.4 Restriction in the sale of sweets, biscuits, etc., in school tuck shops should be discussed at the highest level between the Ministry of Health and the Ministry of Education.

5.5 Increase the training and utilization of operating dental auxiliaries for the prevention and control of periodontal diseases.

5.6 Advocate toothbrushing techniques (using a soft brush) with emphasis on their importance in the prevention and control of gingivitis and periodontal disease.

5.7 Use of disclosing solutions/tablets and other aids in an oral hygiene programme.

5.8 Further study is required for defining the criteria for the assessment of dento-facial anomalies.

5.9 It was considered that countries which do not yet have epidemiological data about their dental and oral disease pattern should endeavour to obtain this information for planning and as a baseline for subsequent evaluation and surveillance of programmes.

**Topic No. 3 - Dental health services and manpower**

1. **Priorities**

1.1 The following order of priorities for types of service rendered was agreed to:

   (a) *Dental emergencies* - defined as cases for the relief of pain and acute infections. Anyone requiring such urgent attention should be treated, and this should be a direct Government responsibility for those unable to pay, or for whom private services are not available.

   (b) *Preventive programmes*, e.g., water fluoridation, use of other forms of fluorides, control of sugar intake, dental health education, oral hygiene programmes.

\[ \text{df} = \text{decayed (d) and filled (f) deciduous teeth} \]

\[ DMF = \text{Decayed (D), Missing because of caries (M), and Filled (F) permanent teeth} \]
(c) Routine dental care for the following groups listed in order:

(i) primary schoolchildren;
(ii) secondary schoolchildren;
(iii) pre-school children;
(iv) adults who cannot pay;
(v) pregnant and lactating women.

1.2 The following order of priorities in terms of teeth was agreed to:

(a) preservation of permanent teeth, and when practicable, conservation of deciduous teeth;
(b) replacement of lost permanent anterior teeth;
(c) replacement of other lost permanent teeth.

2. Recall periods

It was considered that separate recall periods may be indicated for patients with caries and for patients with periodontal disease.

2.1 For caries: the recall period is dependent on the caries experience and susceptibility of individual patients and would vary widely, e.g., from three to twenty-four months.

2.2 For periodontal disease: the recall period is dependent on whether or not operating auxiliaries are used in a periodontal disease prevention and control programme, and would largely depend on the severity of the condition.

3. Dental health in the periphery

3.1 Dental emergencies can be attended to by available persons such as hospital staff, midwives, village chiefs, schoolmasters, who have been given adequate instructions in the rudiments of providing such services.

3.2 Preventive services, e.g., dental health education and/or oral hygiene instructions can be given through the usual educational channels.

\[1\text{By this is meant: places relatively remote from established dental clinics or basic health facilities (such as hospitals or rural health units) with dental staff.}\]
4. **Remedial proposals**

4.1 **Financing**

All sources of funds to support the dental services should be explored. Examples are national and local governments, industrial and commercial establishments, civic organizations, private schools, insurance schemes, international and national dental agencies.

4.2 **Education and training**

Adequate Government support should be provided for the education and training of qualified dentists and auxiliaries in parallel, to provide a balanced dental work force for the services envisaged.

4.3 **Private sector**

Governments should be encouraged to subsidize the provision of dental services to the public in certain areas (e.g., rural areas) by private practitioners on a part-time basis at an appropriate fee.

4.4 **Payment for services**

Dental services, other than specific programmes such as school dental services, should be partially paid for by the individual.

4.5 **Co-ordination**

There should be co-ordination of all the dental health activities in a country with those of health, education, and other governmental and non-governmental agencies.

**Topic No. 4 - Dental auxiliaries**

1. **Classification**

The three broad categories of dental personnel identified by the WHO inter-regional seminar on the training and utilization of dental personnel held in New Delhi in 1967, were considered generally applicable to this Region, namely:

- **Category I** - Professional
- **Category II** - Operating auxiliaries
- **Category III** - Non-operating auxiliaries
2. Role and duties

2.1 In addition to duties normally assigned to operating dental auxiliaries, consideration should be given to equipping the operating dental auxiliaries (or other personnel specifically trained) whenever necessary to deal with dental emergencies as a first-aid measure. The emergencies listed were:

(a) toothache
(b) oral infection
(c) haemorrhage
(d) traumatic injuries to teeth
(e) maxillo-facial injuries.

2.2 The prevention and control of periodontal diseases was considered the first priority need, and may be carried out by the dental hygienist type.

2.3 The prevention and treatment of caries and of gingivitis may be carried out by the school dental nurse type.

2.4 The use of chair-side assistants should be encouraged to increase the productivity of dentists. In selected situations, they could be "shared" by two or more operating dental auxiliaries.

3. Types of auxiliaries

The utilization of dental auxiliaries must be fully encouraged and the category or type should depend upon a number of factors, including:

(a) pattern of dental diseases;
(b) economic and social conditions;
(c) general educational levels;
(d) cultural attitudes;
(e) professional attitudes;
(f) number of dentists;
(g) government policy;
(h) population and population growth.
It was recognized that for the most effective delivery of dental services it is necessary to have a combination of dentists complemented by appropriate dental auxiliaries.

It is for individual countries to decide for themselves the dental auxiliary programme in accordance with local needs and circumstances.

4. Educational entry qualifications

   Educational entry standards should be pre-determined and equated with comparable vocations in each individual country.

5. Curriculum

5.1 Curricula for training of auxiliaries should be adapted to the specific needs of individual countries and the specified duties of auxiliaries.

5.2 Flexibility of curriculum should allow for periodic changes or revisions based on current epidemiological and operational data, and should be oriented to the demands and needs of the public dental service.

6. Location of training facilities

   It was generally felt that training schools for dental auxiliaries should be established on a national level, or even on a sub-national level in special circumstances. But in countries where this was not possible at present, regional training and assistance would be required.

7. Types of training

   It was concluded that there should be formal institutionalized training for various categories of auxiliaries. If this is not feasible, they should receive 'on-the-job' training, pending the establishment of a training institution.

8. Equipment for dental auxiliaries

   It was felt that in principle auxiliaries can be trained to use modern equipment such as high speed air-rotors.

   However, it is stressed that the logistics of supply and maintenance are a basic constraint to this principle.
9. **Supervision**

9.1 Adequate supervision should be maintained. Ideally, newly trained dental auxiliaries should be given direct and close supervision and, thereafter, the amount of supervision should vary with the experience and ability of the operating auxiliary. A periodic form of spot checking as a means of supervision was recommended.

9.2 Under ideal conditions, each child should be examined by a dentist at the time of initial enrolment and at regular intervals thereafter.

10. **Registration and control**

The duties and responsibilities of all types of dental auxiliaries must be defined. In general, each country should devise its own system of control (by legislation, if necessary).

10.1 **Operating auxiliaries**

Legislation is required for the employment or utilization of operating dental auxiliaries. Registration was considered unnecessary if countries have legislation requiring auxiliaries to work within the public health service. Registration of the dental hygienist type is necessary to enable them to be employed outside the public health service.

10.2 **Non-operating auxiliaries**

Registration was considered unnecessary.

11. **Refresher courses**

There is a need for refresher courses for both operating and non-operating auxiliaries.

**Topic No. 5 - Undergraduate and post-graduate dental education**

1. **Undergraduate dental education**

It was generally felt that the highest priority must be directed towards the development of a strong component of preventive dentistry and public health in the undergraduate curriculum of dental schools, so that future dental practitioners will give appropriate emphasis to the preventive aspects of total health programmes.
2. Post-graduate dental education

2.1 Short courses leading to a certificate in public health dentistry

2.1.1 These should be from one to three months in length and should be flexible in design to meet needs of individual dentists or countries.

2.1.2 Some appropriate subjects or topics were listed as follows:

(a) Public health practice

(i) basic principles of dental public health;
(ii) administration and delivery of services;
(iii) epidemiology of dental diseases, including survey techniques and evaluation;
(iv) principles of biometrics;
(v) computer programming;
(vi) planning and development of dental services;
(vii) social sciences.

(b) Preventive dentistry and dental health education

(i) preventive dentistry and its clinical applications;
(ii) oral health education;
(iii) application of fluorides in the prevention of caries;
(iv) techniques of water fluoridation;
(v) social sciences.

(c) Children's dental health, including appropriate social sciences.

2.1.3 It was felt that public health dentists should be encouraged to participate in continuing education. A distinction was made between orientation courses for new entrants to the public health services; refresher courses for experienced public health dentists and continuing courses for dentists with post-graduate qualifications in public health. Of these, it was felt that the orientation courses should be made compulsory whereas the others, although desirable, should not be compulsory.
2.1.4 It was considered that those concerned with teaching these courses should be familiar with prevailing conditions in the countries from which the students are drawn.

2.2 Post-graduate courses of one year's duration leading to a diploma in dental public health (or equivalent)

2.2.1 This was regarded as a desirable prerequisite for all public health dentists involved in administration and planning, but should not be regarded as the sole criterion for appointment and promotion within a public health service.

2.2.2 It was felt that schools within the Region which could offer such courses should be identified.

2.3 Graduate courses of two years' duration leading to a master of dental surgery or master in public health

Courses leading to a master's degree were considered more suitable if they are based on the inclusion of elective subjects matched to the needs of students attending such courses.

2.4 General conclusions

2.4.1 There is a need for short courses to train dentists to work with auxiliaries.

2.4.2 Emphasis was placed on the very great value of the WHO fellowship programme in providing opportunities for dentists to observe dental public health programmes in other countries and/or to study abroad.

2.4.3 The proposed establishment in the University of New South Wales by WHO of a regional teacher training centre for health personnel was noted with interest and it was hoped that advantage would be taken of such an institution by dental teachers.

2.4.4 Stress was laid on the importance of the role of the social scientists in facilitating our understanding of the problems of motivation in dental health education.

2.4.5 Short courses in public health dentistry

WHO should be encouraged to sponsor the establishment of such short courses as described under section 1 of this topic and to provide fellowships for participants.

In the implementation of the short post-graduate courses, the teachers might be drawn from universities, from private practitioners, senior public health personnel, waterworks engineers, education authorities and governmental or international organizations.
2.4.6 It was agreed that the Schools of Public Health in the Western Pacific Region that did not accept dentists to their courses should be persuaded to do so.

Topic No. 6 - Dental health education of the public

PREAMBLE

The educational approach to dental health should not be restricted to informing people alone. Dental health education should include all the processes which go towards motivating people to seek, attain and maintain optimum dental health.

Face-to-face communication with patients is the most effective method of dental health education. All dental personnel have an obligation to their patients to educate them to look after their dental health, to appreciate the dental services rendered to them and to correct unfavourable attitudes that exist through previous dental experiences, misinformations and superstitions.

1. Administration

1.1 A dental health education programme should be an integral part of the dental health services and of the health education programme in the country.

1.2 Effective co-ordination and implementation of the dental health educational programme can be better attained through involvement of existing Government dental organizations with those of national dental associations, other allied health agencies, and civic organizations. The personnel and facilities should include:

(a) the dental profession in general;
(b) lay experts in public relations;
(c) teachers and education authorities;
(d) dental auxiliaries;
(e) medical personnel
(f) parents and family group;
(g) mass media;
(h) information centres.
1.3 The head of the dental public health administration should be responsible for the co-ordination and implementation of public dental health education. He may delegate this responsibility to a senior dentist who has enthusiasm, dedication, and the following qualifications: post-graduate training in dental public health; experience in public relations and principles of teaching.

2. Target groups for dental health education

Programmes should endeavour to reach the whole community, but in the initial stages target groups are:

(a) expectant mothers in maternal and child health clinics and children of pre-school age;

(b) schoolchildren (primary and secondary) and their parents;

(c) adults.

3. Dental health education materials

Dental health education materials should be classified and geared to specific groups of people intended to be reached, e.g., schoolchildren, mothers, pre-schoolchildren, teachers, and other adult groups.

4. Financing of dental health education

4.1 Dental health education programmes should be given a distinct and adequate allocation in the overall health budget and all other resources in the community should be tapped to provide additional logistics to the programme.

4.2 International agencies such as WHO and UNICEF should be requested to assist in programmes of training for health educators and, if necessary, direct support for the establishment of health education programmes.

Topic No. 7 - Symposium on fluorides

1. Fluoridation

1.1 Support for fluoridation

The workshop reaffirmed that water fluoridation is the most effective and economic method for reducing dental caries incidence by up to two-thirds, and supported resolution WHA 22.30 of the twenty-second World Health Assembly on fluoridation.
Where the fluoride level in public water supplies is below the optimum, fluoridation should be introduced.

A requirement for fluoridation is a public water supply controlled by adequately trained personnel.

1.2 Optimum fluoride level

The optimum fluoride level is usually determined by taking into account the annual average maximum temperature. This gives levels lower than 1.0 ppm for tropical countries.

Reports indicated that some countries had been dissatisfied with the results obtained and one had raised the level to 1.0 ppm. Tropical countries using levels lower than 1.0 ppm of fluoride should determine whether they are obtaining the maximum reduction in dental caries incidence, and if not, consider raising the level.

1.3 Fluoride in the reticulation system

Fluoride is absorbed by pipes until an equilibrium is reached. This may take several months, after which there should be no loss of fluoride in the reticulation system. If continuing losses are reported, an investigation should be made.

1.4 Protection of waterworks personnel

Protective measures for the personnel handling fluorides need to be incorporated in the procedures of the water treatment plant. Supervision is needed to see that the safety procedures are carried out.

1.5 Monitoring

Determination of the fluoride level, both at the water treatment plant and at various parts in the service area, should be a daily function of those responsible for operating the waterworks plant. Additionally, monitoring of the fluoride concentration should be the responsibility of a separate agency such as the health department.

1.6 Attention was drawn to the course of one week's duration for waterplant engineers on the technical aspects of fluoridation held annually by the Pan-American Health Organization. The possibility of establishing a similar course in the Western Pacific Region should be investigated.

2. Topically applied fluorides

2.1 Place

When water fluoridation has not been implemented, the topical application of fluorides is a method which will produce a reduction in dental caries incidence of the order of 30 to 40 per cent.
2.2 Cost-benefit

In public health planning, there is a need to subject a programme of topically applied fluoride to cost-benefit analyses. In general, cost-benefit analyses show that the preferred methods are those involving self-application. Methods involving application by dental personnel to individual patients are too time-consuming to be economic as a public health measure except in countries with a high dental caries prevalence.

2.3 Mouth-rinsing techniques

Mouth-rinsing with fluoride solutions varying in concentration from 0.05% to 0.2% and in frequency from daily to five times per year have been shown to be effective. Countries in the Region should consider adoption of such a programme. In programme planning, the ideal combination of concentration and frequency must be considered. Where a school toothbrushing programme is in operation, periodic use of a fluoride solution for toothbrushing followed by a rinse with the solution may be a practical method of implementation.

The use of daily mouth-rinsing with 0.05% sodium fluoride solution especially in places where people cannot afford toothbrushes should be considered.

2.4 Further research

There is a need for further research into the most effective and economic methods of fluoride application in regions of relatively low caries incidence.

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Topic No. 8 - Symposium on international and bilateral aid and assistance

Sources of aid and assistance available to countries were described and discussed in open session at a symposium held on Friday evening, 12 May commencing at 8:30 p.m. under the following headings:

1. World Health Organization

The World Health Organization was established in 1948, as a specialized agency of the United Nations. It has its headquarters in Geneva and for the Western Pacific Region, a regional office in Manila.

WHO acts at the request of governments and the budget is established two years in advance. For example, requests put forward in 1972, if approved, would normally be implemented in 1974.
Examples of assistance given in the past for dental health in the Western Pacific Region are as follows:

(a) consultant and advisory services on inter-country programmes;

(b) support for dental auxiliary training institutions;

(c) fellowships for education and training of national dental health staff;

(d) advisory services and lecturers at dental schools;

(e) seminars, meetings, and workshop;

(f) assistance in the conduct of dental health surveys and the provision of data-processing facilities.

The Headquarters Dental Unit at Geneva is available for consultant assistance through the Western Pacific Regional Office. The Unit is active in promoting research projects in the field of epidemiology and is embarking on a worldwide study on the delivery of dental services.

Assistance is available from the Headquarters Dental Unit through the Regional Office in designing and conducting dental epidemiological surveys using the WHO Basic Oral Health Survey Methods Manual. WHO Headquarters is prepared to process data obtained by this method.

2. Other United Nations bodies - UNICEF, UNDP, FAO

These agencies have in the past assisted with programmes which have dental aspects - UNICEF and UNDP in the development of water supplies, FAO in nutrition. UNICEF has assisted in child dental health programmes but recently has indicated that greater emphasis will be given to programmes in education. In the assistance given by these agencies, preference is given to programmes which lead to the development of complete health services. They will normally view requests for dental assistance within this context.

WHO acts as adviser on health to other United Nations organizations.

3. Bilateral aid - Asia and the Pacific (Colombo Plan)

It was explained that this wide-ranging aid programme formerly known as the Colombo Plan was essentially aid bilaterally negotiated, that is directly between the country requesting aid and the donor country. The New Zealand School dental nurse auxiliary had been introduced largely by means of the Colombo Plan. Dental education and training was one of the areas in which assistance could be sought and negotiated under this programme. The name Colombo Plan is still used for aid and assistance given Asian members.
4. Other governmental and private programmes

There are numerous government and non-governmental programmes which provide assistance and dental personnel should become familiar with those available to their territory.

5. Educational institutions

The developed countries in the Region provide places in their universities, technical institutes, hospitals and auxiliary training institutions for dental personnel from the region, at both undergraduate and post-graduate level.

6. Dental associations and the private sector

It was recognized that there was a need for an overall coherent regional dental health programme involving organized dentistry and the private sector, by its own volition, in the programme defined at the workshop. It was recognized also that the regional dental health programme was dependent for its complete services on the support of national dental associations and their members.

Organized dentistry is represented by the Federation Dentaire Internationale (FDI) and the Asian Pacific Dental Federation - a regional organization of the FDI. These organizations work "in collaboration with WHO". One of the problems is that the members of these organizations who are mostly from the private sector have little opportunity of becoming aware of the WHO programme. They are unable, therefore, to decide precisely where they might play a part.

It was mentioned that there would be an opportunity at a forthcoming meeting of the FDI in the Region to present the WHO regional programme in open session. This should provide national dental associations and their members with the information needed about the programme.

The general conclusion was that considerable aid was available and that dental personnel should be aware of the forms of aid available to their country and make requests through the appropriate channel for the assistance they require.

8. FINAL GENERAL CONCLUSIONS

8.1 National workshops

It is suggested that to follow-up this workshop, it would be useful for countries to hold national workshops, including representatives of the general health administrations, to help develop further the dental health services and education and training programmes.
8.2 WHO advisory services

The participants saw a need for advice to be given by WHO on a continuing basis at an inter-country level on matters raised and conclusions reached, and to promote and co-ordinate, where necessary, the proposed activities in the participating countries.
<table>
<thead>
<tr>
<th>Countries</th>
<th>Name of participants and addresses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HONG KONG</strong></td>
<td>Dr Yap Jin Hwee</td>
</tr>
<tr>
<td></td>
<td>Dental Specialist</td>
</tr>
<tr>
<td></td>
<td>Dental Headquarters</td>
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<td></td>
<td>Kennedy Road</td>
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<td></td>
<td>Hong Kong</td>
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<tr>
<td><strong>KHMER REPUBLIC</strong></td>
<td>Dr Hin Tong Hor</td>
</tr>
<tr>
<td></td>
<td>Directeur Général</td>
</tr>
<tr>
<td></td>
<td>Adjoint des Affaires dentaires</td>
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<tr>
<td></td>
<td>Ministere de la Santé publique</td>
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<td></td>
<td>de la République Khmère</td>
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<td></td>
<td>19 Vithei Kramoun Sar</td>
</tr>
<tr>
<td></td>
<td>Phnom Penh</td>
</tr>
<tr>
<td><strong>MACAO</strong></td>
<td>Dr Joao Horacio Maria da Conceicao</td>
</tr>
<tr>
<td></td>
<td>Estomatologist</td>
</tr>
<tr>
<td></td>
<td>Macao Health Services</td>
</tr>
<tr>
<td></td>
<td>P.O. Box 473</td>
</tr>
<tr>
<td></td>
<td>Macao</td>
</tr>
<tr>
<td><strong>MALAYSIA</strong></td>
<td>Dr Abdul Rahman bin Awang</td>
</tr>
<tr>
<td></td>
<td>Principal Dental Officer</td>
</tr>
<tr>
<td></td>
<td>Government Dental Clinic</td>
</tr>
<tr>
<td></td>
<td>Jalan Pudu, Kuala Lumpur</td>
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<tr>
<td></td>
<td>West Malaysia</td>
</tr>
<tr>
<td></td>
<td>Dr Yim Khai Sun</td>
</tr>
<tr>
<td></td>
<td>Senior Dental Officer</td>
</tr>
<tr>
<td></td>
<td>c/o Medical Department</td>
</tr>
<tr>
<td></td>
<td>Kuching, Sarawak</td>
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<tr>
<td></td>
<td>East Malaysia</td>
</tr>
<tr>
<td></td>
<td>Dr B.J. Moreira</td>
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<tr>
<td></td>
<td>Principal Dental Officer</td>
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<td></td>
<td>Pahang</td>
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</tr>
<tr>
<td><strong>NEW ZEALAND</strong></td>
<td>Dr E. Brebner</td>
</tr>
<tr>
<td></td>
<td>Assistant Director</td>
</tr>
<tr>
<td></td>
<td>Division of Dental Health</td>
</tr>
<tr>
<td></td>
<td>Department of Health</td>
</tr>
<tr>
<td></td>
<td>Wellington, New Zealand</td>
</tr>
</tbody>
</table>
Annex 1 (Cont'd.)

PHILIPPINES

Dr Enrique C. Castillo
Dental Health Adviser
Bureau of Dental Health Services
Department of Health
Manila

Dr Guillermo F. Juliano
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Statistics Division
Bureau of Dental Health Services
Department of Health
Manila

Dr Luis P. Alfiler
General Office Supervising Dentist
Bureau of Public Schools
School Health Division
Arroceros Street
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Korea

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Republic of Singapore

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School Dental Service
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Palmer Road
Republic of Singapore

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Dental Service
Ministry of Health
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Saigon
Viet-Nam

Miss Nguyen Thi Tinh
Chief
Bureau of Curative Dentistry
Dental Service
Ministry of Health
59 Hong Thap Tu
Saigon
Viet-Nam

LIST OF CONSULTANTS AND TEMPORARY ADVISERS

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Workshop Director
Annex 1 (Cont'd.)

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and Preventive Dentistry  
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Dental Training School  
Penang  
Malaysia

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Regional Adviser on Nutrition and  
Operational Officer of the Workshop  
WHO Regional Office  
Manila, Philippines

Dr David E. Barmes  
Epidemiologist  
Dental Health Unit  
World Health Organization  
1211 Geneva 27  
Switzerland

Mr Jose Abcede  
Public Information Officer  
WHO Regional Office  
Manila, Philippines

Mrs Remedios S. Velasco  
Unit Secretary  
WHO Regional Office  
Manila, Philippines
<table>
<thead>
<tr>
<th>Organization</th>
<th>Observer(s)</th>
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<tbody>
<tr>
<td>Asian Pacific Dental Federation</td>
<td>Dr Lim Kheng Ann</td>
</tr>
<tr>
<td></td>
<td>Dental Clinic</td>
</tr>
<tr>
<td></td>
<td>Outram Road General Hospital</td>
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<td>Singapore 3</td>
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<tr>
<td>Asian Pacific Dental Students Association</td>
<td>Mr Yoong Yoon Khee</td>
</tr>
<tr>
<td></td>
<td>Editor</td>
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<td>Dental Clinic</td>
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<td>Outram Road General Hospital</td>
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<tr>
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<td>Singapore 3</td>
</tr>
<tr>
<td>International Dental Federation (FDI)</td>
<td>Professor P.D. Barnard</td>
</tr>
<tr>
<td></td>
<td>Vice-Chairman</td>
</tr>
<tr>
<td></td>
<td>Commission on Dental Public Health</td>
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<td></td>
<td>University of Sydney</td>
</tr>
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<td>Australia</td>
</tr>
<tr>
<td>Malaysia</td>
<td>Dr Ibrahim bin Yassin</td>
</tr>
<tr>
<td></td>
<td>Administrative Dean</td>
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<td></td>
<td>Faculty of Dentistry</td>
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<td></td>
<td>University of Malaya</td>
</tr>
<tr>
<td>Singapore Dental Association</td>
<td>Dr Tan Kwang Jow</td>
</tr>
<tr>
<td></td>
<td>Senior Registrar</td>
</tr>
<tr>
<td></td>
<td>i/o Maternal and Child Health Dental Services</td>
</tr>
<tr>
<td>Ministry of Health, Singapore (Dental Branch)</td>
<td>Dr John Chan Kok Choy</td>
</tr>
<tr>
<td></td>
<td>Senior Registrar</td>
</tr>
<tr>
<td></td>
<td>(Preventive Dentistry and Research)</td>
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<td></td>
<td>Dr Oon Chong Huan</td>
</tr>
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<td></td>
<td>Dental Officer i/c</td>
</tr>
<tr>
<td></td>
<td>Pegu Road School Dental Centre</td>
</tr>
<tr>
<td>University of Singapore (Dental Faculty)</td>
<td>Professor J.A. Jansen</td>
</tr>
<tr>
<td></td>
<td>Professor of Prosthetic Dentistry</td>
</tr>
<tr>
<td></td>
<td>Dr (Miss) Yong Siu Len</td>
</tr>
<tr>
<td></td>
<td>Lecturer in Dentistry</td>
</tr>
</tbody>
</table>
WORKING GROUPS

GROUP I  Hong Kong
         Khmer Republic
         Macao
         Malaysia
         New Zealand

Resource persons
Dr Yap Jin Hwee
Dr Hin Tong Hor
Dr J.H.M. da Conceicao
Dr Abdul Rahman bin Awang
Dr B.J. Moreira
Mr E. Brebner

Observers
Professor G.N. Davies
Dr D.E. Barmes

GROUP II  Malaysia
         Philippines
         Viet-Nam

Resource persons
Dr Yim Khai Sun
Dr L.P. Alfiler
Dr E.C. Castillo
Dr G.F. Juliano
Miss Nguyen Thi Tinh
Miss Ngo Thi Vinh

Observers
Dr C.J. Sundram
Dr M.J. Hollis

GROUP III Republic of Korea
         Ryukyu Islands
         Singapore

Resource persons
Dr Nam-Kyu Kim
Dr Heun-Taik Jhee
Dr Masakatsu Takaesu
Dr Wong Mook Qui
Dr Goh Soo Wan
Dr Tan Yok Lin

Observers
Professor J.W. Knutson
Dr Wong Hee Deong

Dr Lim Kheng Ann
Mr Ong Beng Hua
Dr J. Chan Kok Choy
Professor P.D. Barnard
# FIRST REGIONAL WORKSHOP ON DENTAL HEALTH SERVICES

<table>
<thead>
<tr>
<th>Tuesday 9</th>
<th>Wednesday 10</th>
<th>Thursday 11</th>
<th>Friday 12</th>
<th>Saturday 13</th>
<th>Monday 15</th>
<th>Tuesday 16</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:30 a.m.</td>
<td>Registration</td>
<td>Topic 2. National Dental Epidemiological Data and their Significance</td>
<td>Topic 4. Dental Auxiliaries Dr C. Sundram</td>
<td>Topic 6. Dental Health Education Dr M. J. Hollis</td>
<td>Review of draft report and conclusions</td>
<td>Consolidation of report and conclusions</td>
</tr>
<tr>
<td>9:00 a.m.</td>
<td>Formal opening</td>
<td>Discussion (Working groups and plenary)</td>
<td>Discussion (Working groups and plenary)</td>
<td>Field visit: (a) Dental health education unit, Alexandra Park (b) Delta Circus primary school</td>
<td>Visit to Woodleigh waterworks</td>
<td></td>
</tr>
<tr>
<td>11:00 a.m.</td>
<td>Country presentations</td>
<td>Group discussion</td>
<td></td>
<td></td>
<td>Concluding evaluation</td>
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</tr>
<tr>
<td>1:30 p.m.</td>
<td>Working groups</td>
<td>Topic 3. (a) Dental Health Services and Manpower Dr D. E. Barnes (b) Integration with and Role of General Health Services Dr K. V. Bailey</td>
<td>Topic 5. Graduate and Post-graduate Dental Education Professor G. N. Davies</td>
<td>Working groups</td>
<td>Review of draft report and conclusions (continued)</td>
<td>Visit Dental Faculty, University of Singapore</td>
</tr>
<tr>
<td>3:30 p.m.</td>
<td>Plenary discussion (Working groups and plenary)</td>
<td>Plenary discussion</td>
<td>Plenary discussion</td>
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</table>

*Role of international, bilateral and private agencies in public dental health dentistry.*
EVALUATION

1. A considerable effort was made to evaluate day-to-day papers as well as the total impact of the workshop.

The two instruments used to gather information from the participants were: (a) a daily evaluation questionnaire; and (b) a two-part questionnaire in the standard format used for WHO seminars.

The daily evaluation questionnaire was a modification of that used at the Western Pacific Regional Office "Workshop for Medical Faculty", University of New South Wales, 25 November to 10 December 1971. It was filled in at the conclusion of the discussion of each topic.

The final evaluation questionnaire was distributed to and completed by the participants at the conclusion of the closing ceremony.

Results from the completed daily evaluation forms were processed at the end of each session, and made available to the Steering Committee so that corrective action could be taken, if required.

2. Daily evaluation

Participants were asked to rate six features of each topic as excellent, good, fair or poor by assigning a score of 4, 3, 2, or 1 respectively. Average scores were then calculated. The results showed, on the average, that each feature was rated good or better and that overall the various features would be ranked from highest to lowest as follows:

(a) ease of communication with staff and consultants;
(b) organization of sessions;
(c) effectiveness of group discussions;
(d) impact of working papers;
(e) effectiveness of plenary sessions;
(f) completeness of sessions.

Neither the ratings nor the comments that were made on the daily evaluation forms suggested the need for any drastic reorganization of the programme. Most of the critical comments referred to the physical facilities for the meetings, the lack of specificity in the guidelines for the working groups.
Annex 4 (Cont'd.)

to the lack of time for group discussions. The latter is reflected in
the relatively low rating for "completeness of sessions". The former
is reiterated in the replies to the final evaluation of the workshop.

Participants were also asked to classify the sessions on each
topic as follows: "As good as I hoped"; "Not as good as I hoped"; or
"Better than I hoped".

The results by topic, which are sent out below, indicate a high
degree of satisfaction with the proceedings. From some of the comments,
it would seem that Topic No. 3 should have been placed at the end of
the programme instead of near the beginnings.

<table>
<thead>
<tr>
<th>Topic</th>
<th>Average score for working paper</th>
<th>Evaluation of sessions devoted to this topic number of persons giving answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Dental health programme</td>
<td>3.1</td>
<td>Better than hoped</td>
</tr>
<tr>
<td>2. National dental epidemiological data and their significance</td>
<td>3.3</td>
<td>4</td>
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<tr>
<td>3. (a) Dental health services and manpower</td>
<td>3.4</td>
<td>2</td>
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<tr>
<td>(b) Integration with and role of general health services</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>4. Dental auxiliaries</td>
<td>3.5</td>
<td>1</td>
</tr>
<tr>
<td>5. Under-graduate and postgraduate dental education</td>
<td>3.5</td>
<td>4</td>
</tr>
<tr>
<td>6. Dental health education</td>
<td>3.4</td>
<td>3</td>
</tr>
<tr>
<td>6A. Extra session on manpower and auxiliaries</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>7. Symposium on fluoridation</td>
<td>3.5</td>
<td>6</td>
</tr>
</tbody>
</table>
3. Final evaluation

The first part of the standard WHO questionnaire dealt with organizational and administrative matters. From the replies three conclusions can be drawn:

(a) The leadership of the workshop was the most favourable feature of the organizational arrangements.

(b) There was a general feeling, as reflected in the answers to questions B, D and E, that there was insufficient time to discuss adequately every topic in a crowded programme. A more positive interpretation is that each topic generated much more interest than was expected.

(c) That there was general satisfaction with most of the administrative arrangements.

The eighteen participants were asked to suggest improvements for future meetings of this type. Eleven either made no reply or indicated that they had no suggestions to make. Three suggested that more time should be made available to discuss fewer topics. Three drew attention to the need for efficient air-conditioning in meeting rooms. One suggested that participants should be given clear guidelines concerning the points to be discussed and one suggested that, after returning to their respective countries, participants should be asked to review the changes that were implemented as a result of the new knowledge gained at the workshop.
Annex 4 (Cont'd.)

EVALUATION

These questionnaires are standard forms for WHO seminar. You are kindly requested to complete them and return them (unsigned) to the Secretariat.

Questionnaire No. 1

A. Travel arrangement were:
   Excellent (7) Satisfactory (10) Reasonably (0) Unsatisfactory ( ) No (1) satisfactory answer

B. The amount of free time available for personal matters and rest was:
   Adequate (2) Just enough (6) Not enough (8) More than enough (2)

C. The total length of the workshop was:
   Very (2) Satisfactory (12) Too short (3) Too long (1) satisfactory

D. The schedule of the workshop was:
   Very (4) Satisfactory (7) Too crowded (6) Too loose (1) satisfactory

E. The working hours were:
   Very (2) Satisfactory (7) Too short (2) Too long (7) satisfactory

F. The information bulletins and circulars were:
   Very (7) Helpful (7) Of some help (4) Of no help (0) helpful

G. Library and reference facilities were:
   Adequate (7) Just right (7) Limited (4) Poor (0)

H. Opportunities to become acquainted with the other participants and the staff were:
   Ample (5) Satisfactory (11) Not enough (2) None (0)

I. The leadership at the workshop was:
   Excellent (13) Satisfactory (5) Fairly good (0) Poor (0)
The second part of the questionnaire dealt with the reaction of the participants to the actual proceedings of the workshop. In general terms the participants appeared to be very interested in the workshop, gained some new knowledge, had a reasonable amount of time for discussion, and found the proceedings to be valuable to them. One-third of the participants would have liked a greater opportunity to exchange knowledge and experience with other participants and staff outside working hours.

Questionnaire No. 2

A. Were you interested in the workshop?
   Very much (16) Quite a bit (1) To some extent (1) Very little (0)

B. Did you gain any new ideas or concepts?
   Many (5) Some (11) Very few (2) None at all (0)

C. Did you have enough opportunity to express your own ideas at the workshop?
   Ample (7) Just enough (6) Not enough (3) None at all (1) No answer (1)

D. Did you have enough opportunity to exchange knowledge and experience with other participants and staff outside workshop hours?
   Ample (4) Just enough (8) Not enough (6) None at all (0)

E. Each of you came with specific objectives and expectations. To what extent do you feel that these have been attained?
   Completely (1) For the most part (11) Some (4) A little (2)

F. The scope of the discussion was:
   Adequately covered (4) Just right (10) Too large (3) Too small (1)

G. The workshop has been for you
   Highly valuable (8) Valuable (8) Of some value (2) Of little value (0)
In answer to the question "What do you consider were good features in the content of the Workshop?", five gave no reply; seven referred to specific topics - epidemiology, dental health education, dental health services, manpower, dental auxiliaries, field visits and the stress on preventive dentistry; 2 praised the effectiveness of the small group discussions; 1 commended the essential practical application of the topics to the needs of the countries involved; and 1 said that he now had a better outlook and was better informed.

Six gave no answer to the question "What features did you consider not so good?"; 3 said they were all good; 2 mentioned specific topics - dental health education and delivery of dental services; 4 referred to lack of time at plenary and group discussions and considered the programme contained too much for one week; 1 referred to the language problems of some participants; 2 referred to the need for participants to think regionally rather than 'nationally'.

A wide range of answers was given to the question "How will this Workshop be reflected in your plan for the development and improvement of dental health services in your country?". Six gave no answer; seven said it would be of considerable assistance in either planning or the training of auxiliaries; 2 thought it would be of little help and 1 drew attention to the fact that a poor country at war was in no position to implement some of the proposals; 2 felt that the recommendations would greatly assist them in their negotiations with governments; 1 made a strong plea for the importance of the recommendations to be stressed at the Regional Office of WHO; 1 said that he would, in future, place greater emphasis on the preservation of permanent teeth and on the prevention and control of periodontal disease and 1 said he was most grateful for the opportunity to attend the Workshop.

4. Conclusions

The evaluation indicates that for most of the participants the good features of the Workshop greatly outweighed the relatively minor weaknesses and deficiencies. Some preconceived ideas were challenged, different concepts were generated and new friendship were made. Above all the opportunity to discuss common problems and difficulties has given the participants a new enthusiasm and greater confidence in their ability to improve their service to the public. These benefits will be of permanent value.
Questionnaire
First Regional Workshop on Dental Health Services
Singapore, 9-16 May 1972

Country ......................... Name of participant(s) .........................

Please indicate your answers with a tick where appropriate (✓).
Only one questionnaire is required from each country. Kindly send to the
WHO Regional Office, Manila.

1. BASIC STATISTICS

1.1 Population

<table>
<thead>
<tr>
<th>Year</th>
<th>Total projected population for</th>
<th>Number</th>
<th>% of total population</th>
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<tbody>
<tr>
<td>1980</td>
<td>Total population</td>
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<tr>
<td>1970*</td>
<td>Urban</td>
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<tr>
<td></td>
<td>Rural</td>
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<td>1970*</td>
<td>Population by age groups:</td>
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<td>Preschool age (0-5 years)</td>
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<td>School age (6-14 years)**</td>
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<td></td>
<td>Primary School (   years)**</td>
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<td></td>
<td>Secondary School (   years)**</td>
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<tr>
<td></td>
<td>Adolescents (15-19 years)</td>
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<td></td>
<td>Adults (above 20 years)</td>
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<td>1970*</td>
<td>Distribution of population by</td>
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<td></td>
<td>ethnic groups.</td>
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</tr>
<tr>
<td></td>
<td>(Kindly name distinctive groups and give population figures for each.)</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Distribution of population by</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>language spoken.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(If this is a feature, kindly name distinctive groups.)</td>
<td></td>
<td></td>
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<tr>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

*If another year preferred, specify.
**If other ages, specify.
Annex 5 (Cont'd.)

1.2 Area

Sq. Km. ........................................
or Sq. Mile .....................................

1.3 Economic

Gross National Product (per caput) 1970* US$ ...........
Average annual rate of economic growth % 1970* ............. % per year

1.4 Expenditures for Health Services

Government Health budget as % of national government budget: 1970* ............. % per year
Dental health (health ministry) budget as % of health ministry budget: 1970* ............. % per year
School dental health budget as % of school health budget: 1970* ............. % per year

1.5 Special comment ..................................
................................................................
................................................................
................................................................

2. SURVEYS OF DENTAL HEALTH AND ORAL CONDITIONS

2.1 National survey Year conducted 19 ... Investigator ............

2.2 Please tick (✓) beside years of age or age groups surveyed:

2 ...... 15 - 19 ........
3 ...... 20 - 24 ........
4 ...... 25 - 29 ........
5 ...... 30 - 34 ........
6 ...... 35 - 44 ........
7 ...... 45 - 54 ........
8 ...... 55 - 64 ........
9 ...... 65 and over ........
10 ......
11 ......
12 ......
13 ......
14 ......
### 2.3 RESULTS for:

<table>
<thead>
<tr>
<th>Age (Years)</th>
<th>df (teeth per person)</th>
<th>DMF (teeth per person)</th>
<th>Gingivitis (%)*</th>
<th>Peri-odontitis (%)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>13-14</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15-19</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35-44</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45-54</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other ages</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*(only 1 decimal place or whole number for percentage)*

### 2.4 Is there a marked difference between urban and rural areas, or other ecological zones, in prevalence of:

1. **caries**
   - Yes ( )
   - No ( )
   - If so, specify differences

2. **periodontal disease**
   - Yes ( )
   - No ( )
   - If so, specify differences

### 2.5 If no national survey has been conducted, but some other relevant and reliable local survey has been made, kindly give reference to the publication or report, and answer as many as possible of the above questions on a separate sheet of paper, specifying the conditions (e.g. rural/urban, etc.) to which results are applicable.
### 3. DENTAL PERSONNEL

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>DENTISTS</th>
<th>OPERATING AUXILIARY</th>
<th>NON-OPERATING AUXILIARY</th>
<th>MEDICAL DOCTORS</th>
<th>Physician/Dentist Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Type</td>
<td>Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nurse Hygienist</td>
<td>Other Assistant Technician</td>
<td>Other Type</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MALE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FEMALE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRIVATE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PUBLIC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NO. OF SCHOOLS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YEARS OF FORMAL TRAINING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YEARS OF IN-SERVICE TRAINING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YEARLY OUTPUT</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>POPULATION/PERSONNEL RATIO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>?/1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>POPULATION/&quot;ALL OPERATORS&quot; RATIO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>?/1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.1 Government services

4.1.1 Coverage

(a) Age-group coverage:

Preschool children: Most ( ) Few ( ) None ( )

Schoolchildren: Most ( ) Few ( ) None ( )

Pregnant/lactating women: Most ( ) Few ( ) None ( )

Factory workers: Most ( ) Few ( ) None ( )

Other adults: Most ( ) Few ( ) None ( )

(b) Geographical coverage: Most areas ( ) Few ( ) None ( )

(c) Type of service Curative ( ) Preventive ( ) Both ( )

4.1.2 Emergency service

(a) Is there any? Yes ( ) No ( )

(b) Is it free? Yes ( ) No ( )

4.1.3 Usual place of treatment (check one or more in each column):

<table>
<thead>
<tr>
<th>Preschool age</th>
<th>School age</th>
<th>Adult</th>
<th>Factory</th>
</tr>
</thead>
<tbody>
<tr>
<td>School</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
<tr>
<td>Hospital</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
<tr>
<td>Health centre</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
<tr>
<td>Private surgery</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
<tr>
<td>Other</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
</tbody>
</table>

4.1.4 School dental services

(a) Provided by: Health Ministry ( ) Education Ministry ( )

(b) Are children treated at school? Yes, completely( ) Yes, partly( ) No( )

(c) Coverage of children in one school: All children ( ) Some children ( )

(d) How often are children examined? .........................

(e) How often are children treated? .........................
Annex 5 (Cont'd.)

(f) Are children treated by the school dental service? All ( ) Some ( ) None ( )

(g) Is there toothbrushing programme in schools? All ( ) Some ( ) None ( )

(h) Is there topical application of fluoride? All ( ) Some ( ) None ( )

If, answer is "all" or "some", what form? ..........................................

(i) Is there dental health education activity in schools? All ( ) Some ( ) None ( )

If, answer is "all" or "some", by whom:

- dental personnel Much ( ) Little ( ) None ( )
- general health personnel Much ( ) Little ( ) None ( )
- schoolteacher Much ( ) Little ( ) None ( )

4.1.5 Costs

Who pays the major part of the costs for dental care (check one or more in each column):

<table>
<thead>
<tr>
<th>Preschool age</th>
<th>School age</th>
<th>Adult</th>
<th>Factory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Government</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
<tr>
<td>Patient</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
<tr>
<td>Third party, e.g. insurance, social</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
</tbody>
</table>

4.1.6 Dentist payment

(a) Salary ( )

(b) Fee for item of work, fixed scale ( )

(c) Fee for item of work plus right to charge additional amount above scale (Grant-in-aid) ( )

(d) Fee for item of work, usual and customary fee ( )

(e) Fee for unit of time or per session ( )

(f) Commission on work ( )
(g) Capitation fee per patient

(h) Combination of methods (specify):

4.1.7 Preventive dentistry

(a) Dental health education:

Through health services

Through schools

Through public information media

(b) Water fluoridation:

Year programme commenced, and where:

Number of communities with artificial fluoridation

Population served by these supplies

Number of communities with nationally fluoridated water

Population served by these supplies

What expansion is envisaged?

5. DENTAL AUXILIARIES
(Government and Private Dental Services)

5.1 Training

(a) Do training programmes exist for:

(i) Dental nurses/hygienists/therapists Yes ( ) No ( )

(ii) Dental laboratory technicians Yes ( ) No ( )

(iii) Dental chairside assistants Yes ( ) No ( )
5.2 Services

(a) Dental Laboratory Technicians: legally allowed to prepare prosthetic appliances directly for the public without a prescription from the dentist. Yes ( ) No ( )

(b) Dental Chairside Assistants: permitted to scale and polish?
   - For adults Yes ( ) No ( )
   - For children Yes ( ) No ( )

6. TRAINING IN DENTAL PUBLIC HEALTH

6.1 In your dental faculty(s), at the undergraduate level,
   - Is public health dentistry stressed Much ( ) Little ( )
   - Is it a compulsory examination subject Yes ( ) No ( )

6.2 Postgraduate education in dental public health:
   (a) Have dental officers in government service had such postgraduate training Most ( ) Few ( ) None ( )
   (b) If so, was it mostly: Overseas ( ) Local ( )
7. PRIVATE DENTAL ASSOCIATION

7.1 Number of members .........................

7.2 Does it have significant public dental health activities

Yes ( ) No ( )

If yes, specify .................................

8. FUTURE NEEDS

8.1 Are more dental and oral surveys needed? Yes ( ) No ( )

If yes, what type, where and why ......................................................

8.2 Adequacy of dental manpower:

<table>
<thead>
<tr>
<th></th>
<th>Adequate</th>
<th>Slightly Inadequate</th>
<th>Very Inadequate</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) dental officer</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
<tr>
<td>(b) dental hygienist/nurse/therapist</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
<tr>
<td>(c) dental laboratory technician</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
<tr>
<td>(d) chairside assistant</td>
<td>( )</td>
<td>( )</td>
<td>( )</td>
</tr>
</tbody>
</table>

8.3 Which is the most serious limitation (place 1, for the most serious limitation, 2, 3, for the least)

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) personnel</td>
<td>( )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) money</td>
<td>( )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c) training of personnel</td>
<td>( )</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8.4 What do you consider the priority needs for improving public dental services in your country (both government and private) for the community at large?

........................................................................................................
........................................................................................................
........................................................................................................

8.5 What specific programmes are needed? Are they feasible?

........................................................................................................
........................................................................................................
........................................................................................................
TABLE 1. POPULATION AND DENSITY IN SELECTED COUNTRIES

<table>
<thead>
<tr>
<th>COUNTRY/TERRITORY</th>
<th>TOTAL PROJECTED POPULATION</th>
<th>POPULATION</th>
<th>AREA</th>
<th>DENSITY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year</td>
<td>Number</td>
<td>Total</td>
<td>Urban</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>1980</td>
<td>5 027 700</td>
<td>1970</td>
<td>6 027 700</td>
</tr>
<tr>
<td>Khmer Republic</td>
<td>1980</td>
<td>8 476 816</td>
<td>1970</td>
<td>6 918 171</td>
</tr>
<tr>
<td>Korea, Republic of</td>
<td></td>
<td>-</td>
<td>1970</td>
<td>32 600</td>
</tr>
<tr>
<td>Macao</td>
<td></td>
<td>-</td>
<td>1970</td>
<td>248 636</td>
</tr>
<tr>
<td>West Malaysia</td>
<td>1980</td>
<td>11 760 000</td>
<td>1970</td>
<td>8 610 343</td>
</tr>
<tr>
<td>New Zealand</td>
<td>1980</td>
<td>3 200 000</td>
<td>1970</td>
<td>3 000 000</td>
</tr>
<tr>
<td>Philippines, Rep. of</td>
<td>1980</td>
<td>24 579 000</td>
<td>1970</td>
<td>36 590 065</td>
</tr>
<tr>
<td>Singapore</td>
<td>1980</td>
<td>9 660 000</td>
<td>1970</td>
<td>9 600 000</td>
</tr>
<tr>
<td>Viet-Nam</td>
<td>1980</td>
<td>23 517 832</td>
<td>1970</td>
<td>17 910 300</td>
</tr>
<tr>
<td>Ryukyu Islands</td>
<td>1980</td>
<td>1 090 000</td>
<td>1970</td>
<td>9 400 000</td>
</tr>
</tbody>
</table>

*East Malaysia (Sarawak, Sabah) have additional population of 1 600 000 (1970) Urban - 16%; Rural - 84%

**Macao Rural -2.9%, Maritime-5.9%

TABLE 2. POPULATION BY AGE GROUPS IN SELECTED COUNTRIES, 1970

<table>
<thead>
<tr>
<th>COUNTRY/TERRITORY</th>
<th>Preschool Age (0-5 yrs.)</th>
<th>School age (6-14 yrs.)</th>
<th>Primary School</th>
<th>Secondary School</th>
<th>Adolescents (15-19 yrs.)</th>
<th>Adults (20+)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age</td>
<td>Number</td>
<td>%</td>
<td>Age</td>
<td>Number</td>
<td>%</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>6-11</td>
<td>1 200 000</td>
<td>29.3</td>
<td>8-11</td>
<td>880 615</td>
<td>21.7</td>
</tr>
<tr>
<td>Khmer Republic</td>
<td>6-11</td>
<td>1 200 000</td>
<td>29.3</td>
<td>8-11</td>
<td>880 615</td>
<td>21.7</td>
</tr>
<tr>
<td>Korea</td>
<td>6-11</td>
<td>1 200 000</td>
<td>29.3</td>
<td>8-11</td>
<td>880 615</td>
<td>21.7</td>
</tr>
<tr>
<td>Macao</td>
<td>6-11</td>
<td>1 200 000</td>
<td>29.3</td>
<td>8-11</td>
<td>880 615</td>
<td>21.7</td>
</tr>
<tr>
<td>West Malaysia</td>
<td>6-11</td>
<td>1 200 000</td>
<td>29.3</td>
<td>8-11</td>
<td>880 615</td>
<td>21.7</td>
</tr>
<tr>
<td>New Zealand</td>
<td>6-11</td>
<td>1 200 000</td>
<td>29.3</td>
<td>8-11</td>
<td>880 615</td>
<td>21.7</td>
</tr>
<tr>
<td>Philippines</td>
<td>6-11</td>
<td>1 200 000</td>
<td>29.3</td>
<td>8-11</td>
<td>880 615</td>
<td>21.7</td>
</tr>
<tr>
<td>Singapore</td>
<td>6-11</td>
<td>1 200 000</td>
<td>29.3</td>
<td>8-11</td>
<td>880 615</td>
<td>21.7</td>
</tr>
<tr>
<td>Viet-Nam</td>
<td>6-11</td>
<td>1 200 000</td>
<td>29.3</td>
<td>8-11</td>
<td>880 615</td>
<td>21.7</td>
</tr>
<tr>
<td>Ryukyu Islands</td>
<td>6-11</td>
<td>1 200 000</td>
<td>29.3</td>
<td>8-11</td>
<td>880 615</td>
<td>21.7</td>
</tr>
</tbody>
</table>

*Approximate
TABLE 3. DISTRIBUTION OF POPULATION BY ETHNIC GROUPS AND BY LANGUAGE SPOKEN IN SELECTED COUNTRIES, 1970

<table>
<thead>
<tr>
<th>COUNTRY/TERRITORY</th>
<th>POPULATION BY ETHNIC GROUP</th>
<th>POPULATION BY LANGUAGE SPOKEN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year</td>
<td>Ethnic Group</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>1970</td>
<td>Chinese</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Others</td>
</tr>
<tr>
<td>Khmer Republic</td>
<td>1970</td>
<td>Khmer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chinese</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Viet-Nam</td>
</tr>
<tr>
<td>Korea</td>
<td>1972</td>
<td>Korean</td>
</tr>
<tr>
<td>Macao</td>
<td>1970</td>
<td>Chinese</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Portuguese</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Others</td>
</tr>
<tr>
<td>West Malaysia</td>
<td>1970</td>
<td>Malays</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chinese</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Indians &amp; Pakistanis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Others</td>
</tr>
<tr>
<td>New Zealand</td>
<td>1970</td>
<td>European</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maori</td>
</tr>
<tr>
<td>Philippines</td>
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<td>Not available</td>
</tr>
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<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Singapore</td>
<td>1970</td>
<td>Chinese</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Indians</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Malays</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Others</td>
</tr>
<tr>
<td>Viet-Nam</td>
<td>1970</td>
<td>Viet-Nam</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chinese</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Khmer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Highlander</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Champ</td>
</tr>
<tr>
<td>Ryukyu Islands</td>
<td>1970</td>
<td>Japanese</td>
</tr>
</tbody>
</table>
### Table 4. Some Economic Indicators and Percentages of Expenditures for Health Services in Selected Countries, 1970

<table>
<thead>
<tr>
<th>Country/Territory</th>
<th>Economic Indicators</th>
<th>Expenditures for Health Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
<td>Amount</td>
<td>Year</td>
</tr>
<tr>
<td>------</td>
<td>--------</td>
<td>------</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>1970</td>
<td>700</td>
</tr>
<tr>
<td></td>
<td>1970</td>
<td>200</td>
</tr>
<tr>
<td>Korea</td>
<td>1970</td>
<td>200</td>
</tr>
<tr>
<td>Macao</td>
<td>Not available</td>
<td>Not available</td>
</tr>
<tr>
<td>West Malaysia</td>
<td>1970</td>
<td>300</td>
</tr>
<tr>
<td>Viet-Nam</td>
<td>1970</td>
<td>100</td>
</tr>
<tr>
<td>Ryukyu Islands</td>
<td>1970</td>
<td>700</td>
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</tbody>
</table>

*M$1080 = US$383

### Table 5. National Survey of Dental Health and Oral Conditions in Selected Countries

<table>
<thead>
<tr>
<th>Country/Territory</th>
<th>Year</th>
<th>Investigator</th>
<th>Age Groups Surveyed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>2 yrs.</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>1967-68</td>
<td>K.K. Wong</td>
<td>+</td>
</tr>
<tr>
<td>Khmer Republic</td>
<td>-</td>
<td>No national survey</td>
<td>-</td>
</tr>
<tr>
<td>Korea</td>
<td>1971</td>
<td>Korea Dental Health Association</td>
<td>+</td>
</tr>
<tr>
<td>Macao</td>
<td>-</td>
<td>No national survey</td>
<td>+</td>
</tr>
<tr>
<td>West Malaysia</td>
<td>1970-71</td>
<td>Ministry of Health</td>
<td>+</td>
</tr>
<tr>
<td>New Zealand</td>
<td>1971</td>
<td>Medical Research Council (Pearce)</td>
<td>+</td>
</tr>
<tr>
<td>Philippines</td>
<td>1971</td>
<td>Bureau of Dental Health Services</td>
<td>+</td>
</tr>
<tr>
<td>Singapore</td>
<td>1970-71</td>
<td>Ministry of Health</td>
<td>+</td>
</tr>
<tr>
<td>Viet-Nam</td>
<td>1971</td>
<td>No national survey</td>
<td>-</td>
</tr>
<tr>
<td>Ryukyu Islands</td>
<td>-</td>
<td>No survey data available</td>
<td>-</td>
</tr>
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</table>

*Data from surveys of schoolchildren: K.K. Wong (Khmer), Saigon (Viet-N.), 1971.
**Non-standardised local survey of government school ages 4-5, 6-8, 9-12, 13-18, 1972.
# Table 6A. National Survey Results for Gingivitis and DMF in Selected Countries, 1970

<table>
<thead>
<tr>
<th>Age (Years)</th>
<th>Hong Kong</th>
<th>Chinese Republic</th>
<th>Korea</th>
<th>Macao</th>
<th>West Malaysia</th>
<th>New Zealand</th>
<th>Philippines</th>
<th>Singapore*</th>
<th>Viet-Nam</th>
<th>Ryukyu Islands</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>3.3</td>
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<td>7.0</td>
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<td>5.7</td>
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<td>0.06</td>
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<td>0.06</td>
<td>0.06</td>
<td>0.06</td>
<td>0.06</td>
<td>0.06</td>
<td>0.06</td>
<td>0.06</td>
<td>0.06</td>
<td>0.06</td>
<td>0.06</td>
</tr>
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</table>

*For Chinese
### TABLE 6C. NATIONAL SURVEY RESULTS FOR PI IN SELECTED COUNTRIES, 1970

<table>
<thead>
<tr>
<th>Age (Years)</th>
<th>Hong Kong</th>
<th>Khmer Republic</th>
<th>Korea</th>
<th>Macao</th>
<th>W. Malaysia</th>
<th>New Zealand</th>
<th>Philippines</th>
<th>Singapore</th>
<th>Vle-Nam</th>
<th>Ryukyu Islands</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-6</td>
<td>-</td>
<td>-</td>
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<tr>
<td>12</td>
<td>-</td>
<td>-</td>
<td>11</td>
<td>0.44</td>
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<tr>
<td>13-14</td>
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<td>0.41</td>
<td>-</td>
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<td>-</td>
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<tr>
<td>15-19</td>
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<td>-</td>
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<td>-</td>
<td>-</td>
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<td>-</td>
</tr>
<tr>
<td>35-44</td>
<td>-</td>
<td>-</td>
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<td>-</td>
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<td>-</td>
<td>-</td>
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</tr>
<tr>
<td>45-54</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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</tr>
<tr>
<td>Other ages</td>
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<td>-</td>
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### TABLE 7. DIFFERENCES IN PREVALENCE OF CARIES AND PERIODONTAL DISEASE IN SELECTED COUNTRIES, 1970

<table>
<thead>
<tr>
<th>COUNTRY/TERRITORY</th>
<th>IS THERE A MARKED DIFFERENCE BETWEEN URBAN AND RURAL AREAS, OR OTHER ECOLOGICAL ZONES IN PREVALENCE OF:</th>
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<tr>
<td></td>
<td>C a r i e s</td>
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<tr>
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<td>Yes</td>
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<tr>
<td>Hong Kong</td>
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<tr>
<td>Khmer Republic</td>
<td>No reply</td>
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<tr>
<td>Korea</td>
<td>No reply</td>
</tr>
<tr>
<td>Macao</td>
<td>No reply</td>
</tr>
<tr>
<td>West Malaysia</td>
<td>No reply</td>
</tr>
<tr>
<td>New Zealand</td>
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</tr>
<tr>
<td>Philippines</td>
<td>+</td>
</tr>
<tr>
<td>Singapore</td>
<td></td>
</tr>
<tr>
<td>Viet-Nam</td>
<td>No reply</td>
</tr>
<tr>
<td>Ryukyu Islands</td>
<td>No reply</td>
</tr>
<tr>
<td>TOTAL</td>
<td>%</td>
</tr>
<tr>
<td>COUNTRY/TERRITORY</td>
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<td>-------------------</td>
<td>-------</td>
</tr>
<tr>
<td><strong>COUNTRIES</strong></td>
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<td><strong>TOTAL</strong></td>
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<tr>
<td></td>
<td>Male</td>
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<tr>
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<td>1116</td>
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<tr>
<td><strong>RATIOS</strong></td>
<td>Dentists</td>
</tr>
<tr>
<td></td>
<td>Ratio</td>
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<tr>
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<td><strong>EDUCATIONAL REQUIREMENTS</strong></td>
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<tr>
<td><strong>OPERATIONS</strong></td>
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</table>

*Note: Some data not available.*

**Table 3A.**

*Denotes a correction to the workforce, population, and personnel ratios.*

**Table 3B.**

*Includes some government working also in private practice.*
### Table 8B. Operating Auxiliary: Number, Educational Requirements and Population-Personnel Ratios in Selected Countries

| Year | Hong Kong | China Republic | Korea | Macao | Korea | Malaysia | New Zealand | Philippines | Singapore | Malaysia | Penang | Perlis
<table>
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<tbody>
<tr>
<td></td>
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<td>Hygienist</td>
<td>Nurse</td>
<td>Hygienist</td>
<td>Nurse</td>
<td>Hygienist</td>
<td>Nurse</td>
<td>Hygienist</td>
<td>Nurse</td>
<td>Hygienist</td>
<td>Nurse</td>
<td>Hygienist</td>
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<tr>
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<td>11 0 0 0</td>
<td>11 0 0 0</td>
<td>11 0 0 0</td>
<td>11 0 0 0</td>
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<td>0 0</td>
<td>0 0</td>
<td>0 0</td>
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</tr>
<tr>
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<td>12 4 0 0</td>
<td>11 0 0 0</td>
<td>11 0 0 0</td>
<td>11 0 0 0</td>
<td>11 0 0 0</td>
<td>11 0 0 0</td>
<td>11 0 0 0</td>
<td>11 0 0 0</td>
<td>11 0 0 0</td>
<td>11 0 0 0</td>
<td>11 0 0 0</td>
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</tr>
<tr>
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<td>11 0 0 0</td>
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<td>Public</td>
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<td>11 0 0 0</td>
<td>11 0 0 0</td>
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<td>11 0 0 0</td>
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<td>11 0 0 0</td>
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<td>11 0 0 0</td>
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</tr>
<tr>
<td>MDC, Schools</td>
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<td>0 0</td>
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<td>0 0</td>
<td>0 0</td>
<td>0 0</td>
<td>0 0</td>
</tr>
<tr>
<td>MDC, In-Service Training</td>
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<td>0 0</td>
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<td>0 0</td>
<td>0 0</td>
<td>0 0</td>
<td>0 0</td>
<td>0 0</td>
</tr>
<tr>
<td>POP/PERSONNEL RATIO</td>
<td>34,0750 1 800 000</td>
<td>1 851 111</td>
<td>2000</td>
<td>2200</td>
<td>53 353</td>
<td>52 860</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>POP/ALL OPERATORS RATIO</td>
<td>2500</td>
<td>2200</td>
<td>53 353</td>
<td>52 860</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

*Note: Malaysia, 1971
Name type = 92*
# Table 8C. Non-Operating Auxiliary: Number, Educational Requirements and Population:Personnel Ratios in Selected Countries

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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Year</td>
<td>Type</td>
<td>Year</td>
<td>Type</td>
<td>Year</td>
<td>Type</td>
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<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>Total</td>
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<td>178 ?</td>
<td>153</td>
<td>58</td>
<td>70</td>
<td>1100</td>
<td>350</td>
<td>631</td>
</tr>
<tr>
<td>Male</td>
<td>450 225</td>
<td>178</td>
<td>-</td>
<td>0</td>
<td>465</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Female</td>
<td>50</td>
<td>125</td>
<td>178</td>
<td>-</td>
<td>56</td>
<td>373</td>
<td>-</td>
<td>1100</td>
</tr>
<tr>
<td>Total</td>
<td>450 225</td>
<td>178</td>
<td>-</td>
<td>58</td>
<td>70</td>
<td>1100</td>
<td>350</td>
<td>631</td>
</tr>
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<td>-</td>
<td>57</td>
<td>1100</td>
<td>350</td>
<td>-</td>
<td>-</td>
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<td>1</td>
<td>80</td>
<td>-</td>
<td>-</td>
<td>631</td>
</tr>
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<td>0 0</td>
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<td>6000</td>
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<td>6000</td>
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<tr>
<td>Pop/Personnel Ratio</td>
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<td>12000</td>
<td>18000</td>
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<td>30000</td>
<td>36000</td>
<td>42000</td>
<td>48000</td>
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<tr>
<td>Pop/All Operators Ratio</td>
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<td>2210 8000</td>
<td>2210 8000</td>
<td>2210 8000</td>
<td>2210 8000</td>
<td>2210 8000</td>
<td>2210 8000</td>
<td>2210 8000</td>
</tr>
</tbody>
</table>

*East Malaysia, 1971
**Trained names who have also 3 months formal training and on job training as assistant.

Annex 6 (Cont'd.)
### TABLE 9. COVERAGE OF GOVERNMENT SERVICES IN CERTAIN AGE-GROUPS IN SELECTED COUNTRIES, 1970

<table>
<thead>
<tr>
<th>COUNTRY/TERRITORY</th>
<th>PRESCHOOL CHILDREN</th>
<th>SCHOOL CHILDREN</th>
<th>PREGNANT/LACTATING WOMEN</th>
<th>FACTORY WORKERS</th>
<th>OTHER ADULTS</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Most</td>
<td>Few</td>
<td>None</td>
<td>Most</td>
<td>Few</td>
</tr>
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<td>Hong Kong*</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
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</tr>
<tr>
<td>Korea</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Macao*</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
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<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
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<tr>
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<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Philippines</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Singapore</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Viet-Nam</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
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<tr>
<td>Ryukyu Islands</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
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</tbody>
</table>

*only for government employees and dependents.

### TABLE 10. GOVERNMENT SERVICES IN SELECTED COUNTRIES: GEOGRAPHICAL COVERAGE, TYPE OF SERVICE AND EMERGENCY SERVICE

<table>
<thead>
<tr>
<th>COUNTRY/TERRITORY</th>
<th>GEOGRAPHICAL COVERAGE</th>
<th>TYPE OF SERVICE</th>
<th>IS THERE AN EMERGENCY SERVICE?</th>
<th>IS THE EMERGENCY SERVICE FREE?</th>
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<td></td>
<td>Most Areas</td>
<td>Few</td>
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<td>Curative</td>
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<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Khmer Republic</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Korea</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
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<td>Macao</td>
<td>+</td>
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<td>+</td>
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</tr>
<tr>
<td>New Zealand</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Philippines</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Singapore</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Viet-Nam</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Ryukyu Islands</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

TOTAL

*Coverage - all persons eligible.
### Table 11. Usual Place of Treatment in Certain Age-Groups in Selected Countries, 1970

<table>
<thead>
<tr>
<th>Country/Territory</th>
<th>Preschool Age</th>
<th>School Age</th>
<th>Adult</th>
<th>Factory</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>School Hospital</td>
<td>Health Priv.</td>
<td>Other</td>
<td>School Hospital</td>
</tr>
<tr>
<td></td>
<td>Centre Surgery</td>
<td>Center Surgery</td>
<td></td>
<td>Centre Surgery</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>+</td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Khmer Republic</td>
<td>+</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Korea</td>
<td>+</td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Macao</td>
<td>+</td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>West Malaysia</td>
<td>+</td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>New Zealand</td>
<td>+</td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Philippines</td>
<td>+</td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Singapore</td>
<td>+</td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Viet-Nam</td>
<td>+</td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Ryukyu Islands</td>
<td>+</td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>TOTAL %</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 12A. School Dental Services in Selected Countries, 1970

<table>
<thead>
<tr>
<th>Country/Territory</th>
<th>School Dental Services Provided By:</th>
<th>Are Children Treated at School</th>
<th>Coverage of Children in One School</th>
<th>Frequency of Children Being</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Health Ministry</td>
<td>Education Ministry</td>
<td>Yes Completely</td>
<td>No</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>No school dental service</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Khmer Republic</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Korea</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Macao</td>
<td>+</td>
<td>Health Department</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>West Malaysia</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>New Zealand</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Philippines</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Singapore</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Viet-Nam</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Ryukyu Islands</td>
<td>No school service only</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>TOTAL %</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*for primary schoolchild
### TABLE 12B. SCHOOL DENTAL SERVICES IN SELECTED COUNTRIES, 1970

<table>
<thead>
<tr>
<th>COUNTRY/TERRITORY</th>
<th>ARE CHILDREN TREATED BY THE SCHOOL DENTAL SERVICE</th>
<th>IS THERE TOOTHBRUSHING PROGRAMME IN SCHOOLS</th>
<th>IS THERE TOPICAL APPLICATION OF FLUORIDE</th>
<th>IS THERE DENTAL HEALTH EDUCATION ACTIVITY IN SCHOOLS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All</td>
<td>Some</td>
<td>None</td>
<td>All</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Khmer Republic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Korea</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Macao</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>West Malaysia</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Zealand</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Philippines</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Singapore</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Viet-Nam</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ryukyu Islands</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COUNTRY/TERRITORY</th>
<th>DENTAL HEALTH EDUCATION ACTIVITY IN ALL SCHOOLS UNDERTAKEN BY:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dental Personnel</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>+</td>
</tr>
<tr>
<td>Khmer Republic</td>
<td></td>
</tr>
<tr>
<td>Korea</td>
<td>+</td>
</tr>
<tr>
<td>Macao</td>
<td>+</td>
</tr>
<tr>
<td>New Zealand</td>
<td>+</td>
</tr>
<tr>
<td>Philippines</td>
<td>+</td>
</tr>
<tr>
<td>Singapore</td>
<td></td>
</tr>
<tr>
<td>Viet-Nam</td>
<td>+</td>
</tr>
<tr>
<td>Ryukyu Islands</td>
<td>+</td>
</tr>
<tr>
<td>TOTAL</td>
<td>+</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COUNTRY/TERRITORY</th>
<th>DENTAL HEALTH EDUCATION ACTIVITY IN SOME SCHOOLS UNDERTAKEN BY:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dental Personnel</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>+</td>
</tr>
<tr>
<td>Khmer Republic</td>
<td></td>
</tr>
<tr>
<td>Korea</td>
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</tr>
<tr>
<td>Macao</td>
<td>+</td>
</tr>
<tr>
<td>New Zealand</td>
<td>+</td>
</tr>
<tr>
<td>Philippines</td>
<td>+</td>
</tr>
<tr>
<td>Singapore</td>
<td></td>
</tr>
<tr>
<td>Viet-Nam</td>
<td>+</td>
</tr>
<tr>
<td>Ryukyu Islands</td>
<td>+</td>
</tr>
<tr>
<td>TOTAL</td>
<td>+</td>
</tr>
</tbody>
</table>
TABLE 13. PAYMENT OF THE MAJOR PART OF THE COSTS FOR DENTAL CARE IN CERTAIN AGE GROUP IN SELECTED COUNTRIES, 1970

<table>
<thead>
<tr>
<th>COUNTRY/ TERRITORY</th>
<th>PRESCHOOL AGE</th>
<th>SCHOOL AGE</th>
<th>ADULT</th>
<th>FACTORY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hong Kong*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Khmer Republic</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Korea</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Macao</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>West Malaysia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Zealand</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Philippines</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Singapore</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Viet-Nam</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ryukyu Islands</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*only for government employees and their dependents and emergency treatment for general public.

TABLE 14. DENTIST PAYMENT IN SELECTED COUNTRIES, 1970

<table>
<thead>
<tr>
<th>COUNTRY/ TERRITORY</th>
<th>SALARY</th>
<th>FEE FOR ITEM OF WORK</th>
<th>FEE FOR UNIT OF TIME OR PER SESSION</th>
<th>COMMISSION ON WORK</th>
<th>CAPITATION FEE PER PATIENT</th>
<th>COMBINATION OF METHODS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fixed Scale</td>
<td>Plus right to charge additional amount above scale (grant-in-aid)</td>
<td>Usual &amp; customary fee</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hong Kong</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Khmer Republic</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Korea</td>
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<td></td>
</tr>
<tr>
<td>Macao</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>West Malaysia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>New Zealand</td>
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<td>Philippines</td>
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<tr>
<td>Singapore</td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Viet-Nam</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ryukyu Islands</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Annex 6 (cont')
### TABLE 15. DENTAL HEALTH EDUCATION IN SELECTED COUNTRIES, 1970

<table>
<thead>
<tr>
<th>COUNTRY/TERRITORY</th>
<th>Health Services</th>
<th>Schools</th>
<th>Public Information Media</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Much</td>
<td>Little</td>
<td>None</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Khmer Republic</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Korea</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Macao</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>West Malaysia</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>New Zealand</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Philippines</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Singapore</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Viet-Nam</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ryukyu Islands</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TOTAL</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

### TABLE 16. WATER FLUORIDATION IN SELECTED COUNTRIES, 1970

<table>
<thead>
<tr>
<th>COUNTRY/TERRITORY</th>
<th>WATER FLUORIDATION PROGRAMME COMMENCED</th>
<th>WITH ARTIFICIAL FLUORIDATION</th>
<th>WITH NATURALLY FLUORIDATED WATER</th>
<th>EXPANSION ENVISAGED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Year</td>
<td>Location</td>
<td>Number of Communities</td>
<td>Population Served by these supplies</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>1961</td>
<td>Hong Kong, Kowloon</td>
<td>All</td>
<td>Entire population of 409 000</td>
</tr>
<tr>
<td>Khmer Republic</td>
<td>None</td>
<td>None</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Korea</td>
<td>None</td>
<td>None</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Macao</td>
<td>None</td>
<td>None</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>West Malaysia</td>
<td>1966-69</td>
<td>State of Johore</td>
<td>11</td>
<td>627 630</td>
</tr>
<tr>
<td>New Zealand</td>
<td>1954</td>
<td>Hastings</td>
<td>23 large</td>
<td>1 350 000</td>
</tr>
<tr>
<td>Philippines</td>
<td>None</td>
<td>None</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Singapore</td>
<td>1953</td>
<td>Entire country</td>
<td>All</td>
<td>Entire population of 2,1 million</td>
</tr>
<tr>
<td>Viet-Nam</td>
<td>None</td>
<td>None</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ryukyu Islands</td>
<td>None</td>
<td>None</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

+ As new filtration plants introduced.
+ the Committee Report on Fluoridation of Public Water Supplies in West Malaysia submitted to Ministry of Health and being processed.
+ Adoption of fluoridation by communities (60% of total population).
+ Saigon being undertaken.
### TABLE 17. TRAINING PROGRAMMES FOR DENTAL AUXILIARIES IN SELECTED COUNTRIES, 1970

<table>
<thead>
<tr>
<th>COUNTRY / TERRITORY</th>
<th>DENTAL NURSES/HYGIENISTS/THERAPISTS</th>
<th>DENTAL LABORATORY TECHNICIANS</th>
<th>DENTAL CHAIRSIDE ASSISTANTS</th>
<th>PLANS TO ESTABLISH TRAINING COURSES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Training Programme</td>
<td>Training Programme</td>
<td>Training Programme</td>
<td>For the following</td>
</tr>
<tr>
<td></td>
<td>Duration (mos.)</td>
<td>Duration (mos.)</td>
<td>Duration (mos.)</td>
<td>Dental nurses/</td>
</tr>
<tr>
<td></td>
<td>Under the auspices of:</td>
<td>Under the auspices of:</td>
<td>Under the auspices of:</td>
<td>Dental lab.</td>
</tr>
<tr>
<td></td>
<td>Health Education Univ. Other</td>
<td>Health Education Univ. Other</td>
<td>Health Education Univ. Other</td>
<td>Hygienist</td>
</tr>
<tr>
<td></td>
<td>Ministry Ministry</td>
<td>Ministry</td>
<td>Ministry</td>
<td>(dental)</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>No reply</td>
</tr>
<tr>
<td>Korea</td>
<td>24&quot;</td>
<td>24</td>
<td>24</td>
<td>No reply</td>
</tr>
<tr>
<td>Macao</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>No reply</td>
</tr>
<tr>
<td>West Malaysia</td>
<td>40&quot;</td>
<td>36</td>
<td>24</td>
<td>No reply</td>
</tr>
<tr>
<td>New Zealand</td>
<td>24&quot;</td>
<td>60</td>
<td>+</td>
<td>No reply</td>
</tr>
<tr>
<td>Philippines</td>
<td>+</td>
<td>+</td>
<td>40 hr.</td>
<td>+</td>
</tr>
<tr>
<td>Singapore</td>
<td>36&quot;</td>
<td>+</td>
<td>24</td>
<td>+</td>
</tr>
<tr>
<td>Viet-Nam</td>
<td>+</td>
<td>+</td>
<td>1</td>
<td>+</td>
</tr>
<tr>
<td>Ryukyu Islands</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>No reply</td>
</tr>
</tbody>
</table>

*only dental nurses
**hygienists

### TABLE 18. SERVICES OF DENTAL AUXILIARIES IN SELECTED COUNTRIES, 1970

<table>
<thead>
<tr>
<th>COUNTRY / TERRITORY</th>
<th>DENTAL LABORATORY TECHNICIANS CAN PREPARE PROSTHETIC APPLIANCES DIRECTLY FOR THE PUBLIC WITHOUT DENTIST'S PRESCRIPTION</th>
<th>DENTAL CHAIRSIDE ASSISTANTS CAN SCALE AND POLISH FOR ADULTS/CHILDREN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Legally allowed/Not allowed</td>
<td>Permitted/Not Permitted/Permitted/Not Permitted</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Korea</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Macao</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>West Malaysia</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>New Zealand</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Philippines</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Singapore</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Viet-Nam</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Ryukyu Islands</td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>+</td>
</tr>
</tbody>
</table>
**Table 19. Training in Dental Public Health in Selected Countries, 1970**

<table>
<thead>
<tr>
<th>Country/Territory</th>
<th>Undergraduate Level</th>
<th>Post-Graduate Education in Dental Public Health</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Public Health Dentistry is stressed</td>
<td>Dental officers in government service have such post-graduate training</td>
</tr>
<tr>
<td></td>
<td>Public Health Dentistry is a compulsory examination subject</td>
<td>*If so, was it mostly:</td>
</tr>
<tr>
<td></td>
<td>Much</td>
<td>Little</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Khmer Republic</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Korea</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Macao</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>West Malaysia</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>New Zealand</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Philippines</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Singapore</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Viet-Nam</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Ryukyu Islands</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 20. Private Dental Association in Selected Countries, 1970**

<table>
<thead>
<tr>
<th>Country/Territory</th>
<th>Name of Private Dental Association</th>
<th>Number of Members</th>
<th>It Has Significant Public Health Dental Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>Hong Kong Dental Society</td>
<td>150</td>
<td>+ (all aspects)</td>
</tr>
<tr>
<td></td>
<td>Hong Kong Chinese Dentists Assn</td>
<td>200</td>
<td>+ (publication &amp; Dental Week)</td>
</tr>
<tr>
<td>Korea</td>
<td>Korean Dental Association</td>
<td>2184</td>
<td></td>
</tr>
<tr>
<td>West Malaysia</td>
<td>Malaysian Dental Association</td>
<td>247</td>
<td></td>
</tr>
<tr>
<td>New Zealand</td>
<td>New Zealand Dental Association</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>Philippines</td>
<td>Philippines Dental Association</td>
<td>1860</td>
<td></td>
</tr>
<tr>
<td>Singapore</td>
<td>Singapore Dental Association</td>
<td>186</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Singapore Registered Dentists Assn</td>
<td>160</td>
<td></td>
</tr>
<tr>
<td>Viet-Nam</td>
<td>Viet-Nam Dental Association</td>
<td>128</td>
<td></td>
</tr>
<tr>
<td>Macao</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Khmer Republic</td>
<td>None</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ryukyu Islands</td>
<td>Okinawa Dental Association</td>
<td>129</td>
<td></td>
</tr>
</tbody>
</table>
### Table 21. Future Needs for More Dental and Oral Surveys in Selected Countries, 1970

<table>
<thead>
<tr>
<th>Country/Territory</th>
<th>Type of Surveys</th>
<th>Location</th>
<th>Reason for Need</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hong Kong</td>
<td>+ Among schoolchildren as post-fluoridation check</td>
<td>in urban, farm and coast areas</td>
<td>because of two-level fluoridation during first six years</td>
</tr>
<tr>
<td>Khmer Republic</td>
<td>+ Not specified</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Korea</td>
<td>+ Type of WHO criteria</td>
<td>in schools</td>
<td>since adult part not finished yet</td>
</tr>
<tr>
<td>Macao</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>West Malaysia</td>
<td>+ Not specified</td>
<td>at locations where and when government decides to implement fluoridation</td>
<td>not specified</td>
</tr>
<tr>
<td>New Zealand</td>
<td>+ for adult population</td>
<td>not specified</td>
<td>not specified</td>
</tr>
<tr>
<td>Philippines</td>
<td>+ survey on periodontal disease</td>
<td>in southern areas</td>
<td>to determine severity of disease in areas where practices are conducive to production of this disease</td>
</tr>
<tr>
<td>Singapore</td>
<td>+ Dental Epidemiological Surveys on pre-school and adult groups (6-19 yrs.)</td>
<td>not specified</td>
<td>since not covered by National Dental Survey of schoolchildren</td>
</tr>
<tr>
<td>Viet-Nam</td>
<td>+ WHO criteria</td>
<td>national</td>
<td>evaluation of dental service and programme</td>
</tr>
<tr>
<td>Ryukyu Islands</td>
<td></td>
<td>all areas</td>
<td>no detailed information available</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
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### Table 22. Adequacy of Dental Manpower in Selected Countries, 1970

<table>
<thead>
<tr>
<th>Country/Territory</th>
<th>Adequate Supply</th>
<th>Slightly Inadequate</th>
<th>Very Inadequate</th>
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<tbody>
<tr>
<td></td>
<td>Dental Officer</td>
<td>Dental hygienist/</td>
<td>Dental lab.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>nurse/therapist</td>
<td>technician</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>+</td>
<td>+</td>
<td>*</td>
</tr>
<tr>
<td>Khmer Republic</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Korea</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Macao</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>West Malaysia</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>New Zealand</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Philippines</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Singapore</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Viet-Nam</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Ryukyu Islands</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### TABLE 23. LIMITATION IN DENTAL HEALTH SERVICES AS RANKED BY SELECTED COUNTRIES, 1970

<table>
<thead>
<tr>
<th>COUNTRY/TERRITORY</th>
<th>LIMITATION AS RANKED BY COUNTRIES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Personnel</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>2</td>
</tr>
<tr>
<td>Khmer Republic</td>
<td>3</td>
</tr>
<tr>
<td>Korea</td>
<td>2</td>
</tr>
<tr>
<td>Macao</td>
<td>3</td>
</tr>
<tr>
<td>West Malaysia</td>
<td>1</td>
</tr>
<tr>
<td>New Zealand</td>
<td>No limitations</td>
</tr>
<tr>
<td>Philippines</td>
<td>3</td>
</tr>
<tr>
<td>Singapore</td>
<td>2</td>
</tr>
<tr>
<td>Viet-Nam</td>
<td>3</td>
</tr>
<tr>
<td>Ryukyu Islands</td>
<td>1</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
</tr>
<tr>
<td>Country</td>
<td>Priority Needs for Improving Public Dental Services in the Country (Both Government and Private) for the Community at Large</td>
</tr>
<tr>
<td>------------------</td>
<td>------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Korea</td>
<td>1. Well trained dental health administrator who could give influence in proceeding his planning to higher officials of government; 2. Budget; 3. Manpower</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>1. Establishment of a Dental Nurse Training School and Utilization of Dental Nurses for the treatment of schoolchildren and pre-school children; 2. Training of Dental Hygienists - to assist dental surgeons</td>
</tr>
<tr>
<td>New Zealand</td>
<td>1. Public Dental Services well developed.</td>
</tr>
<tr>
<td>Singapore</td>
<td>1. An organized and well-funded campaign to promote dental health consciousness among the population; 2. A complete dental health service for all pre-school, primary school and secondary school children to be operated by Government.</td>
</tr>
<tr>
<td>West Malaysia</td>
<td>1. Need for personnel especially dentists and dental nurses; 2. Control and preventive measures to be intensified; 3. Pre-school preventive programmes to be planned and implemented; 4. Trained personnel (e.g., nurses) in health education with WHO assisted scholarships.</td>
</tr>
<tr>
<td>Macao</td>
<td>1. School dental services; 2. Dental health education through health services, schools and media.</td>
</tr>
<tr>
<td>Ryukyu Islands</td>
<td>1. Needs to be assessed with new change to Japanese administrative system.</td>
</tr>
<tr>
<td>Viet-Nam</td>
<td>1. Emphasis on dental public health at undergraduate and post-graduate levels; 2. Increase dental health budget at Ministry of Health.</td>
</tr>
</tbody>
</table>
THE WESTERN PACIFIC REGIONAL DENTAL HEALTH PROGRAMME

Part I: The Inter-country Dental Health Programme

by

Brigadier J. Ferris Fuller

Part II: WHO and UNICEF Assistance in the Past, Present and Future in the Western Pacific Region

by

Dr K. V. Bailey

I: THE INTER-COUNTRY DENTAL HEALTH PROGRAMME

This First Workshop on Dental Health Services in the Western Pacific Region climaxes a long-term region-wide inter-country dental health programme which originated from the meeting of the WHO Regional Committee for the Western Pacific held in Wellington, New Zealand in 1961 when, for the first time at that level in WHO, the subject for Technical Discussions by representatives of member governments was "Dental Health". The writer was Chairman of those historic Technical Discussions.

At that meeting it was concluded that dental health had been a neglected subject, that dental disease was a public health problem of some magnitude requiring immediate attention and that long-term overall planning in this neglected field was urgently required. As a consequence, the writer was asked by the Regional Office to present a long-term plan for the Western Pacific Region as a whole. The plan was accepted immediately and has been carefully followed ever since.

1 Director, Defence Dental Services, Ministry of Defence, Wellington 1, New Zealand

2 Regional Adviser on Nutrition and Operational Officer for Dental Health, WHO/WPRO, Manila
The essence of the plan was that data should first be obtained about the type, extent and severity of dental and oral diseases in individual countries in relation to living conditions before any firm planning was done. Furthermore, not only should facts be obtained but those facts should be obtained in terms common to all and directly and readily comparable. Finally, the data so obtained should then be used to design dental health programmes adapted to the individual needs of the countries in the Region.

This was an ecological or environmental approach to a public health problem now fashionable but which in 1961 was ahead of its time.

To provide the valid public health data, representatives were brought from each country in the Region to WHO courses in dental survey methods where they were trained and calibrated against one another. The first of these courses was held at Singapore in 1964 for representatives of the Asian segment while a second course was held at Suva, Fiji, in 1965 for representatives of the South Pacific Island countries and territories.

At the conclusion of these courses the trainees returned to their own home countries where they were expected to set up and complete their own national dental surveys using the methods and criteria they had been taught. In many cases they did so. In others, they have been assisted by WHO short-term consultants assigned to their governments for that purpose.

We have now reached the stage where valid comparable data on the oral health status of almost all countries in this vast Region are available for study and evaluation. It is upon these data that discussions will take place at this workshop and that judgments will be made.

The workshop itself should be seen not as an event in itself but as part of an overall strategy just as the national dental surveys themselves are not ends in themselves but, as Professor J.W. Knutson has said, "... merely the first in a series of related activities designed to generate action in resolving problems".

It should be noted also that the baseline dental epidemiological data obtained from the surveys provide the Regional Office and individual countries with an early warning system which is almost unique. They give a baseline against which signs of an early breakdown or deterioration in dental health can now be detected thus enabling corrective steps to be taken to intercept or prevent the development of a more disastrous situation, provided there are the means and the will to do so.
Activities during the ten-year fact-finding period have not been limited to surveys. Individual countries have been helped in the production of their expert personnel by means of WHO fellowships, advice has been given on the strengthening of existing dental health services and on the establishment of the foundations of a service where none exists and, in several countries, child dental health services have been launched and equipped under joint assistance programmes of WHO and UNICEF.

The writer's own task during this period has been to stimulate, encourage and advise; to visit individual countries from time to time and advise governments; and, when requested, to advise the WHO Western Pacific Regional Office on future dental health programmes.

One area of the Region has already been dealt with. In the South Pacific, a Joint WHO/South Pacific Commission Seminar of an educational and planning nature was held in January/February 1971 at the Headquarters of the South Pacific Commission, Noumea, New Caledonia, at which there were participants from thirteen island countries/territories in the South Pacific along with representatives from Australia and New Zealand. The dental epidemiological data obtained by means of the WHO inter-country regional dental health project were used as the basis for discussions. Area and individual country recommendations were made on the basis of the data and they are now in the process of being implemented.

It became evident almost from the beginning of this multi-phase inter-country programme that the greatest problem would prove to be a shortage of dental manpower and it is towards this problem that accent is now shifting. Of course, the shortage of health manpower generally is one of the greatest problems of our time, that of dental manpower being merely a reflection of shortages in all branches of health services. The dental manpower problem should be seen in that perspective.

The situation as a whole has been best expressed by the Director-General of WHO in a message dated 20 January 1970 marking 1970 as International Education Year when he said:

"Our problem is the world shortage of trained health manpower, which is partly due to shortcomings in general, primary and secondary education, partly to shortages of health training institutions and teachers, and partly to factors such as failure to adapt education to local needs, reluctance to introduce innovations, and deficiencies of curricula and educational method."
Annex 7 (Cont'd.)

We should examine the Western Pacific dental manpower situation and decide whether the above shortcomings, shortages and deficiencies apply and, if so, what corrective and constructive action is both necessary and possible.

It is said that the concept of the dental health team is the most significant step forward in recent years to overcome the dental manpower shortage. This may be so in theory, but the difficulty remains of producing dental health personnel of the right types and in adequate numbers to make those dental teams a reality. And in producing them we should not necessarily set out to make replicas of those dental health personnel developed during a long process of evaluation by the advanced communities of the West.

First, we should assess present needs and forecast likely changes. To do this, we should study the data on the type and extent of dental disease prevailing which fortunately are now available to us. The data will facilitate decision-making about the type of auxiliaries that individual countries in the Region need. For example, if the epidemiological data for a particular country show that the problem is dental caries, the main requirement will be for operating auxiliaries of the dental nurse or therapist type whereas if periodontal disease proves to be the major problem in that country, the main requirement will be for lesser trained auxiliaries of the dental hygienist type. The data may even enable limits to be set on the level to which auxiliaries need be trained by a particular country. But whatever the particular category decided upon, training will need to embrace preventive and educational work and not just treatment alone.

The epidemiological data are not, of course, the whole story. The type of auxiliaries that individual countries can or simply cannot train will also be determined by political, cultural and economic factors; by the social setting from which the students come; and by the general, primary and secondary educational levels reached by a particular country, remembering always that there are so many competing demands in a developing country for the services of those who have received an adequate education.

Regardless of the type or types of auxiliaries deemed necessary for a particular situation, the auxiliary should always be considered complementary to and not a substitute for the dentist who must always be responsible in the final event for their direction and supervision. In other words, the dental team, whether large or small, requires as its head a qualified dentist who shall provide expert direction and professional leadership and upon whom the responsibility for a dental health programme can be fixed.
In this respect, it has been observed by the writer that those countries who have reached a strong position dentally have done so by basing their services upon a hard core of qualified dentists, by insisting upon a rigid standard of registration of both dentist and auxiliary, and by rigid standards of employment of auxiliaries operating under supervision of dentists.

The overall dental manpower situation in the Western Pacific Region of WHO should be studied. The attached dental manpower table has been compiled by the writer together with comparable data for doctors. It is based primarily on data provided by individual countries in 1969, some of which are either incomplete or by now out of date. Countries are invited to bring it up-to-date.

The table shows a substantial professional dental health workforce in the WHO Region which, including Japan, totals 57,000 qualified dentists. Inevitably but understandably, there are wide variations between countries especially in the ratio of dentists to population. Clearly a common dentist/population ratio that should prevail cannot be laid down because so many factors peculiar to each country enter into this calculation including the dental health needs peculiar to each country.

But while we cannot arrive at a dentist/population ratio which is both desirable and universally applicable, a desirable ratio of doctors to dentists might well be another matter. The overall ratio of doctors to dentists in the WHO Region is three to one. It is arguable whether we can accept this as a desirable ratio generally but at least those countries whose ratio of doctors to dentists falls short of three to one should now ask themselves the reason for this.

The share of total health budgets allocated dental health may also be examined in the light of the overall doctor/dentist ratio of three to one. A study by the writer of the situation in several countries suggests that the public dental health budget should be a minimum of 4% to 5% of the total health budget, and, again, countries should measure their own situation against this observation.

It should be noted that there are only 5000 auxiliaries in the Western Pacific Region for the 57,000 dentists. This is a very low overall ratio indeed. Obviously, this aspect calls for urgent attention.

Regarding dental health planning, there are several principles and trends to be kept in mind. The trends in basic health services appear to be towards health promotion and disease control rather than treatment, towards the development of integrated health services and, as far as training of health personnel is concerned, towards the production of multi-purpose as distinct from single purpose workers.
Annex 7 (Cont'd.)

Although health promotion is the ultimate goal, disease control must be the primary objective of any dental health administration while treatment - or the simple everyday health needs of men, women and children - must not be overlooked.

It should be noted that one trend is towards the production of multi-purpose health workers. Consideration should, therefore, be given to the widespread use of middle level health workers to ameliorate the dental manpower shortage because the increasing dental needs of developing countries will never be matched by dental professional resources alone. Instead of concentrating exclusively on the training and education of specialized dental manpower, thought should be given to the involvement of all existing health education workers in the dental health programme - the school teachers, school health education nurses, midwives and nurses at maternal and child health centres, etc., the function of the dentist being to educate the educators. This is a relatively new idea in dentistry.

Finally, let us look briefly at dental health planning. In keeping with good planning practices in any walk of life, the following steps should be taken in logical sequence:

(a) collect and study the data;
(b) make the decisions;
(c) establish priorities and set objectives;
(d) draft the plan;
(e) communicate;
(f) implement the plan;
(g) evaluate accurately and readjust from time to time as found necessary (i.e., incorporate a comprehensive programme of surveillance in the plan).

The dental health plan should meet several requirements; epidemiologically, it should be based on facts and data and not on out-dated dogma; socially, it should be adapted to the way of life of a people and first satisfy their existing needs (although ready also to meet future needs and demands); administratively, it should be integrated into general health services; and economically, it should lie within available resources.

While recognizing always the fact that dental health programmes will vary from country to country depending upon a variety of factors and circumstances, it is possible, nevertheless, to suggest guidelines
and priorities common to all. This has been done within the WHO regional dental health programme, guidelines and priorities being suggested by the writer as follows:

(a) The establishment of a well founded dental department (bureau or section) within a Ministry of Health under the direction of a qualified dental surgeon.

(A WHO Expert Committee on Dental Health\(^1\) has described this as the most important step in the organization of an effective health programme.)

(b) Production and establishment of a strong core or nucleus of fully trained dentists together with the development and training of auxiliaries in parallel.

(c) Emphasis upon dental health promotion, education and prevention.

(d) Priority in any public dental health service to children with elements of assistance to pregnant and nursing mothers.

(It may be necessary to subdivide children as a group into further priorities. For example, dental health services have traditionally commenced with the school child but can they be given earlier, with better long-term effect, to the preschool child, or to the mother and child?)

(e) Mercy or urgent day-to-day services to others within the limits of resources.

(f) The construction of the framework of a dental public health service into which aid and assistance can be put at an appropriate time.

(g) In a developing country, a sponsorship by the Government of a public dental health service and a partnership and understanding in this matter between the Government and the practising dental profession, if in fact, a practising profession exists in a particular country.

A few simple principles have been stated, guidelines suggested and questions posed in the hope that from the discussions, a collective opinion will emerge which will help shape a coherent dental health programme sensitive to the needs of individual countries and to the Region as a whole, both now and in the future.

II. WHO AND UNICEF ASSISTANCE IN THE PAST, PRESENT AND FUTURE IN THE WESTERN PACIFIC REGION

In addition to the seminars mentioned above, WHO has provided consultants to assist the development of school dental services in China (Taiwan), of public dental health services in the Khmer Republic, the Philippines and the Republic of Viet-Nam; and of dental education in Papua New Guinea (Port Moresby Dental College).

Significant assistance has been given by UNICEF to school dental services in China (Taiwan) and Singapore, and dental public health services in Malaysia and the Philippines. Assistance to Malaysia and the Philippines was in the context of general health services. In Singapore, it was linked to school health services and included assistance in the establishment of the school of dental nursing and the dental health education unit. In general, UNICEF assistance was in the form of complete sets of basic dental equipment and sometimes dental health education materials and stipends for training.

In the schools, the amount of dental disease needing attention is usually overwhelming in relation to the resources available. Caries, especially in urban situations (except Hong Kong and Singapore, thanks to fluoridation) is usually becoming rampant. The urgent priorities are for incremental treatment of dental caries, coupled with tooth-brushing and oral prophylaxis for the prevention of periodontal diseases.

In this setting, it is currently considered that one of the top priorities is to assist the establishment of school dental services. This usually requires the training of more dental auxiliaries, who must shoulder the bulk of the dental services. Many dental auxiliaries, including some on WHO fellowships, have been trained in Australia, Fiji, Malaysia, New Zealand and Singapore. Emphasis is now being placed on improving the facilities and content, in as many countries as possible, for the local (national) training of dental auxiliaries. It is expected to extend assistance to several countries in the Region in this respect, during the latter part of 1972 and in 1973.
Only Papua New Guinea has requested assistance in the field of dental education and training (1971, 1973). It is anticipated that in dental faculties the teaching of preventive dentistry, dental public health and dental health education may need more attention in future.

Water fluoridation was the subject of a WHO Assembly Resolution in 1969 (Resolution WHA 22.30). Only Singapore and Hong Kong, in the Asian segment, have full coverage. Several other countries have made beginnings, China (Taiwan) recently had consultant services in this field. UNICEF has indicated possible willingness to extend assistance on a pilot basis. It might be useful to hold courses in water fluoridation techniques for public health engineers.

These remarks serve as an outline of the current trends and policies, and give some perspectives on the areas where assistance may be needed in future. The regional programme is shifting its accent from the area of surveys and definition of problems, to that of dental manpower planning, and the education and training of dental personnel.
### Dental Manpower Summary

(Errors and omissions excepted)

<table>
<thead>
<tr>
<th></th>
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<td>6</td>
<td>13</td>
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<td>2:1</td>
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<tr>
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**TOTAL DOCTORS** | 1175063 |
**TOTAL DENTISTS** | 57718 |
**OVER-ALL RATIO** | 20:1 |

For footnotes, see page 10.
Footnotes:

(1) From ADA evidence to Select Senate Committee (1968) based on estimated population of 11868 thousands

(2) For the year 1969 with an estimated population of 13474 thousands

x Unqualified but registered (Division II) practitioners

(3) For year 1969 with an estimated population of 4499 thousands

(4) For year 1968 with an estimated population of 31000 thousands

(5) For year 1969 with an estimated population of 8513 thousands

* Includes 13 employed in Armed Forces

(6) For 1968 with an estimated population of 2786 thousands (NZ Govt Stat).


(8) For year 1968 with an estimated population of 2354 thousands

** Includes 66 employed in Vietnamese Armed Forces

(9) For year 1966 with an estimated population of 16543 thousands

Sources:

1. WP/RC16/7, Annex 1, page 5/6, Population Estimated as of 1 July for each Year from 1960 to 1971 Countries and Territories in the Western Pacific Region

2. WPR/STAT/67, pages 1 and 3, Health Science Personnel Strength in Countries and Territories of the Western Pacific Region


4. Fuller, J.P. Assignment Report 1969
EPIDEMIOLOGY OF ORAL DISORDERS

by

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1. INTRODUCTION

The national and more limited dental surveys conducted in the Western Pacific Region during recent years provide the data source book for our deliberations at this workshop. The several reports reflect the broad uses of epidemiological methods which may range from efforts to determine the reasons for differences in the prevalence of oral disorders, through objective evaluation of control and preventive measures, to speculation on trends in the occurrence and distribution of dental diseases and disorders. Since data are rarely, if ever, completely adequate, the challenge to the participants in this conference is one of leadership which is best defined as the art of arriving at adequate conclusions from inadequate data.

2. PATTERN OF REVIEW

Inasmuch as all workshop participants are familiar with the scope of dental diseases and abnormal conditions and with the standards established for dental examinations at the Dental Epidemiological Training Course in Singapore in 1964, we need not reconsider or review them at this time. Rather, I shall proceed with an examination and commentary on the data made available in the several reports of dental surveys in this Region. The sequence of the review is related to the time when the surveys were conducted.
Annex 7 (Cont'd.)

3. FIJI

The first regional dental survey, after the 1964 Singapore Course, was conducted under the direction of K.K. Wong in Fiji in 1965. Although the South Pacific Islands are not included in the present workshop, the Fiji survey data are the most adequate currently available, and give some basis for comparison between the South Pacific and Asian segments of the Western Pacific Region. The data reflect Dr Wong's summary statements, "no ravishing dental diseases were found" and "both dental caries and periodontal disease were considered moderate in their condition". In my opinion, the incidence of dental caries in the permanent teeth of the Fiji Islanders, was less than moderate - it was low, resulting in an accumulation of less than three DMF teeth in children aged 13 to 14 years. Although age specific tooth mortality rates were low, the data on gingival inflammation, on the prevalence of periodontal pockets and on the presence of calculus are indicative of the threat of periodontal disease to tooth survival. Handicapping dentofacial anomalies were considered serious enough to require treatment in 9.8% of the Fijians and in 29.2% of Indians. Maxillary overjet was more than twice as prevalent as crowding.

4. PHILIPPINES

The 26,620 persons examined in the national dental survey conducted in the Republic of the Philippines in 1967 provided data on a relatively large sample of the population. The comprehensive analysis of the data made by Allwright in 1969 is an example of the broad uses which epidemiological data can serve, including recommendations for the generation and the deployment of dental manpower resources for the application of preventive and control procedures. It is noteworthy that the DMF prevalence figure for children aged 13 and 14 years is very low - less than 2.5 - and that it reflects an annual incidence rate of roughly 1/4 of a DMF tooth. On the other hand, the consistently higher DMF averages for Manila by comparison with the national averages support the conclusion that the incidence of dental caries is on an upward trend and that this should be countered by more rigorous application of modern preventive procedures, such as water fluoridation.

The comparison of df averages for deciduous teeth by age, for Manila and nationally, indicates a similar trend. Although comparatively higher than the DMF incidence, the overall df average of 4.7 for children aged 5 and 6 years reflects a moderate incidence level.
Annex 7 (Cont'd.)

Certainly, the data on the prevalence of periodontal disease by age support the conclusion that this disorder presents a serious long-term hazard to dental health in the Philippines even though the 1967 data show that a relatively low proportion of persons are edentulous. Handicapping dentofacial anomalies considered serious enough to warrant treatment of persons aged 3 to 19 years totalled 15.3%, with crowding accounting for almost half of the cases and spacing one-third. Whether one considers this figure low or high depends on one's interpretation of the criteria used in the classification system.

5. HONG KONG

Analysis of the dental data collected in Hong Kong in 1967 and 1968, under the direction of K.K. Wong, is rather complex because of the variable impact of six years of water fluoridation. Although, as Wong pointed out, the percentage of decayed primary teeth indicated for extraction was the same in the 1968 survey as it was in Allwright's survey in 1962, if one limits the comparison to the age group 5 to 8 years, it is apparent that there has been a one-third reduction in the average number of df teeth per child as well as in the average df teeth per hundred primary teeth present. Similarly, for this age group the DMF averages for permanent teeth indicates a two-thirds reduction in dental caries prevalence and somewhat more than a 50% reduction for the age group 9 to 11 years. Undoubtedly, Wong's conservative conclusions regarding the impact of water fluoridation during a six-year period were influenced by his comparison of Hong Kong data with Manila data. The Manila data and the data for Taiwan, which will be presented later, suggest that the incidence of dental caries in the permanent teeth of populations in some of the Western Pacific Islands may be quite different to that in the adjacent coastal areas of the mainland of Asia.

The finding in 1962 that 53.8% had handicapping dental facial anomalies whereas only 20.6% were so classified in the 1968 survey, again reflects the problem of establishing uniform criteria of classification.

As Dr Wong pointed out, the high prevalence of gingivitis among children is indicative of the present and emerging problem of periodontal disease in the Hong Kong population. On the other hand, the comparatively low tooth mortality rates and edentulous states in the current adult population could be used to support the conclusion that periodontal disease is of secondary importance.
6. SINGAPORE

The report of Wong, Goh and Oon on "A Ten-Year Study of Fluoridation of Water in Singapore" presents data on dental caries experience in children, aged 7 to 9 years, for the baseline year 1957, and annually for a ten-year period beginning in 1959. Comparable data for the control city, Malacca, in West Malaysia are presented also for each year through the year 1965 when Singapore ceased to be a part of Malaysia. Slightly more than 1000 children, equally divided between two ethnic groups, Malays and Chinese, were examined annually. Certainly, the prevalence of dental caries in deciduous teeth of children in Singapore and Malacca for the baseline year 1957, was very high for both Malays and Chinese, with DMF averages of 10 to 22 for children aged 7 to 8 years. It continued at this high level in Malacca throughout the study years to 1965. On the other hand, the dental caries experience in deciduous teeth of Singapore children aged 7 to 8 years, after ten years of water fluoridation, had been reduced by 33.3% for Malays and 35% for Chinese.

The data on dental caries in permanent teeth of Singapore children indicate that in 1957 and 1959, the DMF averages were high for both Malays and Chinese. After ten years of water fluoridation, these averages had been reduced by roughly one-third. On the other hand, an analysis of the trend in DMF averages for Malacca children indicates that they increased approximately 20% and that all this increase occurred during the period 1957 to 1960. In general, there was no significant change in the prevalence of dental caries in the permanent teeth of Malacca children during the years 1960 through 1965. The authors of the Singapore study concluded that 0.7 part per million of fluoride in the drinking water is a satisfactory level. Inasmuch as less than 5% of the study group showed the very mildest form of mottled enamel, and since the one-third reduction in the prevalence of dental caries is appreciably less than demonstrated in other studies, it would appear that this conclusion is worthy of reconsideration as was done in Hong Kong where the fluoride level was increased to one part per million.

7. TAIWAN

A total of 23,972 examinations were recorded in the 1970-71 Taiwan National Dental Survey. Analysis of the survey data was made separately for three ethnic groups: Taiwanese, Mainlanders and Aborigines whose percentage contribution to a total population of approximately 15 millions was roughly 79, 20 and less than 2, respectively. Slightly more than 13,000 of the examinees were children aged 3, 5, 7, 11, 14 and 17 years. The remainder were adults classified by age within five-year intervals, beginning with the age group, 20 to 24 years.
The impact of dental caries on the teeth of the three ethnic groups was quite similar up through the age group 20 to 24 years. Thereafter, it was strikingly different. The DMF annual increment after age 24 years - which includes the M caused by periodontal diseases - was twice as large in Taiwanese as in Mainlanders, and at least one-third larger than in Aborigines. Since many of the adult Mainlanders exhibited signs of very mild fluorosis, it is speculated that they came from areas of mainland China which had naturally occurring optimum levels of fluoride in the drinking water.

The level of dental caries in deciduous teeth was high, 8.4 DMF teeth. On the other hand, the level of dental caries in permanent teeth was remarkably low, increasing from 0.5 DMF teeth at aged 7 to only 2.8 at aged 17 years. Since permanent first molars and incisors are co-inhabitant of the mouth with deciduous molars for a period of four to five years, this striking difference in the vulnerability of deciduous and permanent tooth populations to dental caries attack is worthy of comprehensive investigations.

Inasmuch as dental care resources in Taiwan are limited - the ratio of dentists to population is approximately 1 to 10,000 - the finding of virtually no fillings in deciduous teeth and a relatively low proportion of filled DMF permanent teeth in children was not unexpected. Among adults aged 25 years and older, however, the Taiwanese, who had more than twice as many filled teeth as Mainlanders, and three times as many as Aborigines, had more than a third of their DMF teeth filled.

It is noteworthy that in spite of a high caries incidence and early loss of deciduous teeth only 8% of all children examined had dentofacial anomalies considered serious enough to require treatment. Crowding accounted for three-fifths of the cases. Periodontal disease is the major hazard to the maintenance of lifetime teeth in Taiwan. The periodontal index for Taiwanese and Mainlanders increased from 0.2 to 0.4 in children and from 0.5 to 1.5 in adults up through the age group 55 to 59 years. It was higher for Aborigines being no less than 0.6 in children, and gradually increasing to 2.4 in adults aged 55 to 59 years. In concert with this finding, the average number of teeth indicated for extraction because of advanced periodontal disease was more than twice as high for adult Aborigines as it was for Taiwanese and Mainlanders.

Tooth mortality caused by the combined impact of dental caries and periodontal disease increased directly with age. Comparatively, it was highest for the Taiwanese who had lost almost one-third of their teeth in the age group 55 to 59 years. It is evident that dental caries is increasing among all ethnic groups and that periodontal disease is now having an insidious and serious impact on the dental health of the inhabitants of Taiwan.
8. MALAYSIA

Some 15,000 persons aged 6 through 18 years were examined in the 1971 National Dental Survey in Malaysia. The computer data sheets made available to me tabulated the distribution of the components of DMF by age and ethnic group. To avoid the rather large task of converting these to DMF averages, DMF estimates were obtained from the age specific percentages of children with one or more DMF teeth. It should be clear, then, that this discussion on dental caries is made on the basis of estimates and that the validity of these estimates will be determined by subsequent comparison with the actual DMF averages.

The most striking characteristic of the data on the prevalence of dental caries in the permanent teeth of Malaysians is the marked ethnic differences. For each age, 6 through 18 years, the DMF averages for Chinese are more than twice as large as for Malaysians and Indians. The DMF averages for Malaysians and Indians are remarkably similar and relatively low. On the other hand, analysis of trends indicate that the incidence of dental caries is increasing.

Common trend lines for Malaysians and Indians indicate that for children age 6 through 9 years, the DMF incidence is one-half a DMF tooth per year, whereas the trend line for persons aged 10 through 18 suggests that persons aged 18 years had an annual incidence of one-fourth of a DMF tooth. Similarly, but at a higher level, the Chinese children aged 6 through 10 years, have an annual incidence of one DMF tooth, whereas the trend line for persons aged 11 through 18 years suggest that those aged 18 years had an annual incidence of one-half the DMF tooth. If this analysis is correct, it lends strong support to the concept that countermeasures must emphasize prevention, rather than a mere increase in personnel available to treat dental caries.

The prevalence of periodontal disease and related factors was quite similar for the three ethnic groups, Malays, Chinese and Indians. The proportion of persons with periodontal disease increased gradually from approximately one-half at aged 6 years to two-thirds at aged 11 years, and then decreased gradually to one-half at the ages 16, 17 and 18 years.

The presence of calculus increased rather uniformly by age, from about 10% at aged 6 years to approximately 50% for persons aged 17 years. The percentages with materia alba by age followed rather closely the percentages with periodontal disease up through aged 13 years, but then dropped rather uniformly with increasing age to 25% at aged 17 years. Although little ethnic difference was apparent, both materia alba and calculus were slightly lower among Chinese than among Malays and Indians.
The percent. of persons with handicapping dentofacial anomalies increased from 16% in children aged 6 years to 40% in children aged 13 years, and continued at about this level through the age of 18 years. Again, it is questionable whether or not these relatively high percentages of persons with handicapping dentofacial anomalies are real or reflect sharp national differences in classification systems.

9. CONCLUSIONS

The foregoing analysis of trends in the prevalence of dental disorders among the peoples of the Western Pacific Region indicate that:

9.1 The incidence of dental caries is increasing with two exceptions: Singapore and Hong Kong.

9.2 Differences in the incidence of dental caries may be as great or greater within ethnic groups of a country than between countries (Figures 1 and 2).

9.3 Fluoridation of the drinking water in Singapore and Hong Kong has reduced the incidence of dental caries. Further reductions can be anticipated if the fluoride concentration is maintained continuously at optimal levels.

9.4 Periodontal disease is more insidious than dental caries and is the major cause of tooth mortality in several countries. Trends indicate that this filth disease is not being prevented and controlled by effective oral hygiene programmes.

9.5 Wide differences in the prevalence of dentofacial anomalies considered serious enough to require treatment, for the same country as well as for all countries, suggest that differences in interpretation of the classification criteria may account for much of the difference. There is a need for review and clarification of the classification criteria.

9.6 The range of detailed findings presented in tables and figures in the several reports is inordinately wide and urgently in need of review and clarification so that the survey data may serve as a baseline against which preventive and control programmes can be evaluated as well as for the other purposes of this workshop such as planning for the training and education of the various types of dental personnel.
9.7 Regionally sponsored and financially supported investigations to determine why there are ethnic differences in the prevalence of dental disorders as well as differences in the vulnerability of the deciduous and permanent tooth populations of the same individuals could prove highly fruitful. Evidence from other sources indicates that Hong Kong, Taiwan and the Philippines rank first, second and fourth for females and first, fifth and eleventh for males, respectively, in a listing of age-adjusted death rates for oral cancer in 40 countries, whereas Japan ranks 33rd for females and 38th for males. Why?

9.8 The data, the tabular material and the analyses made available by the dental surveys are characterized by excesses rather than deficiencies. They are adequate, therefore, when coupled with appropriate information on dental personnel resources, economics, social and political systems and cultural patterns and values, for the fundamental purposes of this first regional workshop on dental health services.
Annex 7 (Cont’d.)

REFERENCES


Figure 1

Percent of Children with One or More DMF Teeth

DMF Teeth per Child

Fiji ▼
Fijians ▼
Indians ▼
Hong Kong ▲
Philippines ■
National □
Manila □
Taiwanese ○
Mainlanders ○
Aborigines ○
Figure 2
Analytical or scientific planning is very old in many areas such as economics but relatively new in health - probably not more than two decades. Thus, when the WHO Expert Committee on Public Health Administration devoted its 1951 discussions largely to health planning, it was among the first to recognize the importance of the subject. Several subsequent meetings of the Committee and of other WHO Expert Committees have contributed an excellent collection of WHO technical reports and papers for our understanding of and guidance in the uses of the planning process.  

1. SCIENTIFIC PLANNING

1.1 Uses

It soon became apparent that if scientific planning was to replace ad hoc professional decision-making based on pressures, experience, and rough estimates of needs, statistical indicators which were uniformly reliable would have to be developed. Initially, special emphasis was given to those indicators which related to economic justifications in terms of benefits to be derived in measurable terms so that priorities could be set and guidance in the allocation of resources would be provided. The inter-relationship of planning and evaluation procedures was acknowledged as basic to the generation of statistics useful in the administration and co-ordination of health services, for identifying effective management, for short- and long-term planning of services, for measuring accomplishment in terms of effectiveness and efficiency, for research purposes, and, not least in importance, for fulfilling the requirements for background information of administrative, legislative and other public bodies responsible for the overall allocation of resources for a multitude of activities.
1.2 Steps in the planning process

The WHO Expert Committee on Health Statistics which met in Geneva 1 to 7 December 1970 listed at least five steps generally recognized as constituting the planning process. The first step is "Situational analysis or the description, definition and statement of the problem, its characteristics and dimensions in relation to population and time; information based on statistical and other data is an essential ingredient of such an analysis". Many of you have participated in taking this first step. Certainly, during the past decade, Brigadier Fuller, WHO Dental Consultant for the Western Pacific Regional Office, has promoted the taking of this step to a highly successful degree. The second step is: "The formulation of alternative tactical approaches to the handling and solution of the problem. The emphasis here is on the formulation of alternative solutions or plans and the working out of their implications in terms of costs, potential effectiveness and the decision-making process." Third: "Decision analysis or the selection of a plan, based on discussions of the alternatives and the balancing of political, cultural, social, and economic considerations against estimates of the biological, psychological, and social consequences". Fourth: "Discussion and implementation of the plan selected. These two functions are combined under the same heading since the procedures and actions to be carried out depend on their success on the acceptance of the plan by both providers and consumers of services". Fifth: "Evaluation of the results achieved by the services in relation to the problems, situations, or populations concerned. Evaluation is essentially concerned with measurement of the results achieved or benefits obtained in relation to the effort expended."

2. SITUATIONAL DATA

2.1 Manner of collection

It is important to recognize that the manner in which you performed the collection of situational data or took the first step in planning, the degree to which you involved both the decision makers and those in a position to influence them in the analysis and understanding of the problem is likely to have important direct and indirect impacts on the success of all succeeding steps. This is why it is considered axiomatic that visiting teams of experts should advise and guide but not be responsible for national health planning.
2.2 Training for surveys

In collecting data to describe the characteristics of dental diseases and conditions, you have done a remarkable job of employing the principles and specific criteria set forth in WHO Technical Report Series No. 242. Your success reflects the wisdom of organizing and conducting the dental survey training project which was held in Singapore in 1964. The training in dental survey techniques, the calibration of dental examiners, and the discussions provided the framework for understanding the criteria for quantitative measurement of dental diseases and conditions in population groups. This understanding permitted you to plan your own examination forms and still retain the criteria for comparability, to analyze your own data and to interpret it. It can be anticipated that as you proceed to the uses of the data for programme planning that ideas and discussion of modifications, supplementations and simplifications of survey procedures will arise and contribute to further understanding.

2.3 Modification of survey form

Several items on dental survey forms might be worthy of discussion. First, does the query "Oral Pain Present" produce meaningful information? Might it not be more useful to get the examiner's subjective assessment of whether immediate or emergency attention is indicated? Second, is the order of the items designed to facilitate maximum use of observations in arriving at diagnostic classifications such as a subjective classification of oral hygiene status after rather than before recording debris, calculus and periodontal scores? Third, because of an increasing need to evaluate service programmes, is it desirable to record both caries and fillings in a tooth rather than give priority to caries? Fourth, can recording be done in a fashion which will facilitate summarization and hand tabulation as well as the use of modern data-processing equipment? Fifth, when should simplified indexes be used? Sixth, what types of tables are considered basic to intelligent interpretation of the data collected? Seventh, but not least important, what problems arise in connection with efforts to classify dento-facial anomalies in accordance with the criteria that they must be severe enough to require treatment?

2.4 Sampling problems

Certainly none of us needs persuasion to enlist the help and guidance of qualified statisticians in designing our examination forms, in providing for summation and analysis of the data, and even more important, developing and selecting practical and meaningful sampling procedures. Although random sampling of population groups is most likely to provide information with minimum biases, it is generally recognized that the collection of information on a purely random basis is very costly. Because
of the cost, minimum numbers are given a very high priority. Since the characteristics of the hazards to dental health and of dental conditions are fairly well established for population groups this intelligence enables us to combine structured and random sampling of our populations. For example, schoolchildren, generally, are fairly representative and congregated. They are readily accessible so that it is simple and easy for an examiner to examine 100 schoolchildren per day. Furthermore, the known characteristics of dental caries enables us to select a few age groups and collect data for adequate estimates of incidence. The samples may be structured also so that the impact of occupation, income and education and of rural versus urban residence may be assessed. On the other hand, getting a representative sample of the adult population, is so complex and time consuming that invariably compromises are necessary which bias the results in varying degrees. Certainly your experience in sampling adults is worthy of a least brief exploration and consideration at this workshop.

2.5 **Teamwork in planning**

Broadly stated, the purpose of health planning is to meet the needs and demands of the people. Since needs and demands may have different meanings to different people, it is important to engage the minds of a variety of people in health planning, not only health professionals but political and social leaders, representatives of consumers of health services, and, of course, the agencies responsible for funding and implementing the plan. This type of teamwork in health planning is especially important in nations where the needs are greatest and are most likely to continue to be unmet or unfilled or even to worsen. This is so because the demand for health services tends to vary directly with their availability and accessibility and with income and education, and the greater the need the more difficult it becomes to secure effective teamwork. Other constraints on effective planning include an everpresent human characteristic - the tendency of people, including many health professionals, to oppose change. Yes, planning with people instead of for people in democratic societies is, indeed, a difficult and complex job.

3. **THE ROLE OF PREVENTION**

3.1 **Water fluoridation**

The second step "the formulation of alternative tactical approaches to the handling and solution of the problem" will receive most of our attention at this workshop. It can be anticipated that there will be little variation in viewpoints and even consensus that preventive services must be given first priority. There may be exceptional instances where political, social or cultural constraints make it
untimely to promote certain preventive measures or to recommend certain types of treatment personnel. There will be differences of opinion as to the personnel required to promote the application of preventive procedures as well as the types of personnel required to provide the various kinds of treatment services which are designed primarily to halt the progression of dental disease. I assume it is safe to predict that none will disagree with Brigadier Fuller's urging that fluoridation of the drinking water supply be instituted as rapidly as possible so that its established effectiveness in reducing the incidence of dental caries in permanent teeth by 65 per cent. and in deciduous teeth by 50 per cent. can be put to use as rapidly as possible. Where articulated or piped water supply is not available, other vehicles for providing an optimum intake of fluoride should be explored. Today, the most promising substitute is salt.

3.2 Topical fluorides

A wide variety of methods of securing the benefits of topically applied fluorides have been developed and tested. Although the effectiveness of the so-called Knutson techniques has been confirmed, it is definitely not practical for use on a public health scale because it is too time-consuming in relation to the caries inhibiting benefits. In my opinion, the only tested method worthy of your consideration for routine use in a public health programme is the Swedish method - brushing the teeth with a fluoride solution at three-month intervals. It is practical in application, effects up to 30 per cent. reduction in dental caries incidence and also provides an excellent means for guidance and periodic reinforcement of instruction in brushing the teeth.

4. PREVENTION AND CONTROL OF PERIODONTAL DISEASE

4.1 Oral hygiene

A major hazard to dental health of people in the Western Pacific, is periodontal disease. The only method available, both for preventing and controlling periodontal disease, is the oral hygiene method. It consists of brushing the teeth at least once a day to remove the soft debris which collects around the gingival cuff area of the teeth so as to prevent or reduce bacterial plaque formation in these areas. Thus, periodontal disease is a filth disease which can be prevented to a large extent by instituting a programme of oral cleanliness - a simple, practical programme which, additionally, could reinforce ever-continuing efforts to interrupt the cycle between the two ends of the alimentary canal.
4.2 Uses and abuses of the toothbrush

Although an oral hygiene programme is simple and relatively inexpensive of application, its effectiveness has been greatly reduced by confusing instructions in the use of the toothbrush. Additionally, there is a general tendency to reduce the worth of such a programme in the Western Pacific Region by supplying or making available for purchase toothbrushes which are much too large for effective use in highly susceptible areas of the mouth such as the facial surfaces of the upper molars and especially the lingual surfaces of the lower molars.

5. INCREMENTAL CARE

5.1 Widening the concept

Although I was among those who, through analysis of the characteristics of dental disease as manifested in population groups, initially advocated the incremental care concept and recommended that available dental care services be directed exclusively to children, I now doubt that this approach is either practical or acceptable. I am not suggesting that the concept be discarded, but that modifications not so rigidly related to age might be in order. Since the application of preventive and maintenance dental health services requires incentives for the patients to co-operate in their application as well as incentives for the dentist to render them, it is doubtful that age can be justified as the sole determining factor. Furthermore, demands for dental health services for whole populations appear to be increasing rather rapidly.

6. DENTAL MANPOWER

6.1 Diversity of the problem

The most critical task of this workshop is to propose, examine and assess alternative methods of filling the needs for dental health service manpower for a wide variety of situations. It is, of course, much more critical for Viet-Nam, Khmer Republic, and Laos with ratios of dentists to population of 1 to 102 000, 1 to 243 000 and 1 to 385 000, respectively, than it is for New Zealand, the Philippines, Australia, and Japan with ratios of 1 to 2400, 1 to 2400, 1 to 2600 and 1 to 2800, respectively. In general, these wide differences in ratios of dentists to population are matched by equally wide differences in levels of economics and education and by differences in social and cultural values.
6.2 Planning the evolution of dentists

Since health and its maintenance are now widely regarded as a human right, deficiencies in health manpower and in the systems for delivering health services appear to be world-wide including the more affluent nations with the better ratios of health manpower. This is especially true with respect to dental health manpower where pressures and plans for expanding and extending the uses of auxiliary personnel have become common concerns. The task of reducing or eliminating deficiencies in dental health manpower, however, is not simply one of training a variety of operating and non-operating auxiliaries but one of planning for the evolution of all categories of dental health service personnel, including dentists. Examination and comparison of alternatives in the planning process should include such long-term objectives. For example, one or more of the alternatives might propose that the training be in stages and that the first stage be limited to the training of personnel to promote and perform preventive dental services and to provide emergency dental care for the relief of pain and infection. The proposal would include specific provisions for a series of training stages or for increments of learning on a staged basis so that the trainee could elect to become a fully qualified dentist. The timetable for this evolutionary process would, of course, be influenced both by economics and other factors which shape the evolution of demand. We must recognize that in economically depressed nations, it is not only the high cost of training dentists in the traditional sense which serves as a deterrent but also the cost of providing them with modern equipment if they are to utilize the full spectrum of their skills.

7. SUMMARY

Yes, planning for health is a complex process. It is a continuing process. It is not a single or a series of reports containing recommendations, proposals, objectives, targets and timetables. As a viable process, it must include specific commitments by government for financing, and a meaningful, rather than a theoretical timetable for its implementation. It has operating commitments which may involve several ministries other than health, such as those responsible for education, construction, and water works. It has specific objectives and targets which may be subject to modification from time to time but hopefully, the modifications will be forever upward and onward. It has built-in requirements for evaluation statistics so that our efficiency and effectiveness in attaining objectives and reaching targets can be assessed, our responsibility as accountable agents for the expenditure of public funds can be fulfilled, and our progress in making dental health services available to an ever-increasing proportion of the people can be measured.
Since emphasis has been placed on the planning process, only a few examples of the substantive content of dental health service programme have been considered. Preventive measures have been given first priority but each measure must be subjected to comparative analysis in terms of effectiveness, acceptability, manpower requirements and cost of application. In like fashion, the treatment or dental care components of the programme must be examined critically so that priorities, limits and exceptions are clearly defined. Only brief reference has been made to the most challenging task in the planning and programming of dental health services; namely, planning for the evolution of all categories of manpower required to apply the preventive and treatment components of the dental programme in accordance with resources available for their training, equipping, employment and continuing education.
REFERENCES

10. World Health Organization Public Health Paper, 1971, No. 44
Dental health services should logically be based on a national survey of dental problems and demands for dental services. In fact, however, in most countries they have been developed pragmatically. Only now do we have national surveys, at least for selected ages, which can be the starting point for rational planning of services and manpower. In this paper, an attempt is made to formulate some of the principles involved in organizing dental services based upon these available data. It is hoped that these principles will be discussed, illustrated, clarified, modified and refined as necessary, so that the workshop can utilize them in suggesting broad plans with a number of alternatives, which should be applicable to all or some of the participating countries. It is hoped that after the workshop, these principles and broad plans will be used, selectively, as the basis for more detailed planning of the development of dental services in each participating country.

Clearly, there is considerable variation between countries in respect of dental epidemiology and dental services (those existing and those required); and the dental health profile also may vary widely in different parts of one country. Factors influencing the situation, often as much as or more than the actual dental epidemiological profile, include: population density, growth and distribution, socio-cultural factors (both the general community structure and attitudes to dental health, etc.), economic status, education levels and the overall pattern of health services and manpower, including systems of training.

Hence, in using national epidemiological data, our planning exercises should not be completely dominated by those data nor err in having delusions of accuracy (certainly not two decimal place accuracy), but should use the data at each successive step as the ever present guide, the connecting thread and the yardstick in developing broadly applicable plans.

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2. EPIDEMIOLOGICAL PROFILE

The available data refer mostly to schoolchildren. At the time of writing, the following are the main anticipated features of significance for our planning exercises:

a) Dental caries intensity: moderate to high in most urban areas, low to moderate in most rural areas.

b) Periodontal disease intensity: high in most adult populations, with indications for the future already clear in school populations.

c) Prevalence of malocclusion and need for prosthetic services: low to moderate in most populations.

d) Other unusual findings (not yet reported).

A fairly high degree of precision in setting high, moderate and low limits is available only for dental caries, for example, DMF* data at 12 years may be classified as:

- Low: \( \leq 3 \) DMFT
- Moderate: 3-6 DMFT
- High: \( > 6 \) DMFT

As the serious consequences of caries and malocclusion commence during primary-school age, and the danger signals of severe periodontal disease in adulthood are already manifest in the large proportion of primary school leavers with severe gingivitis, the needs appear to centre in the first instance on preventive and curative dental care for schoolchildren, since it is during school life that the foundation of good or bad oral health is generally laid.

While the top priority period of school-life for application of such services is clearly primary school, the desirability of earlier application at preschool age and of reinforcing oral health benefits in secondary school should be recognized.

3. SCHOOL DENTAL SERVICES

Historically, school dental services have usually been the first and often the major component of public dental services directed towards a specific target group within the total population. Sometimes they are a separate division of a health department and sometimes they are administered by school health services. In the latter case they may be

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*D = decayed; M = missing; F = filled (teeth)
provided by the Ministry of Education or Health. There may be strong central control, or a high degree of delegation to peripheral health services.

The basic services to be provided when feasible include:

a) incremental dental care, i.e. periodic treatment (period basically dependent on oral disease data) at least for permanent teeth as they erupt; (anything more than emergency care for deciduous teeth should be considered as an addition to the basic service;)

b) dental health education with emphasis on toothbrushing drill;

c) self application of topical fluorides, with application by dental personnel as an alternative (school water fluoridation where feasible and relevant may also be an alternative.

3.1 Incremental care

From survey data it should be feasible to calculate approximate numbers of permanent teeth requiring filling or extraction annually, as well as the individual need for examination and prophylaxis. As a yardstick, it has been proposed that the time required for various procedures is:

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>filling (new, repeat or extension in permanent teeth)</td>
<td>45 minutes</td>
</tr>
<tr>
<td>extraction</td>
<td>30 &quot;</td>
</tr>
<tr>
<td>prophylaxis</td>
<td>30 &quot;</td>
</tr>
<tr>
<td>examination</td>
<td>30 &quot;</td>
</tr>
<tr>
<td>(including records and administration)</td>
<td>15 &quot;</td>
</tr>
</tbody>
</table>

Using these estimates and data for primary schoolchildren, it was found in Saigon that a dental auxiliary could look after 300 first-year pupils and 1200 pupils in the second and later years of the incremental care programme.

Thus the total work force required to meet all the incremental care needs in a country for specific school populations can easily be calculated. In a similar way, a desirable ratio of dental personnel (both auxiliaries and supervising dentists) can be established for each service, based both on division of labour between the two types of personnel and the supervisory duties of the dentist.
Annex 7 (Cont'd.)

Usually, the dental work force available or budget to support it, falls far short of what is required. Decisions are then required as to which sectors of the population will be attended to and which left unattended. Besides their priority need, as schoolchildren are a captive group and dental personnel can be assured of maximum chairside time for these subjects, they are usually given first priority in national dental services. Such services are usually given free, in school dental clinics. Sometimes, however, the services are offered by nearby health centres. In most countries at the present time, coverage is quite poor.

It is in consideration of the existing and foreseeable achievements in coverage and of budgetary deficiencies that several fundamental sets of alternatives need to be considered:

a) Given that the primary school is the place to start, what should be the policy of extension of emergency and incremental care down to preschool and up to secondary school?

b) Given that budgetary and manpower limitations are too stringent for incremental care of both dentitions, is complete care of the permanent dentition really basic or are there still further possibilities of simplification, such as incremental care of first permanent molars only, when limitations border upon the impossible? What should be the minimum policy on prophylaxis and what should be the range?

c) Given that operating and non-operating auxiliaries are desirable in any public dental health programme and that dentists have an essential role in supervising and handling referrals, what should be the various levels of division of function between professional and auxiliary categories?

d) Given that at least six-month and one-year recall periods have been used with success in school populations with high to moderate caries prevalence, and that the average size of the group under incremental care by one operating auxiliary in various services having these recall periods has had a range of 500 to 2000, what other possibilities are there? For example is a two-year recall period and 4000 children per auxiliary feasible for a population with extremely low caries prevalence?
3.2 Dental health education and oral prophylaxis

To develop adequate oral hygiene practices and to help prevent oral diseases, dental health education and toothbrushing drill are encouraged to a varying extent in different countries; Singapore being an outstanding example. This topic is covered in detail in document WPR/DH/23. At this point, it is pertinent to note that the bulk of dental health education work can be undertaken by non-dental personnel, such as school teachers, school nurses, etc., if they are properly briefed for it. Involvement of these personnel is of the utmost importance to minimize loss of operating-time by dental personnel.

Evaluation of the effectiveness of dental health education in bringing about changes in behaviour beneficial to oral health should be an integral part of health education endeavours.

3.3 Use of fluorides

Methods requiring direct application by dental personnel are considered too expensive in terms of time expenditure for trained manpower in most participating countries, so that self-application methods are preferred even if the benefits derived are reduced. The most feasible self-application methods seem to be by (a) fluoride-containing dentifrices, (b) fluoride mouthwashes. (Discussed in Symposium on Fluoridation Procedures.) School water fluoridation requires a moderate capital expenditure and careful control must be maintained. Like topical application by dental personnel, its feasibility is in doubt for many situations and of course, all considerations of school use of fluorides are dependent on the status of fluoridation of public water supplies (see Section 5).

4. GENERAL DENTAL SERVICES

These include:

a) emergency public dental services, e.g., in health centres and hospitals;

b) routine public dental services for adults and preschool children;

c) special public and/or private dental services, e.g., dental care in industry;

d) private services.
The public services are usually provided free, or subject to some sort of means test. The extent of such services varies greatly between countries. Finance is usually a problem, and sometimes the scarcity of trained personnel.

These public dental services may be given in separate centres or in general health centres and sometimes they are associated with school services in terms of physical facilities. Referral between the dental and other branches of health services is usually very weak. In health centres, traditionally, it is most often pregnant women who are attended to, and sometimes pre-school children. Sometimes, these public dental services are not fully utilized.

It is important to note that the desirable time for the toothbrushing habit to be established is at pre-school age. Health education for the parents through health centres is, therefore, vital, and is often neglected. General health personnel often need more briefing for this role.

Partial payment for services provided by the public sector is required or may be desirable in some countries, to ease financial problems. Payments could be selective, e.g., amalgam fillings may be free but prostheses might require full or partial payment.

These services are in general offered mainly to those who cannot afford private practitioner services. Various systems of health insurance coverage might also be feasible and are under study in some countries to cover both public and private services.

Sometimes there are provisions for special groups provided by the public or private sectors or in combination, e.g., in certain institutions including pre-schools, industrial and governmental institutions.

The feasibility and extent of such services have to be determined in the light of various administrative factors including the adequacy of other services described above, the availability of funds and personnel, and the socio-economic priority which can be afforded for these groups in the country.

Private practitioners in some countries extend voluntary assistance to school or general dental services.
Annex 7 (Cont'd.)

Just as for school dental services, these considerations of what exists and what might be feasible, together with calculations* of manpower and financing needs, lead us to ponder upon further fundamental sets of alternatives:

a) Given that some dental health services beside school services should be provided free or at reduced costs, what is the basis of selection of services which are free, those which are reduced in cost, and those for which the recipient pays in full?

b) Given that free emergency public dental services should be provided what should those services be and what health and/or dental health manpower should provide them?

c) Given that routine, special and private dental services should be provided in some complementary combination, how should these services be divided, what should be the basis of eligibility and how should the various services be financed?

5. WATER FLUORIDATION

A very relevant exercise is to calculate the amount of manpower which could theoretically be saved in regard to treatment of dental caries by the implementation of water fluoridation, e.g. in the main city of a country. The theoretical cost-benefit of the procedure could thus be assessed, compared with the financial burden of rendering full incremental dental services in schools. (Additional benefit may also be obtained in the reduction of incidence of caries, and therefore of dental expenses, in some preschool and adult populations.) An example is given in Annex 1.

*If data is available at least for young adults, a rough estimate could be calculated on a similar basis as for schoolchildren, for dental care in industry, of the number of factory workers who could be cared for incrementally by one dental operator. If such a service were to be family-based, the calculation would be made allowing for various oral disease rates and for existing school services. Financing could then be estimated mainly on the basis of number of operators plus their equipment and clinic needs and if there were to be other than government financing, e.g. employer/employee contributions, the estimates could be appropriately subdivided.
6. DENTAL MANPOWER AND BUDGET

The extent to which dental manpower can be provided depends on the available budget and on the training facilities if existing manpower is inadequate. It is important to determine which of these factors is the limiting one. The training of personnel, e.g. the skills imparted to different categories and the types of team required, should be determined by the system in which they work and the duties they will be required to perform, as discussed in subsequent papers.

The overall budget available will be a small fraction of the total health budget (and sometimes of the education budget). It is imperative to maximize the impact of available dental personnel on the dental health problems, by achieving:

a) full utilization of existing personnel;

b) full co-operation from other health personnel;

c) collaboration of extra-governmental personnel.

Regrettably, in many countries none of these conditions is satisfied.

7. FORWARD PLANNING OF DENTAL SERVICES

The foregoing analysis is a somewhat structural approach. It attempts to provide a framework within which a dynamic approach should be adopted. The number of schoolchildren is rapidly growing and their caries incidence and prevalence is likely to increase rapidly. At the same time, social demands for dental care are increasing. Plans for dental services and manpower should therefore look forward at least a decade or two. After estimating the manpower requirements now and in ten years time, the stage is set for drawing conclusions on the training requirements. Finally, the overall budget required will have to be computed and then assessed by the appropriate ministry(ies). In accordance with the ministry's priorities and total budget, a plan may have to be curtailed and implemented only partially. The areas of concentration of effort, and the areas in which implementation will have to be curtailed, should be decided by the dental authorities in consultation with the general health authorities.
8. ROLE OF GENERAL HEALTH SERVICES

Oral health problems are so widespread in the community at large and in schoolchildren that specialized dental personnel cannot possibly cope with them all. Particularly in the field of dental health education, much more could be done at present, in most countries, by general health personnel. For instance, in the context of curative or preventive care extended to adults and children, doctors and nurses should often pay more attention to the teeth. Chronic oral sepsis is frequently seen, especially in remote areas, and can be a significant contributor to poor general health, with attendant risks of local spread and general dissemination of infection. Doctors and nurses may also, with minimal extra training, provide certain emergency dental care, in the absence of a dental specialist. On the other hand, doctors and nurses could often, with advantage, refer many problems of oral pathology (besides dental ones) to dental officers where available.

As mentioned previously, toothbrushing habits should actually commence by pre-school age under the supervision of parents. Therefore, dental health education for mothers both during pregnancy (for their own sake) and during the early years of childhood, should be a regular feature of maternal and child care. Pre-schools and day-care centres also provide excellent opportunities to guide young children and their mothers in oral hygiene practices. School nurses could often undertake dental health education as well as oral examinations, as part of their regular duties.

For all these reasons, the elements of oral hygiene and dental health should be included in both basic and in-service courses for all general health personnel, so that they can supplement the work of specialist dental personnel. But they need good briefing for this role. WHO Headquarters and Regional Office for the Western Pacific have, with this in mind, prepared a small pamphlet.*

Conversely, it is desirable for dental personnel to co-operate closely with general health personnel. There should be frequent two-way referral of patients. As far as possible, dental personnel should provide

services fully integrated within the basic health services at all levels from the infrastructure to the national level. Tendencies to develop independent specialized services are often regrettable.

In another specific area, close co-operation between dental and other health professions is needed, viz. in the provision of education and training facilities. Sometimes these need to be separate, but often there are advantages in proximity. For instance, duplication of laboratory facilities could sometimes be partly (not wholly) avoided by sharing some facilities with medical faculties. Clinical material in oral pathology, for teaching purposes, may be more readily available at general hospital clinics, than at specialized dental clinics. Some types of oral surgical conditions may be better handled by dental surgeons than by general surgeons. Finally, and more important than these, is the point that proximity during the years of basic training will help the dental and other health professions to have a clearer awareness of each other's role and will help to promote interchange of views and experience which should lead to more effective mutual appreciation and co-operation within the whole health team.

These remarks are intended to foster the concept that the dental personnel form a specialized arm of the whole health services. The arm needs the whole body to support it and the whole body needs the arm to do its specialized work. Full integration is the goal.
Few countries in the Region are able to meet even the first-priority dental needs, such as incremental dental care for schoolchildren. Because of the grave shortages of dental manpower and funds to support them, it is widely recognized that maximum use must be made of auxiliary dental personnel. In this paper, it is suggested that a suitable target may be five operating dental auxiliaries, plus appropriate numbers of non-operating auxiliaries, per dentist.

1. THE ROLE OF DENTAL AUXILIARIES

The World Health Organization Expert Committee Report on Auxiliary Dental Personnel (1959) defined dental auxiliaries as all persons who are subject to the supervision and direction of trained professional personnel (i.e., a dentist).

The functions and responsibilities of the auxiliary dental personnel vary widely in the countries which use them. The two main categories are:

1. Dental auxiliaries who are permitted to work in the mouth and to give some portion of dental care, and are termed "operating dental auxiliaries".
2. Those who have no such contact with patients (non-operating dental auxiliaries).

In North America and in Latin America the duties of auxiliaries such as the chairside assistant are being expanded to include limited intra-oral work. The functions of dental hygienists are being expanded in the United States of America and Japan to make them more productive than they have been hitherto.

The definitions of dentists and the two categories of dental auxiliaries are clearly stated by the WHO Inter-regional Seminar on the Training and Utilization of Dental Personnel in Developing Countries*, held in New Delhi in 1968 (see Annex 1a).

*Will be referred to in this paper as the 'New Delhi WHO/TUDP Seminar'.
2. TRAINING REQUIREMENTS

2.1 Formal courses

In the interests of public health it is generally understood that dental auxiliaries must be thoroughly competent in their limited fields. Dunning (1967) of Harvard University restates that because of a number of difficult subjects which the operating dental auxiliaries do not have to learn, this allows them more time, more than might at first be imagined, for good training in operative dentistry. The writer supports this opinion in the light of his experience in the training of dental auxiliaries.

Curriculum designers are agreed that the objectives of each of the subjects taught in the course should be stated explicitly when designing the curriculum. Subsequent curriculum changes depending on the needs of the country at any given time are most acceptable. The periods of training should, however, be as short as possible, otherwise, the whole concept of auxiliary personnel utilization defeats itself.

2.2 Educational standard

The New Delhi WHO/TUDP Seminar recommended that those who wished to become operating auxiliaries should be recruited with an educational standard not more than two years short of full secondary school. The writer feels that it would be preferable, however, to relate educational levels to those required for comparable professions such as hospital nursing, physiotherapy and the like, in the country concerned.

2.3 Length of training

Salaries of the various categories of workers in the public health departments are usually related to the lengths of training.

The length of training for the formal course for the school dental nurse is two years. This also applies to the Australian dental therapist (category 2 operating auxiliary). In Malaysia, there is an additional third phase of training which is not formalized, but is a probationary period of sixteen months in a field situation under the direct supervision and in the same premises as the dental officer. Duration of the course for dental hygienists varies in Japan and the United States of America, but is generally from one to two years. In the United States of America, the hygienist can go on to do a four-year university degree course. In Britain, the minimum period for the hygienist course is of nine months' duration. The minimum period of formal training for a chairside assistant is six months though two states in Australia run three-year courses for their dental chairside assistants. On-the-site training is given to chairside assistants in most countries in the South Pacific. The
training of dental technicians in Malaysia is a two-year formal programme with an additional sixteen months of field experience. This training is confined to the requirements of the public health movement of the country.

3. FACILITIES

3.1 Location

Should the training of dental auxiliaries be undertaken in a university dental school environment or in a government instrumentality, or even as a private enterprise, depends on the training facilities available, the advice of programme planners and the attitudes of the organized dental profession in the country. The New Delhi WHO/TUDP Seminar stressed the value of co-ordinated teaching for teamwork in the field, and recommended that training be undertaken under the same roof as professionals. Certainly if dental auxiliaries are to work as a team with the dentist, then the training should also reflect this spirit and mood. In established university dental schools, auxiliaries in Categories 2 and 3 are usually trained for the schools' own use. The training of dental hygienist would appear to be acceptable in the periodontology departments of many dental schools. University dental schools which have not been responsible for the initiation of a particular dental auxiliary training programme may not accept integration with professional education because of the traditional reluctance of these institutions to accept diploma or certificate level training within the institution. Training facilities, however, may be provided as an in-service feature of the public health department, or in a dental hospital. Indeed the training of school dental nurses, dental technicians and chairside assistants in Singapore, Malaysia, Australia and New Guinea (to name a few countries) grew in the environment of a governmental instrumentality.

3.2 Regional and international training

Though regional training (i.e., for a group of countries) has its merits especially in the education of professionals, the writer feels that there are greater advantages that each developing country should initiate its own training programmes for operating dental auxiliaries. However, the establishment of 'continuing' training centres and international centres to train teachers of auxiliaries, was recommended by the New Delhi (WHO/TUDP) Seminar and is strongly supported by the writer.

3.3 Equipment

The type of equipment (heavy and light) which is best utilized for dental auxiliaries will depend on the country's planners. A seminar of the World Health Organization and South Pacific Commission (WHO/SPC) held in Noumea in February 1971 re-emphasized that the effectiveness of the dental personnel in dental health was dependent on the equipment with which they were supplied. The South Pacific Commission undertook to produce a specification of the minimum equipment required by dental personal. This should be of immense interest and value.
Annex 7 (Cont'd.)

The Adelaide Dental Therapist's School (a recent entrant in this field) uses equipment for sit-down dentistry. The special features are the use of a reclining dental chair, air-driven and micro-motor handpieces, in addition to high volume evacuators built into a cubicle design operatory. The thinking here (Keneare 1969) is that if auxiliaries are to do restorative work of the same standard as the dentist, then she should not be denied similar type of equipment. In sit-down dentistry the question of chairside assistants for the operating auxiliary becomes important.

Where the situation calls for integrated courses (professional and auxiliary) the operating auxiliary may have to be ambivalent and be able to use equipment selected for training professionals. Hollis (1970) recommended the equipment used in the Sydney Dental Hospital's new cubicle design for the staff clinic. The items were supplied by an Australian company which assembled name-brand items specified by the dental hospital into a unit. The items were recommended for training of professionals at the Port Moresby Dental College but could be utilized equally by operative dental auxiliaries when required (see Annex 2a).

The training schools and the school clinics in New Zealand are equipped with conventional dental units with electric-motor driven handpieces and a portable wooden chair for use of their school dental nurses. The Dental Division of New Zealand is presently experimenting with the use of the newer conventional dental chairs.

The training school in Malaysia (Penang) uses a "Special-Student-Dental-Trolley-Unit" (designed by the writer and built locally) with a simple cable-arm type of electric dental motor. The unit also has a built-in cabinet for hand instruments and patients' charts. Each student is also provided with an operator's stool made locally. A conventional child's dental chair is used. One hundred such operatories have been in use for over six years for the training of school dental nurses (see Annex 3a). These units are maintained by the student dental technicians as part of their course.

Each trainee dental nurse is issued with a "Clinical Kit" for restorative work on children (see Annex 4).

The Osaka Dental College Hygienist Training School has developed a set of Instruments contained in a box measuring 8" x 7" x 2" and is called the "Instrument Kit for Hygienists" (see Annex 5).

4. THE CURRICULA

4.1 One category of operating auxiliary

When developing countries have one type of operating dental auxiliary already functioning (e.g., school dental nurse) it would be unwise to introduce another type with dissimilar intra-oral functions and length
of training (such as the dental hygienist). Problems between auxiliaries (e.g., which type and category should receive a higher remuneration; whose duties are more arduous; economic problems of running two types; career aggressions, etc.). Expanding the functions of one auxiliary with tasks performed by the other would appear more realistic. This has been shown (if not explicitly at least implicitly) in a number of recently implemented situations: Adelaide dental therapist, Osaka dental hygienist, Papua New Guinea dental assistant/nurse, the Canadian Royal Dental Corps auxiliary and the Alabama experiment to name a few. Their functions will depend on where they are needed most for periodontal or restorative care or both.

4.2 Curriculum flexibility

There is a considerable difference in the educational courses necessary for a dentist as compared with the extent of theoretical instruction desirable for the different types of auxiliaries. It would be incorrect to merely transpose one segment of a dentist's undergraduate curriculum on to that of the operating dental auxiliary. A curriculum must be aimed at, and designed for the duties which a particular auxiliary is required to perform. If it falls short of objectives it must be changed. Hence, curriculum flexibility should be such as to allow for changes in the distribution of responsibilities to the dental auxiliary. Assessments during and after a training course in relation to the services required of the dental auxiliary, are necessary for curriculum adjustments. The goal of curriculum design for auxiliary training is to increase the productivity of dentists and thereby contribute to raising the dental health levels of the society. The curriculum thus serves the society. The curriculum must also reflect the predictions of health planners for future changes in the dental health demands of the community. In sum, curriculum planners must be guided by health planners who would look at the needs of a country, anticipate future needs, identify the kind of personnel required to meet such needs, and assign tasks to be performed by each category of dental personnel. In doing so, it is imperative that we are cognizant of the attitudes and welfare of the auxiliaries themselves.

4.3 Patient-centred and interdisciplinary

It appears customary in the training of operating dental auxiliaries to spend the first year of a two-year course, on the purely theoretical aspects of training leaving only one year for acquiring clinical skills and experience. This is probably a relic from the training of dentists. From the experience of the Malaysian Auxiliary Training School at Penang, it is felt that students should commence their clinical phase of training after four months of pre-clinical instruction. Ideally, the curriculum should be designed to envelope the roles and scope of the school dental nurse, the dental hygienist, and the chairside assistant. In effect, this would mean the welding of the dental nurse
Annex 7 (Cont'd.)

and the dental hygienist in an integrated and interdisciplinary curriculum by assigning to each other the tasks which are traditionally delegated to one or the other. The curriculum should also allow selected chairside assistants to progress through the transitional stage to complete phase II of the course. This would enable countries using one type of operating dental auxiliary to expand the duties of this type rather than create another worker.\textsuperscript{31,32}

4.4 A curriculum design

The two-year formal curriculum for the operating auxiliary would advisedly consist of two phases:

I. Pre-clinical phase - 4 months;

II. Clinical (Transitional exercises - 2 months) phase (Clinical practice - 18 months) 20 months.

A field-work phase of 16 months is recommended after a two-year formal course so that deficiencies apparent in the formal course can be corrected and the clinical experience of the auxiliary strengthened by preceptorship experiences in the actual environment they will be working in.

The three phases of training for the operating dental auxiliary in Category 2, and the non-operating (clinical) auxiliary in Category 3, are presented in a schematic model in Annex 6a.

4.5 The teacher and the team leader

In implementing any new curriculum design the following would appear deserving of consideration:

-- the teacher must have sufficient knowledge of the aims of the curriculum plan, conviction in the system of training, and be cognizant of the educational gaps between the dentist and the auxiliary; and, importantly, the educational gaps between the categories of auxiliaries.

-- to ensure that the dentist uses his auxiliaries productively, the method of auxiliary utilization must be included either in his undergraduate curriculum or in a continuing education programme.

4.6 Learner-orientated

Apart from being patient-centred, the curriculum should be learner-orientated. This means that the curriculum for dental auxiliaries should be implemented with due regard to the capacities of the learner and not merely what the teacher wants to, or likes to teach. The teacher, a dentist, must understand the need to transfer his knowledge and skills,
which he as a professional has learnt, to the student-auxiliary so that
she can perform the tasks delegated to her skillfully and proficiently.
The teacher does not merely transpose on to the student the training
methods by which he was educated but develops special methods of teaching
the trainee.

4.7 The non-operating auxiliary (technical)

A two-year curriculum of formalized full-time courses is recommended.
This is the consensus in many countries. The writer would suggest a
further 16 months of field-work as a member of the dental health team.
The suggestion is that in some developing countries the technician's
functions should be expanded to include other non-clinical duties, such as:
(a) maintenance of equipment, (b) storekeeping, and (c) x-ray
processing when required. Indeed both types of auxiliaries in Category 3
(clinical and technical) should learn the elements of the additional tasks
stated here. One of the biggest weaknesses in developing countries is
the problem of maintenance of equipment, resulting in loss of productivity.
It is logical to delegate these functions to the non-operating auxiliaries
than to any other. Fourfold, non-clinical functions are in force for
the Malaysian technician and have been recommended by the writer in the
Papua New Guinea situation. A dental-care service can well be
paralyzed by the neglect of equipment used in the various clinics.

A layout for a dental laboratory is shown in Annex 7a for the non-
operating member of the dental health team.24

5. SUPERVISION

5.1 During training

For a given number say 24 students, 3 specially-trained dentists
and 10 selected operating auxiliaries could perform the functions of
supervising the trainee-operators in Category 2 in the various stages
of proficiency. For an amalgam restoration in a tooth, supervision is
in three stages, in addition to inspection of the finished filling.
Treatment planning and completion stages also require supervisory
inspections. The dentist-instructors would not only supervise the
treatment planning and "completion" stages in the patient, but would
necessarily treat all the referrals from the treatment-group of
trainees. One of the three dentists would function as the director of
the school. A co-ordinator of teaching programmes would be essential
in an integrated auxiliary curriculum to ensure continuity of courses.

In Annex 8a is presented a table showing the ratio of teaching
staff to students in eight established institution for the training of
operating auxiliaries.
5.2 After training

The operative principle in the use of dental auxiliaries is that they are supervised by the dentist and that they work on the prescription of a dentist. The dentist achieves this by taking full responsibility for such tasks as he thinks his auxiliaries can perform to his (team leader's) satisfaction.

Supervision of auxiliaries then assumes two forms: "direct" and "indirect". The meaning of "direct supervision" is functionally applicable only when the auxiliaries work in the same premises as the dentist (as with the dental hygienist in the United States of America); and "indirect supervision" is when the auxiliary is not in the same premises as the team leader (as with the New Zealand school dental nurse or as with the dental technician who is situated in a central laboratory). In New Zealand the dentist is required to make three supervisory visits to the school dental nurse annually.

How many auxiliaries one dentist can supervise would vary and be dependent on a number of conditions. However, it may be said that when the team leader works with his team members, he soon knows the worth of each worker. (Hence, the significance of the third phase; field-work). Repetitive procedures like scaling and polishing do not require the intensity of supervision-by-inspection which is required in training. Otherwise the act of supervision itself becomes a meaningless function and indeed self-defeating. One way of "indirect supervision" in use, is based on inspection of the mouths of patients who have had completed restorative treatment. This can be done by a system of recalls of 10 to 15 "initial completions" in one month. One dentist as head of the team with nine auxiliaries is a ratio suggested for "direct" and "indirect" supervision (see Annex 9a).

6. RELATIONSHIP WITH BASIC HEALTH SERVICES

6.1 Maternal and child welfare clinics

A most productive way in which an operating auxiliary can promote dental health practices is where medical nursing and public health personnel give care and guidance services for health. In health centres particularly, the dental auxiliary can be effective in a number of opportunity-situations. Her duties will be in the following areas:

-- dental-health counselling to expectant and nursing mothers, and their children;

-- dental-care delivery, i.e. performing such clinical tasks which have been delegated to her by the dentist as part of the prenatal and antenatal care programme. (This would mainly be scaling, polishing and simple restorative work.)
associating with her medical co-workers and stressing the need for dental care and for integrating dental health advice in their health education programmes.

Whenever there are proposals for the establishment of mother and child welfare clinics or health centres, adequate dental clinic space should be requested and established.

6.2 Government dental clinics

Where dental clinics are in operation for the treatment of the public, operating dental auxiliaries would work as members of the dental health team and in the same premises as the dental officer or/and the dental specialists such as the orthodontist and the maxillo-facial dentist. In sum, she would be used in areas of dental-care and prevention where the need is greatest.

6.3 Mobile dental clinics

In many countries in the Region, mobile dental clinics are utilized to take dental-care services to remote areas. Operating dental auxiliaries could provide this service as members of the team.

6.4 Serving a changing society

If public and professional acceptance of Category 2 operating auxiliary is to become a reality, a name must obviously be given. What name? Australia calls them "dental therapists" in keeping with the terminology used for medical auxiliaries, i.e., physiotherapist, speech therapist, occupational therapist, etc.18,27,37

Puller (1965) and Leslie (1970) predicted changes in the scope and duties of the school dental nurse in New Zealand itself.17,28 On another scene Durocher et alii (1970) are implementing new curricula in the United States of America with a view to graduating professionals who can serve a changing society more effectively.47,48,49

7. RELATIONSHIP WITH SCHOOL HEALTH SERVICE

7.1 School dental service

The general acceptance is that basic improvement in the status of dental health can be realized only if all children receive adequate dental care from the time their first teeth erupt.30 The New Zealand system of using school dental nurses to provide for incremental dental care for pre-school children and those attending primary and intermediate schools (ages 2 1/2 to 13 years), has been time-tested and found successful.7,21,28
The operating dental auxiliary would engage in restorative, conservative and preventive aspects of dental treatment: in school dental clinics located on the same premises as the schools, in government dental clinics, in clinics attached to health centres, and in dental departments of the public hospitals. The operating dental auxiliary would work on the principle of maintaining a treatment-group dentally fit by periodic and regular inspections and treatment. The success of the New Zealand system is largely due to the fact that private dental practitioners are employed by the Government on a fee-for-service basis under the social security (dental benefits) scheme to treat referrals from school dental nurses. However, in countries where government dental services have been established, such conditions which are beyond the scope of operating dental auxiliaries would have to be treated by the supervising dental officers and/or private dental practitioners of the patients' own choice. It would be ideal for the operating dental auxiliary to be a member of the school staff.

7.2 Dental health education

The special position of operating auxiliaries in the school environment would enable her to participate in the dental aspects of the formal course in health and hygiene, both in the classroom and outside it. With most contacts (teachers, parents and others) her duty would primarily be to stimulate action in matters pertaining to dental health.

7.2.1 The activities

What constitutes a dental health educational activity, and what proportion of the total time of an operating dental auxiliary should be devoted towards the educational approach to dental health, should be outlined. Any activity which motivates interest and action for dental health, is an educational one. This is best done on a face-to-face level. Toothbrush drills, records of home toothbrushing, and dental health weeks are some of the devices which operating dental auxiliaries usually use to teach dental health. The assistance of auxiliaries in school health evaluation and surveys has been found useful.* The act of surveying is in itself a dental health educational activity as it serves to arouse interest in dentistry. So also the topical application of fluoride solutions which is best performed by Category 2 operating auxiliaries. Whether or not the chairside assistants in Category 3 should have their duties expanded to assist in these preventive measures, is for the country to decide.

7.3 Non-governmental sectors

Government cannot possibly provide all the dental-care services which a country requires. It is not generally realized that the contributions of private practice in terms of dental-care delivery,

*In the Malaysian School Dental Health Survey, 1971 operating dental nurses were utilized to assist the dental officer.
actually relieve government of certain responsibilities and pressures. As such, it is axiomatic that if the productivity of a dentist is to be increased, this should also take place in his private office.

8. SUMMARY

1. A functional classification in relation to the scope and limitations of two categories of dental auxiliaries as identified by the Inter-regional Seminar of the World Health Organization held in New Delhi is restated as applicable to this Region.

2. The need is for formal courses for dental auxiliaries with the minimum length in the first instance. The location and facilities for training would depend on the country's preference for the type of training.

3. The stress is on curriculum flexibility in the various courses, integration of curricula for dental auxiliaries, and a patient-centred teaching environment. A curriculum design is presented. The advantages of having one type of operating dental auxiliary are briefly reviewed. Subsequent expansion of her duties according to the needs of the country at a given time is desirable. Curriculum planners must be prepared to be guided by health planners in this connection.

4. As members of the dental health team, the non-operating auxiliaries (dental technicians) should advisedly have three other duties added to their present tasks. This is so especially in developing countries where maintenance of equipment and stores is a major problem.

5. Supervision of dental auxiliaries is initially "direct" and subsequently "indirect". A ratio of 1 dentist to 9 dental auxiliaries - 5 operating auxiliaries, 2 chairside assistants, 1 technician and 1 receptionist-clerk - is suggested as minimum requirements for a dental-health team.

6. The relationship of the operating dental auxiliaries with basic health services is essential where health guidance services for the mother and child are given. The private sectors for dental-care delivery have also to be considered. With the school health services their main concern is giving incremental dental-care to the primary schoolchildren on a regularized basis. Their training would be geared to their utilization in areas where they are needed most. Two important aspects of her additional tasks are in the dissemination of information on self-care methods for dental health and the development of dental health interest in the various "publics", wherever opportunity-situations arise.
DEFINITIONS

1. Classification

The New Delhi WHO/TUDP Seminar identified three broad categories with general titles for dental personnel and recommended a range of duties and responsibilities for each category. This system of classification was to minimize confusion as the titles for the same type of worker varies from country to country and sometimes within the same country. It also eliminates the necessity for differentiating name-types within the one category.

Category 1 (professional) refers to a graduate of a university or dental college who is registered to practise dentistry independently (dentist, dental surgeon or dental officer, dental specialist, etc.).

Category 2 (operating auxiliary) includes the school dental nurse (NZ type) and the dental hygienist (USA type) and others who have duties and responsibilities associated with intra-oral care of patients.

Category 3 (non-operating auxiliary) envelopes: (a) the Clinical and (b) the Technical (Laboratory) types, viz. the dental chairside assistant and the dental technician.

We are concerned in this paper with Categories 2 and 3 as they refer to dental auxiliaries only. The role and scope of work of the various categories as defined and recommended by the New Delhi Inter-regional Seminar at New Delhi, are herein restated.41

2. Role, scope and limitations of the different categories

Category 2: Operating dental auxiliary

Definition: A person who, not being a professional, is permitted to carry out certain treatment procedures in the mouth under the direction and supervision of a professional.

Range: This cadre of personnel should be employed in maintaining a specific treatment group in sound dental health and free from dental defects by examining and treating them at regular intervals as need dictates; giving special attention to teaching the principles of oral hygiene and the prevention of dental diseases not only to individual patients, but also to school classes, teachers, women's organizations, parent/teacher associations and similar bodies.
Ability to recognize conditions requiring referral and readiness to take appropriate action are basic to the successful practice of such auxiliaries.

Duties may include a combination of any of the following:

1. The cleaning of teeth;
2. The removal of calculus;
3. Individual and group instruction in oral hygiene;
4. Topical application of medicaments;
5. Examining patients and charting the dental condition;
6. Preparation of cavities in deciduous and permanent teeth and filling with plastic materials;
7. Simple extraction of teeth under local anaesthesia;
8. Exposure of X-rays (intraoral);
9. Taking of impressions for study models.

Restrictions placed on this category are:

1. They are not registered or licensed as professionals;
2. Their work may often be limited to children but local circumstances may be such that adult groups might also be treated;
3. They should normally work within a public health service.

Category 3: Non-operating auxiliary

(a) Clinical

Definition: A person who assists the professional in his clinical work but does not carry out any independent procedures in the oral cavity.

Range: Duties of this cadre of personnel usually include all or some of the following:

1. Reception of the patient;
2. Preparation of the patient for any treatment he or she may need;
3. Preparation and provision of all necessary facilities;
4. Sterilization, care and preparation of instruments;
5. Preparation and mixing of restorative materials;
6. Responsibility, on completion of treatment, for care of the patient until the latter leaves;
7. Preparation of the surgery for the next patient;
8. Presentation of documents to the dental surgeon for his completion; filing of these documents;
9. Assistance with X-ray work, including processing and mounting of X-rays;
10. Instruction of the patient, where necessary, in the correct use of the toothbrush;
11. After care of persons who have had general anaesthetics.

However, this type of auxiliary may be permitted in suitable circumstances to carry out any of the following procedures within the mouth under direct supervision of a professional:

1. Application of rubber dam;
2. Application of matrices;
3. Placement of plastic filling materials in prepared cavities;
4. Trimming and polishing of fillings;
5. Polishing of teeth;
6. Exposure of X-rays in the mouth.

(b) Technical (Laboratory)

Definition: A person who assists the professional by carrying out certain technical laboratory procedures.

Range: The normal duties of this category of auxiliary who should work under the direction of a Category 1 professional, may include any or all of the following:

1. Casting of models from impressions of patients' mouths;
2. Construction of appliances for the mouth;
3. Treatment of metals and plastic materials used in construction of such appliances;
4. Construction of splints used in maxillofacial surgery;
5. Construction of orthodontic appliances;
6. Construction of special appliances such as obturators and special prostheses.
EQUIPMENT USED IN THE SYDNEY DENTAL HOSPITAL STAFF CLINIC
(professional-auxiliary interchangeability suggested)

William Green
40, Bridge Street
RYDALE

1. W.C. Challenger Unit
   (Coral No. 105)

2. Multi-position holder and
   automatic switching

3. Control for air bearing
   handpiece

4. Electro Torque A Control

5. Electro Torque LS. Motor

6. Straight Handpiece

7. Contra Angle Handpiece Complete

8. Supply transformer and syringes

9. Adaptor for Acu-Vision Light

10. Vacudent

11. 1 B.V.C. Exhauster
    (multiple surgeries)

12. C/P Cervical tray arm

13. Water heater

14. Unitize Electro Torque

15. Hanau Syringes

16. A.T.M. Controller

17. Adaptor for Siemens
    X-ray Machine

18. Vacudent fittings

(The manufacturer uses name brand parts but assembles them into a unit.
It is possible to specify any combination of available equipment.)

A.D. International

19. 1 "Yoshida" 2-column Dental Chair,
    colour dental standard Coral No. 105
    (F.I.D.E.)

Martin Halas Pty. Ltd.

20. 1 Unit Mounted (Siemens) Dental X-ray
    Machine 50 K.V.P., 7 m.a. with
    Electronic Timer

Dental Houses

21. 1 Acu-Vision Ritter Castle Operating
    Light Unit mounted

22. 1 Mobile Cabinet (built in Sydney Hospital)

23. 2 Operating stools

notes:

Colour - Standard Coral No. 105 (F.I.D.E.)

(Source: Hollis²²)
SPECIAL STUDENT DENTAL TROLLEY UNIT*
(Dental Nurses' Training School, Penang)

Key: 1. Built-in instrument and card cabinet
2. 3 tiered glass-topped trolley
3. Movable arm for electrical dental motor
4. Paging light
5. Servo laboratory motor (reduced rpm)
6. Operating light
7. Movable instrument tray
8. Tumbler stand, water-tap and saliva ejector
9. Stainless steel bowl (spittoon)
10. Control panel (electrical)
11. Water inlet
12. Water outlet
13. Rubber pads to avoid movement
14. Pedal control for electrical motor
15. Adjustable operator's stool (made locally to specifications)

*Built locally to the training requirements of operating dental auxiliaries, Penang.
<table>
<thead>
<tr>
<th>Item</th>
<th>Description of Equipment</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>1.</td>
<td>Amalgam Carrier, Fig. 5 'Hampel's' (Ash)</td>
<td>1</td>
</tr>
<tr>
<td>2.</td>
<td>Brush, brass wire (Ash)</td>
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<tr>
<td>3.</td>
<td>Dispenser, Mercury (SS.W.)</td>
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<tr>
<td>4.</td>
<td>Holder, Cotton-wool, Fig. 1 (Ash)</td>
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<tr>
<td>5.</td>
<td>Mandrel No. 22C, R.A. &amp; S.T.</td>
<td>2</td>
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<td>6.</td>
<td>Matrix Clamp, Sigvoiland</td>
<td>2</td>
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<tr>
<td>7.</td>
<td>Spatula, Fig. 3 (Ash)</td>
<td>1</td>
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<tr>
<td>8.</td>
<td>Syringe, Rubber Bulb with Nozzle (Ash)</td>
<td>2</td>
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<tr>
<td>9.</td>
<td>Screw Driver (converted)</td>
<td>1</td>
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<tr>
<td>10.</td>
<td>Scissors, small (Ash)</td>
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<tr>
<td>11.</td>
<td>Sterilizing Basket (local manufacture)</td>
<td>1</td>
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<tr>
<td>12.</td>
<td>Ticket Board (local manufacture)</td>
<td>1</td>
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<tr>
<td>13.</td>
<td>Excavators (Ash) Fig. 113/114, 125/126, 129/130, 155/156</td>
<td>4</td>
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<tr>
<td>14.</td>
<td>Handpiece, Contra Anglo, NAVO</td>
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<td>15.</td>
<td>Handpiece, Straight, NAVO</td>
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<td>16.</td>
<td>Mouth Mirrors, Handle 2 Top (Plane) Ash</td>
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<tr>
<td>17.</td>
<td>Probe, Fig. 9 (Ash)</td>
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<td>18.</td>
<td>Scaler, Fig. 43 (Ash)</td>
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<td>19.</td>
<td>Tweezers, College, Fig. 8 (Ash)</td>
<td>2</td>
</tr>
<tr>
<td>20.</td>
<td>Chisels, Fig. 82, and Fig. 85 (Ash)</td>
<td>2</td>
</tr>
<tr>
<td>21.</td>
<td>Hatchets Enamel, Fig. 51, 52, 53, 54 (Ash)</td>
<td>4</td>
</tr>
<tr>
<td>22.</td>
<td>Finisher, Fig. 21 'Wallis's' Cement Carrier (Ash)</td>
<td>1</td>
</tr>
<tr>
<td>23.</td>
<td>Plugger Amalgam No. 5, Fig. 11, Fig. 18, Fig. 154 (Ash)</td>
<td>4</td>
</tr>
<tr>
<td>24.</td>
<td>Carver, Amalgam 'H' (Ash)</td>
<td>1</td>
</tr>
<tr>
<td>25.</td>
<td>Plugger, Prophylactic (converted)</td>
<td>1</td>
</tr>
<tr>
<td>26.</td>
<td>Bottle, Medicament (Ash)</td>
<td>8</td>
</tr>
<tr>
<td>27.</td>
<td>Dappen Glass Cups 'Dixon' (A.D.T.D. Ltd.)</td>
<td>5</td>
</tr>
<tr>
<td>28.</td>
<td>Mortar &amp; Pestle, Amalgam (Ash) complete</td>
<td>1</td>
</tr>
<tr>
<td>29.</td>
<td>De Troy's Glass Hiking Slab Fig. 1 (A.D.T.D. Ltd.)</td>
<td>1</td>
</tr>
<tr>
<td>30.</td>
<td>Plastic Bur Boxes (Local Manufacture)</td>
<td>3</td>
</tr>
<tr>
<td>31.</td>
<td>S.S. Dressing Jar</td>
<td>1</td>
</tr>
<tr>
<td>32.</td>
<td>S.S. Drinking Mug (½ pt.)</td>
<td>1</td>
</tr>
<tr>
<td>33.</td>
<td>Gallipot S.S. 1 oz and 12 ozs.</td>
<td>2</td>
</tr>
<tr>
<td>34.</td>
<td>S.S. Trays, instrument, small (6&quot; X 8&quot;)</td>
<td>2</td>
</tr>
<tr>
<td>35.</td>
<td>S.S. Tray, Catheter (Deep and Long)</td>
<td>1</td>
</tr>
<tr>
<td>36.</td>
<td>S.S. Kidney Dish, small</td>
<td>2</td>
</tr>
</tbody>
</table>

**Heavy Equipment**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description of Equipment</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>37.</td>
<td>Electric Engine (build into unit or mobile)</td>
<td>1</td>
</tr>
<tr>
<td>38.</td>
<td>J.M. Dental Chair (children's)</td>
<td>1</td>
</tr>
<tr>
<td>39.</td>
<td>Special Dental Trolley Unit with Cabinet (local manufacture)</td>
<td>1</td>
</tr>
</tbody>
</table>

(Source: Sundram)
INSTRUMENT KIT FOR THE DENTAL HYGIENIST
(from the Osaka Dental Hygienist School, 1970)

Contents: Medicine Applicator Double End (T.G.)
Evan Wax Carver (T.G.)
Silver Abscess Probes
Porte-Polisher
Explorer Double End No. 5 (T.G.)
Dressing Plier B (S.T.)
Mouth Mirror Holder with Mirror
Broach Holder
Scaler No. 9 (T.G.)
Wood Points 3 pieces
Rubstone 4 pieces
Polishing Brush for HP. 6 pieces
Polishing Brush for CA. 6 pieces
Pyorrhea Scaler 15 pieces (T.G.)
Instrument's Sterilizing Case B type

(Source: Osaka Dental College)
A MODEL FOR AN INTEGRATED, PATIENT-CENTRED AND INTERDISCIPLINED CURRICULUM FOR DENTAL AUXILIARIES
(school dental nurse, dental hygienist and chairside assistant)

### Formal Course

<table>
<thead>
<tr>
<th>Preclinical Phase 4 months</th>
<th>Subject</th>
<th>Code</th>
<th>Period</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Basic Sciences</td>
<td>(a)</td>
<td>4 months (600 hrs.)</td>
<td>Lectures</td>
</tr>
<tr>
<td>Dental Sciences I</td>
<td>(b)</td>
<td></td>
<td></td>
<td>Demonstrations, Tutorials</td>
</tr>
<tr>
<td>Pre-clinical Exercises</td>
<td>(c)</td>
<td></td>
<td></td>
<td>Work on phantom heads, Chairside assisting</td>
</tr>
<tr>
<td>Other courses</td>
<td>(d)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Clinical Phase 20 months</th>
<th>Subject</th>
<th>Code</th>
<th>Period</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>Transitional exercises in patient-centered situations</td>
<td>(e)</td>
<td>2 months (300 hrs.)</td>
<td>Chairside assisting, Tutorials, Demonstrations, Simple oral prophylaxis and restorations</td>
</tr>
<tr>
<td></td>
<td>Tutorials</td>
<td>(h)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dental Sciences II</td>
<td>(f)</td>
<td>18 months (2,700 hrs.)</td>
<td>Lectures, Demonstrations, Tutorials</td>
</tr>
<tr>
<td></td>
<td>Clinical Practice</td>
<td>(g)</td>
<td></td>
<td>Dental-care delivery for children and adolescents performance</td>
</tr>
<tr>
<td></td>
<td>Other courses</td>
<td>(d)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tutorials</td>
<td>(h)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Field-work (probationary period) Phase</th>
<th>Subject</th>
<th>Code</th>
<th>Period</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>III</td>
<td>Presentation of &quot;completed&quot; cases</td>
<td>(i)</td>
<td>16 months</td>
<td>On location in a field situation</td>
</tr>
<tr>
<td>Field Work Phase 12-16 months. Direct supervision of a dentist and by preceptorship</td>
<td>Dental Health Education projects</td>
<td>(j)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Where applicable

(Source: Sundram)

Chairside Assistants
Operating Auxiliaries (dental nurse + dental hygienist type)

CODE - See footnotes (page 22).
Footnotes for the code in Fig. 1

I. Preclinical Phase

(a) Basic Sciences include elementary instruction in Anatomy, Physiology, Pathology, Microbiology General Nursing Pt. 1 (sterilization), etc.

(b) Dental Sciences Pt. 1 include instruction in principles of Dental Assisting, Dental Hygiene, Periodontics, Operative Technique, Dental Health Education, etc.

(c) Preclinical Exercises include students' exercises in restorative technique, scaling and polishing on phantom jaws, chairside assisting, preparation of filling materials, etc.

(d) Other Courses refer to special experience in child management, elements of psychology, human behaviour, etc.

II. Clinical Phase

(e) Transitional exercises include expanded chairside assisting, application of rubber dam and matrices, placement of plastic filling materials in prepared cavities, trimming and polishing of fillings, polishing of teeth, exposure of X-ray in the mouth, etc.

(f) Dental Sciences Pt. 2 include a continuation of courses in Dental Surgery and Pathology, Diagnosis and Treatment planning, etc.

(g) Clinical Practice includes direct patient services such as cavity preparation, lining and filling, extractions under local anaesthesia, scaling and polishing (prophylaxis) tropical application of fluoride solutions, instruction in oral hygiene at the chair, etc.

(h) Tutorials includes discussion of any general, clinical and pathological conditions demonstrated in the clinic; discussion of any matter not specifically stressed during lectures; dental health education devises, etc.

III. Field-Work Phase

(i) Presentation of "completed" cases and "revision completions", i.e., showing-up of completed mouths to the dental officer in-charge.

(ii) Dental Health Education projects include both in-school activity and other reaching-out projects, such as actual classroom instruction, health exhibitions, etc.
A SUGGESTED LAYOUT OF A DENTAL LABORATORY

Scale 1 inch : 3-3/4 feet

Key to figures:
1. Bench presses
2. Vacuum investing machine
3. Electric vibrator
4. Model trimmer
5. Sink
6. Polishing lathe
7. High speed grinder
8. Pre-heating oven
9. Centrifugal casting machine
10. Electric furnace
11. Induction casting machine
12. Sand-blower
13. Acrylic curing bath
14. Bench presses
15. Porcelain furnace
16. Spot-welder
17. Electric-polishing unit
18. Electro-plating unit
19. X'Ray developing tank
20. Suspension motors
21. Maintenance Bench - spare parts

(Source: Jayesuria)
## SOME TEACHING STAFF RATIOS FOR TRAINING THE SCHOOL DENTAL NURSE TYPE OF OPERATING DENTAL AUXILIARIES, NOVEMBER 1970

<table>
<thead>
<tr>
<th>Location</th>
<th>Student-Population per year</th>
<th>TEACHING STAFF</th>
<th>Year Commenced</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUSTRALIA:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adelaide</td>
<td>32</td>
<td>3 (1:11) #</td>
<td>1967</td>
</tr>
<tr>
<td>Hobart</td>
<td>28</td>
<td>3 (1:19) #</td>
<td>1966</td>
</tr>
<tr>
<td>MALAYSIA:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Penang</td>
<td>140</td>
<td>6* (1:32) #</td>
<td>1949</td>
</tr>
<tr>
<td>NEW ZEALAND:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auckland</td>
<td>150</td>
<td>7 (1:21) #</td>
<td>1951</td>
</tr>
<tr>
<td>Christchurch</td>
<td>120</td>
<td>7 (1:17) #</td>
<td>1956</td>
</tr>
<tr>
<td>Wellington</td>
<td>150</td>
<td>8 (1:19) #</td>
<td>1921</td>
</tr>
<tr>
<td>SINGAPORE:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Singapore</td>
<td>40</td>
<td>4 (1:10) #</td>
<td>1962</td>
</tr>
<tr>
<td>UNITED KINGDOM:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>London</td>
<td>100</td>
<td>6 (1:17) #</td>
<td>1960</td>
</tr>
</tbody>
</table>

(=Source: Sundram, by Questionnaire, November 1970.)

### Code under Teaching Staff

(a) = Dentist-instructor.
(b) = Operating Auxiliaries, such as: Staff Dental Nurses, Dental Sisters, Dental Sister Tutors, Dental Matron, Etc.
(c) = Medical and other technical teaching staff on a part-time basis.

*Also undertake teaching duties for trainee dental technicians and treatment of referrals.

### Notes

# The approximate dentist-student ratios given here are based on the student-population figures in one year. The number of graduates per year would be about half of the total number of students. Exact picture of teaching loads for a dentist-instructor cannot be easily conveyed.
PICTOGRAPH OF A DENTAL HEALTH TEAM REPRESENTING THE RELATIONSHIP OF THE DENTIST TO HIS SUPPORTIVE PERSONNEL ON A PRE-DETERMINED RATIO AND IN THE CONTEXT OF SUPERVISION.

(Dental Officer (base))

DENTAL NURSES, ratio 1:5 (ABCDE)

indirect supervision

DENTAL SUTURE ASSISTANTS
non-operating auxiliaries
ratio 1:2

DENTAL TECHNICIAN
ratio 1:1

(chairs induction for C, D, E only)

CLERK-RECEPTIONIST
ratio 1:1

DENTAL NURSES (school dental nurses)

direct supervision
(phase 3 trainees)
REFERENCES


10. Canadian Royal Commission on Health Services (1964): Queen's Printer, Ottawa, Canada.


Additional References

Annex 7 (Cont'd.)

Annex 10a (Cont'd.)


1. INTRODUCTION

Before dealing with the substance of this paper it is necessary to define the words used in the title. Undergraduate education refers to the courses of instruction leading to a first degree in dentistry, dental science or dental medicine.

The term graduate education as used in the United States and some other English-speaking countries is difficult to translate into other languages because it is a specific form of post-graduate education leading to a higher degree. While this is the usual interpretation it is not universally accepted. Different interpretations result from real differences between educational and health systems and in their historical development. Post-graduate education is a better term (and will be used in this paper) since it includes all forms of education offered to a dentist following his graduation from a university dental school. Dental education is, of course, a continuing process, beginning when a student first enters a dental school and ending when he retires from practice as a dentist. Thus undergraduate and post-graduate education are two closely related and complementary phases of the same process.

2. THE INTER-RELATIONSHIP OF EDUCATION AND PUBLIC HEALTH PLANNING

"Education of the Health Professions - regional aspects of a universal problem" was the topic of the Technical Discussions at the Twenty-third World Health Assembly. At this session, it was concluded that in a rapidly changing world, the traditional systems of educating health personnel are no longer adequate, however excellent they may have been in the past, and that "innovations are needed to meet the growing demand for health care everywhere and to reap the full benefit of advances in science and technology".
Annex 7 (Cont'd.)

This statement has several important implications to dentistry and dental education in the Western Pacific Region. The following are some of the points we should consider:

2.1 Not only do countries in the Region differ in their health needs and resources but even within a single country, it may be necessary to vary the pattern of health care from place to place.

2.2 Adaptation to regional needs entails a review of the whole educational programme for health workers.

2.3 As Professor Wahi has said: "Developing countries should refrain from adopting patterns that are foreign to their culture and should evolve principles in keeping with their needs. The type of education required and the types of personnel to be trained should be determined by national health policies." A similar view has been expressed by Professor Bruce-Chwatt in relation to malaria eradication: "The main lesson that we have learned is that ... neither the health situation nor other problems of developing countries can be solved by slavishly applying old formulae which worked in Europe or the United States. Permanent progress in the under-privileged part of the world has better chances of success by adapting rather than adopting the procedures of western science".

I submit that the same principle should apply in relation to planning a dental health programme.

2.4 In adapting the education of health personnel to national or local conditions, the first step is to obtain all the relevant data on the needs and resources of the population concerned. As Brigadier Fuller says in his working paper:

"The essence of the (Regional Dental Health Programme) was that data should first be obtained about the type, extent and severity of dental and oral diseases in relation to living conditions before any firm planning was done".

These data will be available at the workshop.

2.5 Health planning is only one aspect of more general planning for social and economic development. Since the provision of health personnel is a primary consideration, it is essential that there is close collaboration between national health planners and educational institutions. For this reason, I am pleased that an academic viewpoint is to be heard at the workshop.
2.6 The inclusion of public health and preventive dentistry in undergraduate curricula is a comparatively recent development which should be supported and encouraged. There is, however, a need to give greater emphasis to teamwork in the delivery of health care. Essentially, the dental health team consists of fully trained professionals and auxiliaries and the proportion of each will vary according to regional or local conditions. The team approach can succeed only if the members are considered to be performing different but complementary functions. Professionals need to be trained as leaders of the health team. If this training is not provided in undergraduate curricula, it should be provided through post-graduate courses.

3. THE OBJECTIVES OF UNDERGRADUATE DENTAL EDUCATION

The objectives of undergraduate dental education have been defined and described in many different ways but there is general agreement that an essential objective is to provide students with the knowledge, skills and attitudes that they require to become competent general practitioners of dentistry. Traditionally, in most western countries the emphasis has been on the education of a private practitioner. This is understandable (but not necessarily right) in a country like Australia where 82 per cent. of dentists are in private practice, but makes no sense for countries where all dentists are in government service and it does not make much sense for countries where a high proportion of dentists are in government service.

A detailed analysis of the structure of undergraduate courses is beyond the scope of this paper. However, in a workshop devoted to dental health services it is relevant to consider the status of social and preventive dentistry in the curriculum.

4. THE OBJECTIVES OF A COURSE IN SOCIAL AND PREVENTIVE DENTISTRY IN THE UNDERGRADUATE CURRICULUM

As a member of a health profession, a dentist has a responsibility to apply all his knowledge and skill to the establishment and maintenance of oral health in the patients under his care. The ethics of the profession require that he provide the highest quality of service of which he is capable within the limits imposed by each patient's physical and emotional status.

But dentists also have a collective responsibility to ensure that the public at large may enjoy the benefits of oral health. Thus the major objectives of a course in social and preventive dentistry in the undergraduate curriculum are:
4.1 To ensure that each student recognizes that he and his professional colleagues have both an individual and a collective responsibility for the promotion of the dental health of the community.

4.2 To give each student a detailed knowledge of current methods of preventing oral disease and of the application of these measures to individuals and groups.

4.3 To give each student a general knowledge of the principles of public health and the application of these principles to the planning, organization, administration and evaluation of public dental health programmes.

5. THE CONTENT OF A COURSE IN SOCIAL AND PREVENTIVE DENTISTRY

The detailed content of the course should, as far as possible, be related to the needs and resources of the communities in which the graduates will ultimately live and work. Likewise, the number of hours devoted to this general field should be related to the type of dental service which not only is provided now but also is planned for the future.

The following may be regarded as "CORE" topics to be presented in lectures and seminars:

(a) Elementary biometrics
(b) Epidemiology of dental caries, periodontal disease, oral cancer and other conditions of regional importance
(c) The prevention of dental caries, periodontal disease, developmental anomalies and oral cancer
(d) Fluoridation and other means of using fluoride for the prevention of dental caries
(e) Dental health education
(f) Definition of objectives and priorities in programme planning
(g) Principles in the organization, administration and evaluation of public dental health programmes
(h) The assessment of the status of oral health in a community
(i) Training of auxiliary personnel and their role in the dental health team
(j) Methods of financing dental care
(k) Public dental services in different countries

(l) International co-operation in dental health -
   the role of World Health Organization, Federation
   Dental International and Asian Pacific Dental
   Federation

(m) Ethics and dental jurisprudence

(n) Forensic dentistry

(o) The dentist - patient relationship

(p) Practice management

Students should be given an opportunity to observe the operation of
public dental services and private practices, and to participate in
discussions of major topics related to the dental care of individuals
and communities. Above all students must be given ample opportunity to
apply their knowledge of preventive dentistry.

Clinical sessions in preventive dentistry should extend over at
least two years of the course in order that students can evaluate the
efficacy of the preventive measures applied both by themselves and by
patients under their advice and instruction.

6. TENTATIVE OBJECTIVES FOR POST-GRADUATE DENTAL EDUCATION
   IN PUBLIC HEALTH IN THE WESTERN PACIFIC REGION

Since it is essential to adapt the education of health personnel to
national or local conditions, the objectives of post-graduate work cannot
be defined until the needs and resources of the Region are known.
Nevertheless, it would seem reasonable to suggest the following tentative
objectives:

(a) to keep personnel, actively involved in providing
   services, up-to-date on recent developments and
   future prospects in public health and preventive
   dentistry through a programme of short "refresher"
   courses;

(b) to provide career public health dentists in
   administrative positions with training in the
   planning, administration and evaluation of
   dental health programmes through courses of
   one-year's duration which lead to a post-graduate
   certificate or diploma;

(c) to provide senior professional personnel with
   intensive training in public health or a dental
   specialty through courses leading to a higher
   degree.
Legible text is here.
It would, I believe, be very advantageous if WHO would encourage national health administrations to arrange for the conclusions of this workshop to be discussed by a meeting of representatives of the health services, the dental services (both public and private), government and a consultant from the Regional Office.

8. THE ROLE OF THE DENTAL SCHOOLS IN REGIONAL POST-GRADUATE EDUCATION

There are several schools in the Region which provide courses leading to a diploma (e.g. DDPH at Otago and Sydney) and a master's degree (e.g. MDS at Sydney and Otago; M.D. Sc. at Queensland). It is hoped that other schools, especially in the Asian part of the Region, will do the same in the near future since these courses meet an important need.

There are, of course, numerous post-graduate courses leading to higher degrees, diplomas or certificates in dental schools in the United States, Canada, United Kingdom, South America and Scandinavia.

These courses provide excellent training in the general principles of public health planning, administration and practice, but, of necessity, they cannot be designed to meet the different specific needs of individual countries. There is, I believe, a need to develop a new approach not to supplant but to supplement existing post-graduate programmes. One possibility would involve taking the teachers to the students rather than taking the students to the teachers. Another possibility would be for university staff in different countries to co-operate in a joint endeavour.

The first type of programme would be simple to implement and would be most applicable in the case of short post-graduate courses designed to update the knowledge of public health personnel on recent developments in public health practice and preventive dentistry. In this case, the teachers might be drawn from universities, from private practitioners, from senior public health personnel, from waterworks engineers, from education authorities, from government or from international organizations, such as WHO, UNESCO, Federation Dental International or Asian Pacific Dental Federation. Since many universities have staffing and financial difficulties, courses should be arranged during university vacation periods. WHO might provide financial assistance and act in an advisory and co-ordinating capacity.

Examples of the second type of programme are to be found in Europe. Universities in Scandinavia and the United Kingdom have co-operated in the provision of post-graduate courses. At the Royal Dental College at Aarhus in Denmark, a three-month course sponsored by WHO was attended by fellows from Colombia, Viet-nam, Hungary, Turkey, Indonesia, Ghana,
Pakistan, Sudan, Egypt, India, Western Samoa, Peru, Bahrain and Malaysia. The general purpose of the course was to present dental epidemiology and preventive dentistry on a scientific basis and to demonstrate how dental epidemiology and preventive dentistry can be used in the organization of dental public health services. The course included field trips to public health institutions in Denmark, Sweden and England.

Expert staff from several dental schools, government instrumentalities in London and international agencies have combined to run a one-year course leading to a diploma of dental public health. This year's course is organized and administered by the London Hospital Medical College Dental School. It has attracted twenty-nine public health dentists from many different countries including several in South-East Asia and the Western Pacific. These two programmes could serve as models for similar developments in the Western Pacific Region. I feel sure that the university dental schools in the Region would be willing to participate in this sort of co-operative effort.

9. TEACHING THE TEACHERS TO TEACH

An important obstacle to effective and efficient teaching in both medical and dental schools is the fact that in appointing academic staff greater reliance is placed upon professional knowledge and skill than upon teaching ability. This deficiency is also apparent in other university disciplines. Efforts are now being made to correct this anomaly by providing in-service courses in teaching methodology. It is important that dental academics participate in such activities.

10. RECRUITMENT TO THE DENTAL PROFESSION

A shortage of dental manpower is a world-wide problem and is of particular concern in developing countries.

In countries which are experiencing rapid social and political change and an expanding economy there is keen competition for the limited pool of university graduates. The dental profession will only attract a fair proportion of recruits of high calibre from this pool if it can provide an important, challenging and rewarding career. It is clearly wasteful for graduates from a five-year university course to spend much of their professional life doing repetitive tasks that can be done equally well by auxiliaries specifically trained for that purpose.
As stated in Section 2-6 of this paper, there must be a greater emphasis on teamwork in the delivery of health care and the prevention of dental disease. At the head of the team is the university-trained professional. Although this approach will increase the status of the professional, it is only one factor in making a dental career more attractive to a potential university student. Conditions will vary from country to country and factors affecting recruitment should be considered at the workshop.

11. SUMMARY

The development and achievements of any public health programme depend upon the calibre of its personnel and this depends upon the quality of the education and training that they have received at both undergraduate and post-graduate level. The type of education and training which health personnel are given should be adapted to the needs and resources of the area in which they work.

Provision for post-graduate education and training should be an integral part of any public health programme. First priority should be given to providing short courses of a practical nature which are designed for professional personnel to bring them up-to-date on current policy and techniques of public health practice and preventive dentistry. Such "refresher" courses should be scheduled on a regular and continuing basis thereafter.

Long-term planning should include provision for more detailed courses leading to a degree or diploma for professional personnel intending to establish a career in the public service. Encouragement should be given to a regional programme of post-graduate education, co-ordinated and, hopefully, assisted financially by WHO. University dental schools, international agencies, national health administrations and governments in the Region should be invited to participate in a co-operative effort to ensure that maximal use is made of the pool of experts in public health and preventive dentistry in the Region.

Specific details of the content and structure of undergraduate and post-graduate courses must await the analysis of the results of the oral health surveys in the Region and the recommendations of the Workshop on Dental Health Services. There is, however, a need for social and preventive dentistry to be given increasing attention in the undergraduate curriculum.

The world-wide shortage of dentists necessitates a careful study of the factors which influence recruitment to the profession, and of the effect of teamwork on the delivery of dental care and the prevention of dental disease.
Annex 7 (Cont'd.)

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5. Royal Dental College (1971): World Health Organization Course in Child Dental Health, Aarhus, Denmark


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10. WHO Regional Office for Europe (1970): Post-graduate Dental Education. WHO Copenhagen
DENTAL HEALTH EDUCATION

by

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Senior Dental Officer (Training & Dental Health Education)
Dental Nurses' Training School and
Dental Health Education Unit
Dental Branch, Ministry of Health
Singapore

1. INTRODUCTION

1.1 Need for dental health education

Human beings, (unlike the lower animals which on maturation, do what comes naturally to meet the problems of growing up) are provided by nature with many potentials for the development of behaviour and habits, and which are realised depends on what the individual learns. This statement is certainly true in the field of dental health and there is now general agreement that there is a definite need for every individual in any community to learn and develop correct behaviour, habits and attitudes if he is to attain and maintain positive dental health. A WHO Expert Committee on Dental Health Education, which met in Geneva in 1969, is of the opinion that effective utilisation of the educational approach is central to any widespread improvement in oral and dental health.10

1.2 Traditional approaches

In most countries in the Western Pacific Region, some dental health education service is already being provided.8 In Singapore, for the past five decades between 1920 and 1970, children have been informally taught some dental health as part of hygiene or health science by teachers. Commercial firms with dental health interests have often stressed through their advertising materials the importance of dental health and how their products can contribute towards better dental health. Various professional associations, voluntary organisations and other interested agencies have also made valuable contributions to this aspect of education, mainly through the distribution of informative materials. But teaching health means much more than the mere transmission of information. In many countries where vast quantities of dental health information programmes have been conducted for decades in schools and other settings, these efforts have not succeeded in influencing behaviour to the extent expected. Even in those countries providing free and adequately staffed dental services, many people do not avail themselves of the services they need.10
1.3 Need for new approaches

If dental health education activities are to be effectively developed, the whole community must be considered. The programme should be based on epidemiological data and activities planned and co-ordinated to meet pre-determined objectives. Health education of which dental health forms an important aspect, should also involve a series of experiences in which the learner can act out as much as possible of the material which has been imparted to him. It is apparent therefore that more imaginative and aggressive programmes have to be developed.

For the discussion at this workshop, it will be assumed that the preliminaries have been done, i.e. data have been collected and decisions made. Only the following aspects will be considered in the planning of the dental health education service:

(a) Strategy and methods
(b) Role of different personnel
(c) Training of dental health educators
(d) Facilities and equipment.

2. STRATEGY AND METHODS

2.1 Setting up of a dental health education unit

One of the vital steps towards developing more effective dental health education programmes is the setting up of an administrative unit with responsibility for dental health education for the community within the dental health services provided by the government. This is because continued government support, inter-ministry co-operation and co-ordination with other health administrators are all very essential for the successful implementation of any ambitious programme involving the whole community. In the author's experience in Singapore, these are more readily available to such an organization than to any private agencies interested in promoting dental health.

2.1.1 The unit's responsibilities and functions

(a) Planning and directing dental health educational activities independently as well as through various agencies such as the School Dental Service, the Maternal and Child Welfare Service and particularly, the Ministry of Education.
Annex 7 (Cont'd.)

(b) Co-ordinating dental health activities by other agencies with those organised by the unit and co-operating with these agencies whenever possible.

(c) Training, advising and giving assistance to dental health educators.

(d) Producing dental health educational materials for general distribution and constructing and producing audio-visual aids for distribution or loan to dental health educators.

(e) Investigating, prior to implementing any new activity, specific problems and finding solutions for them, collecting data on local attitudes and interests that influence dental health behaviour and evaluating the programme from time to time.

2.1.2 Staffing

The unit should be staffed by dental officers and health educators with training in psychology, education and the use of audio-visual aids. Ancillary staff should include artists, photographers, technicians trained to work with a wide range of materials, and a team of dental auxiliaries, such as dental nurses or hygienists, to assist in giving dental health talks to groups of people and in the running of various types of dental health activities. The number of staff required in each category will vary with the needs of the country and the stage of development of the dental health education programme. In larger countries, a central unit with several sub-units in defined localities, to assist in implementing the programme and feeding back information, may be desirable.

2.1.3 Finance

Traditionally, emphasis has always been given to curative services. Since poor dental health is just as much an educational problem as a dental service problem, the question of finance in terms of what percentage of the total dental services budget should be allocated for dental health education service is an important item and should be discussed in this workshop and some conclusion drawn.

2.2 Programme planning

Dental health activities, which are all aimed at bringing about a desired change of behaviour towards dental health, can conveniently be classified in accordance with the main objective of the activity:
Annex 7 (Cont'd.)

(a) those that develop basic skills in and cultivate the habit of oral hygiene;
(b) those that are aimed at enabling the community to acquire more dental health knowledge;
(c) those that serve to motivate a desired change of behaviour towards or a reinforcement of the practice of good dental habits;
(d) those that enable educational diagnoses.

While a balanced programme should consist of a variety of activities that will together meet all the above objectives simultaneously, the bias in each programme should be tailored to suit the particular problems in a country to be solved by educational procedures.

In considering the content of the programme, adequate attention should be given to the degree of development of the country in regard to the extent of literacy, the socio-economic position of the country, the existence of services in terms of population per dentist ratios and the prevalence and respective incidence of dental diseases and anomalies. Periodic evaluation of the programme in terms of effectiveness in attaining objectives should be undertaken and modifications made whenever necessary.

2.3 Some suggested community activities and their methods

2.3.1 Toothbrushing drill

In many countries in the Western Pacific Region, a very large percentage of children either do not brush their teeth or brush them very haphazardly and infrequently, and many of the toothbrushes in use are unsuitable for children. This state of affairs is mainly due to the fact that oral hygiene is rarely properly taught to children nor are they adequately supervised in their homes.

Counsell has suggested that practical learning may be more effective than didactic instruction and that group participation offers particular advantages because it makes use of a natural inclination to engage in collective activity and can strengthen the motivation of the individual through agreement between peers.

As teachers are in daily contact with the children for long hours, the author feels that the teaching of toothbrushing technique on a large scale and the developing of the toothbrushing habit are best left in the hands of the teachers. Doing toothbrushing daily as an exercise will also ensure that all children will brush their teeth thoroughly at least once a day.
To launch this activity in Singapore, the following preparations were made:

(a) the seeking of approval for such an activity to be carried out in all schools;

(b) the training of representative teachers from all schools who are to take charge of the drill in their respective schools;

(c) the provision of adequate and suitable toothbrushes and mugs at prices within the means of every child;

(d) the production of charts and simple notes on the recommended toothbrushing technique and plaster models of jaws for distribution to all schools to assist teachers in teaching toothbrushing to children;

(e) the investigation into the availability of ablution facilities and water supplies in the schools and, thereafter, the issuing of instructions to all school principals on the methods and dates of implementation.

One serious problem encountered in this activity in Singapore was the lack of enthusiasm amongst certain principals and teachers. To counter this, staff of the Dental Health Education Unit make regular visits to schools to supervise and offer help to teachers with problems. A competition for teachers in presenting the best trained class of children in toothbrushing is organised annually to encourage teachers and principals of schools to make greater efforts to improve the general standard of toothbrushing.

In countries where fluoridation of the public water supplies have not been instituted, a programme of topical application of fluoride solutions through the use of the toothbrush as described by Berggren and Welander, can easily be carried out in conjunction with this activity.¹

2.3.2 Dental health instruction

(a) Children

Health knowledge must precede all other goals in order to reach good dental health habits and behaviour. Therefore, if children are to grow up with the correct behaviour towards preserving and maintaining their own dental health, formal dental health lessons are necessary in the school classroom.⁶ However, in the school programme, the curriculum should not include dental health lessons
of the lecture type alone but also activities and methods of teaching that will lead to the reinforcement and maintenance of dental health behaviour where this is satisfactory or a change to new behaviour that will promote and improve dental health.

Two types of curriculum are commonly in use. The first and the traditional one is the isolated subject curriculum in which health with dental health is taught as a subject. The other, which, the author feels is the better and is adopted in Singapore, is the broad-fields curriculum in which dental health is integrated into the teaching of other aspects of healthy living whenever opportunities occur in the class or school. Only the list of objectives to be achieved in each year and some suggested methods of approach are included in the school curriculum. Teachers are encouraged to include dental health topics in the teaching of other subjects as well. The choice of method and the situation in which dental health topics are included are left to the trained teacher who knows his pupils best. With this type of curriculum, however, teachers need to be regularly motivated by dentists and be fed with authentic professional information and teaching aids. In this area, the Dental Health Education Unit should play an important role.

Teaching dental health through the medium of songs to children is a method not widely used. The author believes there is a great potential in this method of approach. Our children in Singapore sing a locally composed dental health song containing the golden rules of dental health each day of the dental health week.

(b) Adults

While in the curative services, priority is nearly always given to children and often with the exclusion of services to adults by government agencies, in the field of dental health education, it is generally agreed that the adult population must not be neglected as children are still accepting their parents' judgment on many matters pertaining to dental health.
For the adult population, dental health instruction can be carried out by direct face-to-face education (by far the more effective) or by indirect education through mass communication media such as pamphlets, newspapers, radio and television and through regular exhibitions. The content of the mass media programme must be dictated by the needs of the community as revealed by surveys and the communication media to be used will depend on factors such as literacy rate, the extent of the radio and television networks, the availability of educational materials and the economics of operation.

Dunning is of the opinion that mass media can convey simple facts fairly well, but because of their impersonal nature, such media do not have much effect in changing basic attitudes and motives. On the other hand, Young and Striffler are of the opinion that mass communication methods may only be useful in setting a favourable climate for a recommended dental health activity. Where specific dental health action is desired, personal, face-to-face communication, even solicitation is recommended.

Use of a well-constructed exhibit with simple and interesting explanatory notes is quite an effective method in adult education. The author finds that some of the reluctance to visit the dentist can be reduced by educating the public to recognise, through the holding of regular dental health exhibitions, the various common dental conditions, to know something about the consequences of neglect and the effects on their health. The treatment that should be given by the dentist should be emphasised. In order that the use of prepared exhibits is fully exploited, a permanent museum to house selected exhibits and which school-children can visit as one of their dental health education activities in school is recommended. In larger countries, mobile museums can be constructed and these brought to all schools by turn.

2.3.3 Contests

(a) Dental Health Contests based on the contestants' oral health status, not only provide some motivation to all intending participants, but also serve well to stimulate greater interest in dental health amongst indirect participants and many others when the contests and particularly the basis of judging are widely publicised. In Singapore, the conditions of teeth and gums, the degree of malocclusion and the state of
oral hygiene are considered. The contests are conducted in three groups, one for primary schoolchildren, one for secondary schoolchildren and one for the teenagers between 17 and 21 years. In the contests for schoolchildren, principals and teachers are made to participate as judges in the elimination round within each school. For the teenage contest, all participants are required to look into their own mouths or seek the aid of dentists to obtain certain data about their own teeth required in their entry forms.

The incentives provided over these fifteen years of an individual's life and the encouragement from teachers to look after his own dental health through these contests should have a long lasting effect on his dental health behaviour in later years.

(b) Poster Competitions in which competitors have to submit posters with given captions are good activities in that they involve some mental participation by the competitors. Such competitions are easy to conduct through schools.

(c) Essay Competitions are good too, for intending participants need to do research and discover dental health facts for themselves. Here, as well as in the poster competition, topics based on local needs should be selected.

3. ROLE OF DIFFERENT PERSONNEL

3.1 Flexibility in the use of personnel

There is no valid reason why any of the existing dental health personnel should only play his or her traditional role. In any scheme, the fundamental principle to follow is the maximum utilisation of all available personnel so long as they are suitably trained to play the role expected of them. In planning, the administrator, who should be a dentist himself, should first consider the groups of the population that should be reached; secondly, the existing personnel through whom dental health education could be given, their qualifications and training, and then, finally, decide how best to deploy them either on a part-time or full-time basis in his plan. If there is a shortage of personnel, consideration should be given to the feasibility of training suitable multi-purpose personnel before deciding on their deployment. With due consideration to children, the author feels strongly that the classroom teacher, because of her unique position to influence children, should always be included.
3.2 The traditional and recommended role of different personnel

3.2.1 The dentist

The dentists have unique opportunities for dental health education available to them both in the private office and in the community setting. Yet, traditionally, due to economic or other reasons, few dentists have made use of these opportunities. In the office, the face-to-face communication with patients is the most effective method of dental health education and every practitioner has an obligation towards his patients to educate them to look after their dental health, to appreciate the dental services rendered to them and to correct unfavourable attitudes that exist through previous dental experiences, misinformation and superstitions.

In the community, the dentist should give first priority to reaching the non-dental professional people in the community, such as physicians, pharmacists, nurses, teachers, school administrators, social workers and hospital administrators. They should also help plan the education programme with school authorities, support the efforts of other members of the dental health team, and co-operate with teachers to make dental health education meaningful and interesting. In countries where there is a scarcity of dentists, their main function should be that of training other dental health educators.

3.2.2 The dental hygienist

When employed in private practice, the dental hygienist, with more opportunities, should play a similar role as the dentist in patient counselling. In the school service, she should do individual dental health teaching if she is required to do clinical work. She should also be the resource person, who feeds teachers with relevant literature and educational materials and act as co-ordinator of school dental health programme.

3.2.3 The dental hygiene teachers

These are dental hygienists with additional training in the field of education. They are used by the New York State Department of Education as full-time dental hygiene instructors in schools.

3.2.4 The dental nurses (New Zealand type)

Their role includes teaching the principles of oral hygiene and the prevention of dental disease not only to individual children, but also to school classes, teachers, women's organisations, parent-teacher associations and similar bodies. In Singapore, besides the above, dental nurses with special aptitude are also employed full-time in the Dental Health Education Unit to assist in the production of teaching aids and other educational materials, in the supervision of toothbrushing drills in schools and in the running of various competitions.
Annex 7 (Cont'd.)

3.2.5 Related health personnel

These would include physicians, nurses, home visitors and social workers who have direct contact with people either in their homes or in health facilities. All these personnel should be equipped and encouraged to play the important role of advising people on home dental care and of referring them for treatment whenever treatment is needed.

3.2.6 The classroom teacher

The classroom teacher is not normally considered a member of the dental health team, but in the field of dental health education, there is general agreement by authorities both in the fields of education and health that the classroom teacher must carry a major share of the task of dental health education. For young children, the classroom and the presence of a peer group form the ideal setting for acquiring dental health knowledge and developing good habits. Dunning gives two other strong reasons in support of this view. First, the preponderance of teachers over dental health personnel in the school system and the number of hours per year the teacher is in contact with the pupils. Second, the educational training of the classroom teacher and her constant practice in the understanding of the minds and motives of her pupils.

Among the many different aspects of dental health that can be taught, the classroom teacher should teach and cultivate the habit of toothbrushing in children, guide them in selecting foods for snacks and at meal times and encourage regular visits to the dentist.

4. TRAINING OF DENTAL HEALTH EDUCATORS

4.1 Deficiencies in the present dental school curricula

The present curricula of many dental schools which are poorly orientated towards preventive and public health dentistry, make it difficult to train dentists and related personnel to carry out their educational functions. The root cause of the ineffectiveness of many a dental health education programme may be due to the inadequate and inappropriate training the dental health educator has received, thereby resulting in his lack of understanding and appreciation of the complexity of the problems associated with dental health education.
4.2 Need for changes in curricula

New, imaginative undergraduate training programmes for dentists are sorely needed so that the preventive aspects of dentistry can receive proper emphasis. The curriculum of dental schools should provide opportunities for participation in a variety of dental health education activities, in school, hospital, clinic, and industrial settings. In addition, basic concepts of education and motivation must be taught to dental students.

4.3 Training of other dental health educators

Since dental nurses and hygienists are normally expected to devote part of their working time for dental health education, their undergraduate curricula do provide training in this aspect of work. However, it is important to provide trainees with experience in developing and applying a variety of educational procedures and materials. Special emphasis should be placed in individual face-to-face methods and on procedures applicable with small groups such as schoolchildren and women in prenatal clinics. Throughout their training, educational concepts and behavioural principles related to ways of motivating people to take effective dental health actions should be stressed.

In the training programme of the other health personnel, short dental health courses, appropriate to the specific roles they are to play should be included. Similar courses should also be organised for all public health nurses and social workers.

If the unique position of school teachers for dental health education is to be fully exploited, all school teachers should be provided with adequate knowledge in this field during their pre-service training. Singapore's Teachers Training College has embarked on a college curriculum which incorporates this as part of a much-needed health education curriculum. But this must be followed by the regular issue of specially prepared literature in the form of dental health bulletins to keep teachers informed.

For teachers in service, specific courses are arranged during vacations.

5. FACILITIES AND EQUIPMENT

5.1 For the training of dental health educators

While it may be possible or even desirable for the key personnel in the dental health education service to receive training and gain experience in countries more advanced in this specialised field of preventive dentistry,
it is always desirable to provide training facilities in each country for its own requirement of dental health educators because of the large number of trainees involved and the different socio-economic, cultural and educational backgrounds in other countries. On the question of training personnel, some consideration should be given to the forms of assistance WHO could be asked to provide.

In Singapore, dental nurses are trained in their own school by the staff of the Dental Health Education Unit and their training is supplemented by courses in poster and teaching aid production and in teaching methods conducted by the Teachers' Training College.

Short courses for paediatric nurses and public health nurses working in the school and maternal and child health clinics are conducted at the Dental Nurses' Training School. For the larger groups like the kindergarten and primary school teachers, arrangements are made with the Ministry of Education to use school premises that are centrally located.

The equipment needed for training in the use of audio-visual aids is what is available for use in the field.

5.2 **For the production and use of audio-visual aids and other educational materials**

People learn through their various senses and, therefore, audio-visual aids are very useful tools for teaching. Audio-visual aids introduce variety in the learning process and often increase the effectiveness of teaching.2

The aids that are useful in dental health education include motion pictures, film strips, slides, audio tapes, models, charts, exhibits and pamphlets. Again, because of differences in the cultural and educational backgrounds and differences in habits, beliefs, language and other factors, it is also desirable that each country produce its own requirements of audio-visual aids and educational materials.

The facilities and equipment required are:

(a) workshop/labatory with equipment to work with wood, plaster and plastic materials for the production of models and exhibits;

(b) art studio for poster and pamphlet production. If printing requirements are large, a simple printing machine will be an advantage;
Annex 7 (Cont'd.)

(c) sound and photographic studio/darkroom, equipped with tape-recorders, record players, cameras and darkroom equipment for the production of audio-tapes, loop films, film strips, slides and photographic illustrations. To use movie films, film strips and slides, 16 mm and 35 mm projectors are required.

Most of the audio and photographic equipments in use at the Dental Health Education Unit in Singapore have been generously donated by UNICEF.

6. SUMMARY

1. Dental health education is not new but changes to the traditional methods are necessary if the educational approach is to bring about a greater improvement in the dental health of the community.

2. The setting up of a dental health education unit within the dental service to direct, co-ordinate and support all efforts in dental health education has been advocated and some community activities and their methods have been described.

3. The individual role of dental health educators and their deployment in a planned dental health education programme have been suggested.

4. Facilities and equipment required for the training of dental health educators and for the production of educational materials have also been listed.
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It is becoming increasingly accepted by the waterworks profession that public water supplies should contain sufficient fluoride to control dental caries in all the people using them. This attitude, however, was by no means a common one during the late 1940's. At that time, excellent epidemiological evidence had accumulated that fluorides, occurring naturally in water, were beneficial and apparently harmless. However, the waterworks groups were properly advised to wait until more evidence of such benefits and safety had accumulated at those few places where fluorides were added in controlled amounts. More than 27 years of experience in water fluoridation has confirmed its benefits and, as a result, the practice in many countries is being recognized as a routine water treatment process.

This recognition, in turn, is reflected in the slow but steady adoption of the measure throughout the world. At present, there are over 3000 water systems serving over 5500 communities that supply fluoridated water to some 85 million persons in the United States of America. In Canada, another 7 million persons are using such water, while in other parts of the world, some 40 million persons in more than 30 countries are receiving this benefit. Considerable opposition to the measure remains, however, and the opponents have been successful on many occasions in preventing communities from adopting fluoridation. In order to eliminate the expense and effort involved in defending themselves in courts and in attempting to win fluoridation referenda, many governing bodies have passed laws requiring fluoridation of the water supplies within their jurisdictions. The states of Connecticut, Michigan, Delaware, Illinois, South Dakota and Ohio in the United States of America have done this along with Australia, Brazil, Chile and Ireland. Unfortunately, on the other hand, many countries have so far failed to start their first fluoride project. These include France, Italy, Spain and most of the countries in Africa and Asia.
Almost all natural waters contain some fluorides. Surface waters, comprising rivers, lakes, ponds, creeks and cisterns, generally do not contain more than about 0.3 mg/l fluoride except when contaminated with industrial wastes or sewage. Industrial wastes, particularly those from the steel, aluminum and fertilizer industries, cause the receiving streams to exhibit wide fluctuations in their fluoride content. This variation increases the difficulty in maintaining a constant fluoride level in any water obtained from such sources. Sewage from a community which is fluoridating its water supply contains the same fluoride concentration as the water. If such sewage is discharged into a receiving stream, its fluoride level will be raised.

Ground waters (from springs, wells or filtration galleries) are the sources of most of the water supplies of the world. They contain, in general, the higher fluoride levels. Fluorides occur in ground waters usually because of the presence of fluoride-bearing minerals, probably fluor spar, phosphate deposits or cryolite. These fluorides are acquired while the water passes through and dissolves fluoride-mineral deposits. Many ground water sources contain excessive fluoride (more than about 1.5 mg/l) and, if used for domestic water supplies, the excess fluoride should either be removed or diluted. However, many thousands of such sources are deficient in fluorides, and the amount required to meet optimum requirements can easily and economically be added. In most cases the natural fluorides in these sources vary but little, and for this reason the desired fluoride levels can be maintained with a minimum of equipment and supervision.

The optimum level is considered to be that fluoride concentration in water which produces the greatest dental decay reduction with the least noticeable fluorosis. In the United States of America, this has been found to vary with the temperature and a considerable effort has been made to determine this amount for each place. The calculation involves using the formula: mg/l fluoride = 22.2/E; where E is the estimated average daily water consumption of children through 10 years of age, and varies with the ambient temperature; i.e., E = 10.3 plus 0.725 x the average maximum temperature in degrees C. This formula, while applicable to conditions in the United States of America and in most of Europe, may not be accurate for very cold areas. Also, there are some indications that it may produce fluoride levels which are too high in some developing countries. Further investigations should be started in both such areas of uncertainty.

All of the fluoride compounds used in water fluoridation are derived from two minerals which are found in tremendous quantities throughout the world. These are fluor spar, which contains calcium fluoride, and apatite (from phosphate rock), which is a complex calcium compound of phosphates, carbonates, silicates, sulfates and fluorides. Fluorspar can be used in
two ways: the raw mineral, after being pulverized, can be dissolved in an alum solution and then fed as a liquid into water. Fluorspar is also the principal raw material used in the manufacture of all fluoride compounds (except the silicofluorides) now commercially available. It is the source of sodium fluoride which is widely used for fluoridating many small water supplies.

The cost of the fluoride ion derived from fluorspar is considerably cheaper in most countries than from any other source. It is particularly desirable in those areas where the cost of other imported compounds is quite high, or where the chemical industry has not as yet developed to a point where other fluoride compounds can be made. It is for this reason that the fluorspar-dissolving process has been adopted in more communities in Brazil than in all the rest of the world combined.

The other compounds now being used include fluosilicic acid, sodium silicofluoride and ammonium silicofluoride. These are all manufactured as by-products resulting from the purification of phosphate rock in the production of phosphate fertilizers. Such rock contains, as an impurity, up to 3.5 percent fluorides.

Fluosilicic acid is the first compound formed when recovering fluorides. Salts of silicofluorides are obtained by neutralizing the acid with various reagents, to produce, among many others, sodium silicofluoride and ammonium silicofluoride. This acid is probably the most convenient compound to use in water plants because it can be pumped. This facilitates storage, transfer, feeding and safety procedures. While its cost may in some areas be high, it is now being used by more people for fluoridation than any other compound except sodium silicofluoride. This is primarily because of its use in the largest cities, such as Baltimore, Chicago, New York and Washington. Sodium silicofluoride is at present the most popular chemical probably because it is the cheapest except for fluorspar. While its solubility is quite low, this drawback has been overcome with the use of improved designs in dissolving equipment and by means of uniformity in manufacture. Ammonium silicofluoride is used only in those places where the simultaneous use of ammonia is required for disinfection of the water.

The type of chemical feeder for a given water supply will depend on which of these compounds was selected and the maximum amount which will probably be used. The best feeders are those requiring the least maintenance and providing the best accuracy, which should be well within 10 percent. Accuracy and consistency of feeding are probably the most important engineering aspects of a fluoridation programme. Overfeeding is not only a waste of chemicals, but the prolonged use of water containing excess fluorides will produce mottled enamel of the permanent teeth (dental fluorosis). Underfeeding is also serious in that a difference, for example, of only 0.3 mg/l fluoride below the optimum level will, on the average, produce about one additional decayed tooth for each 13-year old child.
For this reason, planning for any fluoridation installation should include provisions for periodic testing for fluoride concentration. Equipment and personnel should be made available for determining these levels by two means; i.e., by daily fluoride analysis of water samples in the laboratory and by computing the fluoride dose on the basis of the quantity of fluoride compound used and the amount of water treated. Fluoride analysis has now become quite standardized which has resulted in the almost universal use of either a colorimetric method utilizing photometers and a reliable reagent such as SPADNS; or a device known as the specific ion electrode. This latter method, which provides unprecedented precision and accuracy, can also be used for determining many other ions in liquid solutions by selecting the appropriate electrodes. Determining fluoride concentrations by calculation requires that equipment be provided for periodically measuring the amount of fluoride compound used and a metre for indicating the quantity of water which had been treated. The results of this calculation and those obtained from the laboratory analyses on samples of the same water should correspond very closely. In addition to these controls, a surveillance of the fluoride levels should be maintained by a laboratory or agency other than the water authority. The local or regional health departments have generally chosen to undertake this needed function. Most of the variations from the optimum fluoride level in treated water appear to occur on the low side; i.e., the average fluoride values over a long period (yearly, for example) are often lower than the optimum. This is caused, in many instances, by factors that could have been administratively corrected. These include the absence of fluoride compounds because the next order had not been placed in time and lack of spare parts for equipment, the need for which had not been anticipated.

Equipment for promoting the safety of the waterworks operators should also be available and its routine use enforced. The greatest hazard to the operators originates in the dust formed from handling powdered compounds. Protection is obtained by carefully handling the shipping containers and by using personal protective devices, such as gloves and masks. The acid is relatively less dangerous because it can be used directly from the shipping containers. Rubber gloves and aprons should be provided when repairs to the acid equipment are necessary.

The relative high cost of fluoride compounds in the United States of America has resulted in an overall cost for water fluoridation of about 10 cents per person per year. The same compounds in other countries may cost only about a tenth as much. In addition, the cost in the United States of America is based on a per caput water consumption of about 600 litres per day and a fluoride level of 1.0 mg/l. In other parts of the world, these averages may be much less with a proportional lowering of fluoridation costs. Other countries, therefore, may experience an annual cost for as little as less than one cent per caput. Equipment costs, on the other hand, have generally been somewhat higher, particularly if they must be imported. For this reason, the simplest design for all types of equipment should be stressed. This usually results in a minimum utilization of instrumentation and automatic controls.
The toxic nature of fluoride compounds and the necessity for maintaining a constant fluoride level in the treated water, require a high degree of skill on the part of the water plant operators. Inasmuch as not all water supply systems can obtain such personnel, many public water supplies will probably remain untreated with fluorides for many years. This is particularly applicable to the smaller plants where funds are not available to retain competent operators. For this reason, it is feasible to fluoridate the water at the larger places first, particularly those with laboratory facilities. Many smaller places have been permitted to add fluorides because their past operating performance has been good. For instance, if their record shows that chlorination has been properly done, then with further training of the operators, it can be expected that fluoridation will be done equally well. Many countries have undertaken training programmes for their operators for this reason.

With the establishment of a relatively simple administrative organization, a modest training programme for operators, and a small investment of funds, a fluoridation programme can be started and maintained in any country. The return in benefits to everyone has been shown many times to outweigh by far the small expenditures involved.
TOPICAL AND OTHER FLUORIDE APPLICATIONS

by

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The objective of an ideal fluoride programme is to deposit fluoride in the enamel up to the level at which complete resistance to dental caries is achieved or, if such a degree of resistance is not possible, to the point where resistance to caries is at maximum. In public health programmes this objective may not always be attainable since the resources are usually limited. Programmes need to be designed to produce the greatest benefit to the largest number of people for the least cost.

Water fluoridation is the method of choice. Fluoridation eventually affects all, produces a large reduction in dental caries, and is cheap, in money terms and in the number of trained staff required. This paper discusses not water fluoridation but methods of fluoride application which can be used in addition to water fluoridation, or in places where it has not been implemented.

The following factors affecting the design of public health fluoride programmes will be considered:

1. Toxicology
2. Fluoride level in enamel
3. Fluoride uptake
4. Methods of fluoride application
5. Economic factors

1. TOXICITY

The lethal dose of sodium fluoride is 2 x 5 grams for an adult. This dose for children is not precisely known, but if 2 grams may be fatal in a 70 kilogram adult then by proportion 0.5 grams may be fatal in a 20 kilogram child. 0.5 grams of NaF is the amount in 500 tablets, or in

- 2.5 ml of a 20% solution
- 50 ml of a 1% solution
- 500 ml of a .1% solution.
Annex 7 (Cont'd)

Generally fluoride programmes utilize small amounts of fluoride per participant. Programmes involving supervision by non-dental personnel and self-application are being planned more frequently. The safety of storage of large quantities of fluoride either in solid form or in concentrated solutions, and the method of dispensing, need to be considered at the planning stage.

Some materials will produce irritation of the gingiva if not used correctly - zirconium silicate with 10% stannous fluoride as a prophylactic paste. Systemic effects have been reported following the use of stannous fluorozirconate in a zirconium silicate prophylaxis paste.8

There is no evidence to suggest that dental fluorosis will be increased in prevalence or severity by post-eruptive fluoride therapy. Dental fluorosis occurs when enamel is formed in the presence of too high a concentration of fluoride. After eruption enamel is able to absorb fluoride without fluorosis becoming manifest.

2. FLUORIDE LEVEL IN ENAMEL

Fluoride tends to be concentrated in the outer layers of enamel, and the concentration depends on the lifetime exposure to fluoride. Levels as high as 6000 p.p.m. have been found in Pacific Islands.2

High levels of fluoride are associated with low prevalence of dental caries, but the Pacific Islanders who have high levels of fluoride also have a non-cariogenic diet. So far an exact relationship between the level of fluoride in enamel and the prevalence of dental caries has not been established.

It would be advantageous if the fluoride level of enamel could be determined in vivo, for this would enable the determination of the present fluoride level, the level at which the maximum resistance occurs, and the effectiveness of fluoride programmes in raising the level. Here is a challenge to the researchers.

The only indication of fluoride level is fluorosis, but it is only a measure of pre-eruption exposure. People are today migrating in large numbers, migration often associated with changes in diet. Thus, the diet and water supply which caused the fluorosis may no longer be present. Further, the optimal level in water fluoridation produces almost no fluorosis.

In the Gilbert Islands fluorosis is found in association with a very low caries prevalence.3 There is no advantage in such circumstances in a fluoride programme.

The uptake of fluoride may not be even over the whole tooth surface. The fissures are the places least resistant to dental caries, and are probably the most difficult to apply fluoride to, especially if a prophylaxis is a necessary pre-requisite, since the plaque at the bottom of
a fissure cannot be removed. Fluoridation data shows that the greatest reduction in dental caries occurs on the smooth surfaces. What results can be expected from a fluoride programme in areas where dental caries is confined to occlusal surfaces?

3. **FLUORIDE UPTAKE**

The details of how fluoride is absorbed into enamel will not be considered. The important factor is when. It is generally agreed that fluoride is more readily absorbed before and shortly after eruption, and that there is a progressive diminution of the ability to absorb fluoride as the enamel ages.

Fluoride programmes have therefore most frequently been implemented for children. Most studies have been done over relatively short time periods - usually two years. The long-term effects need consideration. Is the maximum amount of fluoride absorbed from topical fluoride applications done shortly after eruption, or can more fluoride be absorbed by repeated application at regular intervals? Regular application seems to be the method preferred today.

Fluorides were considered not to affect adults (unless they were applied in childhood) on the grounds that the aged enamel would not absorb fluoride. The idea was supported by the method of determining the effects of fluoridation by measuring changes in the prevalence of dental caries in terms of DMF teeth. Had the incidence of dental caries been considered then a different interpretation of the effect on adults may have occurred. The introduction of water fluoridation was delayed in many places by the idea that there would be little benefit for people already born.

Topical fluoride therapy was also thought to be of no benefit to adults. More recently, however, another view has been taken and fluoride programmes have been initiated in captive adult groups and more private practices are being orientated towards prevention. A group of private practitioners in Sydney will shortly be publishing data to show the degree to which filling requirements per patient have declined since the preventive programme was introduced.

Baume and Vulliemoz in a project in French Polynesia and Western Samoa, have shown an average level of 4517 ppm in the outer layers of the enamel in adults, and 2220 ppm for adolescents, indicating that the fluoride level increases with age. The samples were small and further study is being undertaken to confirm the results.

4. **METHODS OF APPLICATION**

A. **Systemic fluorides - tablets**

To provide fluoride prior to eruption fluoride tablets are the only means available. Some programmes involving regims of one tablet per day for school children have been instituted but, since many children do not start school until six years of age, only some of the permanent teeth will be affected. Dental health education aimed at getting parents to administer
fluoride tablets has met with varying degrees of success. Fluoride tablets are the only method of fluoride therapy which cannot be used in addition to water fluoridation as the intake would be raised to the level where noticeable fluorosis will occur.

Suggestions have been made to fluoridate milk and salt but insufficient research has been done on these vehicles.

B. Topical fluorides

The methods of applying topical fluoride are numerous and include:

(a) Topical application of fluoride solutions.

Three are widely used - sodium fluoride, stannous fluoride and acidulated phosphate fluoride.

(b) Fluoride prophylaxis paste - dentist applied self applied

(c) Fluoride mouth rinsing

(d) Fluoride toothpastes.

Over the past 25 years there has been a bewildering number of trials and a lack of consistent results. It seems incredible that the same product used in the same way can be found to be satisfactory on one group of people and not on another. These differences in results warrant study.

A summary of topical fluoride methods was made in 1970 by Horowitz and Heifitz, who considered a method either as proven if sufficient consistent results had been obtained in research studies, or as unproven. The reader is left with a pessimistic view for all that is recommended is topical application of fluoride solutions, and with the feeling that it is time the researchers sorted the inconsistencies out. However, the summary is well worth reading.

5. ECONOMIC FACTORS

Preventive programmes should be subject to cost-benefit analyses. The costs need to be considered in terms of resources - money and time of educated personnel. Some of the factors which should be considered are:

(a) Prevalence of dental caries
(b) Expected reduction in dental caries incidence
(c) Time taken for the procedure
(d) Finance required
(e) Personnel involved
(a) and (b) Prevalence of dental caries and the expected reduction

A programme of fluoride therapy costs the same regardless of the incidence of dental caries, but the benefits depend upon the incidence. In terms of fillings not required, a reduction of 40% produces a greater benefit in a population with an annual requirement of five fillings per person than in a population needing an average of only one filling per person per year.

The studies of the effectiveness of fluoride have been conducted with populations having high incidences of dental caries. Whether the same procedure would produce a similar reduction in a population with a low incidence is not known.

(c) Time of application

If the dentist or operating auxiliary applies the fluoride, the procedure will only be of benefit if the average time per patient in the dental chair is reduced. Applying the fluoride will take time and this must be compensated for by less time spent doing fillings. Prevention at any price may be a sound goal for individuals. If in a public health programme the average time the dentist or operating auxiliary spends per patient is increased when the fluoride therapy is undertaken, then less people can participate in the programme and the dental health of the population will decline.

If, however, some other person undertakes the fluoride therapy then, provided that there is some reduction, more people can receive dental care.

(d) Finance required

In terms of total cost of the dental programme, if the dentist or the operating auxiliary undertakes the fluoride therapy there will be no increase in the total cost of the programme, even if there is no reduction in the incidence of dental caries. However, unless the reduction is sufficient to allow the time per person to be reduced then the cost per person will rise. Too often it is the total cost with which the budget personnel are concerned, not the cost per participant.

If other personnel undertake the fluoride application, then the cost of the total programme will rise, but provided there is sufficient reduction in dental caries, the cost per person will decline. The cost of the fluoride programme will be much lower if self-application methods are used.
Annex 7 (Cont'd.)

(e) Personnel involved

In most Asian countries, but perhaps not all, there are too few dentists and operating auxiliaries to provide dental health for all. In order to increase the number of people in the dental programme, the cost per patient may have to be increased through the employment of more auxiliaries, even though the reduction in dental caries and the services not needed as a result does not produce sufficient savings to cover the salaries of the extra personnel.

Personnel other than dental personnel may be involved, particularly nurses and school teachers. It should not be automatically assumed that these people have the time to devote to promoting dental health. They, too, belong to professions short of personnel.

ECONOMICS APPLIED TO THE METHODS OF APPLICATION

1. Fluoride Applied by Dental Personnel

(a) Topical applications of fluoride solutions by dentists and operating auxiliaries

The topical application of one of the three accepted solutions is the method best proven to date. The following analyses evaluate the benefits of the method for public health programmes.

Let the reduction in dental caries incidence = 30%

Let the average time per topical
(1 topical per annum, 4 minutes per side + 4 minutes) = 12 minutes

Let the average time per filling
Let the filling requirement per annum

The saving in time = \( \frac{30}{100} \times f \times 20 - 12 \)

For a saving to occur \( \frac{30}{100} \times f \times 20 - 12 > 0 \) \( (\geq) \) means "greater than"

Solving for \( f \) \( f > 2 \)
This means that unless the annual filling requirement is greater than an average of two fillings per person in permanent teeth, the programme has no benefit. Data on topically applied fluoride apply only to permanent teeth. In the Pacific, and in Asia, too, I am sure, there are many places where the filling need is less than two per person per year.

If six monthly applications are given, as is likely in areas of high caries prevalence, then

$$\frac{30}{100} \times f \times 20 - 24 > 0$$

Solving for $f$

$$f \geq 4$$

In this case, a saving will only occur if the average filling requirement is greater than four per person per annum.

The values given to the variables will differ in actual programmes. The formula is -

**Benefit will occur if -**

$$\left(\frac{\text{Percent reduction}}{100}\right) \times \text{mean no fillings per person per annum} \times \text{mean time per filling} - \text{time spent on topicals per person per annum}^2 > 0$$

These analyses indicate that topical applications done by dentists or operating auxiliaries have only a limited place in public health programmes.

(b) **Topical applications of fluoride solutions done by other dental personnel**

The analysis in this case is more difficult and, because a rise in cost per participant may be accepted in order to increase the number of people in the programme, an example will not be given here. In such cases the advice of an economist should be sought.

(c) **Fluoride prophylactic pastes**

If a prophylaxis is to be given it costs no more in time and only a little more in money to use a fluoride prophylactic paste. The effectiveness of the method has not been thoroughly studied but it seems that best results are obtained if it is used in conjunction with other topical methods.
Annex 7 (Cont'd.)

2. Programmes Demanding Minimal Involvement of Dental Personnel

Recently more research has been conducted on programmes in which dental personnel have only a supervisory role and the participants apply the fluoride themselves. The more self-application that can be practised, the greater the number of people that can be reached and it will be possible to include whole populations in the preventive programme. It is difficult to estimate the effects of such a dental care programme but, in the best programme devised so far, water fluoridation, it was shown in New Zealand that the number of patients per operator could be increased by 45%.

The shortage of educated dental personnel and the high cost of employing them necessitates that public health programmes in the future consider more of these self-application programmes. Three programmes are at present being advocated:

(a) **Self-application of a prophylactic paste - the "brush-in"**

The paste is 8% SnF₂ in ZnSiO₄. The method has been described by Muhler. A paste made in Australia uses 10% SnF₂.

Very large groups have been subjected to the brush-in technique. If it is used in schools, small groups should be used. The recommended amount of paste per child is 5 grams. If 10% paste is used the amount of fluoride is 0.5 grams, which may have an adverse effect on a small child who, contrary to instructions, swallows the paste. The control of the brush-in is especially difficult where the instructions are given in a language which the children do not readily understand. It is necessary to have accurate dispensing or some children may receive more than 5 grams. There is also the danger of gingival damage if the instructions are not followed. Thus, this method requires adequate supervision.

(b) **Mouth rinsing**

Daily or weekly mouth rinsing with fluoride solutions have been suggested and some results have been produced, mainly in Scandinavia. Recently, Horowitz et al. reported the results from weekly rinsing with an 0.2% solution of sodium fluoride. Some inconsistencies were observed, but the ease of implementing the programme and the reductions in dental caries incidence achieved warranted, in the opinion of the authors, further research.
Many countries in the Region have developed toothbrushing programmes. The addition of mouth-rinsing to these programmes may be considered, or even brushing with a fluoride solution rather than with water, followed by a rinse. Data on toothbrushing with fluoride solution are not available.

It would be useful to set up a programme of mouth rinsing or toothbrushing with a fluoride solution, and to evaluate it. The evaluation must be done under rigorous scientific conditions since one of the reasons that so many inconsistent results have been obtained in the past has been the use of unsound methods of evaluation.

There are problems of dispensing fluoride solutions. If dilute solutions are distributed, the programme will be faced with the cost of transporting large volumes of water. If concentrated solutions are used, then a relatively toxic solution will be placed in the hands of inexperienced people and a method of correct dilution will have to be devised. It is possible to make dissolving tablets containing the right amount of fluoride for a given volume of water. These are rather expensive but, if bought in bulk, the price would no doubt be reduced.

(c) Home use of fluoride toothpaste and mouth rinses

Toothpastes with fluoride are too expensive for public health use though, again, bulk ordering may reduce the price. Dental health education should advocate the use of fluoride toothpaste at home. Mouth-rinsing at home has been tried but it is too early to encourage its widespread use.

SUMMARY

It is unlikely that oral health can be significantly improved without preventive programmes. Against dental caries fluoride is the most effective known agent. Programmes involving fluoride as a preventive agent need to be implemented, programmes in which dental personnel are used to a minimum and patient self-help to a maximum.
REFERENCES

1. Accepted Dental Therapeutics 1971/72. American Dental Association, Chicago.


