

THE RELATIONSHIP BETWEEN DENTAL HEALTH SERVICES  
AND ORAL HEALTH STATUS

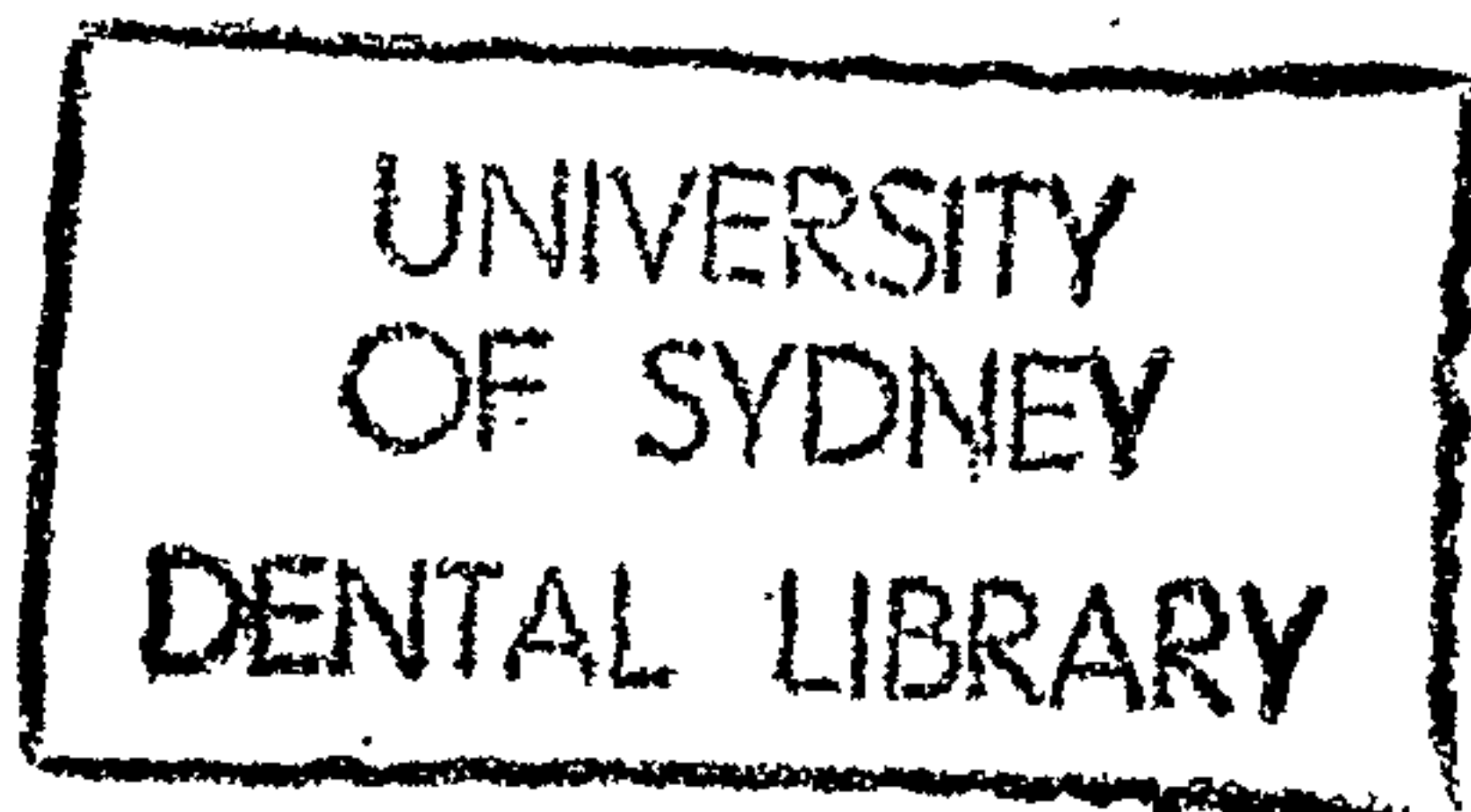
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A thesis submitted in partial  
requirement for the  
degree of

MASTER OF DENTAL SCIENCE



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1980.

### ACKNOWLEDGEMENT

In particular I wish to thank Professor Peter D. Barnard, M.P.H. (Michigan), M.D.S., F.A.P.H.A., F.A.C.D.S., F.R.S.H. (Dental Public Health), for his valuable guidance, assistance and encouragement at various stages. My thanks are also due to Professor Noel D. Martin, M.D.S., F.A.C.D., F.A.C.D.S., F.A.P.H.A., F.I.C.D., A.I.A.O.P. for his support and special assistance. Finally, I gratefully acknowledge the support and encouragement and sacrifices of my wife, Maria.

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## 1. INTRODUCTION

The objective of this thesis is to attempt to relate structural characteristics of the dental health services system in Australia in general and in New South Wales in particular, with the oral health status of the population, in which the system works. Structural characteristics of the dental health services system are major features of the system, particularly its organization, dental manpower system, types of services available and methods of financing. The characteristics of the consumers as well as the providers are also included to make a complete picture of the system.

The dental health services system will also reveal something of the influence that particular segments of society are able to exert on the whole. It often reflects the social classes present in a community and indicates the bases of the stratification system (e.g. occupation, race, education, sex etc.).<sup>37</sup> In short, the dental health services system and oral health status of a community can be seen as something of a social mirror, a mirror that reflects what a society stands for.

The relationship between the dental health services system and the community, in which it exists, is, however a reciprocal one. Not only does the form of the dental health service system derive from the values of the community, but the community's values are also conditioned by the form of the system. It is therefore the precise form of the system, which will determine who gets care: whether it is their abilities to pay, the urgency of their condition or some other criteria that determine how and

when they get care; it will also determine whether their residence, social status, education or other factors are instrumental in the distribution of dental health resources. In this way the system comes to affect people's perception and definition of such concepts as health, disease and illness. It also affects other concepts and, as a result, conditions many of the values people hold.

A better overall picture of the relationship of those variables of the dental health services system and the variables of the population, and the outcome as represented in the oral health status, is shown on the diagram below (Fig. 1).

A set of hypotheses is proposed for testing, based on a method proposed by W.H.O.<sup>12</sup> for evaluating dental health services, namely through availability, accessibility and acceptability of services in dental health service system. Those hypotheses are:

1. Availability:

- a. The greater the availability of manpower the greater the beneficial effect to the consumer.
- b. The greater the number of supporting personnel to operating dental manpower the greater the beneficial effect to the consumer.
- c. Where the degree of central control is high, the beneficial effect to the consumer is greater.
- d. The greater the personnel time spent on preventive services the greater the beneficial effect to the consumer.

2. Accessibility:

- a. The greater the physical (distance, transportation availability, time) ease of contact between consumer and provider the greater the beneficial effect to the consumer.

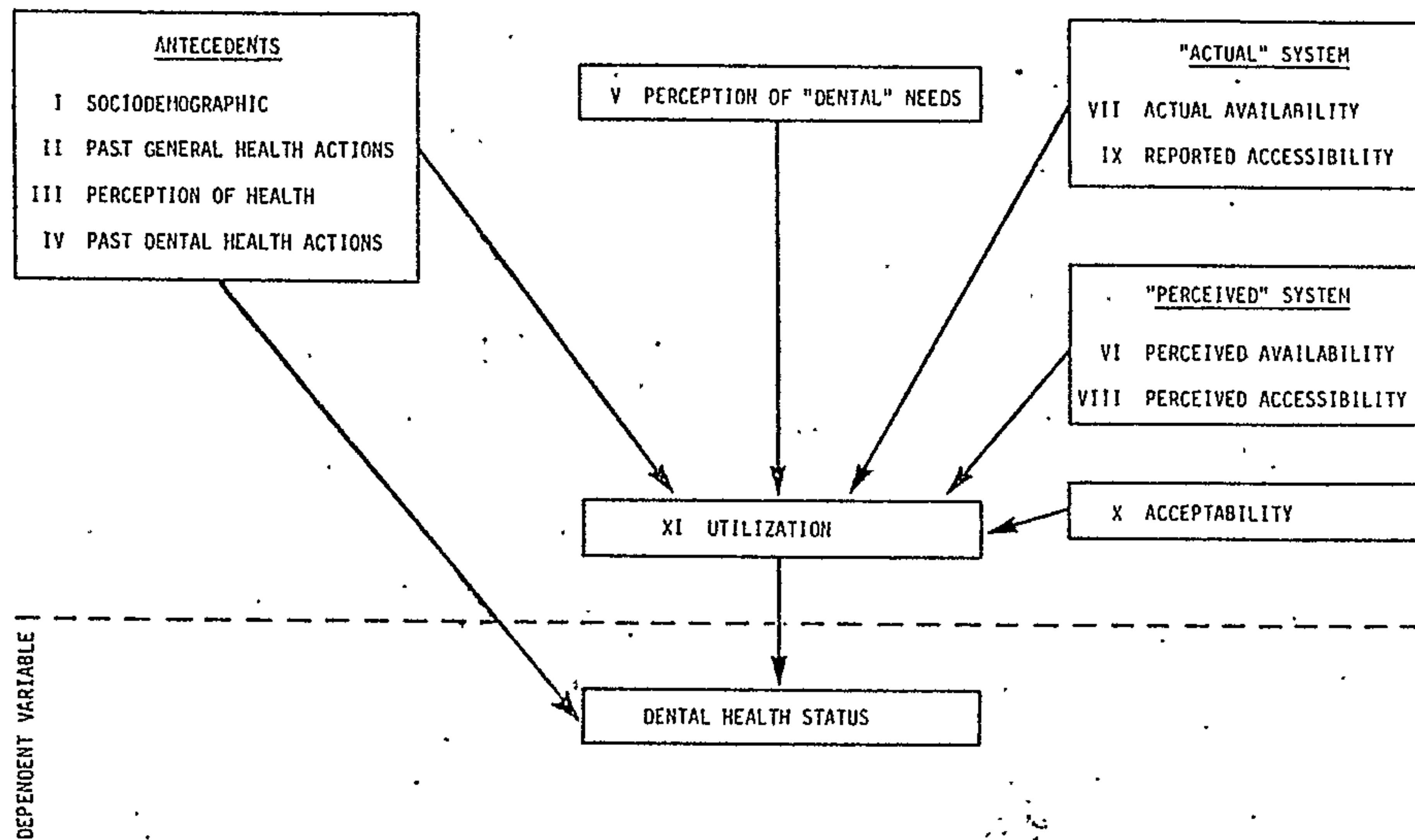


Fig. 1. Plan of data analysis.  
 Plan de l'analyse des données.  
 Plan der Datenanalyse.  
 Plan de análisis de datos.

- c. The more incentives are given to the provider the greater the beneficial effect to the consumer.
- d. The more providers exert initiative in delivering services the greater beneficial effect to the consumer.

3. Acceptability:

- a. The greater the acceptability of a service to a population the greater the beneficial effect to the consumer.
- b. The greater the acceptability of a service to the provider and dental health administration the greater the beneficial effect to the consumer.
- c. The greater the control on quality and quantity of services the greater the beneficial effect to the consumer.

There is not a single, uniform system of delivery of dental care in Australia (with six States and Northern Territory and Australian Capital Territory), although the bulk of the system is channeled through private practice. Therefore, it would be interesting to study individual system characteristics and learn whether they are positive or negative in respect of oral health status of the community they serve. It will help us to move toward a deeper understanding not only of questions of dental health services system and its relationship to oral health status, but also of the wider priorities and values of community at large.

The top administrators in dental health services should be aware and anticipate the change in government policies, change in the population structure, and disease pattern, change in social values, change in technology of health and

dental health services and last but not least, the emerging awareness of health as the right of an individual. In other words, the dental health services organization should be flexible to respond to changing policies and priorities, by closely monitoring the community's needs and priorities and the continuous redefinition of goals, to ensure the successful operation of a system, as large and complex as dental health services. By doing so, the dental health services system fulfills its main duty, that is to achieve the highest standard of oral health status of the community.

The thesis presents a brief sketch of the dental health services system and the types of services provided. Next a profile of the population and its dental diseases pattern and dental needs, is given followed by a case study which was conducted in N.S.W., Australia by the World Health Organisation in 1973. Following summary and discussion, conclusions are presented which include some suggestions for implementation in the existing dental health services system.

## 2. DENTAL HEALTH SERVICES SYSTEM

### 2.1 ORGANIZATION

#### 2.1.1 GOVERNMENT (FEDERAL, STATE, LOCAL)

1. Dental Hospital, Clinic & Outstation
2. Travelling Dental Clinic
3. Day-Nursery Dental Services
4. School Dental Services
5. Public Health Dental Services
6. Flying Doctor Services

#### 2.1.2 OTHER INSTITUTIONS

1. Department of Veteran Affairs Dental Services
2. Armed Forces Dental Services

#### 2.1.3 PRIVATE PRACTICE

including Dental Services provided by charity organizations or employers or unions, such as:  
Hibernian, Manchester City, Legacy, Meyer, B.H.A.S.

### 2.2 MANPOWER

1. Dentist
2. Auxiliaries

### 2.3 TYPES OF SERVICES

1. Treatment Services
2. Community Services
3. Research

### 2.4 HEALTH AND DENTAL EXPENDITURE

### 2.1.1 GOVERNMENT SERVICES

A brief history of the development of the health service and the milestones in health/social service would give a better understanding on the present organizational structure of the health and dental services.

The changing nature of the social response to the problem of providing health care has been determined by the fundamental social attitudes and relationships prevailing in Australian society over 200 years.

The following broad time frames for the consideration of the changes in health care provision in Australia:<sup>36</sup>

1. 1778-1840:

The convict era, in which the state institutionalized benevolence to the people it controlled autocratically.

2. 1840-1890:

The years in which capitalism became the dominant social relationship. Assistance was selective and provided by public charitable institutions, often backed by state resources.

3. 1890-1950:

Capitalism under challenge, in which the minimal universalist and even the socialist interpretation of social goals and social policy were debated and applied alongside the continued use of the selective system.

4. 1950-1970:

Capitalism resurgent, but with some compromises to limited universalism, the better to maintain the system.

Ratchford,<sup>55</sup> on the other hand, concentrated on the 1900-1955 period, by analysing public expenditures, divided that era into 3 periods:

1. 1900-1912: The First Period.

N.S.W. and Victoria began paying old age pensions.

Commonwealth legislation on age pensions and invalid pensions and Maternity Benefits was established in 1912.

2. 1912-1941: The Barren Period.

Department of Health was established in 1921, and by 1939 it had 6 divisions.

Queensland established a system of unemployment benefits, while N.S.W. established widow's pensions and family allowances.

3. 1941-1955: Building the Welfare State.

1941: Family Allowances (Child Endowment) was established.

1944: The Unemployment Act. Sickness and Pharmaceutical Benefits.

1945: Hospital Benefits Act & Tuberculosis Act.

1950-1951: Pharmaceutical & Hospital Benefits Acts were extensively revised.

1953: Medical Benefits Act.

1953: All of these Acts were consolidated in National Health Act.

Prior to an amendment to the Constitution in 1946, the only health function of the Commonwealth Department of Health was in relation to quarantine. Consequent upon this change, the Commonwealth Government was given powers to make laws on pharmaceutical, hospital, sickness benefits, medical and dental services.<sup>32</sup>

Under section 96 of the Constitution, the Government could make grants to the States for health purposes, and also give financial assistance to certain organizations concerned with public health matters.

At the present moment Dental Health Services Branch is under Public Health Division (as shown in Fig. 2) within the organization of the Australian Department of Health. Every state and the territories have their own organization structure, suited to their own particular needs, for example in N.S.W., the Health Commission has:

2 Councils:

1. Health Advisory Council
2. Professional Services Advisory Council.

4 Bureaus:

1. Bureau of Personal Health Services.
2. Bureau of Environmental and Special Health Services
3. Bureau of Manpower and Management Services
4. Bureau of Finance and Physical Resource.

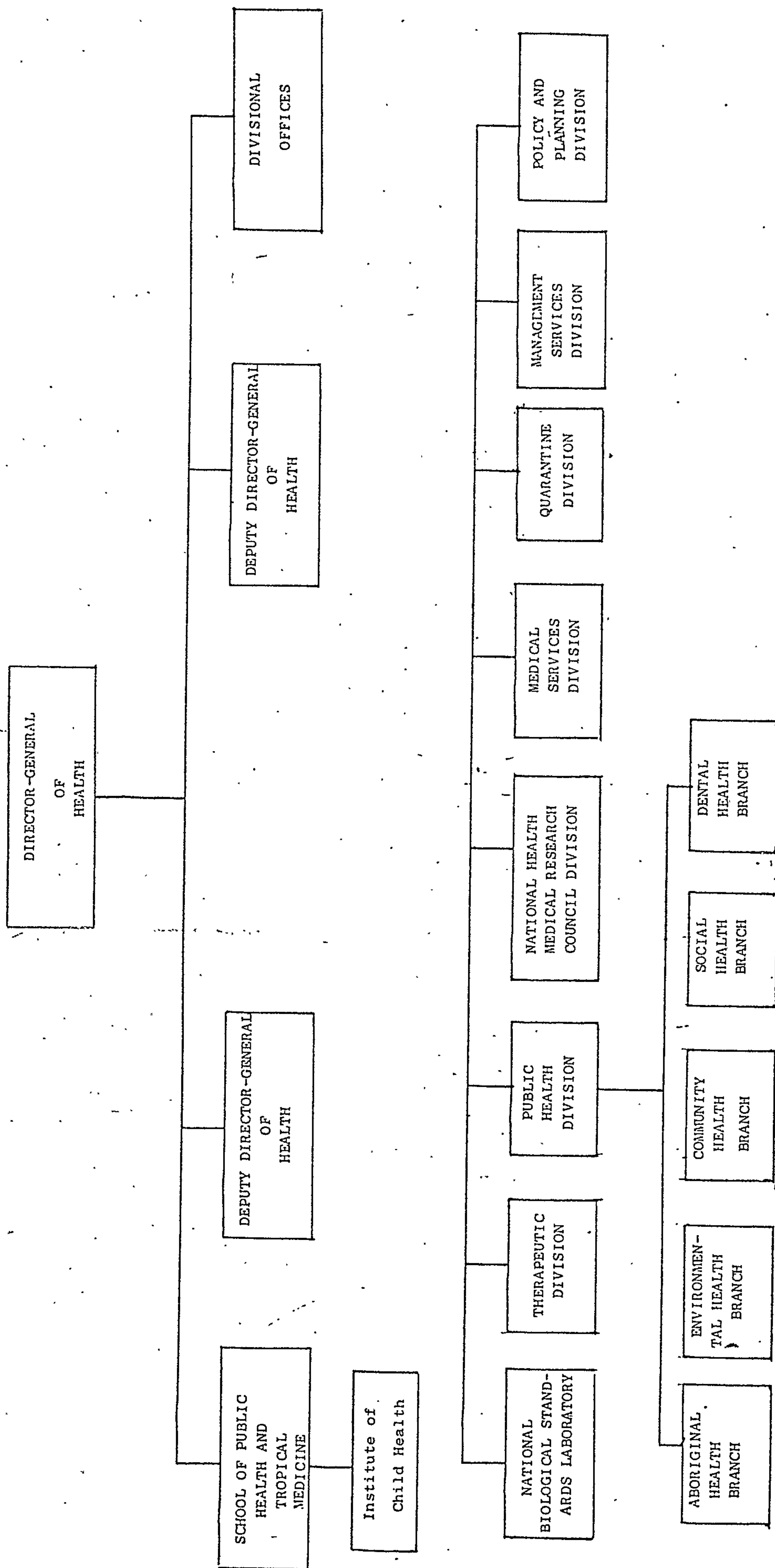
In May 1972, the Regional Organization Act came into operation. This Act divided the State into 9 regions:<sup>49</sup>

- 8 regions covering country areas
- 1 region covering Sydney, Newcastle and Wollongong.

In 1971, the division of the Sydney Metropolitan area into 4 administrative regions had already been approved.

#### 2.1.1.1 Dental Hospital, Clinic & Outstations<sup>52,53,54</sup>

All dental hospitals in Australia are public hospitals, controlled by differently constituted Boards of Management either directly or indirectly, as part of a dental or medical division.



**EXPLANATORY NOTE:**

The Department of Health, like all Australian Government departments, is divided into Divisions, Branches and Sections. Each Division has one or more Branches. These Branches in turn usually have one or more Sections, each with a specific role. This Chart only shows the subdivisions of the Public Health Division to indicate Dental Health with the general organization

Adapted from:

Country Health Information Profile, WHO/WPRO/HST/HPU, AUSTRALIA, February 1976

Most of the larger hospitals provide general and small specialized dental service, including a very limited emergency night service largely for relief of pain or accident.

In the two largest states, in terms of land area of Queensland and Western Australia an extensive system of peripheral hospital clinics/outstations serve most of the more populated areas, while other states concentrate their activities in hospitals with a few small peripheral clinics, usually within the metropolitan area. The main problem of most of the dental hospitals is in attracting and retaining professional staff.

Only three dental hospitals conduct their own training program for dental nurses with varying degrees of difference in training periods, programs and objectives.

Every dental hospital uses a means test to determine eligibility charges for its services on a fee for treatment basis, and most of the patients are the indigent poor or unemployed.

#### 2.1.1.2 Travelling Dental Clinics

Mobile dental clinics are mostly used in conjunction with School Dental Service, providing services to remote or inaccessible areas throughout the country. Road, train, aerial and boat are also used by dental hospital and dental clinic services.

From Department of Health Report on School Dental Service<sup>1</sup> (Table 2.1), there is a gradual increase in the number of mobile clinics in 1973-1976 period (approximately 10% annually), but more increase in recent years (and it corresponds with the increase of dental nurse school graduates).

TABLE 2.1 AUSTRALIAN SCHOOL DENTAL SERVICE - NUMBER OF CLINICS

| YEAR |        | NSW | VIC | QLD | SA | WA | TAS | N.T. | A.C.T. | TOTAL |
|------|--------|-----|-----|-----|----|----|-----|------|--------|-------|
| 1973 | Static | 14  | 2   | -   | 28 | 28 | 33  | 6    | 38     | 149   |
|      | Mobile | 18  | 11  | 4   | 11 | 3  | 23  | 4    | -      | 74    |
| 74   | S      | 14  | 2   | -   | 34 | 33 | 33  | 6    | 41     | 163   |
|      | M      | 13  | 11  | 4   | 11 | 3  | 26  | 4    | -      | 72    |
| 75   | S      | 14  | 2   | 1   | 41 | 36 | 34  | 8    | 44     | 180   |
|      | M      | 18  | 11  | 4   | 14 | 3  | 26  | 4    | -      | 80    |
| 76   | S      | 23  | 2   | 10  | 54 | 58 | 42  | 8    | 48     | 245   |
|      | M      | 21  | 11  | 9   | 14 | 5  | 26  | 3    | -      | 89    |
| 77   | S      | 35  | 5   | 26  | 69 | 62 | 43  | 8    | 49     | 297   |
|      | M      | 22  | 11  | 19  | 14 | 6  | 29  | 2    | -      | 103   |
| 78   | S      | 47  | 17  | 45  | 84 | 83 | 43  | 8    | 54     | 381   |
|      | M      | 32  | 33  | 29  | 14 | 12 | 31  | 3    | -      | 154   |

Source: Department of Health Annual Report 1973-1978.

#### 2.1.1.3 Day Nursery Dental Service

There is no concerted effort throughout the country to provide specific program or service for this group, mostly because of limited resources. There are at least two sections of the services, namely Dental Hospital and School Dental Service, which occasionally provide the needed service, provided the resources permit.

There is no specific or separate data available for the group.

#### 2.1.1.4 School Dental Service<sup>1</sup>

Prior to 1972, each State had its own School Dental Service, whose coverage was very limited due to lack of resources, especially dental manpower, in this case dental auxiliaries. Only Tasmania (commenced in 1966) and Western Australia (in 1967) had training facilities for dental nurses/therapists. For temporary

measure the Federal Government sent 100 girls to be trained as dental nurses in New Zealand between 1972-1975.<sup>1</sup>

In 1972 Dental Services Branch was created within the National Health Division. Its major function was the implementation, development and co-ordination of the new Australian School DDntal Services Scheme; but its work also includes a wide range of general dental matters. Under this scheme, Federal Government would provide substantial grants to the States to develop a school dental service in accordance with agreed principles so as to ensure a unified service throughout Australia. When fully developed, the service would offer free dental care to all children under 15 years of age.

The aim then was to cover all primary school children by 1980, which was set too high as only 30% of primary school children were examined in 1978-1979, and then to expand the service to cover pre-school children and secondary school pupils under 15 years of age.

In cooperation with the States, approximately 3,000 school dental clinics would be established throughout Australia in addition to mobile surgeries which would serve smaller schools. The service was designed to be staffed basically by school dental therapists, working under general direction and control of dentists. Dental Health Education, which is regarded as an integral part of dental care was to be provided by the service to all school children.

From 1973-1978 period (Table 2.1) the number of dental clinics, static as well as mobile, increased substantially. Static clinics more than doubled from 149 to 381, while mobile

clinics increased 80 in number (from 74 to 154).<sup>1</sup>

The number of school children covered/treated by the service increased from 171.776 children in 1973 to 334.865 children in 1977, comprising approximately 17.86% of primary-school age group).<sup>1</sup> (Table 2.2). The highest coverage is in A.C.T. (86.47%), followed closely by Tasmania (84.94%); and the lowest is in Victoria: (4.09%), the rest of the States are in between (in 1978: 472.371 or 25% and in 1979 30% was expected). The rapid development of School Dental Service was achieved in Western Australia, South Australia and in New South Wales (Table 2.1 and 2.2). This was due mainly through the availability of school dental therapists in each state (described in Manpower, section 2.2).

#### 2.1.1.5 Public Health Dental Services

In this particular field, the Dental Health Branch can cooperate with other Branches in Public Health Division, such as Community Health Branch and Environmental Health Branch or implement recommendations endorsed by the National Health and Medical Research Council.

Examples of overlapped areas are Food Standards, Nutrition Health Advertising, and Poisonous Material. By 1979 Queensland was the only state where water fluoridation was not implemented widely. The Estimated Australian Population who received artificially fluoridated water supplies in 1979 was 67.0% (Table 2.3).<sup>22,25</sup> Almost all States surpassed the national average figure of 67.1%, except Northern Territory (63.1%) and the lowest is Queensland (10.1%).

Compared with the rest of the world, Australia with other small island countries, such as Hong Kong and Singapore, lead

TABLE 2.2 AUSTRALIAN SCHOOL DENTAL SERVICE,  
CHILDREN TREATED, STATE AND TERRITORIES.

| YEAR | NSW      | VIC    | QLD    | SA     | WA     | TAS    | N.T.  | A.C.T. | TOTAL   |
|------|----------|--------|--------|--------|--------|--------|-------|--------|---------|
| 1973 | 23.311** | 24.783 | 17.000 | 27.137 | 1.679* | 50.871 | 4.792 | 22.203 | 171.776 |
| ***  | 2.32     | 3.06   | 3.82   | 9.96   | 0.67   | 52.99  | 19.05 | 52.96  | 5.83    |
| 1974 | 34.812   | 24.903 | 15.247 | 36.585 | 10.987 | 53.304 | 8.441 | 22.978 | 207.257 |
|      | 3.46     | 3.05   | 3.38   | 13.43  | 4.25   | 55.81  | 30.27 | 48.93  | 6.96    |
| 1975 | 49.050   | 16.996 | 20.308 | 42.006 | 27.867 | 50.516 | 3.862 | 25.536 | 236.141 |
|      | 4.83     | 2.06   | 4.48   | 15.45  | 10.53  | 52.84  | 15.12 | 50.18  | 7.86    |
| 1976 | 68.720   | 17.498 | 19.561 | 59.631 | 38.825 | 63.340 | 3.841 | 26.587 | 290.003 |
|      | 6.83     | 2.07   | 4.02   | 21.05  | 14.03  | 65.46  | 14.97 | 53.04  | 9.71    |
| 1977 | 59.100   | 20.339 | 42.672 | 80.989 | 50.741 | 48.970 | 3.778 | 28.276 | 334.865 |
| †    | 9.34     | 4.09   | 14.86  | 46.43  | 29.52  | 84.94  | 18.09 | 86.47  | 17.86   |

Source: Department of Health Annual Report 1973-1978.

- \* Excludes children treated in rural and remote areas.
- \*\* Number of children who received routine dental examinations.
- \*\*\* As percentage of population aged 3 to 14 years inclusive.
- † As percentage of primary school children.

in water fluoridation program (in 1991 expected coverage would be: 77% and mostly urban; the percentage of non-urban expected 20%).

TABLE 2.3 ESTIMATED POPULATION LIVING IN FLUORIDATED AREAS  
(%) BY STATES, AUSTRALIA.

|           | YEAR | NSW  | VIC  | QLD  | SA   | WA   | TAS  | N.T. | A.C.T. | AUST. |
|-----------|------|------|------|------|------|------|------|------|--------|-------|
| 30th June | 1971 | 71.5 | 0.1  | 9.1  | 68.3 | 65.2 | 59.0 | -    | 100.0  | 41.6  |
|           | 1972 | 78.7 | 0.1  | 9.0  | 75.0 | 81.7 | 57.8 | 56.1 | 100.0  | 46.5  |
|           | 1974 | 78.6 | 0.6  | 8.9  | 72.0 | 64.6 | 61.7 | 55.5 | 97.3   | 45.0  |
|           | 1975 | 80.2 | 0.7  | 9.2  | 70.0 | 84.0 | 72.8 | 76.0 | 99.9   | 47.5  |
|           | 1976 | 80.1 | 0.7  | 9.1  | 70.5 | 83.3 | 72.5 | 57.8 | 99.7   | 47.6  |
|           | 1977 | 80.8 | 73.2 | 10.2 | 70.7 | 83.3 | 73.9 | 57.8 | 99.7   | 67.2  |
|           | 1978 | 81.1 | 72.4 | 10.1 | 70.1 | 83.0 | 74.4 | 63.1 | 99.7   | 67.1  |
|           | 1979 | 81.1 | 72.3 | 10.1 | 70.1 | 83.1 | 74.4 | 63.1 | 99.7   | 67.0  |

Note: Victoria: Fluoridation commenced in February 1977 with the complete population being served by September 1977 in Melbourne. Approximately 60% of population was served at 30th June 1977 in Melbourne, 61% (or 8.250.000) of Australia.

Source: P.D. Barnard, Facts and Figures, 1971-1979 & Australian Bureau of Statistics.

2.1.1.6 Flying Doctor Services<sup>32</sup>

It is a non-profit organization providing medical/dental services in remote/isolated areas in Australia. During 1977-1978 the Service made flights totalling 4.5 million kilometres and transported 7.629 patients and conducted 86.6% consultations, and dental treatment was given to 4,462 patients.

For its capital and operational costs, the Service received Commonwealth Government grants and donations from other sources

(in 1978 Government paid \$1,700,000 for operational costs and \$699,500 for approved capital expenditure).

### 2.1.2 OTHER INSTITUTIONS

#### 1. Department of Veteran Affairs Dental Services<sup>28</sup>

Total cost of service in 1979-1980 was \$7,757.000. The total number of patients treated was not available.

The total number of patient's treatments was 160,423 in 1979-1980.

#### 2. Armed Forces Dental Services<sup>28</sup>

R.A.A.F.: The total number of patients treated was 29,700.

R.A.A.D.C.: The total number of treatments was 150,000 (estimated). The total number of dental visits was

100,000; all in 1979-1980 period.

R.A.N.: no data available for 1979-1980 yet.

These institutions provide services limited to a group of people, under their own jurisdiction, and to a varying degree to their families and dependants.

### 2.1.3 PRIVATE PRACTICE

Type of employment: (Table 2.4)<sup>25</sup>

The total work force (active dentists) in December 1978 was 5.718 (79.6% of the total number of registered dentists). The number of self-employed dentists was 4.053 (56.4% of the total registered dentists) and 1.665 were employed dentists (23.2% of the total registered dentists).

The number of dentists in solo-practice (general practice and specialist) were 2,949 (72.7% of the total self-employed dentists) and 1.104 were in partnership (27.3% of the total self-employed dentists).

TABLE 2.4: TYPE OF EMPLOYMENT IN AUSTRALIA (%)

## DENTISTS 1970-1978

| <u>Year</u> | <u>Self-Employed</u> | <u>Employed</u> | <u>Not Practising</u> |
|-------------|----------------------|-----------------|-----------------------|
| 1970        | 60.7                 | 21.4            | 17.9                  |
| 1971        | 61.1                 | 20.9            | 18.0                  |
| 1972        | 61.6                 | 21.8            | 16.6                  |
| 1973        | 61.2                 | 22.8            | 16.0                  |
| 1974        | 61.6                 | 22.8            | 15.6                  |
| 1975        | 60.1                 | 22.1            | 17.8                  |
| 1976        | 58.3                 | 23.2            | 18.5                  |
| 1977        | 58.2                 | 23.2            | 18.6                  |
| 1978        | 56.4                 | 23.2            | 20.4                  |

Source: P.D. Barnard, Facts and Figures, 1971-1979.

Age

In December 1979,<sup>25</sup> the age of the A.D.A. members were:

44.1% in 25-39 years old group

33.4% in 40-54 years old group

12.9% in 55-64 years old group.

Sex

In December 1978, there were: 6,579 male registered dentists and 675 female registered dentists (9.3% of the total registered dentists).<sup>25</sup>

There are a number of organizations, communities, Friendly Societies, and groups providing clinic dental services for special groups in the community, some examples are:

|                 |                                             |
|-----------------|---------------------------------------------|
| N.S.W.          | - Broken Hill Mines                         |
|                 | - Hibernian Society                         |
|                 | - Western Shires (Local Government)         |
| Victoria        | - Friendly Societies                        |
|                 | - Legacy                                    |
|                 | - Manchester Unity                          |
|                 | - Tramways Benefit Society                  |
| South Australia | - Broken Hill Associated Smelters           |
| Tasmania        | - Associated Pulp and Paper Makers' Council |
| Queensland      | - Aboriginal Medical Service.               |

Based on the available data, the estimated total number of patients who received dental services from these institutions was 120,000, with the estimated total number of visits of 203,000 and the estimated total number of treatments of 243,465 in 1978-1979 period.

## 2.2 MANPOWER

### 2.2.1 DENTIST

There are 5 dental schools throughout Australia with the total number of students of 1,504 in 1980 (1158 male, 346 female).<sup>28</sup>

The total number of students admitted was 323 in 1979; and graduates from 1979 final year were 273 (61 were female).<sup>28</sup>

In 1978 approximately 75.7% of the total number of registered dentists from 3 States, i.e. N.S.W., Victoria and Queensland (Table 2.5), which provided dental services to approximately 77.1% of the total Australian population (Table 2.6).

The dentist to population ratio for Australia was 1:2,475 in 1970 (ratio for active dentists: population = 1:3,015) and

TABLE 2.5: NUMBER OF DENTISTS IN AUSTRALIA, BY STATE 1969-1978

| YEAR | NSW  | VIC  | QLD  | SA  | WA   | TAS | N.T. | A.C.T. | AUST. |
|------|------|------|------|-----|------|-----|------|--------|-------|
| 1969 | 1957 | 1119 | 763  | 349 | 404  | 109 | 25   | 74     | 4800  |
| %    | 40.8 | 23.3 | 15.9 | 7.3 | 8.4  | 2.3 | 0.5  | 1.5    | 100   |
| 1970 | 2024 | 1169 | 839  | 389 | 427  | 110 | 35   | 78     | 5071  |
|      | 39.9 | 23.0 | 16.6 | 7.7 | 8.4  | 2.2 | 0.7  | 1.5    | 100   |
| 1971 | 2078 | 1213 | 853  | 414 | 450  | 114 | 56   | 87     | 5265  |
|      | 39.5 | 23.0 | 16.2 | 7.9 | 8.5  | 2.2 | 1.1  | 1.6    | 100   |
| 1972 | 2098 | 1258 | 836  | 442 | 463  | 111 | 48   | 93     | 5349  |
|      | 39.2 | 23.5 | 15.6 | 8.3 | 8.7  | 2.1 | 0.9  | 1.7    | 100   |
| 1973 | 2103 | 1272 | 804  | 477 | 484  | 110 | 48   | 111    | 5409  |
|      | 38.9 | 23.5 | 14.9 | 8.8 | 8.9  | 2.0 | 0.9  | 2.1    | 100   |
| 1974 | 2114 | 1321 | 857  | 521 | 510  | 112 | 61   | 119    | 5615  |
|      | 37.6 | 23.5 | 15.3 | 9.3 | 9.1  | 2.0 | 1.1  | 2.1    | 100   |
| 1975 | 2203 | 1433 | 897  | 564 | 571  | 118 | 60   | 123    | 5969  |
|      | 37.0 | 24.0 | 15.0 | 9.4 | 9.6  | 2.0 | 1.0  | 2.0    | 100   |
| 1976 | 2350 | 1521 | 961  | 598 | 639  | 109 | 58   | 142    | 6378  |
|      | 36.9 | 23.8 | 15.1 | 9.4 | 10.0 | 1.7 | 0.9  | 2.2    | 100   |
| 1977 | 2532 | 1640 | 1040 | 635 | 714  | 123 | 56   | 136    | 6876  |
|      | 36.8 | 23.9 | 15.1 | 9.2 | 10.4 | 1.8 | 0.8  | 2.0    | 100   |
| 1978 | 2617 | 1745 | 1131 | 667 | 742  | 132 | 71   | 149    | 7254  |
|      | 36.0 | 24.1 | 15.6 | 9.2 | 10.2 | 1.8 | 1.0  | 2.1    | 100   |

Source: P.D. Barnard, Facts and Figures, 1969-1979.

TABLE 2.6: POPULATION BY STATES (x 1000)  
AUSTRALIA, 1969-1978

| YEAR | NSW   | VIC   | QLD   | SA    | WA    | TAS | N.T. | A.C.T. | AUST.  |
|------|-------|-------|-------|-------|-------|-----|------|--------|--------|
| 1969 | 4.474 | 3.384 | 1.768 | 1.144 | 946   | 388 | 68   | 122    | 12.296 |
| 1970 | 4.566 | 3.443 | 1.799 | 1.164 | 980   | 392 | 71   | 133    | 12.551 |
| 1971 | 4.601 | 3.502 | 1.827 | 1.174 | 1,031 | 390 | 86   | 144    | 12.756 |
| 1972 | 4.662 | 3.545 | 1.869 | 1.186 | 1.053 | 392 | 93   | 158    | 13.000 |
| 1973 | 4.702 | 3.586 | 1.914 | 1.199 | 1.068 | 395 | 95   | 168    | 13.131 |
| 1974 | 4.743 | 3.631 | 1.967 | 1.218 | 1.094 | 400 | 101  | 180    | 13.338 |
| 1975 | 4.789 | 3.673 | 1.997 | 1.234 | 1.122 | 406 | 88   | 192    | 13.502 |
| 1976 | 4.777 | 3.647 | 2.037 | 1.245 | 1.145 | 403 | 97   | 198    | 13.549 |
| 1977 | 4.957 | 3.782 | 2.137 | 1.278 | 1.197 | 411 | 106  | 208    | 14.074 |
| 1978 | 5.012 | 3.818 | 2.167 | 1.288 | 1.222 | 414 | 113  | 216    | 14.249 |

Source: P.D. Barnard, Facts and Figures, 1969-1979.

in 1978 it became 1:1,964 for registered dentists, and 1:2,467 for the active dentists to population ratio (Table 2.7). Female dentists increased as a proportion of all Australian dentists during the 1961 to 1978 period:<sup>2</sup>

1961 : 183 (5.0%)

1966 : 197 (5.3%)

1971 : 253 (6.2%)

1978 : 675 (9.3%)

The percentage increase from previous year of registered dentists in 1977-1978 were:<sup>25</sup>

|        | <u>1977</u> | <u>1978</u> |
|--------|-------------|-------------|
| Male   | 7.3%        | 4.9%        |
| Female | 13.7%       | 11.9%       |

## 2.2.2 AUXILIARY PERSONNEL

### 2.2.2.1 Dental Nurse (School Dental Therapist)

It took approximately 50 years to see the existence of school dental therapist widely accepted in Australia after New Zealand introduced the school dental nurse in 1922.

In 1972-1973 the Commonwealth Government, then under Labor Party, introduced the Australian School Dental Service Scheme which offered free dental care to all children under 15 years of age.

In the initial years, large sums of money went into capital investment (1974-1976 period) i.e. for building training schools and equipment. This is reflected in the number of dental therapy schools, as follows:<sup>1</sup>

1974-1975: 10 schools in operation, with potential total capacity to graduate 242 dental therapists each year.

TABLE 2.7: PERCENTAGE INCREASE OF POPULATION &  
DENTISTS AND ITS RATIO, 1970-1978.

| YEAR | PERCENTAGE INCREASE OF |                        |                     | POPULATION:<br>REG. DENTIST<br>RATIO | POPULATION:<br>WORKING<br>DENTIST<br>RATIO |
|------|------------------------|------------------------|---------------------|--------------------------------------|--------------------------------------------|
|      | POPULATION             | REGISTERED<br>DENTISTS | WORKING<br>DENTISTS |                                      |                                            |
| 1970 | 1.94                   | 5.6                    | -                   | 1:2475                               | 1:3015                                     |
| 71   | 2.11                   | 3.8                    | 3.7                 | 1:2422                               | 1:2955                                     |
| 72   | 1.64                   | 1.6                    | 3.3                 | 1:2430                               | 1:3011                                     |
| 73   | 1.56                   | 1.1                    | 1.8                 | 1:2427                               | 1:2890                                     |
| 74   | 1.62                   | 3.8                    | 4.3                 | 1:2375                               | 1:2815                                     |
| 75   | 1.02                   | 6.3                    | 3.5                 | 1:2262                               | 1:2752                                     |
| 76   | 1.02                   | 6.9                    | 2.3                 | 1:2124                               | 1:2607                                     |
| 77   | 1.23                   | 7.8                    | 6.3                 | 1:2047                               | 1:2550                                     |
| 78   | 1.20                   | 5.5                    | 4.6                 | 1:1964                               | 1:2467                                     |

By February 1976 additional schools in:

Shellharbour, N.S.W.

St. Kilda, Victoria.

Yeronga and Townsville, Qld.

Warwick, W.A.

which made total capacity to graduate to 390 students annually (from a total of 10 dental therapist schools), in 1978 282 dental therapists graduated.<sup>25</sup>

The number of dental therapists employed in School Dental Service was increased dramatically, from 120 in 1973 to 515 in 1977 (Table 2.8). In June 1978, the number was 779 and in 1979 it was 1,041.

However the number of graduates will decrease in the near future, because the number of first year trainees was cut down. (The training school at Shell Harbour, N.S.W. did not take any first year trainees in 1978).

The pattern of school dental therapists distribution throughout Australia did not follow the pattern of dentists: 1977 (%):

|              | NSW  | VIC  | QLD  | SA   | WA   | TAS  | N.T. | A.C.T. |
|--------------|------|------|------|------|------|------|------|--------|
| Dentist      | 36.8 | 23.9 | 15.6 | 9.2  | 10.2 | 1.8  | 0.8  | 2.0    |
| D. Therapist | 17.3 | 3.3  | 10.5 | 26.6 | 23.1 | 12.0 | 3.0  | 4.0    |

#### 2.2.2.2 Dental Hygienist<sup>25</sup>

ARMED FORCES Training in Combined Services Courses was conducted by Royal Australian Navy by H.M.A.S. Cerberus. Trained chairside assistance in the Navy can receive a further 17 weeks full time course to become a Dental Hygienist. The number of dental hygienists who completed training in 1978 was 6.

TABLE 2.8: AUSTRALIAN SCHOOL DENTAL SERVICE -  
DENTAL THERAPISTS EMPLOYED.

| YEAR | NSW | VIC | QLD | SA  | WA  | TAS | N.T. | A.C.T. | TOTAL |
|------|-----|-----|-----|-----|-----|-----|------|--------|-------|
| 1973 | 9   | -   | -   | 54  | 9   | 34  | 1    | 13     | 120   |
| 74   | 10  | -   | -   | 66  | 23  | 34  | 3    | 15     | 151   |
| 75   | 15  | 4   | 3   | 72  | 36  | 34  | 7    | 21     | 192   |
| 76   | 27  | 13  | 31  | 112 | 69  | 52  | 16   | 21     | 341   |
| 77   | 89  | 17  | 54  | 137 | 119 | 63  | 16   | 20     | 515   |

Source: Department of Health, Annual Report 1973-1977.

## SOUTH AUSTRALIA

### Department of Further Education - School of Paradental Studies

Dental Hygienist Certificate Course commenced 1975. The length of the course was one year. The number of dental hygienists completed training in 1978 was 7.

The total number of dental hygienists in Australia in December 1978 was:

43 in Armed Forces  
4 in State, Territories  
28 in Private Practice  
75.

#### 2.2.2.3 Dental Assistant<sup>25</sup>

The national Dental Assistants Association conducts annual examinations in all States for their National Certificate.

In N.S.W., Queensland and South Australia Post Certificate in Dental Radiography is available. Practically all States and Territories, as well as Armed Services offer Dental Assistant Training course, correspondence or lectures/practical, full time/part time, conducted by Technical Colleges, Dental Hospitals (Melbourne, Perth), A.D.A. (Victoria), A.D.A. and the Dental Assistants Association (Tasmania).

In 1978 742 dental assistants were trained. 119 with radiography certificate (D.A.A. Certificate was given to 607 dental assistants and 119 with radiography certificate). In 1978: 1,653 worked in Government Services, 6,500 estimated in private practice, 68 in other institutions).

#### 2.2.2.4 Dental Technicians<sup>25</sup>

In N.S.W. apprenticeship - scheme was discontinued in April 1978, while in other States apprenticeship as well as courses are available, through Technical Colleges or Armed Forces Dental Corps.

The number trained in 1978 was estimated to be 138.

### 2.3 TYPES OF SERVICES

There is no uniform or standardized reporting of the type of services or treatments provided for the community, among the hospitals or States.

Since there are no national figures on individual dental health services provided in Australia, comparative figures can be derived from the report by the Northern Territory Health in 1977-1978; for general service (Table 2.9) and school dental service (Table 2.10).

Total population treated by General Service and School Service were 66.101 persons.

Assuming average number of visits = 2.0/person/year, it was  $(66.101:2)/106.000 \times 100\% = 31.2\%$  of population had attended in 1977-1978 (Sydney Metropolitan Area, 1972 in Community Dental Health Survey:

All age groups: 50% had attended.

Average number of visits = 2.5).

Most of the services provided were restorative and minor surgery (extraction) for general services, while for school services it was preventive and restorative.

## Northern Territory health

TABLE 2.9. DENTAL HEALTH SERVICES PROVIDED IN THE NORTHERN TERRITORY—SCHOOL SERVICE—1977-78

(Number)

|                                  | <i>Northern Region</i> | <i>East Arnhem<br/>Region</i> | <i>Southern Region</i> | <i>Total<br/>Northern Territory</i> |
|----------------------------------|------------------------|-------------------------------|------------------------|-------------------------------------|
| Initial—                         |                        |                               |                        |                                     |
| Examinations (a) . . . . .       | 3 632                  | 886                           | 1 573                  | 6 091                               |
| Completions (b) . . . . .        | 3 094                  | 624                           | 1 375                  | 5 093                               |
| Revision—                        |                        |                               |                        |                                     |
| Examinations (c) . . . . .       | 1 392                  | 761                           | 1 514                  | 3 667                               |
| Completions (d) . . . . .        | 1 226                  | 759                           | 1 463                  | 3 448                               |
| Preventive—                      |                        |                               |                        |                                     |
| Patients—Plaque control. . . . . | 5 845                  | 1 457                         | 3 293                  | 10 595                              |
| Topical fluoride . . . . .       | 4 165                  | 546                           | 2 183                  | 6 894                               |
| Restorative—                     |                        |                               |                        |                                     |
| Deciduous treatments . . . . .   | 4 406                  | 663                           | 2 741                  | 7 810                               |
| Permanent treatments . . . . .   | 3 566                  | 861                           | 2 586                  | 7 013                               |
| Extractions—                     |                        |                               |                        |                                     |
| Deciduous . . . . .              | 1 230                  | 181                           | 593                    | 2 004                               |
| Permanent . . . . .              | 69                     | 1                             | 17                     | 87                                  |
| Patients treated—                |                        |                               |                        |                                     |
| Aboriginal . . . . .             | 390                    | 272                           | 211                    | 873                                 |
| Non-Aboriginal . . . . .         | 4 634                  | 1 375                         | 2 876                  | 8 885                               |

- (a) The first examination a child receives in the school dental health service.  
 (b) Completion of the course of treatment arising from initial examination.  
 (c) All examinations subsequent to initial examination.  
 (d) Completion of course of treatment found necessary as a result of revision examination.

Northern Territory health

TABLE 2.10 DENTAL HEALTH SERVICES PROVIDED IN THE NORTHERN TERRITORY—GENERAL SERVICE—1977-78

|                                  | Northern Region |        | East Arnhem Region |        | Southern Region |        | Total Northern Territory |        |
|----------------------------------|-----------------|--------|--------------------|--------|-----------------|--------|--------------------------|--------|
|                                  | Clinic          | Mobile | Clinic             | Mobile | Clinic          | Mobile | Clinic                   | Mobile |
| Consultations                    |                 |        |                    |        |                 |        |                          |        |
| Referred patients . . . . .      | 665             | 4      | 85                 | —      | 236             | —      | 986                      | 4      |
| Examinations                     |                 |        |                    |        |                 |        |                          |        |
| Number of patients. . . . .      | 4 449           | 2 314  | 2 059              | 904    | 1 654           | 187    | 8 162                    | 3 405  |
| General anaesthetics             |                 |        |                    |        |                 |        |                          |        |
| Number of operations. . . . .    | 93              | —      | 14                 | —      | 34              | —      | 141                      | —      |
| Major oral surgery               |                 |        |                    |        |                 |        |                          |        |
| Number of patients. . . . .      | 298             | 30     | 77                 | 8      | 84              | —      | 459                      | 38     |
| Minor oral surgery               |                 |        |                    |        |                 |        |                          |        |
| Number of patients. . . . .      | 3 572           | 506    | 794                | 435    | 1 253           | 6      | 5 619                    | 947    |
| Orthodontic                      |                 |        |                    |        |                 |        |                          |        |
| Number of—Patients . . . . .     | 573             | 4      | 20                 | —      | 104             | —      | 697                      | 4      |
| Treatments. . . . .              | 1 963           | 7      | 63                 | —      | 346             | —      | 2 372                    | 7      |
| Preventive                       |                 |        |                    |        |                 |        |                          |        |
| Number of patients. . . . .      | 590             | 258    | 39                 | 1      | 56              | —      | 685                      | 259    |
| Prosthetic                       |                 |        |                    |        |                 |        |                          |        |
| Number of prostheses . . . . .   | 1 638           | 89     | 478                | 29     | 554             | —      | 2 670                    | 118    |
| Restorative                      |                 |        |                    |        |                 |        |                          |        |
| Number of treatments . . . . .   | 14 580          | 3 292  | 5 046              | 395    | 3 378           | 63     | 23 004                   | 3 750  |
| Miscellaneous                    |                 |        |                    |        |                 |        |                          |        |
| Number of treatments . . . . .   | 5 254           | 497    | 905                | 98     | 950             | —      | 7 109                    | 595    |
| Patients treated—                |                 |        |                    |        |                 |        |                          |        |
| Aboriginal adults—               |                 |        |                    |        |                 |        |                          |        |
| Paying . . . . .                 | 34              | 79     | 64                 | 11     | 15              | 5      | 113                      | 95     |
| Exempt . . . . .                 | 374             | 510    | 279                | 614    | 247             | 128    | 900                      | 1 252  |
| Non-Aboriginal adults—           |                 |        |                    |        |                 |        |                          |        |
| Paying . . . . .                 | 16 458          | 527    | 5 880              | 61     | 7 105           | 23     | 29 443                   | 611    |
| Exempt . . . . .                 | 2 024           | 82     | 104                | 73     | 678             | 2      | 2 806                    | 157    |
| Children—                        |                 |        |                    |        |                 |        |                          |        |
| Aboriginal . . . . .             | 69              | 971    | 169                | 356    | 104             | 33     | 342                      | 1 360  |
| Non-Aboriginal . . . . .         | 11 062          | 392    | 4 319              | 93     | 3 416           | 2      | 18 797                   | 487    |
| Total patients treated . . . . . | 30 021          | 2 561  | 10 815             | 1 208  | 11 565          | 193    | 52 401                   | 3 962  |

Note: Northern Region Clinics (Darwin, Nightcliff, Katherine); East Arnhem Region Clinics (Gove, Alyangula); Southern Region Clinics (Alice Springs, Tennant Creek); Mobile services by road and air.

From the two tables, it is obvious that the preventive dentistry is more widely applied and practiced in school service.

The pattern of types of services provided to the community by private practice does not differ very much although preventive dentistry is widely accepted at present. From the analysis of the proportion of time spent by dentists on various dental procedures in N.S.W. it was found out that: (WHO study)<sup>11</sup>

|     |                                 |                 |                |
|-----|---------------------------------|-----------------|----------------|
| 56% | for operative dentistry         | in metropolitan | (47% in rural) |
| 5%  | for endodontic                  | " " "           | ( 4% " " )     |
| 16% | for prosthetic                  | " " "           | (25% " " )     |
| 9%  | for extraction and oral surgery | "               | (12% " " )     |
| 4%  | for Health Education            | "               | ( 3% " " )     |
| 5%  | for periodontics                | "               | ( 4% " " )     |
| 3%  | for orthodontics                | "               | ( 2% " " )     |

### Community Dentistry

Beside water fluoridation, which was introduced first in 1956, and made progress steadily since then, Dental Health Education is certainly second in importance in Community Dentistry. In N.S.W. there are several dental health educators, employed by hospitals, School Dental Service to provide D.H.E. to school children. However there was no national body which coordinates and sets up the guide-lines to implement D.H.E. in the community at large.

### Research

Dental research is mostly carried out by:

- Universities
- Institute of Dental Research
- The National Biological Standards Laboratory

- Commonwealth Bureau of Dental Standards, Melbourne.
- Some State Dental Services.

Finance for dental research comes from:

- National Health and Medical Research Council
- University Research Grants
- Australian and overseas Governments
- Commercial sources.

#### 2.4 HEALTH AND DENTAL EXPENDITURE

Under the National Health Act of 1953-1979 the Australian population are covered with:<sup>32</sup>

##### National Health Benefits (1979)

It is designed to provide all residents with a basic level of coverage against the costs of medical and hospital treatment. Individuals are free to choose additional coverage from private insurers.

##### Medical Benefits

In 1978 a new concept of bulk-billing for disadvantaged patients was introduced whereby the Government pays 75% of the Schedule fee for services rendered (provided the patients are not insured privately), and this scheme is not available for other persons.

##### Hospital Benefits (1979)

The present system is standard hospital coverage, by which everyone without private insurance for hospital benefits is entitled to free standard ward accommodation in recognized hospitals with treatment by hospital doctors (except in Queensland, those with private insurance for hospital benefits are also eligible for free standard ward coverage if they so choose).

Public hospitals are provided and maintained by State Governments with funds from Commonwealth Governments aid, public subscriptions, legacies and fees.

#### Pharmaceutical Benefits (1979)

All persons receiving treatment from a medical practitioner /dentists registered in Australia are eligible for benefits on a comprehensive range of drugs and medicines when supplied by an approved pharmacist upon presentation of a prescription or by an approved private hospital when that person is hospitalized. Special arrangements exist for remote/isolated areas.

At present patient's contribution, except eligible pensioners and their dependants, is \$2.75 for each benefit prescribed. The total cost of prescriptions for eligible pensioners and their dependants is paid by Commonwealth Government.

From March 1973 administration and control of these benefits were transferred to the Department of Social Security. Under the National Health Act, patients can recover up to 85% of total costs of medical care and hospitalization.

Other benefits and services provided and its related costs are shown in Table 2.11.

Total health expenditure was 7.7% of Gross Domestic Product in 1976-1977, 7.8% in 1977-1978 and 7.6% in 1978-1979. Private sources was 33.5%, 37.1% and 36.0% of total health expenditure in those respective years.<sup>25</sup>

Total dental expenditure was 0.35% of Gross Domestic Product in 1976-1977, and 0.37% in 1977-1978.

Total private sources was 78.5% and 78.4% of total dental health expenditure in those respective years.<sup>25</sup> (Table 2.12)

Expenditure on health

TABLE 2.11. DEPARTMENTAL EXPENDITURE—NATIONAL WELFARE FUND ACT 1973-74 TO 1977-78  
Note: Figures shown in italics are included for comparison only, and have not been added into totals.  
See footnote(a).

| (\$'000)                                         |         |         |           |         |             |
|--------------------------------------------------|---------|---------|-----------|---------|-------------|
| <i>National Welfare Fund Act</i>                 | 1973-74 | 1974-75 | 1975-76   | 1976-77 | 1977-78     |
| National Health Act—                             |         |         |           |         |             |
| Medical benefits                                 | 163 449 | 195 818 | 80 744    | 1 741   | 180         |
| Medical services for pensioners                  | 35 417  | 47 800  | 5 344     | —       | —           |
| Hospital benefits                                | 89 488  | 116 150 | 103 165   | 31 102  | 2 949       |
| Payments to public hospitals for pensioners      | 24 295  | 25 187  | 7 196     | 21      | —           |
| Nursing home benefits                            | 86 741  | 87 333  | 75 461    | 72 829  | (c) 185 558 |
| Additional nursing home care benefits (b)        | 25 999  | 64 157  | 68 309    | 91 495  | —           |
| Domiciliary care benefit                         | 6 309   | 7 112   | 7 697     | 8 089   | 7 929       |
| Pharmaceutical benefits                          | 151 493 | 181 643 | 176 509   | 119 701 | 128 136     |
| Pharmaceutical benefits for pensioners           | 66 803  | 80 699  | 107 334   | 115 202 | 127 912     |
| Milk for school children                         | 8 079   | 47      | 8         | —       | —           |
| Tuberculosis medical services and allowances (d) | 12 083  | 14 293  | 11 909    | 6 721   | 3 190       |
| Aids and appliances                              | —       | —       | 3 501     | 4 826   | 3 768       |
| Pathology laboratories                           | —       | —       | (e) 7 655 | 7 352   | 8 668       |
| Home nursing services                            | —       | —       | 7 200     | 9 360   | 10 700      |
| Miscellaneous                                    | 12 408  | 17 783  | 6 168     | 5 945   | 5 297       |
| Other Acts—                                      |         |         |           |         |             |
| Payments under the Nursing Home Assistance Act—  |         |         |           |         |             |
| Deficit financing of eligible organisations      | —       | 10 103  | 51 904    | 70 081  | 68 612      |
| Total                                            | 250 866 | 294 465 | 320 284   | 544 465 | 552 899     |

- (a) Control of these items was transferred to the Department of Social Security from 1 March 1973. Expenditure for the whole of 1972-73 is excluded. From 1 July 1976 these items came under the control of this Department. The figures that appear in italics have been included for comparison only and have not been added into totals.
- (b) Prior to 1 October 1976 this Commonwealth benefit was payable only in respect of pensioners eligible for pensioner health benefits and who were accommodated in approved nursing homes. An equivalent amount of private insurance benefit was also payable in respect of persons in approved nursing homes insured with a registered private hospital benefits organisation. With the introduction of the Health Insurance Levy on 1 October 1976 the Commonwealth benefit became payable in respect of all persons in approved nursing homes covered by Standard Medibank. The equivalent amount of private insurance benefit continues to be payable in respect of persons in approved nursing homes insured with both a registered private hospital benefits organisation and a registered private medical benefits organisation.
- (c) From 1 October 1977 Nursing home benefits and Additional nursing home benefits were combined into one appropriation item i.e. Nursing home benefits (including Supplementary benefits).
- (d) Includes allowances paid through the Department of Social Security—see Tables 68 and 69.
- (e) Prior to 1975-76 expenditure for these items included under Miscellaneous.

2.12. HEALTH AND DENTAL EXPENDITUREAUSTRALIA 1976-1977 to 1978-1979

|                           | <u>\$'000 Australian</u> |                    |                    |
|---------------------------|--------------------------|--------------------|--------------------|
|                           | <u>1976 - 1977</u>       | <u>1977 - 1978</u> | <u>1978 - 1979</u> |
| <u>Health Expenditure</u> |                          |                    |                    |
| Commonwealth Government   | 2,752,000                | 2,682,000          | 2,891,000          |
| State & Local Government  | 1,527,000                | 1,756,000          | 2,022,000          |
| Total Government          | 4,279,000                | 4,438,000          | 4,913,000          |
| Private Sources           | 2,154,000                | 2,616,000          | 2,768,000          |
| Total                     | 6,433,000*               | 7,054,000*         | 7,681,000*         |

\* Percent of Gross Domestic Product: 7.7 % ; 7.8% ; 7.6 %

|                                                                                        | <u>\$'000 Australian</u> |                    |                    |
|----------------------------------------------------------------------------------------|--------------------------|--------------------|--------------------|
|                                                                                        | <u>1976 - 1977</u>       | <u>1977 - 1978</u> | <u>1978 - 1979</u> |
| <u>Dental Expenditure</u>                                                              |                          |                    |                    |
| Commonwealth (excluding<br>Veterans Affairs and grants<br>to States: includes ACT, NT) | 11,540                   | 12,980             |                    |
| State and Local Government                                                             | 49,740                   | 58,870             |                    |
| Total Government                                                                       | 61,280                   | 71,850             |                    |
| Other Clinics                                                                          | 2,800                    | 3,625              |                    |
| Private Practice                                                                       | 221,300                  | 256,490            |                    |
| Total Private Sources                                                                  | 224,100                  | 260,115            |                    |
| Total                                                                                  | 285,380                  | 331,965            |                    |
|                                                                                        | 4.4:0.35%                | 4.6:0.37%          |                    |

\* Per cent of Health Expenditure: and Gross Domestic Product  
Source: Health Expenditure - Australian Bureau of Statistics

Public Finance and Taxation Section September 1980

Dental Expenditure - Estimates by P. D. Barnard

Australian Government expenditure increased when the Dental Health Services Branch was created within the National Health Division, with its major function to implement the School Dental Service Scheme. Initially the Federal Government contributed 100% approved capital and operational costs of training facilities for dental therapists, 100% approved capital costs of school dental clinics and 75% of approved operational costs of the field service. From 1 July 1976 Federal Government contributed 90% of capital and recurrent costs of training school as well as capital costs of school dental clinics, and only 65% of the recurrent costs of school dental clinics. The total Commonwealth payments to States in 1974-1978 period are shown in Table 2.13.<sup>1</sup>

Since 1976, there were no major payments for capital costs of training facilities for dental therapists, because by that time most of the training facilities had been completed (in 1974-1975: 10 schools in operation, in Feb. 1976 four more to be completed, see section 2.2 Manpower).

## Dental health

TABLE 2.13. AUSTRALIAN SCHOOL DENTAL SCHEME—COMMONWEALTH PAYMENTS TO STATES—1974-75 TO 1977-78

(\$'000)

|                   | N.S.W. | Vic.  | Qld   | S.A.  | W.A.  | Tas.  | Total  |
|-------------------|--------|-------|-------|-------|-------|-------|--------|
| Training schools— |        |       |       |       |       |       |        |
| Capital           |        |       |       |       |       |       |        |
| 1974-75           | 2 788  | 3 038 | 1 982 | 1 454 | 1 065 | 1     | 10 328 |
| 1975-76           | 1 586  | 1 698 | 3 541 | 271   | 598   | 5     | 7 699  |
| 1976-77           | 598    | —     | 31    | 1     | 7     | 45    | 682    |
| 1977-78           | —      | —     | —     | —     | 44    | —     | 44     |
| Recurrent         |        |       |       |       |       |       |        |
| 1974-75           | 306    | 58    | 181   | 733   | 332   | 461   | 2 071  |
| 1975-76           | 785    | 277   | 559   | 1 051 | 1 104 | 642   | 4 418  |
| 1976-77           | 2 054  | 814   | 1 002 | 1 368 | 1 049 | 561   | 6 848  |
| 1977-78           | 1 022  | 1 260 | 1 239 | 1 068 | 1 123 | 351   | 6 063  |
| Field service—    |        |       |       |       |       |       |        |
| Capital           |        |       |       |       |       |       |        |
| 1974-75           | 426    | 143   | 370   | 793   | 244   | 68    | 2 044  |
| 1975-76           | 530    | 346   | 1 758 | 553   | 2 257 | 312   | 5 756  |
| 1976-77           | 1 593  | 1 711 | 1 865 | 829   | 927   | 87    | 7 012  |
| 1977-78           | 1 069  | 1 740 | 2 840 | 1 658 | 787   | 127   | 8 221  |
| Recurrent         |        |       |       |       |       |       |        |
| 1974-75           | 673    | 858   | 448   | 967   | 426   | 778   | 4 150  |
| 1975-76           | 1 061  | 1 074 | 439   | 1 498 | 1 166 | 905   | 6 143  |
| 1976-77           | 1 535  | 1 077 | 1 023 | 1 731 | 1 605 | 914   | 7 885  |
| 1977-78           | 1 890  | 861   | 788   | 2 618 | 1 894 | 1 334 | 9 385  |

Source: Dept. of Health, Annual Report 1977-1978.

### 3. POPULATION

#### 3.1 DEMOGRAPHY AND HEALTH INDICATORS<sup>32</sup>

The Aboriginal population is believed to be at least 300,000 when the first Europeans settled in Australia. Over the next 150 years the Aboriginal population declined drastically so that by 1933 it is estimated to have totalled about 67,000. Since then it has risen to about 116,000 in 1971, and the current rate of growth exceeds 2% a year. The growth of Australian population in over 200 years is as follows:

1858 : the first 1,000,000  
 1918 : 5,000,000  
 1977 : 14,000,000  
 2000 : projected at 18,000,000.

From 1861 natural increase has been the major element in population growth and immigration the most variable (Table 3.1). During 1861-1890 period: total growth exceeds 3% a year on average, natural increase 2%.

1901-1910 period: natural increase declined and negligible immigration reduced the rate of growth to 1.63% (3.70% in 1861-1890 period).

1910-1920 period: immigration resumed and the births rose during and post 1914-1918 war period.

1930s (depression years): the lowest level of natural increase ever; in some years overseas departures exceeded arrivals.

1939-1945 period: the increased number of marriages and births, however migration was negligible.

Table 3.1. POPULATION AND COMPONENTS OF GROWTH • Dec. 1978.

| Period    | Population at<br>end of period<br>( '000) (a) | Average annual rate of growth (b)<br>(per cent) |                      |          |
|-----------|-----------------------------------------------|-------------------------------------------------|----------------------|----------|
|           |                                               | Natural<br>increase                             | Net<br>migration (c) | Total    |
| 1851-1860 | 1,145.6                                       |                                                 |                      |          |
| 1861-1870 | 1,647.8                                       | 2.47                                            | 1.23                 | 3.70     |
| 1871-1880 | 2,231.5                                       | 2.07                                            | 1.01                 | 3.08     |
| 1881-1890 | 3,151.4                                       | 2.05                                            | 1.46                 | 3.51     |
| 1891-1900 | 3,765.3                                       | 1.73                                            | 0.07                 | 1.80     |
| 1901-1910 | 4,425.1                                       | 1.53                                            | 0.10                 | 1.63     |
| 1911-1920 | 5,411.3                                       | 1.60                                            | 0.43                 | 2.03     |
| 1921-1930 | 6,500.8                                       | 1.32                                            | 0.53                 | 1.85     |
| 1931-1940 | 7,077.6                                       | 0.79                                            | 0.05                 | 0.85     |
| 1941-1950 | 8,307.5                                       | 1.13                                            | 0.47                 | 1.61     |
| 1951-1955 | 9,311.8                                       | 1.38                                            | 0.95                 | 2.31     |
| 1956-1960 | 10,391.9                                      | 1.40                                            | 0.83                 | 2.22     |
| 1961-1965 | 11,505.4                                      | 1.27                                            | 0.74                 | 1.98     |
| 1966-1970 | 12,663.5                                      | 1.11                                            | 0.91                 | 1.94 202 |
| 1971-1975 | (d) 13,849.3                                  | 1.08                                            | 0.49                 | 1.59     |
| 1971      | (d) 13,070.0                                  | 1.29                                            | 0.81                 | 2.11     |
| 1972      | (d) 13,283.9                                  | 1.19                                            | 0.43                 | 1.64     |
| 1973      | (d) 13,490.6                                  | 1.03                                            | 0.51                 | 1.56     |
| 1974      | (d) 13,709.5                                  | 0.96                                            | 0.65                 | 1.62     |
| 1975      | (d) 13,849.3                                  | 0.90                                            | 0.10                 | 1.02     |
| 1976      | (d) 13,991.2                                  | 0.83                                            | 0.18                 | 1.02     |
| 1977      | (d) 14,163.5                                  | 0.84                                            | 0.39                 | 1.23     |

(a) Excludes full-blood Aborigines prior to 1961. (b) The average annual rates of population growth for periods greater than one year are calculated on the compound interest principle. The rates refer to the population at the beginning of the period. Discrepancies between the sum of the rate of growth due to natural increase and net migration and the rate of total growth are due to intercensal adjustment. (c) From 30 June 1971, net migration is defined as the excess of overseas arrivals over overseas departures classified as permanent and long term movement. (Long term includes visits to and absences from Australia lasting one year or longer.) From 30 June 1933 to 30 June 1971, net migration represents the excess of all arrivals over all departures. Prior to 30 June 1933, net migration includes discrepancies disclosed by the various censuses, which were corrected by adjusting recorded overseas departures. (d) These population estimates and rates of growth incorporate revisions resulting from an examination of evidence of under-enumeration in the 1976 and 1971 censuses. The estimated population at 31 December 1970 used to compute rates of growth thereafter was 12,799,600.

1947-1961 period: the continued high natural increase (baby boom) and a marked increase of immigration, especially 1949-1952 period, resulting in very high net gains.

1961-1970 period: crude birth rate and natural increase rate declined, but immigration continued as in the previous decade.

1971-now: birth rate is low and together with lower level of immigration reduces the rate of natural increase.

(Fig.3, Fig.4, Fig.5).

By using certain assumptions, the projected Australian population to year 2011 is shown in Table 3.2 and 3.3.

The assumptions used in the projections are:

1. Fertility

- Births will stabilize by about 1981 at a level somewhat lower than that experienced by recent generations of women.
- Proportion of women with one child who will have a second child will remain more or less the same.
- The falling off in fertility rates among women who have 3 or more children will continue until 1984. Constant rates are assumed thereafter.

2. Mortality

- Age specific mortality of 1975-1976 will apply for the duration of the projection except that infant mortality is assumed to continue to decline.
- The annual rate of improvement would decline by about 1% per year bringing the infant mortality rate to 7.7 for males and 6.0 for females by 2011.

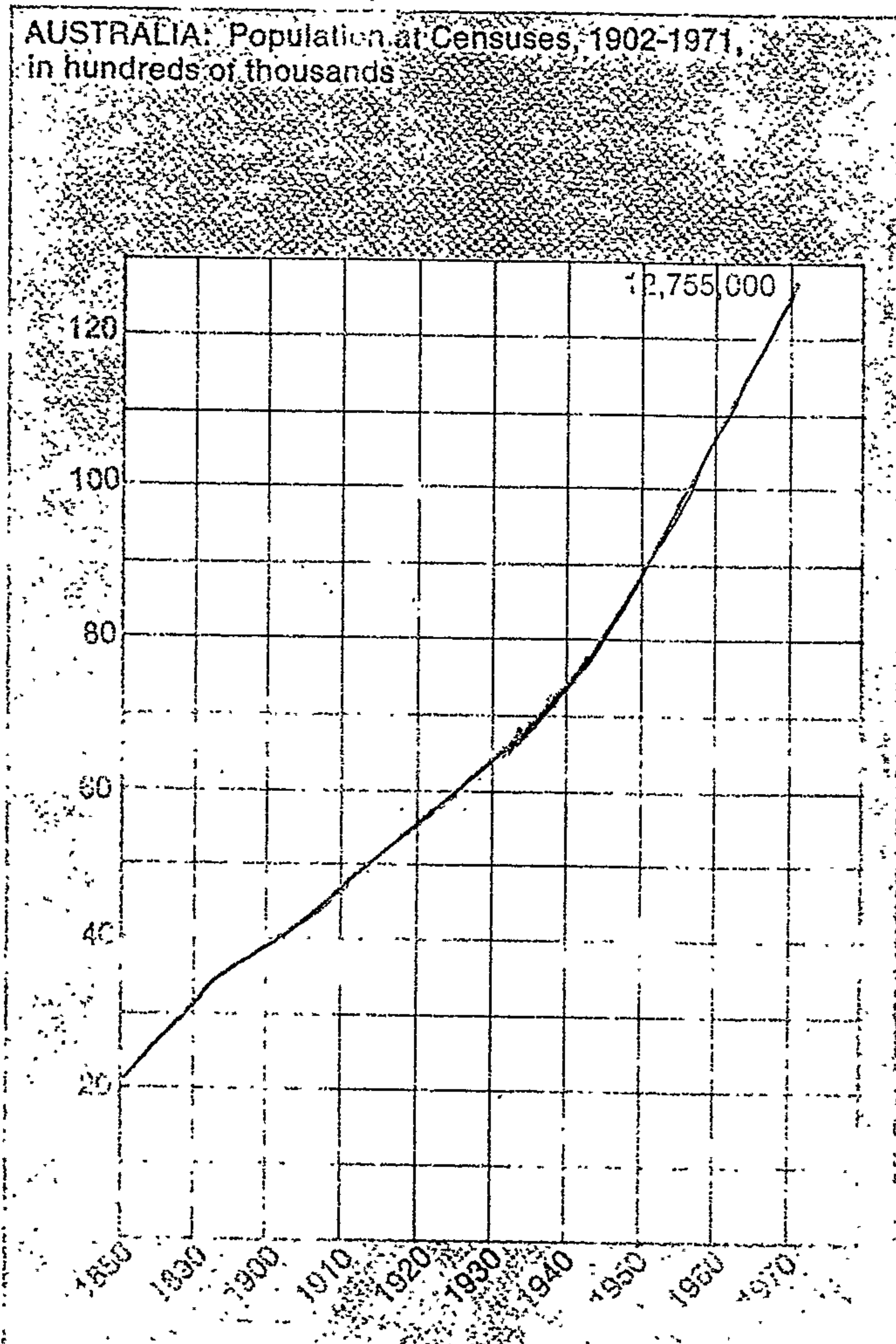


Fig.3. Population Trend..

Source: Coppell.W.G. Australia in  
figures.

Fig. 4. ANNUAL POPULATION INCREASE 1946-47 to 1975-76

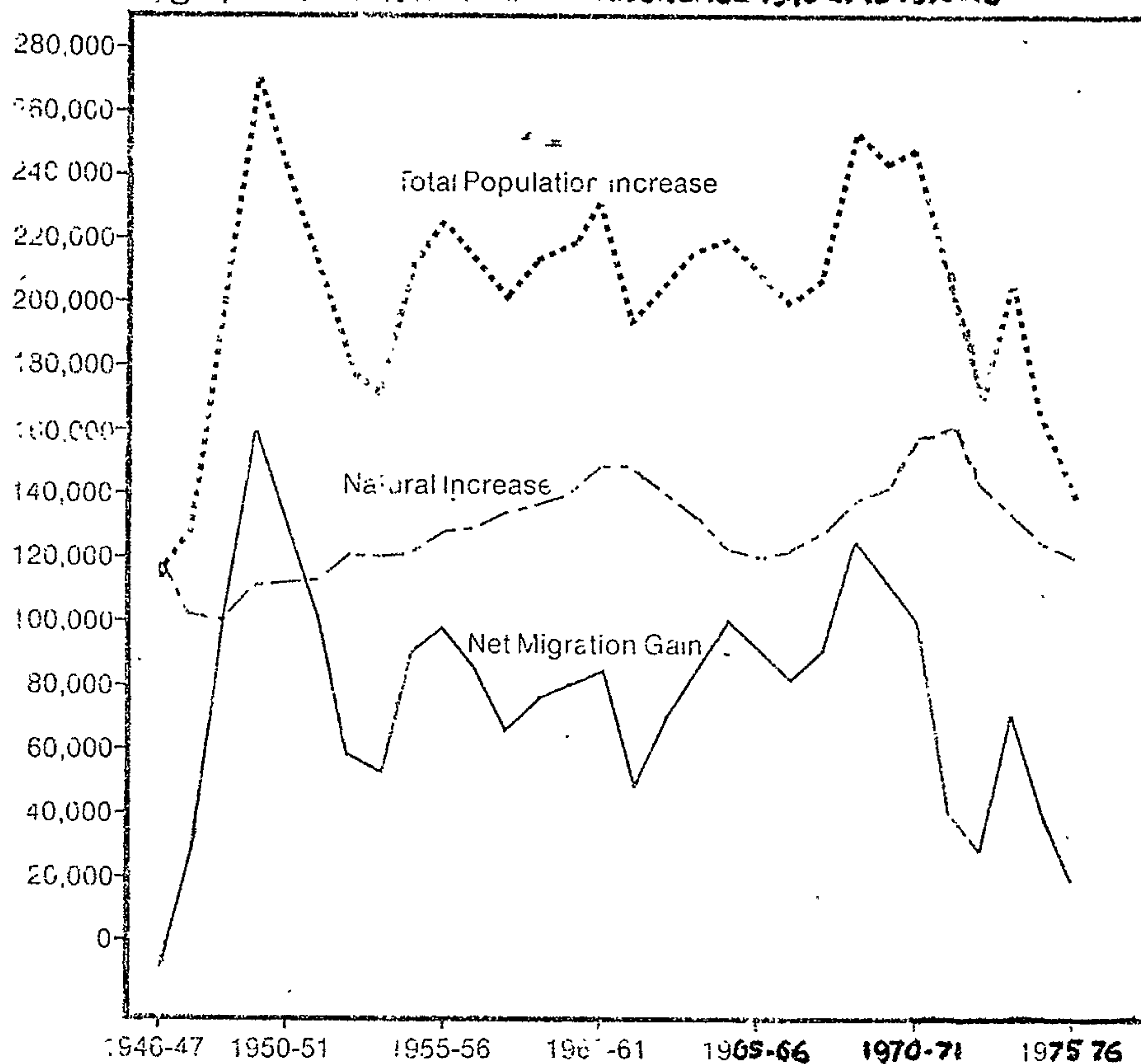
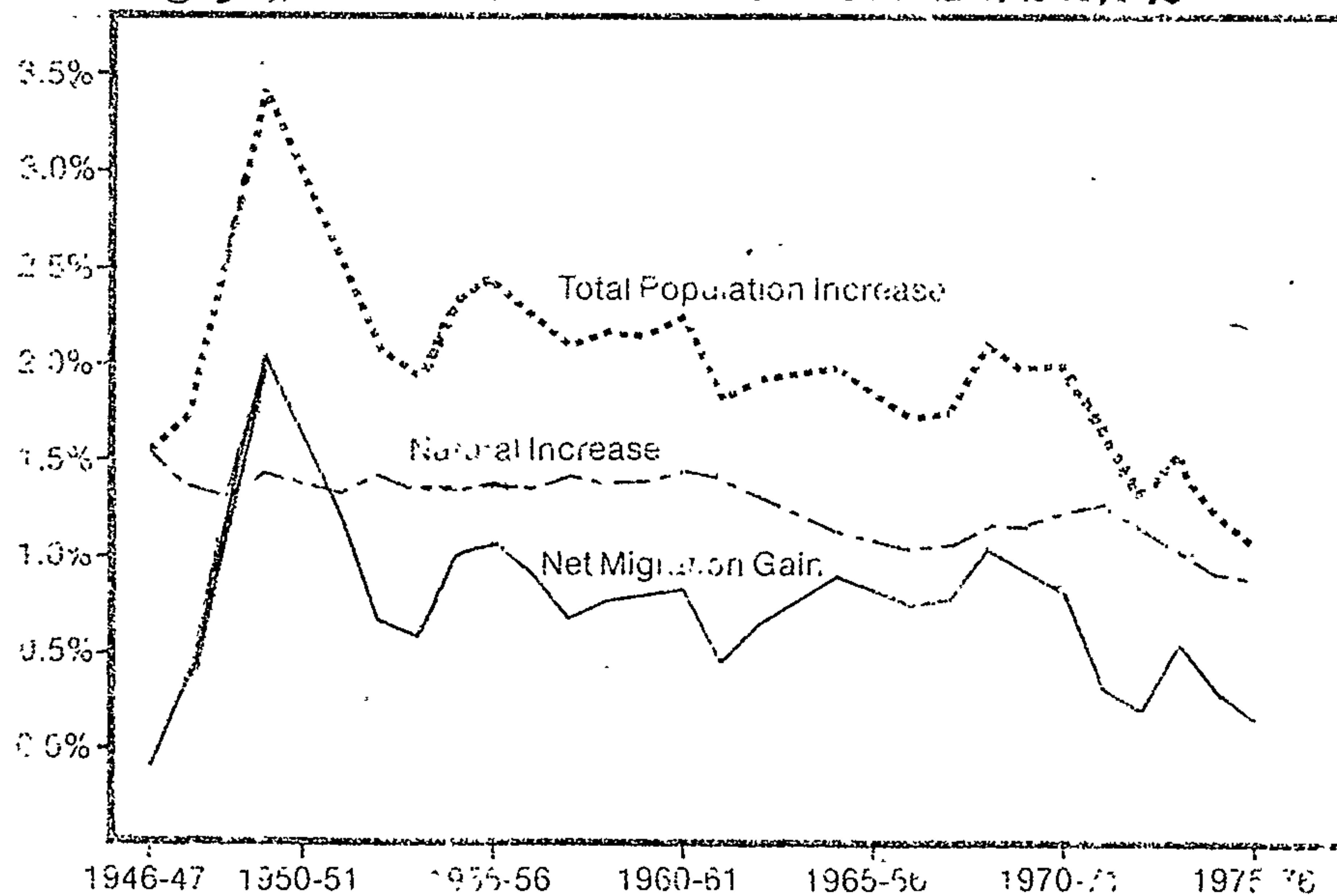


Fig. 5. RATES OF POPULATION INCREASE 1946-47 to 1975-76



Source: Australian Population and Immigration Council.

Table 3.2. PROJECTED POPULATION OF AUSTRALIA: 1978 TO 2011

| 30 June— | Excluding migration after 30 June 1978 | Resulting from net immigration at the illustrative level of 50,000 persons a year after 30 June 1978 | Including net immigration at the illustrative level of 50,000 persons a year after 30 June 1978 |
|----------|----------------------------------------|------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
|          | '000                                   | '000                                                                                                 | '000                                                                                            |
| 1978p    | 14,259.0                               | ..                                                                                                   | 14,259.0                                                                                        |
| 1979     | 14,359.0                               | 50.6                                                                                                 | 14,410.5                                                                                        |
| 1980     | 14,460.8                               | 102.4                                                                                                | 14,563.1                                                                                        |
| 1981     | 14,564.9                               | 155.4                                                                                                | 14,720.3                                                                                        |
| 1986     | 15,154.7                               | 440.9                                                                                                | 15,595.6                                                                                        |
| 1991     | 15,734.6                               | 753.2                                                                                                | 16,487.8                                                                                        |
| 1996     | 16,262.4                               | 1,085.0                                                                                              | 17,347.4                                                                                        |
| 2001     | 16,705.2                               | 1,436.0                                                                                              | 18,141.3                                                                                        |
| 2006     | 17,058.1                               | 1,809.2                                                                                              | 18,867.3                                                                                        |
| 2011     | 17,375.4                               | 2,205.3                                                                                              | 19,580.7                                                                                        |

Table 3.3. PROJECTED AVERAGE ANNUAL RATES OF GROWTH (a), AUSTRALIA 1978 TO 2011  
(per cent)

|           | Excluding migration after 30 June 1978 |        |                | Including net immigration at the illustrative level of 50,000 persons a year after 30 June 1978 |        |                  |                 |                |
|-----------|----------------------------------------|--------|----------------|-------------------------------------------------------------------------------------------------|--------|------------------|-----------------|----------------|
|           | Births                                 | Deaths | Rate of growth | Births                                                                                          | Deaths | Natural increase | Net immigration | Rate of growth |
| 1978-81   | 1.55                                   | 0.84   | 0.71           | 1.56                                                                                            | 0.84   | 0.72             | 0.35            | 1.07           |
| 1981-86   | 1.68                                   | 0.88   | 0.80           | 1.70                                                                                            | 0.87   | 0.83             | 0.33            | 1.16           |
| 1986-91   | 1.67                                   | 0.92   | 0.75           | 1.70                                                                                            | 0.90   | 0.80             | 0.31            | 1.12           |
| 1991-96   | 1.62                                   | 0.96   | 0.66           | 1.65                                                                                            | 0.92   | 0.72             | 0.30            | 1.02           |
| 1996-2001 | 1.53                                   | 0.99   | 0.54           | 1.56                                                                                            | 0.95   | 0.61             | 0.28            | 0.90           |
| 2001-06   | 1.44                                   | 1.02   | 0.42           | 1.49                                                                                            | 0.97   | 0.51             | 0.27            | 0.79           |
| 2006-11   | 1.42                                   | 1.06   | 0.37           | 1.48                                                                                            | 1.00   | 0.48             | 0.26            | 0.74           |

(a) Calculated using the compound interest principle. The rates are split between the components of natural increase and net migration according to the relative size of each component.

Source: Year Book Australia 1979.

### 3. Migration

- Net immigration has been projected at the level of 50,000 per year.
- The age-sex composition is based on the pattern of permanent arrivals and departures in the 5 years 1972 to 1977.

Between 1951 and 1976 the Australian population grew from 8.3 million to 13.6 million, an increase of 5.3 million (64%).

Other projections of the Australian population were presented by Australian Population and Immigration Council<sup>3</sup> in its Green Paper, as shown in Table 3.4.

The assumptions used in the projections are:<sup>3</sup>

1. Around 1975-1976 fertility would decline to a level which yielded a net reproduction rate (N.R.R.) of replacement level or unity.
2. A gross intake of around 100,000 migrants would be required to achieve a net migration gain of 50,000 and 170,000 to 200,000 migrants would be needed to achieve a net migration gain of 100,000.

The most populated state is New South Wales (35.17%) and the least populated is Northern Territory (0.79%) (Table 3.5). However A.C.T. certainly has the highest population density (approximately 90 person/km<sup>2</sup>) and N.T. again has the lowest density (0.08 person/km<sup>2</sup>) (Table 3.6).

From the profile of population pyramid, Australia has the same characteristics of modern industrial country (Fig. 6). Table 3.7 illustrates the gradual change of age distribution in the Australian population between 1911 and 1977.

Table 3.4. Projected total population and growth rates  
1973-2001  
NRR = 1 from 1975-76

|                                           |         | With zero<br>net<br>migration p.a. | With net<br>migration<br>50 000 p.a. | With net<br>migration<br>100 000 p.a. |
|-------------------------------------------|---------|------------------------------------|--------------------------------------|---------------------------------------|
| Total<br>populations<br>(in<br>thousands) | 1973.   | 13 132                             | 13 132                               | 13 132                                |
|                                           | 1981    | 13 976                             | 14 406                               | 14 837                                |
|                                           | 1991    | 15 019                             | 16 063                               | 17 106                                |
|                                           | 2001    | 15 878                             | 17 612                               | 19 346                                |
| Annual<br>growth<br>rate<br>(per cent)    | 1973-74 | 0.90                               | 1.28                                 | 1.66                                  |
|                                           | 1981-82 | 0.76                               | 1.13                                 | 1.49                                  |
|                                           | 1991-92 | 0.65                               | 1.01                                 | 1.32                                  |
|                                           | 2001-02 | 0.44                               | 0.80                                 | 1.10                                  |

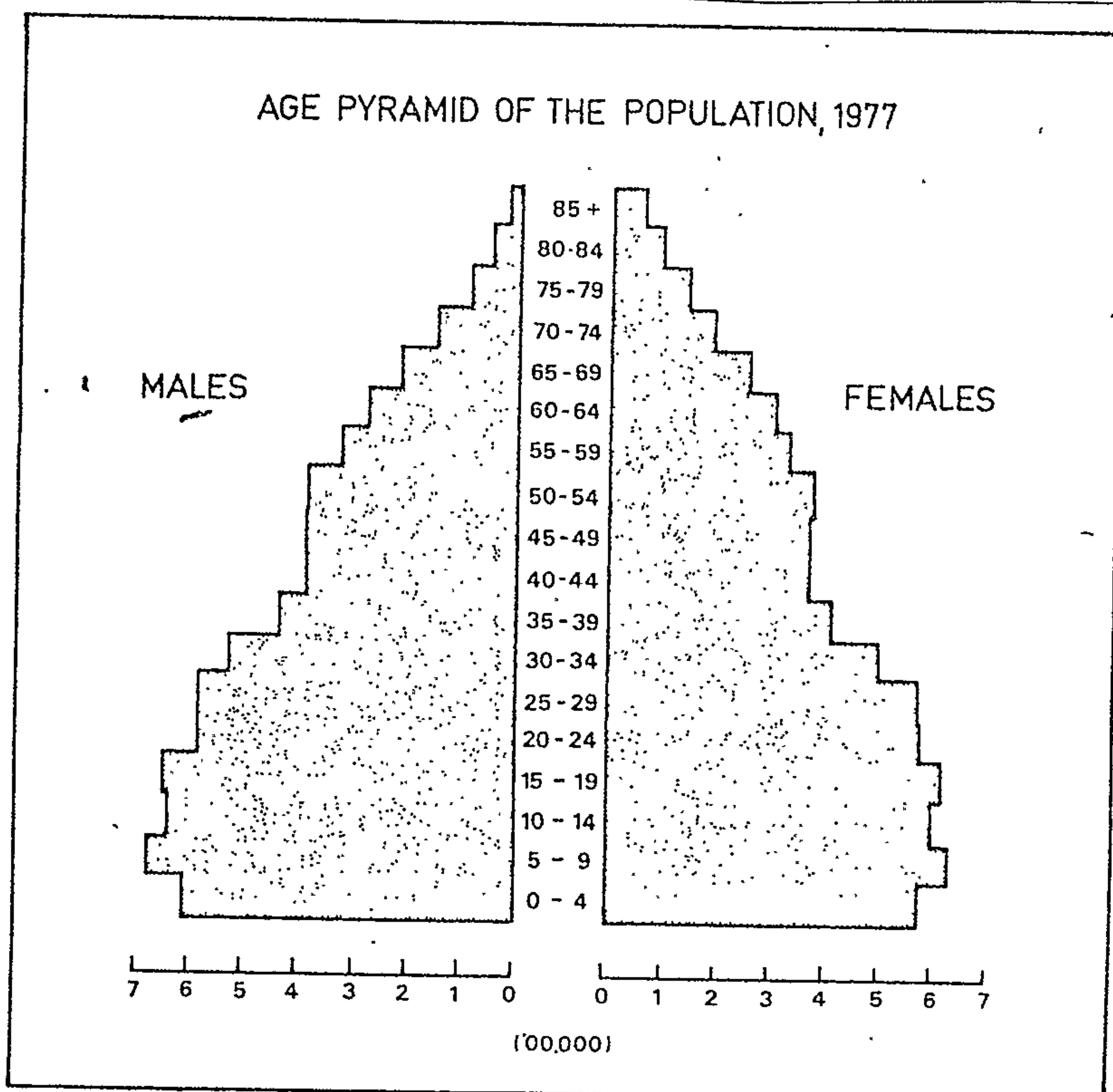


Fig.6.

Source: Year Book Australia.1979.

TABLE 3.5: POPULATION OF STATES AND TERRITORIES

AUSTRALIA, 1978.

|                    |            |          |
|--------------------|------------|----------|
| New South Wales    | 5,011,600  | (35.17)  |
| Victoria           | 3,018,700  | (26.80)  |
| Queensland         | 2,166,700  | (15.20)  |
| South Australia    | 1,287,600  | ( 9.04)  |
| Western Australia  | 1,222,100  | ( 8.58)  |
| Tasmania           | 413,700    | ( 2.90)  |
| Northern Territory | 112,300    | ( 0.79)  |
| A.C.T.             | 215,900    | ( 1.51)  |
| Australia          | 14,248,500 | (100.00) |

Source: Year Book, Australia 1979.

TABLE 3.6 POPULATION DENSITY, BY STATES<sup>33</sup>

AUSTRALIA, 1978.

| <u>States</u>      | <u>Person/Km.<sup>2</sup></u> | <u>% of Total Land-Area</u> |
|--------------------|-------------------------------|-----------------------------|
| New South Wales    | 6.25                          | 10.43                       |
| Victoria           | 16.78                         | 2.96                        |
| Queensland         | 1.25                          | 22.47                       |
| South Australia    | 1.31                          | 12.81                       |
| Western Australia  | 0.48                          | 32.88                       |
| Tasmania           | 6.10                          | 0.89                        |
| Northern Territory | 0.08                          | 17.53                       |
| A.C.T.             | 89.96                         | 0.03                        |
| Australia          | 1.85                          | 100.00                      |

TABLE 3.7: DISTRIBUTION BY AGE (IN YEARS)  
AUSTRALIA 1911, 1971 and 1977.

| <u>YEAR</u> | <u>0-9</u> | <u>10-19</u> | <u>20-39</u> | <u>40-64</u> | <u>65+</u> |
|-------------|------------|--------------|--------------|--------------|------------|
| 1911        | 22.0%      | 19.7%        | 32.7%        | 20.8%        | 4.3%       |
| 1971        | 19.2%      | 18.3%        | 28.0%        | 26.2%        | 8.3%       |
| 1977        | 17.8%      | 17.9%        | 30.0%        | 25.2%        | 9.1%       |

Australia's post war population growth was mainly due to immigration, and with its age distribution, has contributed to the youthful age structure of the current population.

Since 1962 approximately 45% of all settlers arriving have been between 20 and 39 years of age. Each year since then, irrespective of the size of the annual intake, around 11% have been 4 years old or less, compared with 3% to 4% who were 60 years old or over.

However it must be emphasized that fertility fluctuations are more significant determinants of age structure than the fluctuations in the level of immigration.

Life expectancy increased between 1881-1976 period. 22.1 years for male, and 25.42 years for female (from 47.20 to 69.30, and 50.84 to 76.26 respectively)<sup>1</sup> (Table 3.8).

The number of Australians who were born overseas is ever increasing (Fig. 7)<sup>33,30</sup> in

|       |               |        |
|-------|---------------|--------|
| 1947: | approximately | 10%    |
| 1961: | "             | 16.9%  |
| 1971: | "             | 20.2%  |
| 1976: | "             | 20.2%. |

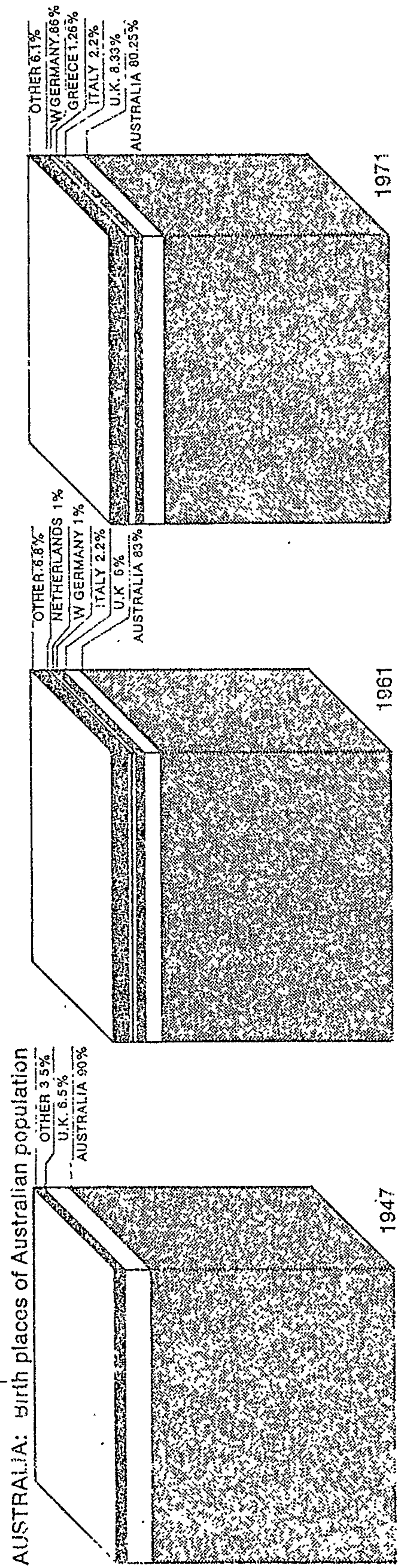
Life expectancy, birth and death rates

TABLE 3.8. COMPARATIVE EXPECTATION OF LIFE 1881-1890 TO 1976(a)

| Year                                            | Expectation of life (years) |         |             |         |
|-------------------------------------------------|-----------------------------|---------|-------------|---------|
|                                                 | At birth                    |         | At 65 years |         |
|                                                 | Males                       | Females | Males       | Females |
| 1881-1890 (b)                                   | 47.20                       | 50.84   | 11.06       | 12.27   |
| 1891-1900 (b)                                   | 51.08                       | 54.76   | 11.25       | 12.75   |
| 1901-1910 (b)                                   | 55.20                       | 58.84   | 11.31       | 12.88   |
| 1920-1922 (b)                                   | 59.15                       | 63.31   | 12.01       | 13.60   |
| 1932-1934 (b)                                   | 63.48                       | 67.14   | 12.40       | 14.15   |
| 1946-1948 (b)                                   | 66.07                       | 70.63   | 12.25       | 14.44   |
| 1953-1955 (b)                                   | 67.14                       | 72.75   | 12.33       | 15.02   |
| 1960-1962 (b)                                   | 67.92                       | 74.18   | 12.47       | 15.68   |
| 1965-1967 (b)                                   | 67.63                       | 74.16   | 12.16       | 15.70   |
| 1970-1972 (b)                                   | 67.90                       | 74.60   | 12.21       | 15.90   |
| Increase in life-expectancy since 1881-1890 (b) | 20.70                       | 23.76   | 1.15        | 3.63    |
| 1972 (c)                                        | 68.19                       | 74.99   | 12.31       | 16.11   |
| 1973 (c)                                        | 68.23                       | 75.17   | 12.30       | 16.20   |
| 1974 (c)                                        | 68.01                       | 75.03   | 12.19       | 16.07   |
| 1975 (c)                                        | 68.86 r                     | 75.90 r | 12.71       | 16.61   |
| 1976 (c)                                        | 69.30                       | 76.26   | 12.80       | 16.81   |

(a) Excludes particulars of full-blood Aborigines prior to 1965-67  
(b) Based on Official Life Tables, calculated by the Australian Government Actuary on the occasion of the census  
(c) Based on annual Life Tables calculated by the Australian Statistician. These tables are based on estimates of the population, by age, taking into account the results for the total population, males and females separately, from the 1971 Census. Because of the method of calculation, these figures are subject to annual fluctuations which may not be indicative of a longer term trend  
Source: Australian Government Actuary and A.B.S.  
Note: A graph showing life expectancy at birth and at 60 years of age by sex since 1880 can be found in the Annual Report of the Director-General of the B.H.P.S. p. 147

Fig.7. Source: Coppel. Australia in figures.



With a favourable immigration policy towards refugees the trend may increase in the future.

More than half of the Australian population live in the capital cities, approximately 69.84% in June 1977, and approximately 84.5% are classified as urban residents (Fig. 8).<sup>35</sup>

The percentage of the population living in rural areas has declined over the years as metropolitans and big towns attract the population growth, however this trend seemed to have slowed down since 1971.

### 3.2 DISEASE PATTERN AND DENTAL NEEDS

#### 3.2.1 GENERAL HEALTH

In the 1960s Australia ranked 14th in male life expectancy and 7th in female life expectancy among 22 industrial countries.<sup>61</sup> However if the ranking is based on - standardized death rates

- late foetal death rate
- infant mortality rate
- maternal mortality rate,

Australia had the third best record, after Sweden and Switzerland, but ahead of Netherlands, Canada, Czechoslovakia, Belgium, United Kingdom, USA, France and West Germany in that order, in 1968.<sup>61</sup> That situation does not change much in 1976 as Table 3.9 shows.

The Australian per capita population per hospital bed is certainly among the best in the world, in 1969 it is 83 person/hospital bed. The medical doctor to population ratio was 1:847 in 1969.

POPULATION

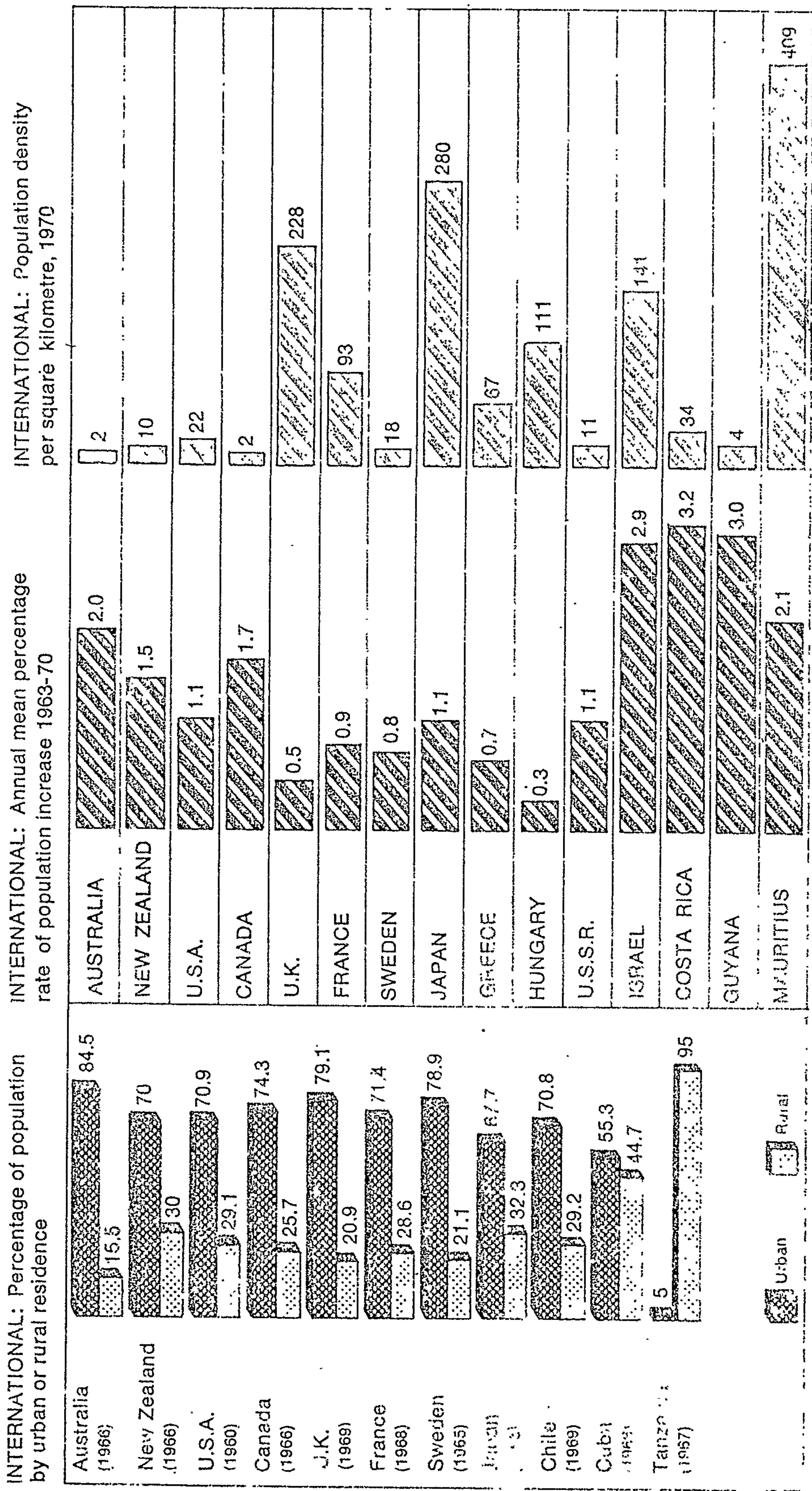


Fig.8. Source: Coppell.Australia in figures.

## Life expectancy, birth and death rates

TABLE 3.9. COMPARATIVE EXPECTATION OF LIFE, CRUDE BIRTH, CRUDE DEATH, INFANT MORTALITY AND NEONATAL MORTALITY RATES - SELECTED COUNTRIES

| Expectation of life (years) |      |          |         |             |         |      |                      |                      |                           |                             |
|-----------------------------|------|----------|---------|-------------|---------|------|----------------------|----------------------|---------------------------|-----------------------------|
| Country                     | Year | At birth |         | At 65 years |         | Year | Crude birth rate (a) | Crude death rate (b) | Infant mortality rate (c) | Neonatal mortality rate (d) |
|                             |      | Males    | Females | Males       | Females |      |                      |                      |                           |                             |
| Australia                   | 1976 | 69.3     | 76.3    | 12.8        | 16.8    | 1976 | 16.4                 | 8.1                  | 13.8                      | 9.9                         |
| Austria                     | 1975 | 67.6     | 74.7    | 12.2        | 15.7    | 1975 | 12.3                 | 12.7                 | 20.8                      | 17.1 (e)                    |
| Canada                      | 1974 | 69.6     | 77.1    | 13.8        | 18.0    | 1975 | 15.7                 | 7.3                  | 15.0 (e)                  | 17.9 (f)                    |
| Denmark                     | 1975 | 71.5     | 77.2    | 13.9        | 17.5    | 1975 | 14.2                 | 10.0                 | 10.6                      | 8.0 (e)                     |
| England and Wales           | 1974 | 69.4     | 75.7    | 12.4        | 16.3    | 1975 | 12.2                 | 11.8                 | 15.7                      | 16.7                        |
| France                      | 1974 | 69.5     | 77.6    | 13.6        | 17.8    | 1976 | 13.6                 | 10.5                 | 12.6                      | n.a.                        |
| Germany, F.R.               | 1974 | 68.2     | 74.7    | 12.4        | 15.7    | 1975 | 9.7                  | 12.1                 | 19.8                      | 15.3 (e)                    |
| Greece                      | 1974 | 72.5     | 76.9    | 15.4        | 17.3    | 1975 | 15.6                 | 8.9                  | 24.1                      | 17.8 (e)                    |
| Hong Kong                   | 1971 | 68.4     | 76.4    | 13.2        | 17.9    | 1975 | 18.2                 | 4.9                  | 14.9                      | 10.8 (e)                    |
| Hungary                     | 1975 | 66.4     | 72.5    | 12.0        | 14.7    | 1975 | 18.4                 | 12.4                 | 32.6                      | 28.4 (e)                    |
| Ireland                     | 1974 | 68.5     | 73.6    | 12.1        | 14.7    | 1975 | 21.6                 | 10.7                 | 17.1 (e)                  | 12.7 (f)                    |
| Italy                       | 1974 | 69.9     | 76.1    | 13.6        | 16.7    | 1975 | 14.8                 | 9.9                  | 20.7                      | n.a.                        |
| Japan                       | 1975 | 71.9     | 77.2    | 13.9        | 16.9    | 1975 | 17.2                 | 6.4                  | 10.1                      | 7.1 (e)                     |
| Mauritius                   | 1974 | 61.9     | 67.3    | 10.7        | 14.0    | 1975 | 25.1                 | 8.1                  | 48.7                      | 24.1 (e)                    |
| Mexico                      | 1973 | 62.9     | 67.0    | 15.3        | 16.0    | 1974 | 43.4                 | 7.2                  | 52.0 (f)                  | 20.1 (f)                    |
| Netherlands                 | 1975 | 71.5     | 77.9    | 13.5        | 17.4    | 1975 | 13.0                 | 8.3                  | 10.6                      | 8.0 (e)                     |
| New Zealand                 | 1974 | 68.9     | 75.0    | 12.8        | 16.3    | 1975 | 18.4                 | 8.1                  | 16.0                      | 9.4 (e)                     |
| Northern Ireland            | 1974 | 66.8     | 73.8    | 11.7        | 15.2    | 1975 | 17.0                 | 10.7                 | 20.3                      | 14.0 (e)                    |
| Norway                      | 1973 | 71.4     | 77.9    | 14.0        | 17.3    | 1975 | 14.0                 | 9.9                  | 10.5 (e)                  | 7.4 (e)                     |
| Poland                      | 1975 | 67.3     | 74.8    | 12.8        | 16.1    | 1975 | 19.0                 | 8.7                  | 24.8                      | 15.6 (e)                    |
| Romania                     | 1974 | 67.5     | 72.1    | 13.2        | 14.9    | 1975 | 19.7                 | 9.3                  | 34.7                      | 12.8 (e)                    |
| Scotland                    | 1975 | 67.8     | 74.4    | 11.8        | 15.9    | 1975 | 13.1                 | 12.1                 | 17.0                      | 12.0                        |
| Singapore                   | 1970 | 65.1     | 70.0    | 9.8         | 11.8    | 1975 | 17.8                 | 5.1                  | 13.9                      | 16.2                        |
| Spain                       | 1974 | 70.6     | 76.2    | 13.5        | 16.3    | 1975 | 18.3                 | 8.2                  | 12.1                      | n.a.                        |
| Sweden                      | 1975 | 72.2     | 78.1    | 14.1        | 17.6    | 1975 | 12.6                 | 10.8                 | 8.3                       | 6.1                         |
| Thailand                    | 1970 | 62.8     | 68.9    | 13.1        | 16.6    | 1973 | 29.3                 | 6.0                  | 21.8                      | 5.1                         |
| United States               | 1974 | 68.2     | 76.0    | 13.5        | 17.7    | 1975 | 14.7                 | 8.9                  | 16.1                      | 12.3 (e)                    |
| Yugoslavia                  | 1974 | 67.0     | 72.0    | 13.0        | 15.0    | 1975 | 18.1                 | 8.6                  | 40.5                      | 20.6 (f)                    |

(a) The number of live births per 1000 mean population

(b) Number of deaths per 1000 mean population

(c) The number of deaths of live born children within one year of birth per 1000 live births

(d) The number of deaths of live born children within twenty-eight days of birth per 1000 live births

(e) 1974 figures

(f) 1973 figures

Source: U.N. and W.H.O.

Australian pattern of nutrients intake is certainly one of western industrialized countries (Fig. 9). The consumption of sugar, in any form of food, is very high, approximately 50 kg/person/year.<sup>11</sup>

Total expenditure for alcohol and tobacco was 6.34% and 2.69% of total consumption expenditure in 1972-1973, and these figures did not vary up to 1976-1977 period<sup>1</sup> (6.23% and 2.47%, Table 3.10). The way of life and the eating habits of the Australian reflect in the ranking of cause of death. The top ten in 1977-78 were:<sup>1</sup>

1. Heart disease
2. Malignant neoplasm
3. Cerebrovascular
4. Motor accidents
5. Bronchitis, emphysema and asthma
6. Other accidents
7. Pneumonia
8. Arteriosclerosis
9. Maternal and Perinatal deaths
10. Suicide and/or Diabetes

The disease pattern and cause of death also reflect in the drugs prescribed. In 1977-78 period the top ten were:<sup>1</sup>

- Analgesics
- Penicillins
- Drugs acting on the heart
- Diuretics
- Drugs acting on blood vessels
- Bronchial spasm preparations

AUSTRALIA Percentage source of nutrients in national diet, 1970-71

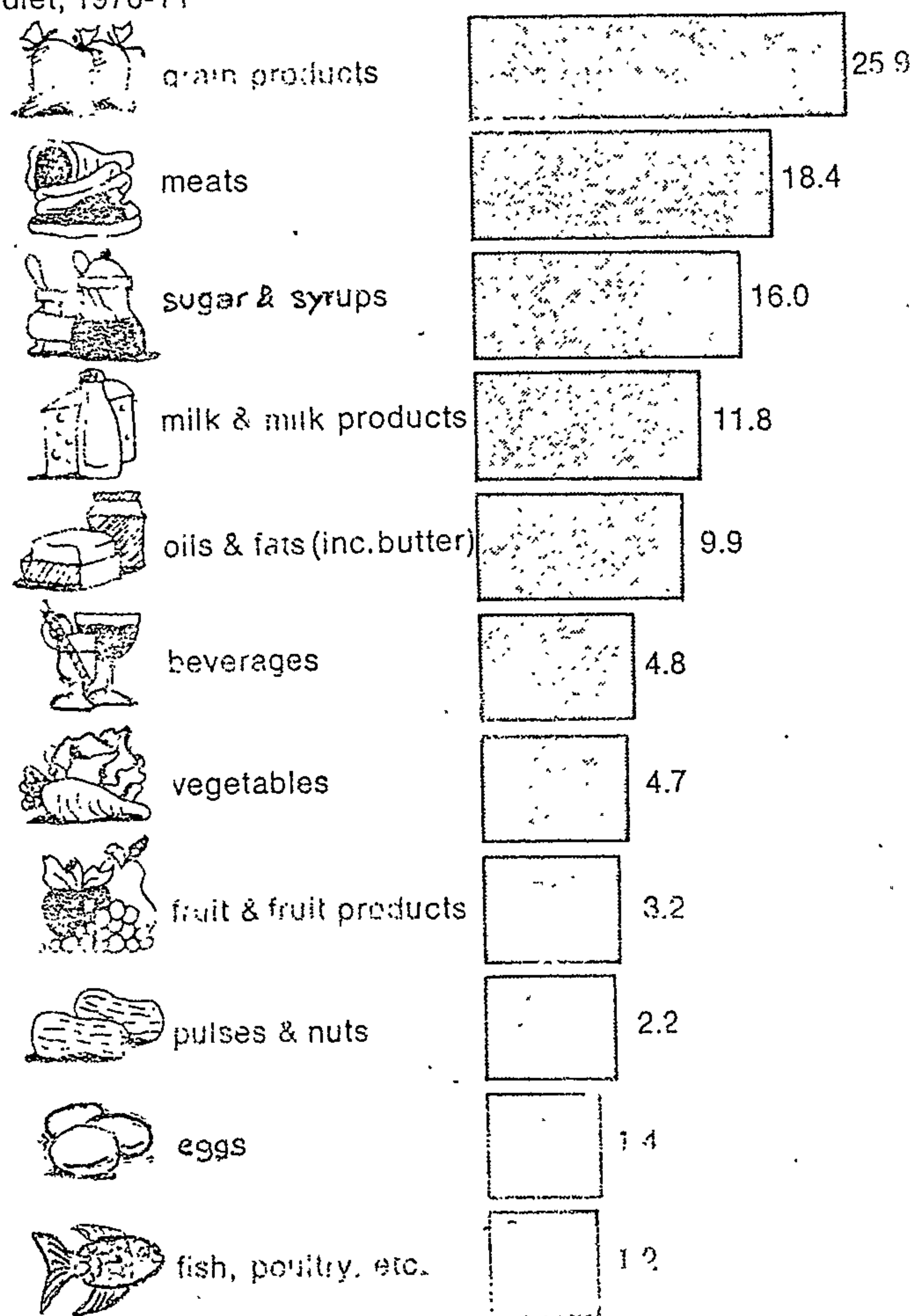


Fig.9.

Source: Coppell. Australia in figures.

## Alcohol and tobacco

TABLE 3 PERSONAL CONSUMPTION EXPENDITURE AND PERCENTAGE OF ALCOHOL AND TOBACCO  
 3.10. EXPENDITURE TO TOTAL CONSUMPTION EXPENDITURE 1972-73 TO 1976-77

|                                  | Total expenditure (\$ million) |         |         |         |         | Average expenditure per head of population \$ <sup>1</sup> |          |          |          |          |
|----------------------------------|--------------------------------|---------|---------|---------|---------|------------------------------------------------------------|----------|----------|----------|----------|
|                                  | 1972-73                        | 1973-74 | 1974-75 | 1975-76 | 1976-77 | 1972-73                                                    | 1973-74  | 1974-75  | 1975-76  | 1976-77  |
| Alcoholic drinks . . . . .       | 1 575                          | 1 836   | 2 164   | 2 637   | 2 979   | 118.59                                                     | 136.12   | 158.01   | 190.45   | 212.31   |
| Cigarettes & tobacco . . . . .   | 668                            | 745     | 877     | 1 075   | 1 183   | 50.30                                                      | 55.23    | 64.03    | 77.64    | 84.55    |
| Food . . . . .                   | 4 569                          | 5 393   | 6 190   | 7 082   | 8 177   | 344.02                                                     | 399.83   | 451.97   | 511.48   | 584.41   |
| Rent (a) . . . . .               | 3 469                          | 4 038   | 4 889   | 6 014   | 7 409   | 261.20                                                     | 299.37   | 356.97   | 434.34   | 529.51   |
| Travel & communication . . . . . | 3 771                          | 4 379   | 5 402   | 6 543   | 7 340   | 283.94                                                     | 324.65   | 394.43   | 472.55   | 524.59   |
| Household durables . . . . .     | 1 892                          | 2 478   | 3 020   | 3 786   | 4 187   | 142.46                                                     | 183.72   | 220.51   | 273.43   | 299.25   |
| Clothing . . . . .               | 2 224                          | 2 698   | 3 097   | 3 487   | 3 893   | 167.45                                                     | 200.03   | 226.13   | 251.84   | 278.23   |
| Other . . . . .                  | 6 665                          | 7 702   | 9 488   | 10 944  | 12 646  | 501.84                                                     | 571.02   | 692.77   | 790.40   | 903.82   |
| Total . . . . .                  | 24 833                         | 29 269  | 35 127  | 41 568  | 47 814  | 1 869.79                                                   | 2 169.97 | 2 564.82 | 3 002.12 | 3 417.29 |
| Alcohol as % of total . . . . .  | 6.34                           | 6.27    | 6.16    | 6.34    | 6.23    |                                                            |          |          |          |          |
| Tobacco as % of total . . . . .  | 2.69                           | 2.55    | 2.50    | 2.59    | 2.47    |                                                            |          |          |          |          |

(a) Includes imputed rent for owner-occupied dwellings.

Source: A.B.S.

- Broad spectrum antibiotics
- Anovulants
- Tranquillizers
- Sulphonamides

and they make 65.5% of total cost of prescriptions (Table 3.11).

### 3.2.2 ORAL HEALTH

There have been a number of regional studies on dental health, but these are mostly limited in their scope or age groups covered. No national dental study/survey has been carried out to date on a representative sample of Australian population. However disregarding possible differences between examiners, the methods and tools used in their studies, there have been few significant variations in dental disease observed throughout the country, as shown in the following studies. The 1973 study on oral health is presented as a special case study in Chapter 4.

#### Dental caries

In 1955, Barnard<sup>18</sup> made a comprehensive study (including radiographs) on school children, 6-15 years of age, in New South Wales, and the result was presented in Table 3.12. The average DMFT/child was 0.99 at 6 years old to 13.91 at 15 years old (with approximately estimated average incidence of 1.44 teeth/year/child). The school children who lived in rural areas had lower dental caries in all age groups than those who lived in urban areas (prevalence of dental caries was 86.3% to 92.8% and DMFT/child was 6.24 to 7.18).

In 1972, WHO conducted an oral survey, again in New South Wales (the result was summarized in section 4, case study).

## Pharmaceutical benefits

TABLE 3.11. BENEFITS PRESCRIPTIONS AND COST (a) OF MORE FREQUENTLY PRESCRIBED DRUG GROUPS 1977-78

| Drug groups                                            | Benefit prescriptions |                     | Total cost of benefit prescriptions |                     |
|--------------------------------------------------------|-----------------------|---------------------|-------------------------------------|---------------------|
|                                                        | Number                | Percentage of total | Amount                              | Percentage of total |
|                                                        | '000                  | %                   | \$'000                              | %                   |
| Analgesics . . . . .                                   | 11 245                | 12.07               | 38 707                              | 10.71               |
| Penicillins . . . . .                                  | 7 243                 | 7.77                | 29 218                              | 8.09                |
| Heart--Drugs acting on . . . . .                       | 4 164                 | 4.47                | 27 822                              | 7.70                |
| Diuretics . . . . .                                    | 7 134                 | 7.65                | 26 335                              | 7.29                |
| Blood vessels -- Drugs acting on . . . . .             | 3 690                 | 3.96                | 25 220                              | 6.98                |
| Bronchial spasm preparations . . . . .                 | 4 858                 | 5.21                | 24 555                              | 6.80                |
| Broad spectrum antibiotics . . . . .                   | 5 052                 | 5.42                | 21 544                              | 5.96                |
| Anovulants . . . . .                                   | 5 401                 | 5.80                | 17 456                              | 4.83                |
| Tranquillisers . . . . .                               | 4 598                 | 4.94                | 13 338                              | 3.69                |
| Sulphonamides . . . . .                                | 3 240                 | 3.48                | 12 516                              | 3.46                |
| Anti-depressants . . . . .                             | 3 525                 | 3.78                | 10 715                              | 2.97                |
| Water and electrolyte replacement . . . . .            | 2 480                 | 2.66                | 8 740                               | 2.42                |
| Anti-diabetics . . . . .                               | 800                   | 0.86                | 8 250                               | 2.28                |
| Sedatives and hypnotics . . . . .                      | 3 457                 | 3.71                | 7 370                               | 2.04                |
| Genito-urinary infections -- Drugs acting on . . . . . | 1 640                 | 1.76                | 6 274                               | 1.74                |
| Anti-histamines . . . . .                              | 2 303                 | 2.47                | 5 670                               | 1.57                |
| Eye drops . . . . .                                    | 1 902                 | 2.04                | 5 591                               | 1.55                |
| Antacids . . . . .                                     | 1 904                 | 2.04                | 4 953                               | 1.37                |
| Gastro intestinal sedatives . . . . .                  | 1 273                 | 1.37                | 4 464                               | 1.24                |
| Sera, vaccines . . . . .                               | 963                   | 1.03                | 3 850                               | 1.07                |
| Anti-convulsants . . . . .                             | 554                   | 0.59                | 3 794                               | 1.05                |
| Corticosteroids . . . . .                              | 641                   | 0.69                | 2 764                               | 0.77                |
| Parkinsons disease -- Drugs used for . . . . .         | 257                   | 0.28                | 2 343                               | 0.65                |
| Iron preparations . . . . .                            | 453                   | 0.49                | 1 033                               | 0.29                |
| Expectorants and cough suppressants . . . . .          | 423                   | 0.45                | 859                                 | 0.24                |
| Anti-cholinergics . . . . .                            | 287                   | 0.31                | 674                                 | 0.19                |
| Other drug groups . . . . .                            | 13 680                | 14.68               | 47 185                              | 13.06               |
| Total. . . . .                                         | 93 167                | 100.00              | 361 240                             | 100.00              |

(a) See footnote (b) Table 51.

Source: Dept. of Health, Annual Report. 1977-1978.

TABLE 3.12: PERCENTAGE OF CHILDREN CARIES-FREE AND  
MEAN DMF PERMANENT TEETH, N.S.W.

| AGE   | RURAL         |       |               | URBAN         |       |               | TOTAL |               |      |
|-------|---------------|-------|---------------|---------------|-------|---------------|-------|---------------|------|
|       | % CARIES FREE | DMFT  | % CARIES FREE | % CARIES FREE | DMF   | % CARIES FREE | DMFT  | % CARIES FREE | DMFT |
| 6     | 65.1          | 0.80  | 47.7          |               | 1.30  | 58.7          | 0.99  |               |      |
| 7     | 29.0          | 2.04  | 13.4          |               | 2.79  | 23.5          | 2.31  |               |      |
| 8     | 14.3          | 2.99  | 3.7           |               | 3.64  | 10.5          | 3.22  |               |      |
| 9     | 5.2           | 4.21  | 2.2           |               | 4.82  | 4.1           | 4.44  |               |      |
| 10    | 6.6           | 5.04  | 1.5           |               | 5.66  | 4.6           | 5.28  |               |      |
| 11    | 3.5           | 6.73  | 0.8           |               | 7.43  | 2.5           | 6.98  |               |      |
| 12    | 1.2           | 9.14  | 0.8           |               | 9.62  | 1.0           | 9.32  |               |      |
| 13    | 0.7           | 10.51 | 0.0           |               | 11.06 | 0.4           | 10.70 |               |      |
| 14    | 0.5           | 12.95 | 0.8           |               | 12.50 | 0.6           | 12.78 |               |      |
| 15    | 0.0           | 13.17 | 0.0           |               | 14.60 | 0.0           | 13.91 |               |      |
| TOTAL | 13.7 ± 0.53   | 6.24  | 7.2 ± 0.51    |               | 7.18  | 11.3 ± 0.38   | 6.59  |               |      |

SOURCE: Dental Survey of State School Children in NSW, 1955, Barnard.

The picture was slightly different; while the prevalence of dental caries was much the same (13-14 years old: 93.6%), the average DMFT for 8-9 years old and 13-14 years old were much less (2.27 and 6.7 respectively). This change in dental caries pattern which occurred during two decades will be discussed in section 5 (Discussion). From different surveys<sup>16,17,20,21,23,20,29</sup> conducted in the 1960s, estimates were made by Barnard, and were very close to those found in New South Wales in 1954.

6 years old:

DMFT, 1954 = 1.0  
 1962 = 1.0  
 1974 = 0.5

12 years old:

DMFT, 1954 = 9.3; MT = 1.1; % F/DMFT = 36%  
 1962 = 8.4; MT = 0.7; % F/DMFT = 40%  
 1972 = 5.4; MT = 0.3; % F/DMFT = 48%

In 1972, Barnard<sup>29</sup> examined 1600 children; aged between 3-14 years, in Darwin; consisting of:

91% European descent  
 5% Asian  
 4% Aboriginal

and the results were:

8-9 years old:

Prevalence of dental caries: 85% - 87%  
 dmft = 1.00 - 1.04  
 DMFT = 2.3 - 2.9

13-14 years old:

DMFT = 7.9 - 8.6.

From the examination of 6,787 school children in New South Wales<sup>18</sup> (metropolitan and rural); and 4,300 school children in Tamworth<sup>23</sup> (1963), and 706 school children in Yass (1962) Barnard found that:

DMFT at 6 years old = 1.0      MT at 7 = 0.1

12    "    "    = 9.0

16    "    "    = 15.0      MT    = 2.8

dmft at 5 years old = 7

8    "    "    = 8

Treatment need for primary and permanent teeth were:

at 5 years old = 11 surfaces

7    "    "    = 15    "

12    "    "    = 10    "

Fulfilled need for primary teeth = 20% and 30% for permanent dentition.

In 1972 Barnard & Minns<sup>24</sup> examined 1,354 persons, between 0-75 years old in Sydney Metropolitan area, and found that:

DMFT at 20 years old = 15.0

40 years old = 20.0

Average number of fillings needed = 2/person.

The data published by Dental Health Branch,<sup>1</sup> Department of Health, showed lower figures in 1977 for dmft and DMFT for children between 5-14 years old. These children examined were all under regular care from School Dental Scheme (Table 3.13 and 3.14).

### Periodontal Disease

Gingivitis is present even in the pre-school children. By the time they are 12 years old, 10% have begun to show evidence of bone loss due to periodontal disease.<sup>42</sup>

Dental health

TABLE 3.13. THE AVERAGE NUMBER OF TEETH PER CHILD (a) WITH DENTAL CARIES EXPERIENCE (b)—STATES AND TERRITORY—1977

| Type of teeth | N.S.W. | Vic. | Qld  | S.A. | W.A. | Tas. | A.C.T. | Aust.(c) |
|---------------|--------|------|------|------|------|------|--------|----------|
| Deciduous (d) | 2.20   | 3.03 | 2.34 | 2.72 | 2.11 | 2.59 | 1.89   | 2.49     |
| Permanent (e) | 2.57   | 3.79 | 3.25 | 2.93 | 2.39 | 3.76 | 1.49   | 3.04     |

(a) Primary school children examined in the Australian School Dental Scheme.  
(b) Includes all teeth which were decayed or filled and permanent teeth which have been extracted.  
(c) Average, weighted for the different number of primary school children in each State or Territory. Excludes N.T.  
(d) Children aged 5 to 12 years.  
(e) Children aged 5 to 14 years.

Dental health

TABLE 3.14. THE AVERAGE NUMBER OF TEETH PER CHILD (a) WITH DENTAL CARIES EXPERIENCE (b)—AGE—AUSTRALIA(c)—1977

| Type of teeth | Age (years) |      |      |      |      |      |      |      |      |      |
|---------------|-------------|------|------|------|------|------|------|------|------|------|
|               | 5           | 6    | 7    | 8    | 9    | 10   | 11   | 12   | 13   | 14   |
| Deciduous     | 2.96        | 3.13 | 3.35 | 3.37 | 3.01 | 2.23 | 1.23 | 0.66 | —    | —    |
| Permanent     | 0.09        | 0.51 | 1.21 | 1.94 | 2.50 | 3.10 | 3.92 | 4.80 | 5.83 | 6.49 |

Footnotes (a) to (c) see Table 59.

Source: Dept.of Health,Annual Report 1977-1978.

In the 17 years old group 70% had calculus and over 10% had severe and extensive periodontal pockets.<sup>42</sup> Barnard<sup>29</sup> found in Darwin, for 8-9 years old group O.H.I. score was 1.04-1.02 with P.I. score 0.55-0.53 and for 13-14 years old group O.H.I. score was 0.99-1.00 and P.I. score was 0.48-0.56.

### Edentulousness

From Barnard & Minns<sup>24</sup> study in Metropolitan area (Sydney) in 1972, it was found that:

15% of the total group (1.354 examined, 0-75 years old) and 23% of those over 23 (in U.S.A.: 13% and 19% respectively).

The figure increased with the age:

20% in the 40's

40% in the 60's

80% above 60 years old, and the average age the persons became, edentulous was 41 years.

### Malocclusion<sup>23,42</sup>

From the Tamworth study.

In 1963: Angle Class I: 74%

Normal : 8%

In 1973: Angle Class I: 62%

Normal : 14%

without change in pattern for Class II and Class III

Using the Godfrey index, based on qualitative treatment index, it was found in 1963:

Slight to moderate malocclusion 56%

No treatment indicated 19%

and in 1973:

Slight to moderate malocclusion 28%

No treatment indicated 39%

In 1972 WHO<sup>11</sup> study, Barnard found that:

9.1% of the sample of 988 children were receiving treatment  
35.1% of the sample required corrective care.

#### Treatment Needs

In Tamworth there were changes in treatment needs following fluoridation.

6 years old: (Martin & Barnard)<sup>23</sup>

1963: 10.1 cavities to be restored  
2.3 teeth extracted or needing extraction.  
1973: 3.4 cavities to be restored  
0.6 teeth extracted or needing extraction.

12 years old:

1963: 90% required restorations  
6.0 surfaces/child  
1973: 66% required restorations  
3.2 surfaces/child.

13-19 years old: WHO study<sup>11</sup> 1972, it was found that only 29.7% of sample were free of basic treatment needs as determined by clinical examination.

20-24 years old: Barnard & Boyles<sup>30</sup> found that among the university students (ANU) 36% needed treatment.

Barnard and Minns<sup>24</sup> also found that among a 1,354 sample (0-75 years old) in Sydney, 1972, 36% of the total sample needed treatment at the time of the examination (for 20-24 years old: 57%).

## DENTAL BEHAVIOUR

### Dental visits

Barnard & Minns<sup>24</sup> study found that: - dental attendance was 50% with average visits of 1.3 within 12 months period (average visits for those who attended: 2.5). (In U.S.A. 46% attendance, and average of 1.6 visits).

In university students sample the situation was better, as shown by Barnard & Boyles<sup>30</sup> figure of: 72% attendance with average visits of 1.6 (A.N.U. in 1972).

WHO survey<sup>11</sup> in Sydney area, 1973:

35-44 year olds: 57.3% attendance with average visits of 2.8 (for those who attended) and 1.6 for total sample. From the Australian Health Survey,<sup>25</sup> 1977-1978, it was found that: 48.1% of the sample (N = 12,332,300), with the age of six years old or more, visited dentist within 12 months period.

Barnard and Minns<sup>24</sup> also found that:

19% of the sample needed dental treatment, but did not seek it (20-34 years old: 33%).

49% of the sample went for regular care.

For more educated population, Barnard & Boyles<sup>30</sup> found the figures higher for regular care:

20-34 years old: 23% needed dental treatment but did not seek it.

77% of the sample went for regular care.

### Oral Cancer

From 1959-1964 period Tan<sup>65</sup> found from major hospitals throughout Australia:

5,693 new cases, 78.7% (4,478) male, 21.3% (1,215) female, with prevalence of: 14.0/100,000 for male and 9.0/100,000 for female.

Most frequent types were - squamous cell carcinoma 73.8%  
- Unspecified carcinoma 12.3%  
- Basal cell carcinoma 5.8%.

#### 4. CASE STUDY

CASE STUDY<sup>9,10,11,12,13,27,31,33,34,39,43,46,64</sup>

International Collaborative Study of Dental Manpower systems in relation to Oral Health Status.

##### 4.1 OBJECTIVE

To define the relationships between structural characteristics of major national dental services system and selected measures of effectiveness and efficiency for the consumer, the provider and the organization in which both operate.

##### 4.2 METHODS AND MATERIAL

###### 4.2.1 Time: 1973

###### 4.2.2 Sampling

The age group selected to represent CONSUMERS are:

- 8-9 years: represent the early years of primary schooling, when a program had time to complete at least the initial treatment, but still the effects of pre-school or no pre-school service can still be observed.
- 13-14 years: the end of primary schooling when the effects of good or inadequate incremental care or voluntary care could be observed.
- 35-44 years: the adult age at which the major effects of dental diseases (i.e. dental caries and periodontal disease) could be observed. This broader age-grouping was a WHO standard for descriptive epidemiology, thus the data could be compared with earlier studies.

Approximately 1000 persons from each age group were to be selected and every effort made to ensure an equal number of males and females from urban and rural areas, within the age range.

Provider: (Dentists)

The required number of 100 (later increased to 110, making allowances for non-response and non-contact) was obtained by random sampling of a complete list of dentists in the study area. Geographical and stratified random sampling method was used in the sampling procedure.

4.2.3 STUDY AREA

Part of Sydney Statistical Division and the Outer Sydney Statistical Division.

| <u>METROPOLITAN</u> | <u>NON-METROPOLITAN</u> |
|---------------------|-------------------------|
| Fairfield Shire     | Wyong Shire             |
| Hornsby Shire       | Gosford Shire           |
| Kuringgai Shire     | Camden Shire            |
| Liverpool Shire     | Windsor Shire           |
|                     | Blue Mountain Shire     |

4.2.4 DATA COLLECTION

Except for clinical examination, all other data involved interviews. Variables and sources of information are shown below:

| Variables                    | Source of information |           |           |
|------------------------------|-----------------------|-----------|-----------|
|                              | Consumer              |           | Provider  |
|                              | Examination           | Interview | Interview |
| Independent<br>(Structural)  |                       |           | +         |
| Mediating<br>(Efficiency)    |                       | +         | +         |
| Dependent<br>(Effectiveness) | +                     | +         | +         |

Standardized methods, questionnaires and criteria for clinical examinations as developed by WHO for a number of countries were used.

#### 4.2.5 CALIBRATION

##### Adult consumer interviewers:

All interviewers had previous experience in interviewing in a variety of situations. However training was necessary to set the pattern of procedures in making interviews, i.e. initial contact, the explanation of the study and its purposes, the invitation to participate etc. The sociologist was mostly available to clarify issues which arose during the day to day work.

##### Dental examiners:

Two local epidemiologists were checked by the roving epidemiologist, with duplicate examinations being performed in the United Dental Hospital, and queries were clarified as they arose. For the coders who were all university graduates and worked directly under the coordinator, little training was required.

#### 4.2.6 CRITERIA

##### 1. Structural (Independent) Variables

- a. Availability: of manpower services in relation to provider and consumer.
  - Total number and distribution of operating dental manpower (professional and dental nurse).
  - supporting personnel.
  - proportion in time spent on preventive/D.H.E.. to restorative services.

b. Accessibility: ease of approach in obtaining manpower services.

- physical distance (between provider and consumer)
- waiting time
- the system of payment for dental services, direct-indirect or third-party system.

c. Acceptability: degree of consistency in expectations on part of consumer and provider for the quality and type of services provided.

## 2. Effectiveness (Dependent) Variables

a. Oral health status of consumers on:

- dental caries
- periodontal disease
- malocclusions
- other pathological conditions
- denture.

b. Treatment needs.

## 3. Efficiency (Mediating) Variables

Cost factors, both economic and non-economic, may be expected to alter or modify the relationship between independent and dependent variables and may help to explain the relationship between them.

a. supply as reported by providers:

- number of dentists' hours/week
- number of weeks/year.

b. demand as reported by consumers.

## 4.2.7 ANALYSIS

- Oral Health Data and Socio-economic data was computer processed in Geneva, by WHO.

- Multivariate Regression Analysis was applied to determine the relationships of socio-economic variables and oral health status indicators.

### 4.3 RESULTS

#### 4.3.1 NUMBER OF TEETH

##### Children (8-9 years old):

The number of teeth present/child was 9.7 primary and 12.6 permanent teeth (Table 4.1 & 4.2). Primary teeth were lost (other than by exfoliation) primarily as a result of dental caries (0.93), while permanent teeth were equally lost due to caries and other reasons such as malocclusion or trauma (0.06 each). Due to agreed criteria, 0.4 permanent teeth/child were excluded from clinical consideration (3.25% of average teeth present/child), for such reasons as orthodontic banding.

TABLE 4.1: NUMBER OF TEETH: 8-9 YEARS, PRIMARY TEETH.

| Group  | N   | Average number<br>Teeth |        | Teeth lost/Person - Reason |       |          |
|--------|-----|-------------------------|--------|----------------------------|-------|----------|
|        |     | Present                 | Absent | Caries                     | Other | Excluded |
| Male   | 439 | 10.28                   | 0.87   | 0.83                       | 0.04  | 0        |
|        |     | 3.12                    | 1.57   | 1.53                       | 0.35  | 0        |
| Female | 529 | 9.28                    | 1.05   | 1.02                       | 0.03  | 0        |
|        |     | 3.33                    | 1.79   | 1.79                       | 0.27  | 0        |
| Rural  | 548 | 9.48                    | 0.97   | 0.94                       | 0.03  | 0        |
|        |     | 3.23                    | 1.70   | 1.67                       | 0.28  | 0        |
| Urban  | 420 | 10.06                   | 0.96   | 0.92                       | 0.04  | 0        |
|        |     | 3.30                    | 1.70   | 1.68                       | 0.34  | 0        |
| TOTAL  |     | 9.73                    | 0.97   | 0.93                       | 0.04  | 0        |
| SD.    | 968 | 3.27                    | 1.70   | 1.68                       | 0.31  | 0        |

TABLE 4.2: NUMBER OF TEETH: 8-9 YEARS, PERMANENT TEETH.

| Group  | Average number<br>Teeth |        | Teeth lost/person - Reason |           |       |          |
|--------|-------------------------|--------|----------------------------|-----------|-------|----------|
|        | Present                 | Absent | Caries                     | Per. Dis. | Other | Excluded |
| Male   | 12.20                   | 0.13   | 0.05                       | 0         | 0.08  | 0.44     |
|        | 2.80                    | 0.48   | 0.31                       | 0         | 0.38  | 0.87     |
| Female | 12.98                   | 0.12   | 0.07                       | 0         | 0.05  | 0.39     |
|        | 2.86                    | 0.50   | 0.40                       | 0         | 0.31  | 0.71     |
| Rural  | 12.82                   | 0.08   | 0.07                       | 0         | 0.01  | 0.48     |
|        | 2.90                    | 0.42   | 0.40                       | 0         | 0.14  | 0.83     |
| Urban  | 12.38                   | 0.18   | 0.05                       | 0         | 0.12  | 0.33     |
|        | 2.79                    | 0.56   | 0.30                       | 0         | 0.49  | 0.72     |
| TOTAL  | 12.63                   | 0.12   | 0.06                       | 0         | 0.06  | 0.41     |
| S.D.   | 2.86                    | 0.49   | 0.36                       | 0         | 0.35  | 0.79     |

Student (13-14 years old):

The average number of permanent teeth present was 26.3, with another 0.9 teeth lost due to caries (0.5) and other (0.4), mainly orthodontic reasons.

The number of teeth excluded from clinical examination was 1.3 teeth (approximately 5% of average teeth present/student. (Table 4.3)

TABLE 4.3: NUMBER OF TEETH: 13-14 YEARS.

| Group  | N   | Average number<br>Teeth |        | Teeth lost/person - Reason |           |       |          |
|--------|-----|-------------------------|--------|----------------------------|-----------|-------|----------|
|        |     | Present                 | Absent | Caries                     | Per. Dis. | Other | Excluded |
| Male   |     | 26.14                   | 0.80   | 0.48                       | 0         | 0.31  | 1.39     |
|        | 489 | 2.57                    | 1.37   | 1.06                       | 0         | 0.98  | 3.35     |
| Female |     | 26.43                   | 0.96   | 0.53                       | 0         | 0.43  | 1.22     |
|        | 508 | 1.99                    | 1.47   | 1.10                       | 0         | 1.13  | 3.49     |
| Rural  |     | 26.42                   | 0.88   | 0.56                       | 0         | 0.33  | 0.94     |
|        | 546 | 2.11                    | 1.40   | 1.12                       | 0         | 0.99  | 2.60     |
| Urban  |     | 26.13                   | 0.87   | 0.45                       | 0         | 0.43  | 1.74     |
|        | 451 | 2.50                    | 1.45   | 1.02                       | 0         | 1.14  | 4.17     |
| TOTAL  |     | 26.29                   | 0.88   | 0.51                       | 0         | 0.37  | 1.30     |
| S.D.   | 997 | 2.30                    | 1.43   | 1.08                       | 0         | 1.06  | 3.42     |

Adult (35-44 years old):

The average number of teeth present was 18 with 12.8 absent, and 1.2 excluded from clinical examination.

Teeth were lost mostly as a result of caries (12.02). Male and urban groups were better compared with female and rural groups (20.2 to 16.4 and 20.2 to 14.9) (Table 4.4).

TABLE 4.4: NUMBER OF TEETH: 35-44 YEARS.

| Group  | N   | Average number<br>Teeth |        | Teeth lost/person - Reason |           |       |          |
|--------|-----|-------------------------|--------|----------------------------|-----------|-------|----------|
|        |     | Present                 | Absent | Caries                     | Per. Dis. | Other | Excluded |
| Male   | 306 | 20.23                   | 10.75  | 10.05                      | 0.17      | 0.52  | 1.03     |
|        |     | 8.80                    | 9.08   | 9.12                       | 1.34      | 1.30  | 1.50     |
| Female | 431 | 16.44                   | 14.25  | 13.42                      | 0.24      | 0.58  | 1.31     |
|        |     | 10.19                   | 10.62  | 10.61                      | 2.10      | 2.08  | 1.74     |
| Rural  | 307 | 14.90                   | 15.95  | 15.04                      | 0.33      | 0.58  | 1.15     |
|        |     | 10.13                   | 10.43  | 10.41                      | 2.47      | 2.24  | 1.58     |
| Urban  | 436 | 20.17                   | 10.61  | 9.94                       | 0.13      | 0.54  | 1.22     |
|        |     | 8.98                    | 9.36   | 9.43                       | 1.17      | 1.42  | 1.70     |
| TOTAL  | 737 | 18.01                   | 12.79  | 12.02                      | 0.21      | 0.56  | 1.19     |
| S.D.   |     | 9.81                    | 10.15  | 10.15                      | 1.82      | 1.80  | 1.65     |

4.3.2 ORAL HYGIENE & PERIODONTAL INDEX

8-9 years old (Table 4.5)

The average of O.H.I. index score was 1.45, and could be classified as medium/fair. Female and Rural groups were slightly better off than Male and Urban groups.

Periodontal index (modified) for all groups was 0.84, and could be classified as low (as expected for this young age group). The Female group was better than Male, but Metropolitan group was slightly better than Rural group.

TABLE 4.5: O.H.I. and P.I. SCORE: 8-9 YEARS OLD.

| GROUP  | O.H.I.       | P.I. MODIFIED |
|--------|--------------|---------------|
| Male   | 1.51<br>0.60 | 0.87<br>0.43  |
| Female | 1.39<br>0.61 | 0.82<br>0.44  |
| Rural  | 1.42<br>0.63 | 0.88<br>0.43  |
| Urban  | 1.49<br>0.59 | 0.79<br>0.44  |
| TOTAL  | 1.45         | 0.84          |
| S.D.   | 0.61         | 0.44          |

13-14 years old (Table 4,6)

The average O.H.I. index score was 1.10, and classified as medium. The female and rural groups were slightly better than the male and urban groups. The situation was the same as in younger group for periodontal Index scores. Female and Urban groups were better than male and rural groups. The average score was 0.77.

TABLE 4.6: O.H.I. and P.I. SCORE: 13-14 YEARS OLD.

| GROUP  | O.H.I.       | P.I. MODIFIED |
|--------|--------------|---------------|
| Male   | 1.19<br>0.59 | 0.81<br>0.38  |
| Female | 1.02<br>0.56 | 0.73<br>0.39  |
| Rural  | 1.09<br>0.58 | 0.79<br>0.40  |
| Urban  | 1.12<br>0.58 | 0.75<br>0.37  |
| TOTAL  | 1.10         | 0.77          |
| S.D.   | 0.58         | 0.39          |

35-44 years old (Table 4.7)

The average O.H.I. index score was 1.08; which was medium and less than 8-9 year olds.

In this age group, female and urban groups were better than male and rural groups, and the difference between male and female was significant (1.32 to 0.88).

The average Periodontal Index score was 1.22, which was higher than the younger age groups. Again female and urban groups were better off than male and rural groups.

TABLE 4.7: O.H.I. and P.I. SCORE: 35-44 YEARS OLD.

| GROUP  | O.H.I.       | P.I. MODIFIED |
|--------|--------------|---------------|
| Male   | 1.32<br>0.99 | 1.37<br>0.95  |
| Female | 0.88<br>0.73 | 1.10<br>0.85  |
| Rural  | 1.17<br>0.93 | 1.26<br>0.92  |
| Urban  | 1.04<br>0.86 | 1.19<br>0.90  |
| TOTAL  | 1.08         | 1.22          |
| S.D.   | 0.89         | 0.91          |

4.3.3 DENTAL CARIES8-9 years old:PRIMARY DENTITION (Table 4.8)

Prevalence of dental caries was 79.1%, and the average dmft was 4.10, consisting of dt = 1.92 (49%), mt = 0.93 (18%) and ft = 1.25 (33%).

There was no significant difference in average dmft figures, or component scores, other than a slight difference in dmft scores between male and female.

TABLE 4.8: dmft per child, primary teeth, 8-9 years old.

| Group  | dt                 | mt                 | ft                 | dmft         | % dmft > 0   |
|--------|--------------------|--------------------|--------------------|--------------|--------------|
| Male   | 1.96 (52%)<br>3.25 | 0.83 (16%)<br>2.31 | 1.19 (32%)<br>1.53 | 3.98<br>1.87 | 77.7<br>0.42 |
| Female | 1.88 (47%)<br>2.31 | 1.02 (19%)<br>1.79 | 1.29 (34%)<br>1.98 | 4.19<br>3.34 | 80.3<br>0.40 |
| Rural  | 1.90 (49%)<br>2.30 | 0.94 (18%)<br>1.67 | 1.24 (33%)<br>1.99 | 4.08<br>3.32 | 78.3<br>0.41 |
| Urban  | 4.12 (49%)<br>2.33 | 0.92 (18%)<br>1.68 | 1.25 (33%)<br>1.86 | 4.12<br>3.28 | 80.2<br>0.40 |
| TOTAL  | 1.92 (49%)         | 0.93 (18%)         | 1.25 (33%)         | 4.10         | 79.13        |
| S.D.   | 2.31               | 1.68               | 1.93               | 3.30         | 0.41         |

#### PERMANENT DENTITION (Table 4.9)

Prevalence of dental caries was 77.3% and the average DMFT score was 2.27 and consisted of DT = 1.35 (63%), MT = 0.06 (2%) and FT = 0.86 (35%).

The only significant difference was between FT component of male and female groups, with the female group having more filled teeth.

#### 13-14 years old (Table 4.10)

Prevalence of dental caries was 93.6% and the average DMFT score was 6.67 which consisted of DT = 2.51 (38%), MT = 0.51 (6%) and FT = 3.66 (56%). The Rural group had a higher DMFT score (7.20) and decayed teeth component (DT = 2.76 or 38%). Although the female group had higher DMFT score than the male group (6.88 to 6.46), they had fewer decayed teeth (2.39 to 2.64) and a

higher filled teeth score (3.96 to 3.34 or 58% compared with 53% for the males).

TABLE 4.9: DMFT per child, permanent teeth, 8-9 years old.

| Group  | DT   |       | MT   |      | FT   |       | DMFT | % DMFT > 0 |
|--------|------|-------|------|------|------|-------|------|------------|
| Male   | 1.38 | (67%) | 0.05 | (2%) | 0.74 | (32%) | 2.16 | 74.5       |
|        | 1.59 |       | 0.31 |      | 1.25 |       | 1.80 | 0.44       |
| Female | 1.33 | (60%) | 0.07 | (2%) | 0.96 | (38%) | 2.36 | 79.6       |
|        | 1.42 |       | 0.39 |      | 1.37 |       | 1.66 | 0.40       |
| Rural  | 1.32 | (61%) | 0.07 | (2%) | 0.88 | (37%) | 2.27 | 75.2       |
|        | 1.54 |       | 0.40 |      | 1.35 |       | 1.79 | 0.43       |
| Urban  | 1.39 | (65%) | 0.05 | (2%) | 0.83 | (33%) | 2.27 | 80.0       |
|        | 1.45 |       | 0.30 |      | 1.29 |       | 1.64 | 0.40       |
| TOTAL  | 1.35 | (63%) | 0.06 | (2%) | 0.86 | (35%) | 2.27 | 77.3       |
| S.D.   | 1.50 |       | 0.36 |      | 1.32 |       | 1.73 | 0.42       |

TABLE 4.10: DMFT per child, 13-14 years old.

| Group  | DT   |       | MT   |      | FT   |       | DMFT | % DMFT > 0 |
|--------|------|-------|------|------|------|-------|------|------------|
| Male   | 2.64 | (41%) | 0.48 | (6%) | 3.34 | (53%) | 6.46 | 92.84      |
|        | 3.09 |       | 1.06 |      | 3.36 |       | 4.22 | 0.26       |
| Female | 2.39 | (35%) | 0.53 | (6%) | 3.96 | (58%) | 6.88 | 94.29      |
|        | 2.93 |       | 1.10 |      | 3.45 |       | 4.15 | 0.23       |
| Rural  | 2.76 | (38%) | 0.56 | (7%) | 3.89 | (55%) | 7.20 | 94.69      |
|        | 3.26 |       | 1.12 |      | 3.57 |       | 4.32 | 0.22       |
| Urban  | 2.21 | (38%) | 0.45 | (6%) | 3.38 | (57%) | 6.03 | 92.24      |
|        | 2.64 |       | 1.02 |      | 3.22 |       | 3.93 | 0.27       |
| TOTAL  | 2.51 | (38%) | 0.51 | (6%) | 3.66 | (56%) | 6.67 | 93.58      |
| S.D.   | 3.01 |       | 1.08 |      | 3.42 |       | 4.19 | 0.25       |

35-44 years old (Table 4.11)

Prevalence of dental caries was as high as 99.6% and the average DMFT score was 21.59, which consisted of DT = 1.06 (6%), MT = 12.02 (51%) and FT = 8.51 (43%). DMFT score for males was lower than for females (19.62 to 22.99) and the urban group was slightly better than the rural group (21.10 to 22.30).

In the first case the difference was due to the MT component which was 10.05 for male and 13.42 for female. On the other hand the difference between urban and rural groups was due to MT component (9.94 to 15.04) and FT component (10.01 to 6.35), and if both components are considered, the urban group score of 19.95 is less than that of the rural group (21.39).

TABLE 4.11: DMFT per person, 35-55 years old.

| Group  | DT                | MT                   | FT                  | DMFT          | % DMFT > 0    |
|--------|-------------------|----------------------|---------------------|---------------|---------------|
| Male   | 1.37 (8%)<br>2.30 | 10.05 (47%)<br>9.12  | 8.20 (45%)<br>6.88  | 19.62<br>7.01 | 99.35<br>0.08 |
| Female | 0.84 (4%)<br>1.68 | 13.42 (54%)<br>10.61 | 8.74 (42%)<br>7.66  | 22.99<br>5.85 | 99.77<br>0.05 |
| Rural  | 0.91 (5%)<br>1.70 | 15.04 (62%)<br>10.41 | 6.35 (33%)<br>6.45  | 22.30<br>6.74 | 99.67<br>0.06 |
| Urban  | 1.16 (6%)<br>2.15 | 9.94 (43%)<br>9.43   | 10.01 (51%)<br>7.56 | 21.10<br>6.41 | 99.54<br>0.07 |
| TOTAL  | 1.06 (6%)         | 12.02 (51%)          | 8.51 (43%)          | 21.59         | 99.59         |
| S.D.   | 1.98              | 10.15                | 7.35                | 6.57          | 0.06          |

#### 4.3.4 DENTOFACIAL ANOMALIES

13-14 years old (N = 977)

The percent of students affected has been summarised:

Dentition anomaly; 33.0%

|                     |       |
|---------------------|-------|
| Congenital absence  | 1.6%  |
| Supernumerary teeth | 0.2%  |
| Malformed teeth     | 1.2%  |
| Impacted teeth      | 2.0%  |
| Transposed teeth    | 0.2%  |
| Missing teeth       | 29.9% |
| Retained teeth      | 0.4%  |

Space anomaly; 47.9%

|                       |       |
|-----------------------|-------|
| Crowding              | 21.3% |
| Spacing               | 10.3% |
| Anterior irregularity | 31.9% |
| Diastema              | 7.9%  |

Occlusion anomaly; 45.4%

|                                  |       |
|----------------------------------|-------|
| Ante posterior molar<br>relation | 15.7% |
| Posterior openbite               | 4.1%  |
| Posterior crossbite              | 8.1%  |
| Overjet                          | 25.2% |
| Overbite                         | 16.1% |
| Midline deviation                | 1.6%  |
| Soft-tissue impingement          | 6.0%  |

Combinations of anomalies were:

25% of space and occlusion;

19% of space and dentition;

17% of occlusion and dentition.

#### 4.3.5 PROSTHESES (Table 4.12 and Table 4.13)

It was observed from WHO study,<sup>11</sup> that:

- those who had no denture, and need none were 36.2% of the sample
- those who had no denture but need one were 16.6% of the sample
- those who had denture, and need none were 18.5% of the sample
- those who had denture, but need one were 28.4% of the sample.

Female and Rural groups had more dentures compared with male and urban groups.

Almost 90% of the sample did not have bridge-work in their mouths, and the treatment need was 3.3%. Female and urban groups had less treatment needs for bridge work than male and rural groups.

In 1968-1970 Barnard<sup>19</sup> *et al.* found among 2,000 patients who were completely or partially edentulous that:

- 35% wearing dentures more than 11 years and most of them did not want them renewed.
- less than 50% non-denture wearers requested dentures (dentists' and patients' assessments agreed closely).

#### 4.3.6 TREATMENT NEEDS

##### 4.3.6.1 Dental caries

##### 8-9 years old

There were only minor differences in the percentage of sample requiring caries treatment/required no treatment between the groups (Table 4.14).

TABLE 4.12: DENTURE NEED, 35-44 YEARS OLD, N.S.W. 1972.

| Classification               | Male         | Female       | Country      | Metropolitan | Total        |
|------------------------------|--------------|--------------|--------------|--------------|--------------|
| No Denture<br>Need none      | 117<br>15.8% | 150<br>20.3% | 73<br>9.9%   | 194<br>26.3% | 267<br>36.2% |
| No Denture<br>Need Denture   | 75<br>10.1%  | 48<br>6.5%   | 54<br>7.3%   | 69<br>9.3%   | 123<br>16.6% |
| Have Denture<br>Need none    | 41<br>5.5%   | 96<br>13.0%  | 66<br>8.9%   | 71<br>9.6%   | 137<br>18.5% |
| Have Denture<br>Need Denture | 73<br>9.9%   | 137<br>18.5% | 108<br>14.6% | 102<br>13.8% | 210<br>28.4% |
| TOTAL                        | 306<br>41.5% | 431<br>58.5% | 301<br>40.8% | 436<br>59.2% | 737<br>100%  |

TABLE 4.13: BRIDGE WORK NEED, 35-44 YEARS OLD, N.S.W. 1972.

| Classification                          | Male         | Female       | Country      | Metropolitan | Total        |
|-----------------------------------------|--------------|--------------|--------------|--------------|--------------|
| No Bridge<br>Need none                  | 271<br>36.7% | 384<br>52%   | 279<br>37.8% | 376<br>51%   | 655<br>88.8% |
| No Bridge<br>Need new                   | 23<br>3.1%   | 10<br>1%     | 19<br>25%    | 37<br>5%     | 56<br>7.5%   |
| With Bridge<br>Need none                | 9<br>1%      | 33<br>4.4%   | 2<br>0.2%    | 17<br>2.3%   | 19<br>2.5%   |
| With Bridge<br>Need new/<br>replacement | 3<br>0.3%    | 4<br>0.4%    | 1<br>0.1%    | 6<br>0.6%    | 7<br>0.8%    |
| TOTAL                                   | 306<br>41.5% | 431<br>58.4% | 301<br>40.8% | 436<br>59.1% | 737<br>100%  |

TABLE 4.14: CARRIES TREATMENT NEED (%) OF SAMPLE

| GROUP                  | N   | PERCENTAGE SAMPLE REQUIRING: |                |                |                       |                           |                       |
|------------------------|-----|------------------------------|----------------|----------------|-----------------------|---------------------------|-----------------------|
|                        |     | NO<br>TREATMENT              | ONE<br>SURFACE | TWO OR<br>MORE | EXTRACTION<br>CARRIES | EXTRACTION<br>PERIODONTAL | EXTRACTION<br>DENTURE |
| <u>8-9 years old</u>   |     |                              |                |                |                       |                           |                       |
| Male                   | 439 | 38.27                        | 33.03          | 45.33          | 19.82                 | 0.0                       | 0.0                   |
| Female                 | 529 | 39.89                        | 29.30          | 47.07          | 17.01                 | 0.0                       | 0.0                   |
| Rural                  | 548 | 39.23                        | 33.39          | 45.26          | 17.15                 | 0.0                       | 0.0                   |
| Urban                  | 420 | 39.05                        | 27.86          | 47.62          | 19.76                 | 0.0                       | 0.0                   |
| Total                  | 968 | 39.15                        | 30.99          | 46.28          | 18.29                 | 0.0                       | 0.0                   |
| <u>13-14 years old</u> |     |                              |                |                |                       |                           |                       |
| Male                   | 489 | 29.24                        | 61.15          | 39.67          | 8.18                  | 0.0                       | 0.0                   |
| Female                 | 508 | 29.72                        | 63.98          | 34.06          | 5.51                  | 0.0                       | 0.0                   |
| Rural                  | 546 | 26.37                        | 64.65          | 37.00          | 7.33                  | 0.0                       | 0.0                   |
| Urban                  | 451 | 33.26                        | 60.09          | 36.59          | 6.21                  | 0.0                       | 0.0                   |
| Total                  | 997 | 29.49                        | 62.59          | 36.81          | 6.82                  | 0.0                       | 0.0                   |
| <u>35-44 years old</u> |     |                              |                |                |                       |                           |                       |
| Male                   | 306 | 40.52                        | 38.89          | 28.43          | 8.82                  | 2.61                      | 3.27                  |
| Female                 | 431 | 57.31                        | 31.09          | 17.40          | 5.10                  | 1.39                      | 2.78                  |
| Rural                  | 301 | 53.49                        | 33.55          | 19.27          | 6.31                  | 1.99                      | 2.33                  |
| Urban                  | 436 | 48.17                        | 34.86          | 23.85          | 6.88                  | 1.83                      | 3.44                  |
| Total                  | 737 | 50.34                        | 34.33          | 21.98          | 6.65                  | 1.90                      | 2.99                  |

Some 39.2% of the sample did not need any treatment for their teeth.

For the primary dentition there was relatively slight difference shown between the groups and the types of treatments required. However, the greatest required treatment was for restorative work. The average number of primary teeth/child which did not require treatment was 7.82 and was 11.21 for permanent teeth (Table 4.15 and Table 4.16). Female as well as rural groups were slightly better than their counterparts. Table 4.17, 4.18, 4.19, 4.20 show the relationships between number of teeth to be treated and the dmf/DMFT and ft/FT scores. As dmf scores increased, the number of teeth to be treated increased and as ft scores increased, the number of teeth to be treated was decreased. The same pattern was shown for the permanent dentition.

#### 13-14 years old

The average number of teeth which required treatment were 2.65, 2.49 for restorative treatment, 0.13 for extraction (0.11 due to dental caries) and 0.03 for nerve/pulp treatment (Table 4.21). There was a slight variation in treatment needs between the groups, with female and urban groups showing less treatment needs than male and rural groups in almost every treatment need.

#### 35-44 years old

Approximately 56.3% of the sample (N = 737) required restorative treatment (Table 4.14), with male and urban groups needing more treatment than their counterparts.

The percentage of sample who did not require any treatment was 50.3%; the female group was the highest (57.3%), followed by the rural (53.5%), urban (48.2%) and male (40.5%) groups.

Table 4.15. Treatment needs: primary dentition - teeth/child

|                  | Nil  | Fillings: |             | Crown | Total | Other |
|------------------|------|-----------|-------------|-------|-------|-------|
|                  |      | 1 surface | 2+ surfaces |       |       |       |
| Male             | 8.34 | 0.49      | 1.01        | .11   | 1.61  | 0.00  |
| Female           | 7.40 | .46       | .94         | .10   | 1.50  | .00   |
| Metropolitan     | 8.14 | .45       | .97         | .11   | 1.53  | .00   |
| Non-metropolitan | 7.58 | .50       | .97         | .10   | 1.57  | .00   |
| Total N=968      | 7.82 | 0.48      | 0.97        | 0.10  | 1.55  | 0.00  |
| S.D.             | 4.01 | 0.85      | 1.41        | 0.42  | -     | 0.00  |

Table 4.16. Treatment needs: permanent dentition - teeth/child

|                  | Nil   | fillings: |             | Crown | Total | Other |
|------------------|-------|-----------|-------------|-------|-------|-------|
|                  |       | 1 surface | 2+ surfaces |       |       |       |
| Male             | 10.76 | 0.81      | 0.66        | 0.02  | 1.49  | 0.00  |
| Female           | 11.58 | .72       | .54         | .02   | 1.28  | .00   |
| Metropolitan     | 10.89 | .78       | .63         | .02   | 1.43  | .00   |
| Non-metropolitan | 11.45 | .73       | .57         | .01   | 1.31  | .00   |
| Total            | 11.21 | 0.75      | 0.59        | 0.02  | 1.36  | 0.00  |
| S.D.             | 3.04  | 1.04      | 0.92        | 0.16  | -     | 0.00  |

Table 4.17. Caries prevalence/treatment needs: primary dentition

| dmf score     | number of teeth to be treated |     |     |     |      |       | TOTAL |
|---------------|-------------------------------|-----|-----|-----|------|-------|-------|
|               | 0                             | 1-2 | 3-4 | 5-7 | 8-10 | 11-20 |       |
| 0             | 202                           | 0   | 0   | 0   | 0    | 0     | 202   |
| 1-2           | 63                            | 115 | 0   | 1   | 0    | 0     | 179   |
| 3-4           | 44                            | 59  | 46  | 0   | 0    | 0     | 149   |
| 5-7           | 44                            | 86  | 58  | 68  | 0    | 0     | 256   |
| 8-10          | 24                            | 33  | 37  | 43  | 19   | 0     | 156   |
| 11-20         | 2                             | 3   | 6   | 4   | 8    | 3     | 26    |
| Total persons | 379                           | 296 | 147 | 116 | 27   | 3     | 968   |
| Mean dmf      | 1.9                           | 4.1 | 6.1 | 7.2 | 9.4  | 11.7  | 4.10  |
| S.D.          | 2.7                           | 2.6 | 2.4 | 1.8 | 1.2  | 1.2   | 3.30  |

Table 4.18. Filled teeth/treatment needs: primary dentition

| ft score      | number of teeth to be treated: |     |     |      |      |       | TOTAL |
|---------------|--------------------------------|-----|-----|------|------|-------|-------|
|               | 0                              | 1-2 | 3-4 | 5-7  | 8-10 | 11-20 |       |
| 0             | 219                            | 145 | 84  | 92   | 26   | 3     | 569   |
| 1-2           | 72                             | 73  | 37  | 16   | 1    | 0     | 199   |
| 3-4           | 42                             | 44  | 14  | 7    | 0    | 0     | 107   |
| 5-7           | 38                             | 33  | 12  | 1    | 0    | 0     | 84    |
| 8-10          | 7                              | 1   | 0   | 0    | 0    | 0     | 8     |
| 11-20         | 1                              | 0   | 0   | 0    | 0    | 0     | 1     |
| Total persons | 379                            | 296 | 147 | 116  | 27   | 3     | 968   |
| Mean ft       | 1.4                            | 1.5 | 1.3 | 0.45 | 0.04 | 0.00  | 1.25  |
| S.D.          | 2.2                            | 1.9 | 1.7 | 1.1  | 0.2  | 0.0   | 1.93  |

Table 4.19. Caries prevalence/treatment needs: permanent dentition

| DMFT Score    | number of teeth to be treated: |      |      |      |      |       | TOTAL |
|---------------|--------------------------------|------|------|------|------|-------|-------|
|               | 0                              | 1-2  | 3-4  | 5-7  | 8-10 | 11-20 |       |
| 0             | 211                            | 9    | 0    | 0    | 0    | 0     | 0     |
| 1-2           | 64                             | 219  | 7    | 0    | 0    | 0     | 290   |
| 3-4           | 102                            | 123  | 192  | 1    | 0    | 0     | 418   |
| 5-7           | 3                              | 11   | 11   | 10   | 0    | 0     | 35    |
| 8-10          | 0                              | 0    | 3    | 1    | 0    | 0     | 4     |
| 11-20         | 0                              | 0    | 0    | 0    | 0    | 1     | 1     |
| 21            | 0                              | 0    | 0    | 0    | 0    | 0     | 0     |
| Total persons | 380                            | 362  | 213  | 12   | 0    | 1     | 968   |
| Mean DMFT     | 1.31                           | 2.27 | 3.75 | 5.58 | 0    | 15.00 | 2.27  |
| S.D.          | 1.66                           | 1.23 | 0.86 | 1.31 | 0    | 0.00  | 1.73  |

Table 4.20. Filled teeth/treatment needs: permanent dentition

| FT score      | Number of teeth to be treated: |      |      |     |      |       | TOTAL |
|---------------|--------------------------------|------|------|-----|------|-------|-------|
|               | 0                              | 1-2  | 3-4  | 5-7 | 8-10 | 11-20 |       |
| 0             | 215                            | 204  | 179  | 12  | 0    | 1     | 611   |
| 1-2           | 67                             | 119  | 28   | 0   | 0    | 0     | 214   |
| 3-4           | 97                             | 39   | 6    | 0   | 0    | 0     | 142   |
| 5-7           | 1                              | 0    | 0    | 0   | 0    | 0     | 1     |
| Total persons | 380                            | 362  | 213  | 12  | 0    | 1     | 968   |
| Mean FT       | 1.25                           | 0.85 | 0.24 | 0.0 | 0    | 0.0   | 0.86  |
| S.D.          | 1.62                           | 1.13 | 0.66 | 0.0 | 0    | 0.0   | 1.32  |

Table 4.21. Treatment needs - permanent dentition - teeth per student

|                  | FILLINGS       |                |       |       | PULP<br>TREATMENT | EXTRACTION |        |       | Total |
|------------------|----------------|----------------|-------|-------|-------------------|------------|--------|-------|-------|
|                  | One<br>surface | 2+<br>surfaces | Crown | Total |                   | Caries     | Perio. | Other |       |
| Male             | 1.64           | 0.86           | 0.09  | 2.59  | 0.04              | 0.13       | 0.0    | 0.02  | 0.15  |
| Female           | 1.68           | .65            | .06   | 2.39  | .01               | .09        | .0     | .03   | .12   |
| Metropolitan     | 1.48           | .70            | .05   | 2.23  | .03               | .10        | .0     | .01   | .11   |
| Non-metropolitan | 1.81           | .80            | .09   | 2.70  | .02               | .12        | .0     | .03   | .15   |
| Total            | 1.66           | 0.76           | 0.07  | 2.49* | 0.03              | 0.11       | 0.0    | 0.02  | .13   |
| S.D.             | 1.93           | 1.27           | 0.32  | -     | 0.23              | 0.47       | 0.0    | 0.24  | -     |

\* Total surfaces approximately 3.9 per person

4.3.6.2 Periodontal disease

8-9 years old

- 11% of the sample (968) needed no treatment
- 87% needed individual oral hygiene instruction
- 28% needed plaque removal.

13-14 years old

As seen from Table 4.22 no sophisticated periodontal treatment was needed. Almost 70% of the sample needed individual oral hygiene instruction, 32% of the sample needed plaque removal and 0.1% only needed major scaling.

Male and urban groups scored consistently higher in all conditions. Differences were minimal between rural and urban groups.

TABLE 4.22: Periodontal treatment requirements,  
13-14 years old.

|                  | Per cent requiring: |                   |        |
|------------------|---------------------|-------------------|--------|
|                  | Major<br>scaling    | Plaque<br>removal | O.H.I. |
| Male             | 0.2                 | 36.2              | 74.6   |
| Female           | 0.0                 | 28.0              | 65.0   |
| Metropolitan     | 0.2                 | 31.3              | 70.7   |
| Non-metropolitan | 0.0                 | 32.6              | 68.9   |
| Total            | 0.1%                | 32.0%             | 69.7%  |

35-44 years old

For the dentate sample only: 13.3% did not need periodontal treatment or oral hygiene instruction.

Broken down to groups, the figures were:

Metropolitan: 14.3%

Rural: 11.5%

Females: 18.5%

Males: 6.8%

The treatment needs were as follows:

- Plaque removal: 60% of the sample
- Individual oral hygiene instruction: 57.4%
- Restoration to be recontoured/replaced: 1%
- Scaling: 16%
- Periodontal surgery: 17%
- Extraction due to periodontal disease: 2.3%.

Treatment/Need ratio = 0.82 for the sample; and 48% had received treatment related to their needs.

Successful treatment/Need = 0.67 for the sample, and only 29.3% had all of their needs successfully treated.

4.3.6.3 Dentofacial anomalies

It was found that 36.3% of the sample required treatment, 54.3% did not require treatment, while 9.4% of the sample were either being treated or had been treated. (Table 4.23).

TABLE 4.23: Treatment and treatment needs: Dentofacial anomalies

| Treatment required | Treatment status |             |           | Total       |
|--------------------|------------------|-------------|-----------|-------------|
|                    | Not given        | Being given | Completed |             |
| No                 | 526 (54.3)       | 12 (1.2)    | 16 (1.7)  | 554 (57.2)  |
| Yes                | 351 (36.3)       | 54 (5.6)    | 9 (0.9)   | 414 (42.8)  |
| Total              | 877 (90.6)       | 66 (6.8)    | 25 (2.6)  | 968 (100.0) |

#### 4.3.7 ATTITUDES, PERCEPTION AND VALUES

##### 13-14 years old

Most of the students (76%) were satisfied with the condition of their teeth and gums. Some of them were dissatisfied mostly with their teeth.

##### Occupation ranking: (with a scale of 5 occupations)

The dentist was ranked no.1 by 7%

no.2 by 52%

no.3 by 24%

(medical practitioner was included in the list).

##### The decision to visit the dentist was made for:

63% by the family

16% by themselves

21% by the dentists (through recall system).

##### Reason for visit:

45% for asymptomatic condition

38% for symptomatic condition (the most common was toothache).

Lack of severity of a condition was the frequent answer for not visiting a dentist given by 34% of the sample.

##### Pain anticipation:

62% anticipated pain

10% medium to high pain level

19% no pain.

With regard to students' oral health behaviour in relation to carious teeth, 26% of the variability was explained by sociological variables and the 5 best predictors for dental caries were:<sup>27</sup>

1. the number of visits to the dentist in the past 12 months.
2. Asymptomatic reasons for dental visit.
3. the proportion of all conditions perceived in the last 12 months.
4. the level of educational aspiration.
5. Lack of severity of the oral condition as a reason for not visiting the dentist.

A tree diagram using mean DT score is presented in Fig. 10.

For Gingivitis, the 5 best predictors only explained 5% of the variability and they were:<sup>27</sup>

1. the number of visits to the dentist in the past 12 months.
2. Whether or not the student perceives multiple needs for visiting the dentist.
3. Whether or not the professionals decide that the student should visit the dentist.
4. the sex of the student.
5. the age of the student (in fractional years).

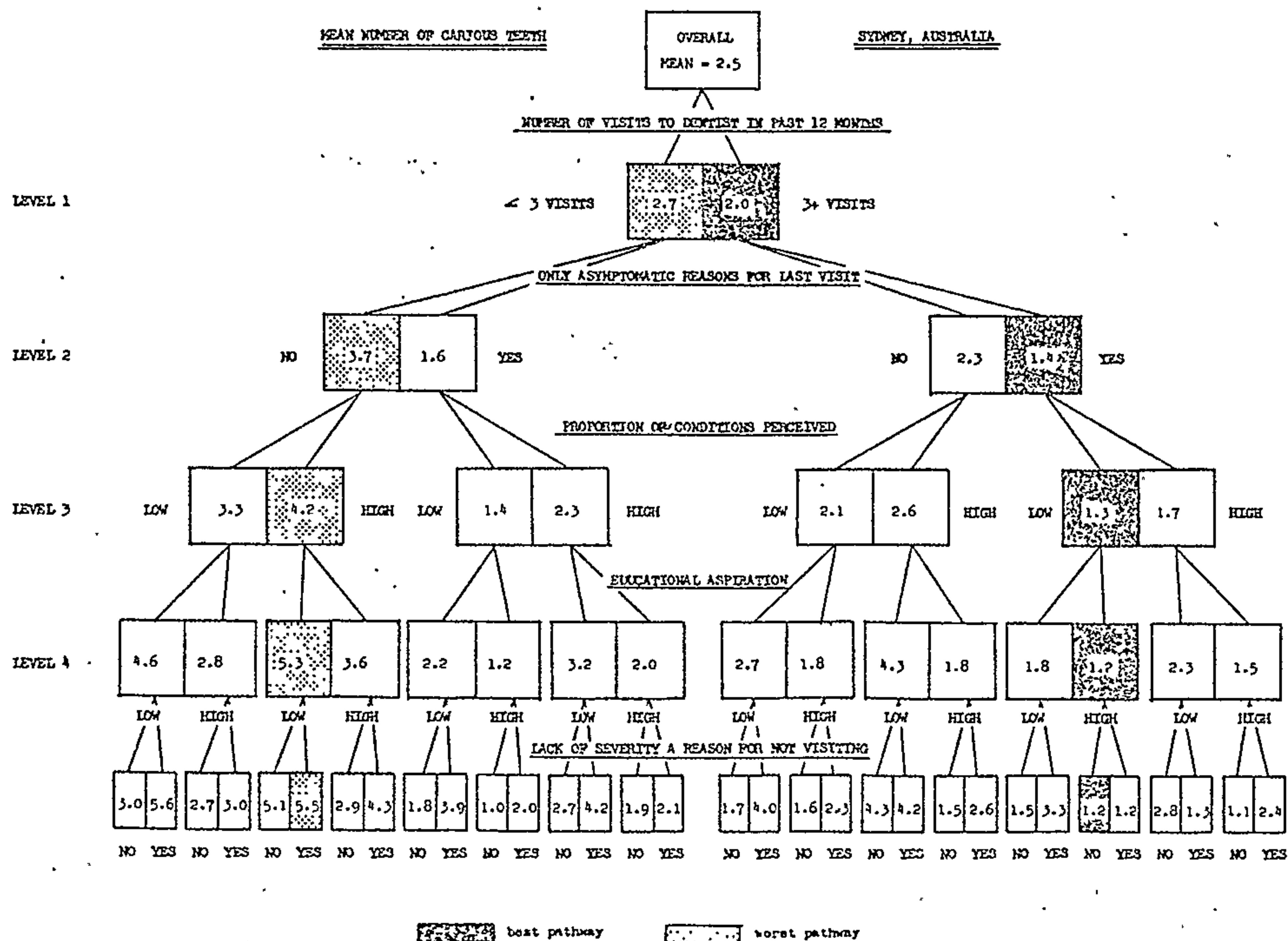
A tree diagram using mean number of teeth with gingivitis is presented in Fig. 11.

For Treatment/Need ratio, the 5 best predictors which explained 20% of the variability were:<sup>27</sup>

1. the number of visits to the dentist in the past 12 months.
2. Asymptomatic reason for dental visit.
3. Lack of severity of the oral condition as a reason for not visiting the dentist.
4. the proportion of all conditions perceived in the last 12 months.
5. the number of siblings per student.

A tree diagram using mean Treatment/Need ratio is presented in Fig. 12.

FIGURE 10.



From a tree diagram of the DT values for these 5 predictor variables in Fig. 10; it can be seen: 27

The mean number of carious teeth, at level 1 in the diagram, for those who made two or less visits to the dentist in the previous 12 months was 2.7, a figure considerably greater than the mean of 2.0 teeth observed among those who made three or more visits.

The differences observed at level 2 between those who gave asymptomatic reasons only for visiting the dentist and those who did not, were greater and consistent on both sides.

The greater difference occurred in the group who had visited the dentist less than three times during the preceding year (3.7 compared with 1.6).

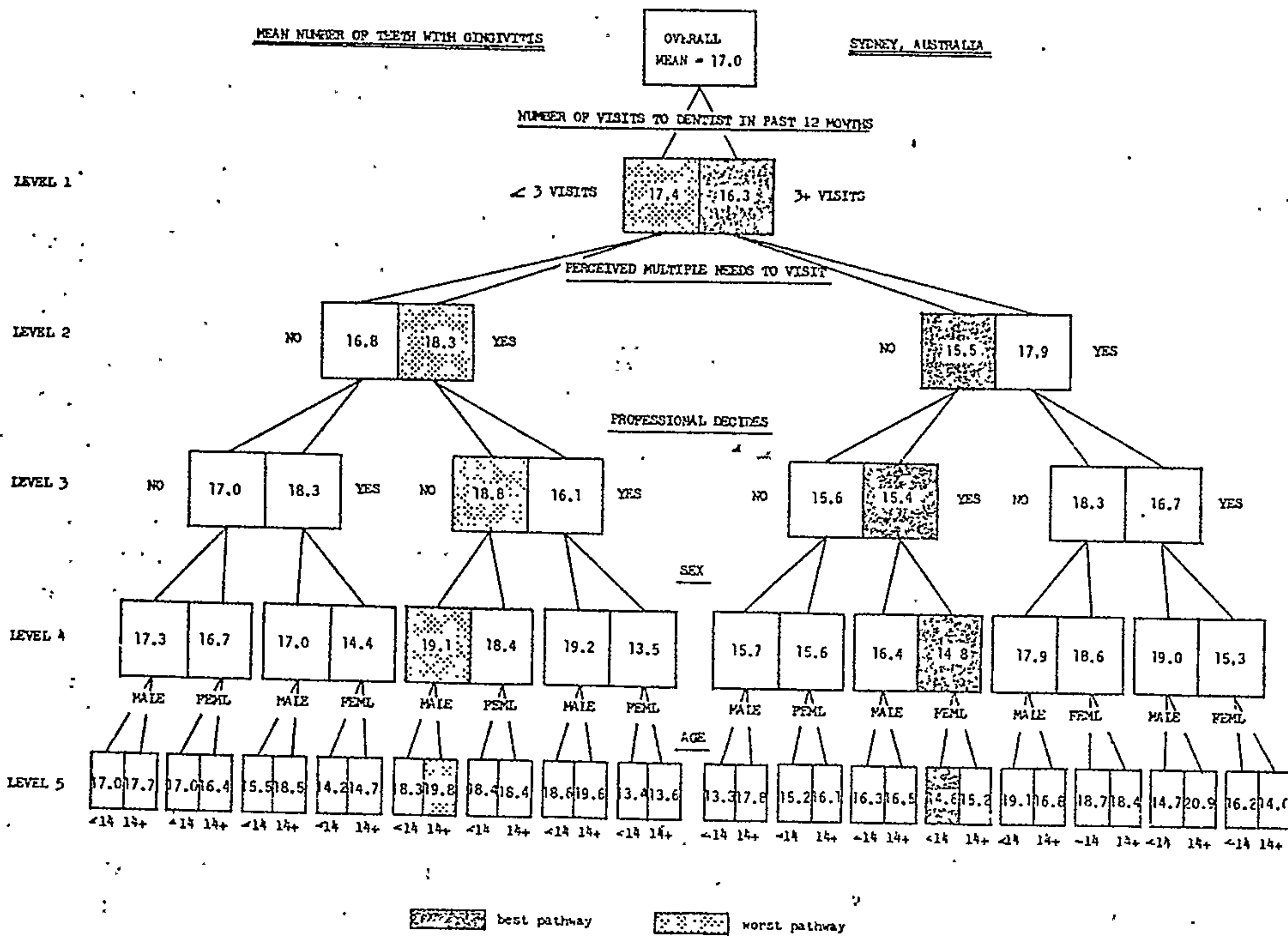
The differences observed at level 3 between those who perceived their oral condition as no treatment required, or only one condition needing care, with those reporting a treatment need for 2 or more conditions (level 3), the former had lower carious teeth (from 0.4 to 0.9) and the difference was consistent. Level 4 was the variable measuring educational aspirations, and without exceptions, those with higher aspirations had lower carious teeth means.

At level 5, where the variable was lack of severity given as the reason for not visiting, 14 out of 16 dichotomies indicated lower carious teeth means for those who would visit even without a severe condition.

A clear picture of variables related to carious teeth score can be shown by tracing the high and low scores through the tree diagram.

At 5th level it can be seen that those who visit the dentist less and only when they have symptoms, perceive higher levels of need, have lower educational aspirations and would not visit unless they have a severe condition, had a mean score of 5.5 carious teeth. Those who visit more and without symptoms, perceive lower levels of need, have higher educational aspirations and would visit even though they have no severe condition, had a mean score of 1.2 carious teeth.

FIGURE 11.



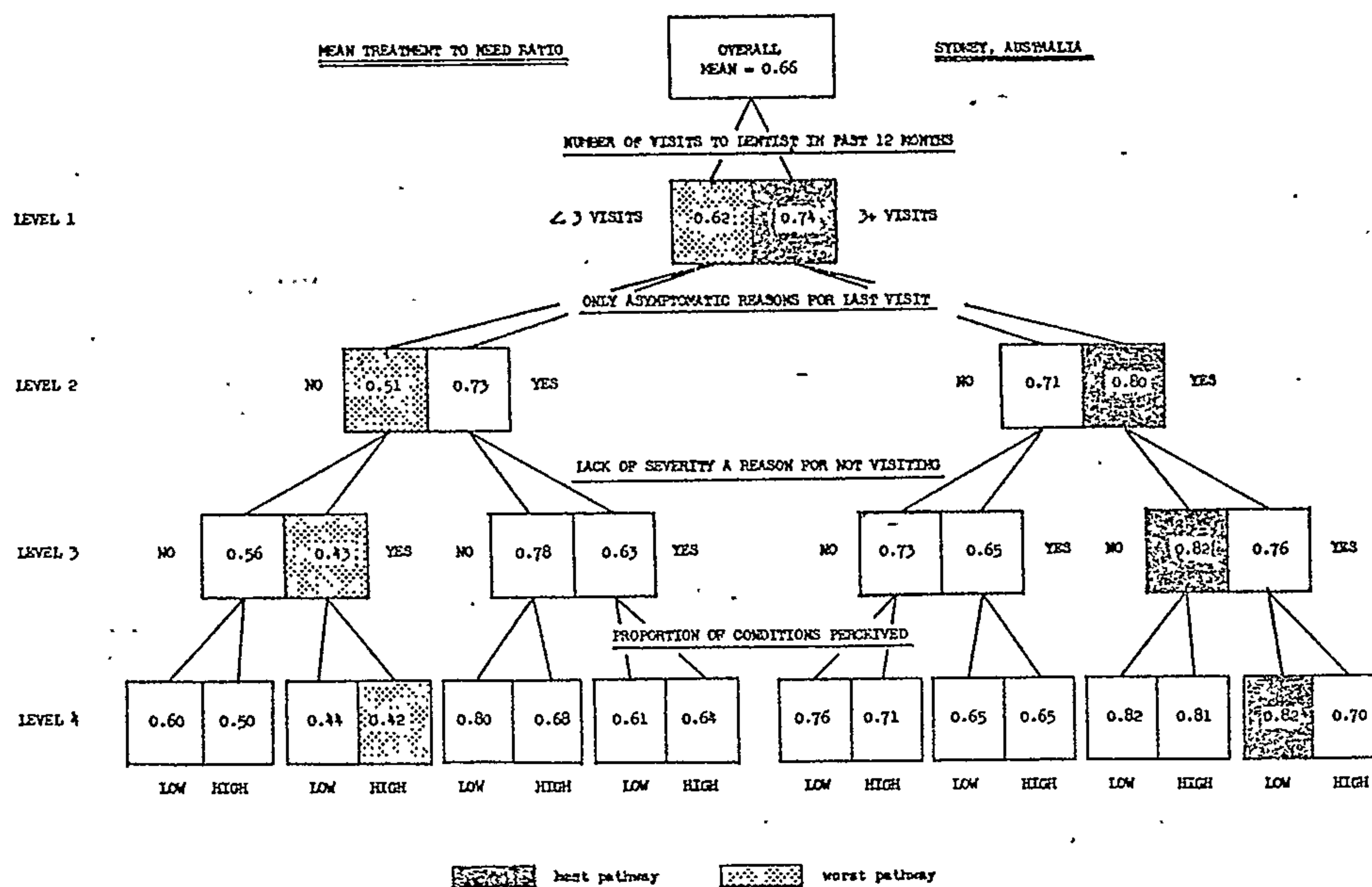
For the first variable there was a small difference between those who had visited the dentist less than 3 times during the preceding 12 months (17.4) and those who had visited 3 or more times (16.3).

There was consistency in the direction of the various dichotomies at each level in the tree diagram until the 5th variable (age) which showed several reversals from the more usual and expected higher score for older students.

Among those for whom the professional decides when the next visit will be, females had an average of 3 teeth fewer with gingivitis than males. Where the professional did not make the decision there was practically no difference in scores between males and females. The greatest contrast found in the analysis was 19.8 against 14.6 teeth with gingivitis.

Those who visit more, perceived none or single need, for whom the professional decides on the next visit, and who are female, and less than 14 years have the lowest score and those with the converse for those dichotomies the highest.

FIGURE 12.



Consistency in dichotomy differences throughout a tree diagram was found, there being only one reversal at level 4 dealing with the perception of number of conditions needing care. At level 4 the treatment difference shown was 82% against 42%. Those who visited more and asymptotically, felt that lack of severity was not a reason controlling visit behaviour and perceived no treatment needs or one condition requiring care have the highest score and those who claimed the opposite for each of these variables the lowest.

### Oral health knowledge:

100% knew about toothpicks and mouthwashes

80% knew about fluoride toothpaste

40% knew about dental floss and disclosing tablets

98% reported toothbrushing for personal oral health care carried out the day prior to interview.

Only 6% of the students had actually used toothpicks, 3% dental floss, and 1% disclosing tablets.

The number of snacks between meals varied widely. The average was 3.3/day/student.

The prime source of information about oral health care practices were the parents, and the next most frequent source was the dentist.

### 35-44 years old

#### Satisfaction with their condition of:

general health: 42% fairly satisfied

17% fairly or very dissatisfied

dental health: 38% highly satisfied

55% medium satisfaction

6% low satisfaction

1% very low satisfaction

56% satisfied with their gums

35% satisfied with their teeth

12% fairly or very dissatisfied with the gum

25% dissatisfied with the teeth

- 78% perceived low degree - severity of dental condition.

- 22% perceived dental conditions more serious than non-dental conditions.

Of the 46.9% of the sample who were wearing dentures:

- 82% felt that natural teeth were superior

- 8% felt that false teeth were better
- 10% thought they were about the same.

Dental visit:

57.4% received dental care in the past 12 months, and almost all (55%) went to private practitioner. The comparative use of medical practitioner was 60% and 21% for pharmacists.

Reasons given for dental visit:

63% symptomatic

37% preventive

Reasons given for not visiting dentist: (in the past 12 months)

44% had already made a visit

36% had no symptoms

20% other reasons

4.6% fear of pain.

Out of the total sample, 18.2% of adults sometimes and 15.8% almost always avoided dental visits for fear of pain. From past experience 9.4% reported a great deal of pain and 71.3% some pain from a dental visit. However only 3% listed pain as a reason for not taking care of their teeth and gum.

Perceived need:

48% thought they needed restorative dentistry

35% periodontal disease treatment

17% prosthetic treatment.

Personal oral health practice:

97% used toothbrush and only 1% used disclosing tablets

42% rinsed after eating.

27% used toothpicks, 30% gum massage, 21% mouthwash, and

8% dental floss.

Availability and accessibility:

6.8% considered public services were sufficient in the community.

60% agreed with one or more of the following statements:

- Dentists are seldom available when needed (13.7%).
- Dentists can almost always select the patients they want.
- More dentists are needed in the area.

Appointments:

42.5% got an appointment within half a week.

42.2% between 1 week and one month.

Mode of travel to dental surgery:

70% by car

13% by public transport

13% walked.

The average distance travelled was 6.6 km to the surgery and travel costs averaged \$0.60.

Dental Fee

71% of the sample did not discuss the fee before treatment.

When fees were discussed, there was mostly no change in the decision to have the work carried out (19.3% work done and 1.1% not done).

When discussions affected the fee level (8.4%), 3.6% did not proceed with the work.

The median payment from personal resources was \$10.50/12 months (the total payment \$20.50 including 3rd party payments).

48.4% of the sample desired lower fees.

Time of employment lost:

3.2% for less than 2 hours/year

10.8% for 2 or more hours/year

Only 1.9% of the sample had any loss of earnings as a result of dental visit.

## UTILIZATION OF DENTAL SERVICE

The average number of visits in the past 12 months was 1.60 and the figure for those who did attend was 2.80 visits.

42.7% of the sample did not visit the dentist within the previous year (9% had not visited the dentist within 10 years).

The number for whom one year had elapsed since their last visit was 2.4%, two years 10.9%, three years 5.4%, four years, 3.6%, five years 3.5%.

### Classification of users:

- 2.6% remote one-time users
- 40% remote multiple-users
- 14.3% recent intermittent-users
- 43.1% recent consistent-users.

### Type of services received at last visit:

- 47.5% diagnostic
- 36.2% restorative
- 4.6% rehabilitative
- 5.5% prosthetic
- 10.9% extraction
- 10.5% other treatments
- 24.1% prophylactic treatments.

For seven selected oral health status indicators the variance explained by the sociological variables was determined.

| <u>Total sample</u>              | <u>Percentage of variance explained</u> |
|----------------------------------|-----------------------------------------|
| Missing teeth                    | 55%                                     |
| Treatment/Need ratio             | 31%                                     |
| Treatment-Retreatment/Need ratio | 33%                                     |

Non-edentulous sample

|                                  |     |
|----------------------------------|-----|
| Decayed teeth                    | 36% |
| Treatment/Need ratio             | 44% |
| Treatment-Retreatment/Need ratio | 45% |
| Periodontal Index (modified)     | 32% |

There was a remarkable consistency in that just two independent variables account for most and in some cases for almost all of the variance explained. These variables are user type and perceived need for prosthetic treatment.<sup>10</sup>

User type is a measure of utilization in which the score increases from never visited to remote one time utilization, through multiple and recent single or intermittent visits, to recent multiple and consistent visits to the dentist.

The expected relationship between user type and oral health status is that the more favourable the user type is, the better the oral health status (positive relationship). The variable pertaining to perceived need for prosthetic treatment results from a yes/no response to the question. "If you went to the dentist tomorrow do you think he would find anything wrong with your teeth or gums?" The possible responses number six and include both dentures and crown and bridge work. Perceived need for prosthetic treatment has a positive relationship with number of missing teeth and amount of disease present while user type is negatively related to these variables. For treatment/need ratios the relationships are negative for the perceived need for prosthetic treatment and positive for user type.

The other 3 best predictors were:

- satisfaction with condition of teeth
- reasons for any visits
- total years of schooling.

## THE PROVIDER<sup>11</sup>

All dentists listed in the rural area were included, a sampling ratio was used for urban study area. 98 dentists were interviewed out of the 110 selected.

## THE PROFILE

### Job - Classification

96 were classified as general dental practitioners (the only specialists were urban dentists).

5 were Royal Australian Air Force dentists (all in rural area).

1 was working for the School Dental Service.

### Sex and Age

|                | <u>Male</u> | <u>Female</u> | <u>Average Age</u> |
|----------------|-------------|---------------|--------------------|
| Urban          | 91%         | 9%            | 45.4 years         |
| Rural          | 100%        | 0%            | 43.1 years         |
| Average Total: |             |               | 44.3 years         |

The average number of years working as a dentist was: 17.9 years, for urban dentist: 19.6 years and rural dentist: 16.0 years.

### Education

93% had a basic dental education (with the average of 4.3 years) in Australia.

13% of urban dentists had post-basic dental education (with the average of 3 years, compared to 1.2 years for rural dentists).

11% of the sample considered that they had further qualifications (16% of urban, and 6% of rural dentists), but only 2% practiced in their specialty.

Type of employment

90% were self-employed based in their primary practice.

(83% were self-employed if all types of practice were considered, 7% were also employed part-time away from their primary practice).

PRACTICE CHARACTERISTICS

Almost all practices (97%) employed auxiliaries. 47% of private practices in urban areas and 37% in rural areas had more than one dentist.

In the average practice there were (with 2.3 chairs):

- 1.3 general practitioners
- 1.6 chairside assistants
- 0.3 dental technician
- 0.5 receptionist

(A total of 2.4 auxiliaries).

Working hours in practice

Dentist: (1,3 of them)

47 hours for chair-side

8 hours in Laboratory and Administration work.

Auxiliaries:

49 hours for chairside

28 hours for office management

12 hours for Laboratory procedures

2 hours for X-rays

The average number of patients was 90/dentist/week.

Waiting time for appointment

|                       | <u>Urban</u> | <u>Rural</u> |
|-----------------------|--------------|--------------|
| No wait               | 8%           | 17%          |
| 1 day to 1 week       | 54%          | 30%          |
| > 1 week to 1 month   | 34%          | 33%          |
| > 1 month to 2 months | 2%           | 20%          |

Recall System

|                                      | <u>Urban</u> | <u>Rural</u> |
|--------------------------------------|--------------|--------------|
| None                                 | 14%          | 23%          |
| Yes for patients requesting it       | 37%          | 37%          |
| Yes for patients selected by dentist | 8%           | 13%          |
| Yes for all patients                 | 41%          | 27%          |

ATTITUDES, PERCEPTION & VALUES

Perceived achievement: (compared with their age-group):

0.28 = low (metropolitan: 0.33, rural: 0.23).

Opportunity perceived:

1.05 for metropolitan, 0.93 for rural.

It was noted that 47% of dentists said they would dissuade their own child from a career in dentistry.

The changes in the delivery system as expressed by providers:

|                                             | <u>Urban</u> | <u>Rural</u> |
|---------------------------------------------|--------------|--------------|
| Need for increase in:                       |              |              |
| 1. Dentists in urban areas                  | 26%          | 21%          |
| 2. Dentists in rural areas                  | 97%          | 86%          |
| 3. Dental clinics in urban public hospitals | 70%          | 82%          |
| 4. Dental Clinics in rural public hospitals | 75%          | 71%          |
| 5. Dental assistants used                   | 74%          | 67%          |
| 6. Hygienists                               | 84%          | 74%          |
| 7. Salaries of dentists                     | 73%          | 48%          |
| 8. Fees for services                        | 48%          | 14%          |
| 9. Dental care insurance                    | 94%          | 97%          |
| 10. Reduced wait for appointments           | 71%          | 69%          |

Provision of Services

Weeks/Hours worked/dentist = 47.1 weeks/year in urban

(40.2 hours/week)

44.3 weeks/year in rural

(37.5 hours/week)

and equal to:

- 1.658 hours spent at chairside in urban (rural: 1.409 hours)
- 3.1 hours for laboratory work/week in metropolitan (rural: 4.8 hours).

Time per visit:

0.41 hours/patient = 25 minutes (metropolitan: 25.8 minutes, rural: 23.4).

Proportion of time spent on various dental procedures

|                  | <u>Urban</u> | <u>Rural</u> |
|------------------|--------------|--------------|
| Crown-Bridge     | 6%           | 4%           |
| Endodontics      | 5%           | 4%           |
| Orthodontics     | 3%           | 2%           |
| Periodontics     | 5%           | 4%           |
| Partial Dentures | 5%           | 7%           |
| Full Dentures    | 5%           | 14%          |
| Extractions      | 7%           | 10%          |
| Operative        | 56%          | 47%          |
| Oral Surgery     | 2%           | 2%           |
| Oral Diagnosis   | 2%           | 3%           |
| Health Education | 4%           | 3%           |

The Frequency of Consultation with their Colleagues

Urban: 3.7 times/week

Rural: 2.9 times/week.

Periodontal disease (treatment or diagnose)

Urban: 3.5 patients/day

Rural: 4.2 patients/day

and the average time for the periodontal examination was 5.1 minutes.

Some 66% of dentists (in rural area 71% and in urban area 60%) indicated that they had patients presenting for periodontal consultations.

## 5. SUMMARY AND DISCUSSION

According to its Constitution Australia is a federation of six States and two Territories, and most of the functions of the government are carried out by the States, such as agriculture, education and health services. Defence, foreign affairs, aviation, quarantine and communication are responsibilities of the Federal Government.

As most of each government's income is controlled by the Federal Government, it has the power to influence policies in the States to some extent in some areas and these include health and dental health. However the Federal Government has little control on training and distribution of dental manpower/dentists.

Dental Health Service in Australia tends to be administered independently at all governmental levels and is often isolated from health services. However the independence always has to be considered in the administration and routine work of the dental health services only. Full cooperation and integration should be implemented among divisions/services in the Health Department, and applying a multi-disciplinary approach for solving the national health/dental health problems, by using efficiently all resources within and between departments.

As Tejada-De Rivero<sup>66</sup> summed it up:

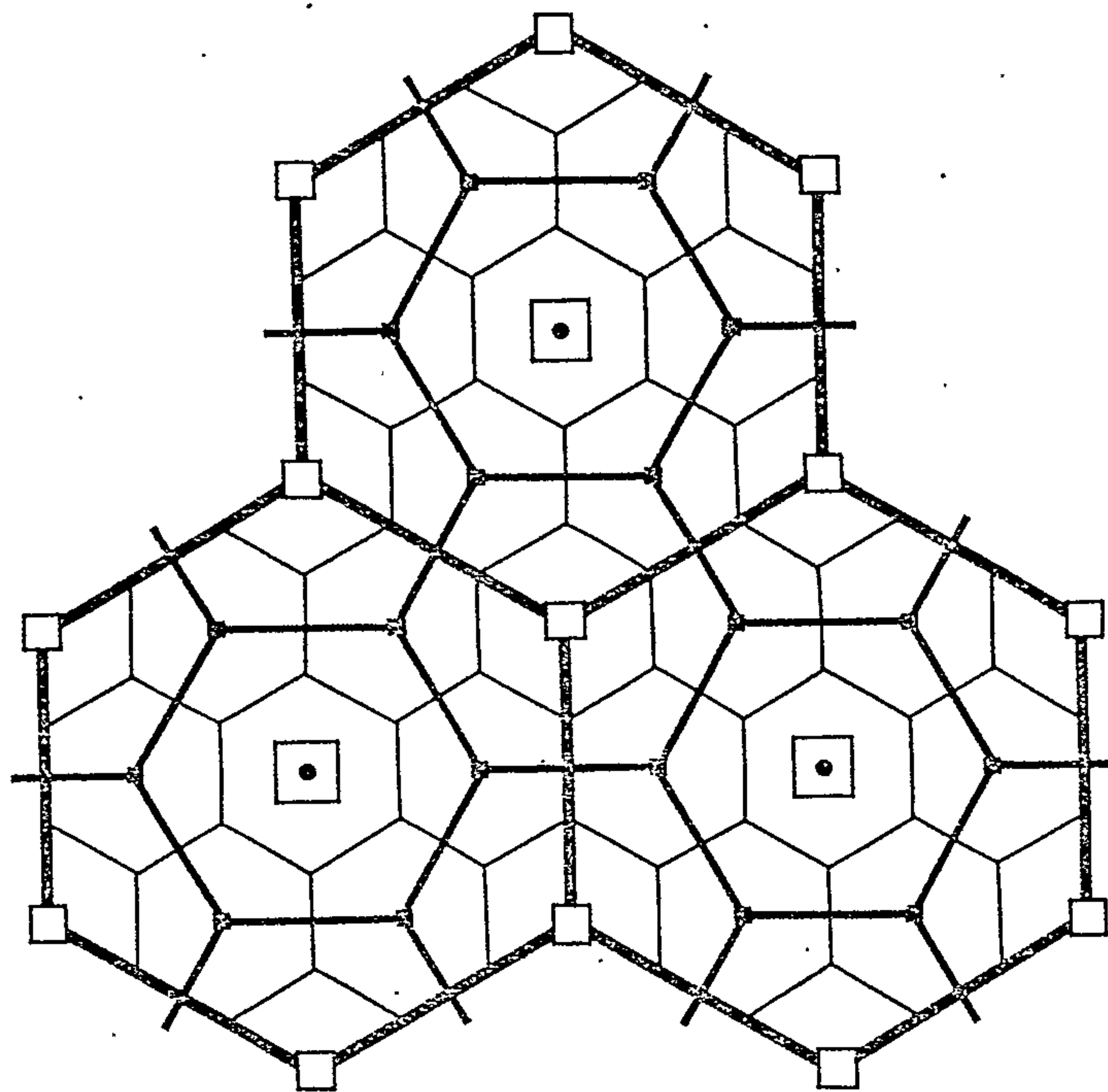
"In essence, its objective is to provide the right type of education and training for the right number and type of people needed to render effectively and safely the right types of services when and where required by the people".

## 5.1 AVAILABILITY

The registered dentist to population ratio in Australia in 1978 was 1:1.964, varying from 1:1.447 in A.C.T. to 1:3.134 in Tasmania. (Active dentist: population ratio for Australia in 1978 was 1:2.467, varying from 1:1.711 in A.C.T. to 1:3.506 in Tasmania). (U.S.A. in 1976: 1:2.130<sup>38</sup>). Compared with the 1954 figure for registered dentist: population ratio which was 1:2.276, and in 1963 which was 1:2.573, the ratio certainly improved since then. However the above ratio is still far away from that which had been reached by Sweden<sup>4</sup> (in 1976 the ratio was 1:1.000) and Norway<sup>8</sup> (in 1976, 1:970). As in other Western democratic countries, Australia does not have a centralized administration for its dental health services such as found in most socialist/communist countries. Hence the Federal Government does not have the overall control of manpower distribution, except those who are working for the Armed Forces. The dentists tend to converge to capital cities or other population centres, causing uneven distribution of dental manpower (as is also found in U.S.A. and in U.K.), and place the population in rural areas at a disadvantaged position.<sup>68</sup>

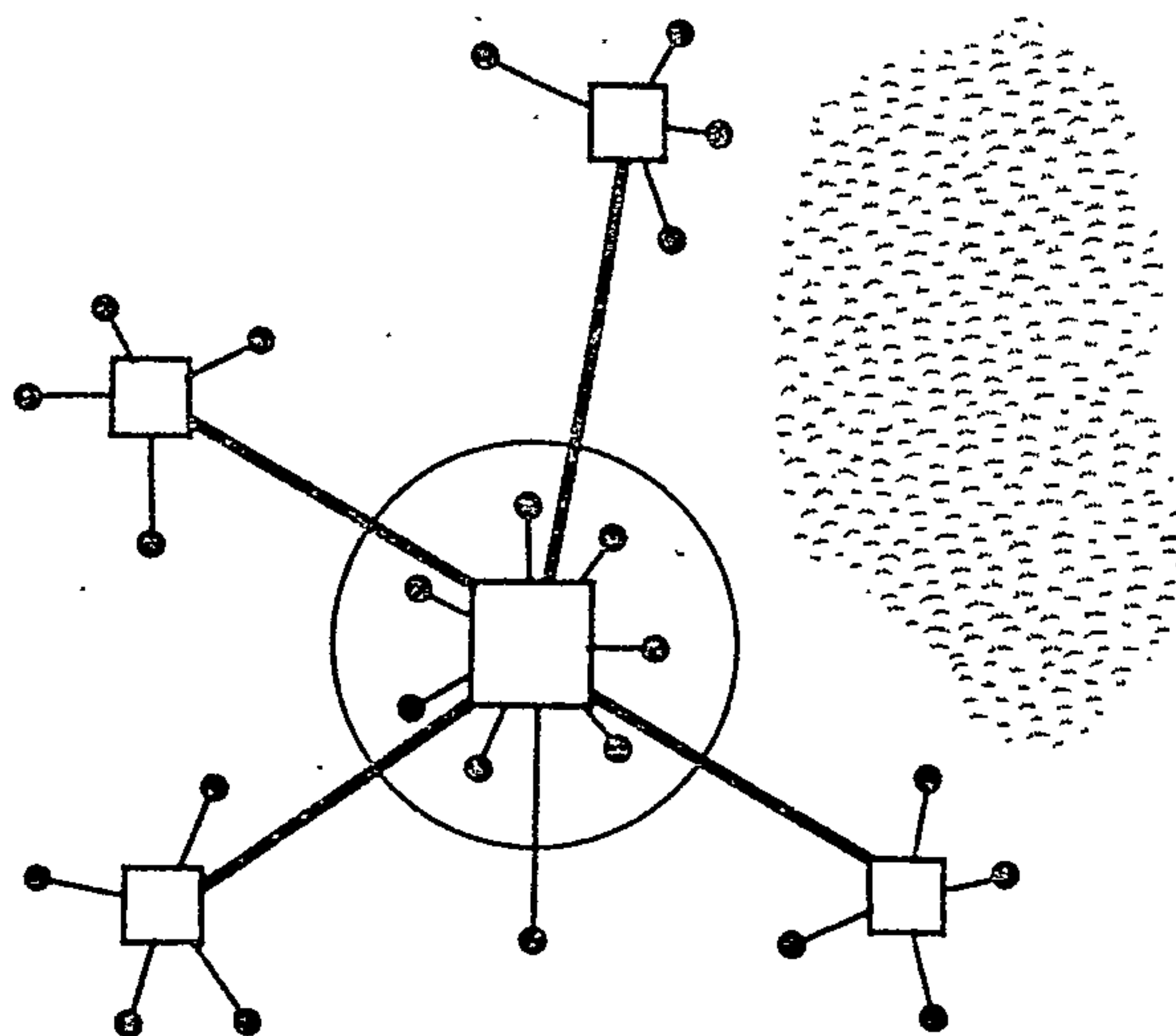
The above situation can be improved if there is a network of dental health delivery care system, with an effective referral system.

Shannon & Dever<sup>62</sup> proposed an ideal health delivery model and a realistic health delivery model, as shown in Fig. 13 and Fig. 14. This principle of regionalisation and delegation of authority actually had been implemented, such as in N.S.W. and Queensland.<sup>49,53,54</sup> However at the present moment each service whether it is a dental clinic or child/baby centre or other



- ◻ REGIONAL HOSPITAL (>500 beds)
- ◻ DISTRICT HOSPITAL (101-500 beds)
- RURAL HOSPITAL (20-100 beds)

Figure 13. An ideal health delivery model.



- ◻ REGIONAL HOSPITAL (>500 beds)
- ◻ DISTRICT HOSPITAL (101-500 beds)
- RURAL HOSPITAL (20-100 beds)

Figure 14. A realistic health delivery model.

service, tends to occupy separate buildings. A health centre, which provides primary health care and dental care, as a first contact between the consumer and the provider, seems to be the realistic solution; justified from its multidisciplinary approach, the comprehensiveness of the services (although basic), and its lower overhead-costs.<sup>49</sup> Cohen<sup>33</sup> commented:

"Dental care organizational forms which approximate or complement or cohabit comfortably with medical care organizational form existent for the same population will engender better lifelong health patterns than will dental care system which stand apart from the dominant pattern for health care in that place".

During 1970-1978 period, the number of registered dentists did increase more rapidly than the population,<sup>25</sup> partly due to low birth-rate and lower level of immigration and marked increase in the number of overseas dentists coming to Australia (Table 2.7). If the pattern of population increase and the supply of dental manpower are constant, there might be an over-supply of dental manpower, unless the number of overseas dentists is reduced or the community becomes more aware of their dental needs and the need for utilization of dental services. The ever increasing number of female dentists, together with the growth of School Dental Service, could contribute to the increased number of salaried dentists in the future.

Since 1972,<sup>1</sup> when Denal Health Branch was created in the Commonwealth Department of Health, school dental therapist training program had gained momentum. With 10 training schools in operation at the present moment (with annual potential graduate capacity of 390), there will be an oversupply of school dental therapists in the near future (the average additional dental clinics, mobile and static, was 56 per year within

1973-1978 period), if the government does not increase school dental clinics in proportional numbers or reduce the number in training.

From the WHO<sup>11</sup> study it seemed that there was not enough evidence to correlate the availability of manpower and the oral health status of the community. As Cohen<sup>34</sup> stated:

"...., oral health status, in contrast, seems to be more closely affected not by manpower arrangements but by consumer behaviour and beliefs".

## ACCESSIBILITY

### Finance

Newman and Anderson's<sup>34</sup> study on dental service utilization in the U.S.A., found that:

10% of the individuals accounted for  $\frac{3}{4}$  of the total expenditure;

of which 3% of the individuals accounted for  $\frac{1}{2}$  of the total expenditure;

of which 0.8% of the individuals accounted for  $\frac{1}{4}$  of the total expenditure, or expressed another way:

18% of the individuals accounted for  $\frac{3}{4}$  of total visits, of which 8% of the individuals accounted for  $\frac{1}{2}$  of total visits, of which 1.8% of the individuals accounted for  $\frac{1}{4}$  of total visits.

In other words, there was a small percentage of U.S.A. population who were in the position to utilize a high percentage of dental service and spent a fortune to pay for those services. From the Australian Health Survey,<sup>25</sup> 1977-1978, cost was not the main reason given for not having a dental visit within the previous 12 months period (ranked fourth only, the first being "nothing was wrong"). In the WHO study only a minority of

patients did not proceed with the treatment plan (1.1%), even after discussion of the fee. Only 1.9% of the patients had any loss of earnings, and only 5.4% gave economic reasons for not visiting a dentist. Although finance did not appear to be a major barrier, 48.4% desired lower fees.

Dental care is mainly provided through private practice (70%), government services (20%) and other institutions (10%). Payment of the service is mostly based on fee-for-service and payment is direct to the dentist in private practice. Third parties involved in financing dental services received in private practices may be:<sup>25</sup>

- Government (Department of Veteran Affairs, Armed Forces, Pensioners, Aborigines, Indigent persons).
- Non-profit Health Insurance
- Commercial Insurance
- Employers, employee groups or others.

By October 1978 approximately 2,613,000 persons were enrolled in 58 non-profit health insurance schemes with 6,590,000 persons covered for dental benefits (46% of total Australian population); with persons paying premiums and receiving rebates on the costs of dental treatment with private practitioners.

#### Time:

Most of the sample were able to make appointments within half a week (42.5%). The waiting time (once at the surgery) was relatively short (less than 15 minutes 35%, 15 minutes to half an hour; 30%), and the number of hours of employment lost for dental visits was less than 2 hours (3.2%) and 2 hours or more (10.8%)<sup>11</sup>.

### Spatial

The average distance to the surgery was 6.6 kms, and most persons used private car (70%), public transport (13%) or walked (13%).<sup>11</sup>

However even when adequate facilities are available without cost, eligible populations fail to accept needed care. Utilization for the employees of the U.S. Public Health Service and their families was reported to be less than 50%, and from St. Louis Labor Health Institute, it was only 27% during a test period.<sup>38</sup> From the Cutress Survey of Adults in New Zealand,<sup>41</sup> 1976, it was found that 15% of the sample ignored enrolling in Dental Benefits Scheme. Nikias<sup>47</sup> also found that elimination of the cost factor alone would not eliminate the differential use of dental service. It seems that financial, spatial and time factors are not major barriers to most Australians to receive dental services which they need.

### ACCEPTABILITY

7% of the students from the case study<sup>11</sup> ranked dentistry as a number one occupation, number two (52%), third by 24%, within a scale of 5 occupations.

From the WHO adult sample, 38% had high satisfaction in relation to dental health condition; 55% medium satisfaction, 6% low satisfaction and only 1% with very low satisfaction. Some 57.4% had made a dental visit in the previous 12 months in the adult group (74% for the students). From Australian Health Survey Data ('77-'78) 48.1% persons over 6 years old visited the dentist in a 12 months period, and for university student: 72%. (cf. U.S.A. National Survey: 46%).

Average visits/person was 2.8 (WHO study), 2.2 (A.N.U.), U.S.A. 3.5.

The decision to visit the dentist was usually made by the family (63%), 16% made the decision themselves, and for 21% of the students the decision was that of the dentist through the recall system. However, 45% of the students considered that the reason for their last visit to the dentist was an asymptomatic one. 38% of the students visited for asymptomatic reasons, and the most common of these was a toothache (for the adult sample, 63% of the sample gave symptomatic as the main reason for any visits to the dentist).

Type of treatments at last visit to dentist,<sup>11</sup> as follows:

|                | <u>Students</u> | <u>Adults</u> |
|----------------|-----------------|---------------|
| Diagnostic     | 57%             | 47.5%         |
| Fillings       | 48%             | 36.2%         |
| Extraction     | 20%             | 10.9%         |
| Preventive     | 20%             | 24.1%         |
| Orthodontic    | 7%              |               |
| Prosthetic     |                 | 5.5%          |
| Rehabilitative |                 | 4.6%          |

All these patterns were in the favour of the acceptance of preventive dentistry, not only by the customers (especially the younger generation), but by the providers as well. This is a good trend, because restorative dentistry seems to postpone rather than prevents the breakdown of the natural dentition.

Pain was anticipated by the majority of the students, only 19% did not, while the adult sample pain was one of the reasons given for avoiding dental visits (15.3% almost always avoided dental visits).

Recall system was widely practiced, 49% actively by the dentists, 37% if the patients requested in urban practices. (in rural: 40% and 37% respectively).

43.1% of adult users of dental services were classified recent- consistent- users, 14.3% were recent-intermittent users, and 40% were remote-multiple users (only 2.6% were classified as remote- one-time users.) It seemed that the dental service was well accepted, most of them visited more than once, and a great number of them were regular customers. However, only 6.8% considered public services were sufficient in the community. Almost 60% felt that they needed more dentists; that the dentists were seldom available when needed, and that dentists could almost always select the patients they want.

To change specific behaviour patterns or specific beliefs, Babson<sup>7</sup> suggested the education of health care consumers as well as the adaptation of health care services to differing cultural norms.

The study by Axelsson and Lindhe<sup>5</sup> in Sweden deserves more attention for adaptation to the Australian environment and the possibility of using dental therapists for adult patients.

## EFFECTIVENESS

### Oral health status

From the epidemiological point of view, the dental disease pattern in Australia was quite similar with U.S.A. 30 years ago. Water fluoridation firstly introduced in 1956 in Australia, and since then there has been a change in dental disease pattern. Martin & Barnard<sup>23</sup> analysis on 1963-1973 data showed the DMFT reduction between 46% (for 15 year olds) to 72% (for 7 year olds), and the DMFS reduction was between 44% to 76% respectively.

For primary teeth the dmft reduction was between 35% (for 9 years old) to 67% (for 4 years old) and the dfs reduction was between 33% to 83% respectively. The treatment needs were changed as well as a consequence:

If in 1963, 6 year olds needed 10.1 cavities to be restored and 2.3 teeth to be extracted, then in 1973 it was only 3.4 cavities to be restored and 0.6 teeth to be extracted. For 12 year olds 90% required restoration with 6.0 surfaces/child as average figure in 1963, it dropped to 66% required restoration with 3.2 surfaces/child in 1973. In the WHO study,<sup>11</sup> 13-14 year olds; 39.7% were free of basic treatment needs, determined by clinical examination, the average number of teeth which required treatment were 2.65 (2.49 for restorative treatment). For 35-44 year olds, 56.3% required restorative treatment.

Gingivitis is already found in the pre-school children, and by the time they are 12 years old, 10% have begun to show evidence of bone loss due to periodontal disease. By 17, 70% have calculus and over 10% have periodontal pockets.<sup>42</sup>

O.H.I. score for 8-9 year olds was 1.04-1.02 with P.I. score 0.55-0.53 and for 13-14 year olds O.H.I. score was 0.99-1.00 and P.I. score was 0.48-0.56, as found by Barnard in Darwin.<sup>29</sup>

Although it seems that the periodontal disease situation is not as grave or as bad as in U.K. sample which was examined by Sheiham,<sup>63</sup> (36% of the sample had periodontal pocket), periodontal disease has been too long obscured by dental caries problems. The extent and the destructive potential of periodontal disease should get more attention by the provider as well as by the consumer. Plaque control as implemented in one study in Sweden<sup>5</sup> seems to be promising and needs further study for

implementation in Australia.

Malocclusion, is also decreasing, in 1963 Angle class I was 74%, with Normal: 8% and in 1973 Angle class I was 62%, with Normal: 14%; without change in pattern in Class II and Class III.

In the WHO study,<sup>11</sup> 35.1% required corrective care, while 9.1% had or were receiving treatment.

The Department of Health<sup>1</sup> reported annually the percentage of caries reduction for 6-12 year olds in A.C.T. since water fluoridation was introduced there in 1967. The percentage reduction in 1968 was 17.5% (DT component only 34.7%), but in 1974 the figure was 61.6% (and DT: 76.2%).

The change in disease pattern resulted in the change of treatment needs and malocclusion as well (section 3.2.2). It certainly was not caused by water fluoridation alone because there were many factors contributing to the change among others:

- preventive dentistry was widely accepted by the professionals and the community to some extent;
- the community was better informed on dental health matters by dental health education programs and the communication media;
- the increasing useage of Fluoride preparations.

Almost 100% of the toothpaste available in the market contain fluoride. Barnard<sup>29</sup> found in the Darwin study: that 21% of the sample had received Prenatal Fluoride. 21% of the sample had received Fluoride supplement.

The gratifying situation is that younger generation seems to be more aware of the availability of preventive treatments as found by WHO study<sup>11</sup> in N.S.W. (45.9% of the sample expected preventive treatment would be given).

To increase further the utilization of preventive dentistry, it is worthwhile studying the system used in the Netherlands, that is Dental Fitness Card,<sup>6</sup> whereby everybody is compelled to be dentally fit if he wants to get the maximum benefits from his insurance company. Sustained personal effort in the pursuit of personal health must be rewarded with benefits sufficiently tangible that the individual can be convinced of the effort/benefit relationship.

Sugar consumption in Australia should get more attention as the average figure is very high (around 50 kg/capita, in U.S.A. Nizel<sup>48</sup> found in 1977: 128 pounds/capita). Russell<sup>60</sup> has demonstrated the relationship from the epidemiological point of view (low sugar consumption with low DMFT in the Far East, and high sugar consumption with high DMFT in South America). No preventive programs will be fully effective nor efficient when the community consumes great quantities of sugar in their diet.

If edentulousness is used as an indicator of the effectiveness of dental care, the Australian figure was 13% (WHO study, 1972), Barnard & Minn's<sup>24</sup> figure was 15% (1972), the difference was due to the age group of the sample (the first was up to 44, while the latter was up to 75). (U.S. figure was 13% in 1957-1958,<sup>38</sup> 11.2% by 1971, 10.6% in Baltimore<sup>31</sup> and in Canterbury, New Zealand it was 36%,<sup>10</sup> Trondelag, Norway was 6%,<sup>10</sup> and in Hanover, Germany, 2%<sup>10</sup>.)

#### EFFICIENCY

Establishing a dental practice in July 1980 would cost \$28,300, up 12.5% compared with 1979 figure (\$25,164) according to the Australian Dental Traders Association calculation. Hence the trend of group-practice in private practice (1978: 46.5%).

Barnard<sup>25</sup> estimated annual dental costs for:

| <u>Government services:</u> | <u>1976-1977</u> | <u>1977-1978</u> |
|-----------------------------|------------------|------------------|
| cost/person                 | \$45.02          | \$51.77          |
| cost/treatment              | \$13.27          | \$15.26          |
| <u>Private Practice:</u>    |                  |                  |
| cost/person                 |                  | \$54.10          |
| cost/treatment              |                  | \$15.90          |
| <u>Total N.S.W.:</u>        |                  |                  |
| cost/person                 |                  | \$53.75          |
| cost/treatment              |                  | \$15.81          |

From Survey of Health Expenditure:<sup>25</sup> dental expenditure: \$0.74/week/household. Payments of Dental Charges are net and exclude any refunds or expected refunds on the payments made. Estimated Dental Benefit Premium for 1977 was \$40 (for 35-45 year olds) and \$45 for 1978 (Barnard<sup>28</sup>).

WHO study<sup>11</sup> found that median payment by personal resources was: \$10.50/12 months (the total payment, including 3rd party premium was \$20.50).

Working hours of a dentist in private practice from WHO study was: 40.2 hours/week (in 1961: 45.5, 45.4 for employed dentists), with average of 37.9 hours/week for dental auxiliary.

In comparing the use of dental health services, some variables have been examined, such as:

predisposing variables:

- demographic factors: age, sex, marital status.
- social-structure factors: family size, social class, education and race.

enabling variables:

- family factors: income, voluntary health/dental health insurance.
- community factors affecting access to services (urban and rural).

perceived illness:

- such as dental health level and perception of symptoms.

However the reasons for the differences in the utilization rates are dependent on such factors as the age, sex, dental health facilities, prevalence levels, levels of education, family income and the perception of both the providers and recipients of dental services.

It is clear however that there is a large gap existing between the need for dental treatment and the demand for such treatment. Most of the samples studied were shown to be unaware of the existence of the dental disease. Thus an important factor in the utilization of dental services or non-utilization, must be an individual's awareness of his need to seek treatment. It seems however there are many persons who recognize that they need a dental visit but for many reasons do not translate this need into demand. Thus the utilization of dental services may be seen as being largely patient-initiated, it depends on voluntary and individual action. Knowledge of what to do is not enough, and it is important to study the factors involved in actualizing human behaviour. Rosenstock<sup>59</sup> hypothesized that a decision to make a preventive dental visit in the absence of symptoms or pain will not be made unless the following conditions are met:

1. An individual is psychologically ready to make a preventive dental visit. The extent of readiness to act is defined by whether the individual feels susceptible to dental disease and the extent to which its possible occurrence is viewed as having serious personal consequences.
2. An individual believes that the preventive visit is both possible and appropriate, that it would reduce either his perceived susceptibility to or the perceived severity of the condition and that no serious psychological barriers to the proposed action are present.
3. A cue or stimulus occurs to trigger the response.

From Kegeles<sup>58</sup> study it was found that his data indicated that most individuals perceive themselves to be susceptible to dental disease, but they do not perceive dental disease to be a serious problem. Since dental disease appears not to be very serious to the majority, actions to relieve dental problems are not considered important, even if most people do know the correct practice to follow.

It has long been known that people's beliefs, values and tradition may be antithetical to their seeking health service, even where the services are accessible and effective. Moreover, it is also known that many people do not voluntarily enter the dental care system as patients unless they are confronted with disabling symptoms in the form of toothache or pain, and yet the greatest potential contribution of the dental profession must be to prevent and detect dental disease in an early stage in addition to treating it. Therefore the dentist has the dual roles that is as an educator and a practitioner. So far, WHO study<sup>11</sup> has not informed how far dental utilization practices are affected by

the public's perception of dentists and of the messages which they deliver to the public.

Freeman and Lambert's<sup>58</sup> study showed a marked relationship between a mother's preventive dental behaviour and the use of private dentists for preventive check-ups for their children. Mothers who were prevention-oriented towards themselves were 9 times as likely to use private dentists for check-ups for their children. Kreisberg and Treiman<sup>67</sup> found that if parents go to the dentist for preventive treatment, a high percentage (79%) of their teenage children will do so (for both low and high income groups).

Metz and Richards<sup>57</sup> suggested that children's dental behaviour may be impervious to change if educational efforts are directed to children alone. Rayner<sup>56</sup> suggested that regardless of social class, education of mothers to provide good examples seemed to be the key to changing children's dental health practice. There should be some consideration on the validity of this suggestion by attempting a practical demonstration of such a method in improving dental utilization by children.

It is clear that the decision to seek dental care is a complex one and therefore the need now is to undertake further study in this field.

## 6. CONCLUSIONS

### AVAILABILITY:

1. The greater the time spent on preventive services the greater the beneficial effect to the consumer in terms of improving oral health status and comfort and well-being.

### ACCESSIBILITY:

1. To most Australians, time financial and spatial variables seems to be not major barriers to have access to dental services to meet their needs.
2. Equal access to dental services does not correlate with its utilization, which varies with socio-economic, education, age and sex variables.

### ACCEPTABILITY

1. There is a tendency of greater acceptability of preventive dentistry in the Australian community as well as in dental profession, especially in the younger generation.
2. The greater the acceptability of preventive dentistry to the community the greater the beneficial effect to the consumer.

### EFFECTIVENESS

Australia has shown the early signs of the benefits of the implementation of preventive dentistry by the provider and the consumer by the facts of improving oral disease patterns and dental treatment needs.

### SUGGESTIONS

1. Primary health care and dental care are provided best through health centre type of organizations with good referral systems to more sophisticated district or regional

hospital.

2. Dental clinic should be an integral part of every general hospital.
3. Dental Health Education should be included in every dental care program.
4. An effective dental health education program should give primary attention to the factors involved in actualizing human behaviour rather than to the mere information of scientifically accurate information.
5. Since parents and home appear to be the primary source of dental information, dental health education program focussed on the family as a unit deserves more attention.
6. To encourage the utilization of preventive services, the maximum possible refund should be structured in dental insurance scheme.
7. There should be a concerted campaign at national level to decrease sugar consumption in Australia by A.D.A., A.M.A. and National Health and Medical Research Council.

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